Course Code:	USCS501
Course Type:	Core Subject
Course Name:	Artificial Intelligence

Unit No: I

- Define AI. State its applications.

- What is AI? Write about the History of AI.

- State different foundations that led to the growth of AI.

- What is PEAS? Explain with two suitable examples.

- Define heuristic function. Give an example heuristic function for solving an 8-puzzle problem.

- Write states, Initial States, Actions, Transition Model and Goal test to formulate 8 Queens problem.

- Write states, Initial States, Actions, Transition Model and Goal test to formulate Toy problem.

- Explain following task environments.
a) Discrete Vs Continuous
b) Known Vs Unknown
c) Single Agent vs. Multiagent
d) Episodic vs. Sequential
e) Deterministic vs. Stochastic
f) Fully observable vs. partially observable

- Explain Simple Reflex Agent.

- Explain Model Based Agent.

- Describe Utility based agent.

- Describe Goal based agent.

- Describe a Learning agent in detail.

- Explain Depth First Search (DFS) strategy in detail.

- Explain Breadth First Search (BFS) strategy along with its pseudocode.

- Explain Uniform Cost Search with suitable examples.

- Write a short note on Depth Limited Search Strategy.

- Write a short note on Iterative Deepening Depth First Search Strategy.

- Write a short note on Bidirectional Search.

- Explain Thinking rationally and acting rationally approaches of AI.

- Write a short note on Thinking Humanly and Acting Humanly approaches of AI.

- Describe problem formulation of vacuum world problem.

- Explain Artificial Intelligence with the Turing Test approach.

- What are PEAS? Mention it for Part picking robot and Medical Diagnosis system.

- Sketch and explain the agent structure in detail.

- Explain A* search Algorithm. Also explain conditions of optimality of A*.

- Explain Greedy Best First Search Strategy.

- Explain Recursive Best-First search algorithm.

- Define AI. Explain different components of AI.

- What are various informed search techniques? Explain in detail.

- What are various uninformed search techniques? Explain in detail.

- Give the difference between DFS and BFS.

- What is an Agent? Describe structure of intelligent agents.

- Give the difference between Unidirectional and Bidirectional search methods.

Unit No: II

- What is Knowledge Representation? What are different kinds of knowledge that need to be represented?

- Write a short note on the AI Knowledge cycle.

- Explain following knowledge representation technique -
a) Logical Representation
b) Semantic Network Representation
c) Frame Representation
d) Production Rules

- Write a short note on Propositional Logic.

- Explain the concept of First Order Logic in AI.

- Write note on -
a) Universal Quantifier
b) Existential Quantifier

- Write a short note on Support Vector Machines

- What is an Artificial Neural Network?

- What is entropy? How do we calculate it?

- What are the similarities and differences between Reinforcement learning and supervised learning?

- Explain Single-layer feed forward neural networks.

- Write a short note on Multilayer feed forward neural networks.

- Explain the Restaurant wait problem with respect to decision trees representation.

- What is Backpropagation Neural Network?

- What is an artificial neuron? Explain its structures.

- Write a note on Supervised Learning.

- Write a note on the Nearest Neighbour model.

- Write a note on overfitting in the decision tree.

- Differentiate between Supervised & Unsupervised Learning.

- Differentiate between Linear Regression & Logistic Regression.

- What is propositional Logic in AI?

- Explain Entropy, Information Gain & Overfitting in Decision tree.

- Discuss different forms of learning Models.

- Discuss different forms of Machine Learning.

- Write a note on K-Nearest Neighbours.

- Describe Reasoning in First Order Logic (FOL).

- What are the logical connectives used in Propositional logic?

- What are the types of Quantifiers used in First order Logic?

- Write a short note on Deductive Reasoning

- How is reasoning done using Abductive Reasoning?

- Write a short note on Inductive Reasoning.

- Explain Modus Ponens with an example

- What are the main components of PDDL?

- What is the role of planning in Artificial Intelligence?

- Explain the concept of Fuzzy logic.

- What are the various types of operations which can be performed on Fuzzy Sets?

- Explain the architecture of the Fuzzy Logic System.

- Explain any 5 membership functions of Fuzzy Logic Systems.

- Explain Defuzzification process using any suitable method

- What are Parametric models? Give their advantages

- Explain the non-parametric models.

- Explain the concept of Classification used in Machine learning

- What is Regression? What are its types?

- Explain the following -
a) Simple Linear Regression
b) Multiple Linear Regression

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   c) Polynomial Regression

   d) Logistic Regression

- What is Bias? What is Variance? What is Bias/Variance Trade-off?

- What do you mean by Regularization? How does it work?

- Explain the following-

a) Ridge Regression (L2 Norm)

b) Lasso Regression (L1 Norm)

- Describe the Ensemble learning.

- What is Gradient Descent? How does it work?

Unit No: III

- Write a short note on statistical learning.

- Explain Bayesian Learning with an example.

- What is an EM algorithm? What are its steps?

- Explain Maximum-likelihood parameter learning for Continuous models.

- Write a short note on temporal difference learning.

- Explain the concept of Reinforcement Learning.

- Explain applications of Reinforcement Learning.

- Write a short note on Passive Reinforcement Learning.

- Write a note on Naive Bayes models.

- Write a short note on the Hidden Markov Model.

- Explain the concept of Unsupervised Learning.

- What are hidden variables or Latent Variables? Explain with examples.

- Describe adaptive Dynamic programming.

- Explain Q- Learning in detail.

- What is Association rule mining?

- What are the metrics used to evaluate the strength of Association Rule Mining?

- Explain the following with respect to Association Rule Mining:
a) Support
b) Confidence
c) Lift

Course Code:	USCS502
Course Type:	Core Subject
Course Name:	Information & Network Security

Unit No. I

- Explain the architecture of OSI security.

- Describe the Security Requirements Triad.

- Explain the CIA Triad.

- Define attacks. Explain its types.

- Explain Passive attacks in detail

- What are active attacks?

- What are X.800 Security Services?

- What are various Security mechanisms available?

- Explain X.800 Security mechanism in detail.

- Explain Symmetric Cipher Model

- Explain Principles of Public-Key Cryptosystems.

- Explain Substitution Techniques in detail.

- Write a short note on Play fair cipher.

- Explain Mono-Alphabetic Cipher with an example.

- Explain Transposition Techniques.

- Write a short note on Steganography.

- Describe the Feistel Structure of Encryption & Decryption.

- Explain Data Encryption Standard (DES) in detail.

- Explain Triple DES in detail.

- Explain AES Encryption & Decryption in detail.

- Write a short note on the Electronic Code Book (ECB).

- Explain cipher block chaining & cipher feedback mode.

- What are the different modes of operation in DES?

- Explain RSA algorithm in detail.

- Perform encryption and decryption using RSA Algorithm for the following. P=17; q=11; e=7; M=88.

- Perform encryption and decryption using RSA Algorithm for the following. P=7; q=11; e=17; M=8

- List the parameters for the three AES version?

Unit No: II

- Explain Diffie-Hellman Key Exchange.

- Explain Public-Key Cryptosystems.

- User A & B exchange the key using Diffie Hellman alg. Assume á=5 q=11 XA=2 XB=3. Find YA, YB, K.

- User Alice & Bob exchange the key using Diffie Hellman alg. Assume α=5 q=83 XA=6 XB=10. Find YA, YB, K.

- Explain the use of Hash function

- State various applications of Cryptographic Hash Functions.

- What is known as Message Authentication Codes (MAC).

- Write a short note on MD5 algorithm.

- Explain the Secure Hash Algorithm (SHA) in detail.

- What do you mean by Digital Signatures?

- Describe the Generic Model of Digital Signature process.

- Explain the two approaches of Digital Signatures.

- Describe a simple key distribution Scenario in detail.

- Explain Public Key Distribution scenario in detail.

- Describe X.509 Certificate format.

- Explain PKIX Architectural Model.

- Explain Public key Infrastructure in detail.

- Explain Kerberos in detail.

- Describe the working of Kerberos in depth.

Unit No: III

- What are Firewalls? Explain the Types of Firewalls.

- Explain Secure Electronic Transaction.

- Explain Intrusion Detection systems.

- Explain SSL in detail.

- Explain Firewall Design Principles ☐ Explain the Principles of Firewall Design.

- Explain the importance of web security.

- Explain Viruses and threats.

- Explain DDOS.

- Write a short note on PGP.

- Write a short note on S/MIME.

- Explain IP Security Architecture.

- What is encapsulating security payload in IP Security?

- Discuss web security Considerations.

- Write a short note on Secure Socket Layer.

- Write in brief about Transport Layer Security.

- Differentiate between IDS & IPS.

- What are the types of Intrusion Detection systems?

- What is Malicious Mobile Code?

- Define Virus. State its types of Viruses.

- Write a short note on Honeypots.

Course Code:	USCS5031
Course Type:	Skill Enhancement Elective 1
Course Name:	Linux Server Administration

Unit No: I

- Explain the steps to create a physical volume in linux.

- Explain init Daemon in linux systems.

- What is User Management tools? Explain any three command line tools.

- Explain use of following files with its fields:
a) /etc/passwd
b) /etc/shadow
c) /etc/group

- What are chains? Explain the five predefined chains in Netfilter.

- Explain the commands for building and compiling a kernel?

- Write a short note on the booting process in Linux.

- How does the TCP protocol work? Explain in detail.

- Explain IPv4 Header with neat and labelled diagram.

- Explain ext3 file system in Linux.

- Explain ARP protocol

- Explain chain with neat and labelled diagram.

- Explain with example concept in subnetting.

- List and explain network security tools to help monitor your system.

- Explain grub.conf file with its parameters.

- What is runlevel? What are different runlevels provided by Linux? Explain with /etc/inittab file.

- Explain steps how to configure Netfilter.

- How to manage software using rpm command. Explain in brief with its options.

- What is the use service and config command. Explain with example.

- Explain complete process of how TCP connection works?

- Diagrammatically explain various steps involved in creating a logical volume with commands.

- What is the importance of /etc/fstab in linux file system.

Unit No: II

- List and explain different types of domain name servers.

- What is DNS Server? Explain how it works.

- Explain operation mode of FTP protocol.

- Write a short note on vsftpd.conf file.

- What is Apache web server? Explain its various modules.

- Explain working and advantages of using Apache web server.

- Write a short note on Kerberos.

- How user management helps to secure Linux server from security threats?

- Explain the procedure to install and configure Kerberos server and client?

- Explain the working of LDAP protocol.

- Write a short note on SMTP protocol.

- Explain installing process of Postfix server.

- What is SSH Client? Explain their vendors.

- Describe secure shell (SSH) client program of OpenSSH.

- Write a short note on SSHD Configuration file.

- List and explain the key components (MUA ,MDA,MTA) that are essential for email to work. Explain in short

- Differentiate between IMAP and POP3 protocol.

- Explain steps to install and configure sendmail server.

- List & explain common record types for DNS Server.

- Explain the following files
a./etc/resolv.conf
b./etc/nsswitch.conf
c./etc/hosts

- Write the purpose of the following parameters of vsftpd.conf file
    a. anonymous_enable
    b. write_enable
    c. ftpd_banner
    d. Local_umask
    e. anon_upload_enable

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- Explain how to disable anonymous FTP.

- Write the purpose of any five Global Configuration Directives of httpd.conf.

- List and explain configuration options available in sshd_config file.

Unit No: III

- What is NFS? Discuss features of various NFS Version.

- What is NFS? Explain any five RPC processes in NFS.

- Explain /etc/exports configuration file of NFS Server.

- Explain Samba daemons in details.

- How to handle username and password issues in samba heterogeneous environment?

- Differentiate between traditional network file server and distributed file system.

- Explain various implementations of DFS.

- What is NIS? Discuss NIS daemons and processes.

- Describe the process of configuring an NIS Client.

- What is LDAP? Explain LDAP uses and features.

- Write a short note on OpenLDAP utilities.

- What is DHCP? Explain working of DHCP.

- Explain configuration process of the DHCP Server.

- How the public key infrastructure is setup for VPN?

- State and explain steps of LAMP installation?

- What is OpenLDAP Server? Explain how to install and configure OpenLDAP server?

- Explain the smbclient and smbmount commands with suitable example.

- Explain different sections of samba configuration file

- Explain steps to create share in Samba.

- Explain the importance 0f LDAP? Generate LDAP tree for tycs.mu.ac.in?

- Explain the servers required for running chat applications.
- IRC Server
- Jabbar Instant Messaging Server

- Explain steps to configure NIS Server.

- Define MySql. Explain steps involved in installing and configuring mysql server and phpmyadmin.

Course Code:	USCS5032
Course Type:	Skill Enhancement Elective 1
Course Name:	Software Testing & Quality Assurance

Unit No: I

- What is software testing? Discuss the need of software testing.

- What is quality? Discuss various quality factors.

- Elaborate the difference between QA and QC in detail.

- Discuss about quality control process

- Illustrate the concept of software quality assurance.

- What are Software quality factors? Explain their impact on testing.

- Discuss the Role of testing in each phase of software development life cycle.

- What is quality assurance? Write down the purpose of the quality assurance.

- Differentiate between verification and validation.

- What is software review? List different types of it and explain.
- Discuss different types of software reviews.

- Differentiate between Inspection and walkthrough

- What is the role of the software quality assurance (SQA) group?

- Explain the concepts of Software Review, Inspection and walkthrough.

- Write a short note on software testing and its need.

- Differentiate between Quality Assurance and Quality Control

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- Explain in details McCall's Quality factor.

- Write in brief about QA, QC and QM

- Distinguish between Quality Assurance and Quality control.

- Explain the need of testing.

- What are the various nature of error?

- Write a short note on SQA plan.

- Differentiate between validation and verification.

- Explain different phases of SDLC

- Explain the role of testing in each phase of SDLC.

- Explain any five desirable software qualities.

- Give the concept of inspection, walkthrough and software review

- Write a short note on V-V model of software testing.

- List and explain goals and objective of SQA.

- Define quality and explain software quality attributes.

- Define the terms: error, fault and failure.

- State the objective of testing.

- What is software review? Explain the types of review?

Unit No: II

- What is White Box testing and Black Box testing?
- Discuss in details Experience Based Testing.
- Explain test case template. Design test case for login page.
- What is software testing? Explain testing principles.
- Explain SQA plan in detail.
- Explain BVA and Equivalence Partitioning.
- Explain unit testing in details

- Explain validation testing and its requirement?

- Explain software metrics and its importance

- What is integration testing? Explain its various types.

- Write a short note on system testing.

- What is smoke testing and its benefits?

- What are test plans and test cases? Explain with example.

- Explain cyclomatic complexity with example.

- Write a short note on black box testing.

- Distinguish between structural and functional testing.

- Write a short note on white box testing.

- Explain unit testing in detail.

- Explain integration testing and its various types in details.

- What are the various approaches of integration testing and the challenges

- What is validation testing?

- Difference between alpha beta testing.

- Define software metrics and its importance.

- What is complexity metrics and their significance in testing

- Discuss "strategic approach to software testing."

- Define software metrics. Give its purpose. Explain its types.

- Explain top-down integration testing.

- Explain bottom-up integration testing.

- What is system testing? List its various types. Explain any two in short.

- What is error guessing?

- Explain exploratory testing in detail.

- What is check list testing?

- What is equivalence testing.

- Write a short note on boundary value testing and decision table testing.

- Explain state transition testing.

- Write a note on basic path testing.

- Write a note on branch testing.

- Write a note on basic path statement testing.
- What is smoke testing and its purpose and benefits.
- Explain categories of software metrics.
- Write in brief about test case design. Give example.
- Discuss levels of testing.
- What are coverage criteria? list and explain any two coverage criteria in short.
- Write a short note on regression testing.

Unit No: III

- Explain in detail SQA challenges.
- Explain the defect management process in detail with a neat diagram.
- Explain formal technical review and its benefits in detail.
- List quality improvement methodologies and explain any three in detail.
- Explain software metrics and its importance.
- Explain cyclomatic complexity with an example.
- State types of quality costs. Explain any one in detail.
- Write a short note on ISO 9000 standards.
- Explain the process of software review in detail.
- Discuss phases of formal review.
- Write in brief about defect life cycle.
- Write a short note on software reliability.
- What are quality improvement tools? List and explain any two.
- Explain scatter diagrams in details.
- Short note on six sigma and kaizen.
- Explain cause and effect diagrams.
- Explain run charts.
- What is defect? List and explain common types of defect.
- Explain the concept of quality.
- List and explain various challenges faced by SQA.

- Explain Rate of occurrence of failure.
- Explain Probability of Failure on Demand.
- What is TQM?
- Explain pareto diagram with example.
- Define six sigma. Explain its basic steps.
- Discuss formal technical review in details.
- Explain the steps of defect management process.
- What is the format of defect report? Explain
- Discuss types of software quality factors.
- List types of quality cost. Explain in details.
- How to measure quality cost?
- Explain the following: a) ISO b) ISO 9000 c) ISO 9000 series
- What is the measure of reliability and availability? Explain.
- What are the advantages of ISO 9000 standards?
- List various methodologies to quality improvement. Explain any four.
- Short note on run chart
- Write a short note on cause-and-effect diagrams.
- Discuss any 5 guidelines for formal technical review.
- What are the elements of software reliability? State factors affecting it.
- Write in brief any three-reliability metrics.
- How to use defect for process improvement.
- Explain defect life cycle
- Discuss how reliability changes over the lifetime of a software product and a hardware product.

Course Code:	USCS5041
Course Type:	Skill Enhancement Elective 2
Course Name:	Cyber Forensics

Unit No: I

- What is Cyber forensics? Explain Need of it.

- Write a note on Forensic Triad.

- Explain Role of maintaining Professional Conduct in cybercrime investigation

- State and Explain steps in Computer/Cyber Forensic Investigation Process.

- Explain procedures for private sector High-Tech Investigations as an Investigator.

- How to set up your workstation for digital Forensics?

- Write a note on Digital Evidence

- Explain Storage Formats for Digital Evidence.

- Explain in detail the field of digital forensics.

- Briefly explain how to prepare for computer investigations.

- Differentiate between public-sector and private-sector investigations.

- Explain the importance of maintaining professional conduct.

- Summarize how to prepare a digital forensics investigation by taking a systematic approach.

- What are the required procedures for private-sector digital investigations?

- Explain the necessary requirements for data recovery workstations and software.

- What are the certification requirements for digital forensics labs?

- Describe all the physical requirements for a digital forensics lab.

- Explain the criteria for selecting a basic forensic workstation.

- Describe the components used to build a business case for developing a forensics lab.

- List the digital evidence storage formats?

- Explain the methods to determine the best acquisition method.

- What is contingency planning for data acquisitions?

- Describe various methods on how to use acquisition tools.

- Describe RAID acquisition methods.

- Briefly explain how to use remote network acquisition tools.

- List other forensics tools available for data acquisitions.

- Explain the following terms:
  1) Raw Format
  2) Proprietary Format
  3) Advance Forensic Format

- How to determine the best Data Acquisition Method?

- Explain Types of Acquisition methods.

- What do you understand about Contingency Planning for Image Acquisitions?

- List and Explain Different Acquisition Tools.

Unit No: II

- Write a note on Identifying Digital Evidence.

- Explain the steps involved in preparing for search and seizure of computers or digital devices in digital investigations?

- What are the best ways to determine the tools you need for digital Investigation.

- Write a note on Securing a Digital Incident or Crime scene.

- Explain Processing incident or crime scene.

- Write a note on Storing Digital Evidence.

- How to Document the Evidence? What are the precautions needs to take during Documenting Evidence.

- Explain Types of Digital Forensics Tools.

- Write a note on Determining what data to collect and analyse during computer forensics analysis and Validation.

- Explain different types of Computer forensic tools.

- Write a note on data hiding techniques in detail.

- Write a note on recovering graphic files.

- Explain implementation of steganography in graphics files.

- Describe how to collect evidence at private-sector from incident scenes.

- What are the guidelines for processing law enforcement crime scenes?

- What are the steps in preparing for an evidence search?

- Describe how to secure a computer incident or crime scene.

- Explain the necessary guidelines for seizing digital evidence at a crime scene.

- What are the procedures for storing digital evidence?

- Explain how to obtain a digital hash.

- Explain how to evaluate needs for digital forensics tools.

- Describe available digital forensics software tools.

- What are the basic considerations for digital forensics hardware tools?

- What are the methods for validating and testing forensics tools?

- Describe the types of graphics in file formats.

- Explain types of data compression.

- Explain how to locate and recover graphics files.

- What is the process in identifying unknown file formats?

- How do we determine the data to analyse in a digital forensics investigation?

- Explain tools used to validate data.

- Explain common data-hiding techniques.

- Describe Linux file structures.

- Briefly explain copyright issues with graphics.

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<u>Unit No: III</u>

- What are Network Forensics?

- Explain Standard procedures for Network Forensics.

- Explain Network forensics Tools.

- How to select tool for Live Response?

- Explain Network Forensics Tools Collection best practices.

- How to perform Live data Collection on Microsoft windows System?

- How to perform Live data Collection on Unix-Based System?

- Explain the role of Email in Investigations.

- Write a note on Email Headers.

- Explain Tools and techniques to investigate Email messages.

- Explain Email Forensics Tools.

- Explain Acquisition procedures for mobile devices.

- Write a note on SIM card.

- Explain importance of Investigation Reports.

- What are the Guidelines Need to be followed for Writing Reports?

- Explain Reporting Standards.

- What are the standard procedures for conducting forensic analysis of virtual machines?

- Describe the process of performing a live acquisition of a system.

- Explain how network intrusions and unauthorized access can be investigated through network forensics expert.

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- What are some standard procedures and tools used in network forensics?

- What is the role of email in digital investigations?

- Explain the difference between email clients and servers.

- What techniques can be used to investigate email crimes or policy violations?

- How can email server logs be used in an investigation?

- Give examples of specialized email forensic tools and their use.

- Briefly explain how digital forensics can be applied to social media investigations.

- What are some basic concepts of mobile device forensics?

- Describe the procedures for acquiring forensic data from mobile devices.

- What are some challenges with acquiring IoT device data forensically?

- Explain the importance of report writing in forensic investigations.

- What should be included in a forensic investigation report?

- How can forensic tools assist in generating investigative reports?

- What are the guidelines for providing witness testimony?

- What should be done to prepare for testifying in court?

- How does testimony in depositions differ from court?

- What rules apply when testifying in hearings?

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Course Code:	USCS5042
Course Type:	Skill Enhancement Elective 2
Course Name:	Game Programming

Unit No: I

- Explain the following terms:
  a) Position Vectors   b) Unit Vectors   c) Cartesian Vectors

- Explain how the dot product is useful in calculating lighting of an object.

- Explain in detail Dot or Scalar products with suitable examples.

- How does Dot product help in Back Face Detection?

- What is the back face detection problem? State and explain how dot product is used to calculate back face detection.

- Explain 3D translation, 3D scaling with suitable examples.

- Write a short note on 3D rotation.

- Write a short note on lighting.

- Explain the concept of Shader Models.

- Explain Dot and Scalar product with examples.

- Explain the concept of Colour in 3D Modelling and rendering.

- Explain how the dot product is useful in back face detection of an object.

- Define Quaternions. Explain addition and subtraction of two Quaternions.

- Write a note on perspective projection.

- Drive on unit normal vector for a triangle.

- Explain how dot product is used in calculation of back face detection.

- Write a short note on change of axes.

- Explain Ambient, diffuse and specular lights in detail.

- Explain types of parallel projections.

- Explain 2D reflection and 2D shearing

- Write a short note on homogeneous Coordinate system

- Write a short note on Direction cosines

- What is interpolation? Explain linear interpolation in detail.

- Explain culling and clipping in detail.

- Write a short note on RayTracing.

- Explain 3D modelling and rendering engines.

- Write a short note on trigonometric interpolation.

- Write a short note on Cubic interpolation.

- Given a square with coordinate points A(0, 3), B(3, 3), C(3, 0), D(0, 0). Apply the translation with distance 1 towards X axis and 1 towards Y axis.   Obtain the new coordinates of the square.

- Explain 2D scaling with examples.

- Define Lighting. Explain the following lightning
  a. point light   b. Directional light   c. Spot light

- Given a light source at (20,20,40) and the illuminated source as (0,10,0) and unit vector n (0,1,0) check the visibility of the object.

- Explain in detail Cross or Vector product with suitable example.

- State the difference between dot product and cross product of vectors.

- How does Dot product help in Light Intensity calculation?

- Explain how the dot product is useful in calculating lighting of an object.

- Explain in detail Direction Cosine.
- write a short note on direction cosines.

- Explain Rotation in Brief.

- Explain Shearing in Brief.

- Explain Reflection in Brief.

- Explain Scaling in Brief

- Explain Translation in Brief.

- Explain Direction Cosine with an Example.

- Explain 2D Transformations with an Example

- Explain 3D Transformations with an Example.

- How to Calculate 2D Areas.

- Explain Vectors/Vector Notation.

- Consider x and y values and find the vector tails and then measure its components.

- Consider x and y values and find the Vector Addition and Subtraction

- Short note on the following:
1. Position Vectors
2. Unit Vectors
3. Cartesian Vectors
4. Vector Multiplication

5. Scalar Product
6. Dot Product in Back-Face Detection
7. Matrices
8. Homogeneous Coordinates
9. Determinants and Transforming Vector
10. Shader Models
11. Lighting, Color
12. Texturing, Camera and Projections
13. Culling and Clipping.
14. Character Animation
15. Physics-based Simulation
16. Scene Graphs.

Unit No: II

- Explain the game engine architecture.

- Explain in detail the main components of the game engine.

- Explain the concept of swap chain and page flipping.

- Explain in detail about COM.

- What is COM? Explain the texture and resources format in DirectX.

- Explain the game development techniques with pygame.

- Explain multisampling theory.

- Explain the concept of game view?

- Explain depth buffering.

- List down the advantages and disadvantages of game engines.

- Explain game engine tasks.

- Explain any 2-game development SDK available in the market.

- Brief about game loop in Pygame.

- Explain in brief game logic and its subsystems.

- Explain the texture and resources format in DirectX.

- With respect to Pygame state and explain how to create game window, create character and perform character movement.

- Explain about feature levels in Direct3D.

- Brief about Direct3D. How to setup in Visual studio environment.

- Explain 2D Game Development with Pygame.

- Explain 2D Game Development with Numpy.

- Explain Pygame music and mixer module

- Explain in detail Game Development with Ursina.

- Explain in detail how to perform animation with game object of in Pygame.

- State and explain different types of game engines.

- Explain the structure of Pygame .

- Explain Following function in pygame with example.
  1. pygame.init():
  2. pygame.display.set_mode()
  3. pygame.display.set_caption():
  4. pygame.QUIT:

- How to load image in pygame? Explain with examples.

- Explain the texture and resources format in DirectX.

- Describe Feature Levels Game.

- Explain OpenGL in detail.

- Explain Multisampling Theory.

- Explain Texture Resource Views.

- Write about swap chain and Page flipping.

- Discuss COM, Textures and Resources Formats

- Explain Game logic in detail.

- Explain Resources and File systems.

- Write a short note on Engine support systems.

- Describe Game engine architecture.

Unit No: III

- Explain the Unity Development Environment.

- Explain the Rigid-body components in Unity.

- Explain the concept of Unity Colliders.

- Explain the concept of Animation in Unity.

- Explain how to publish games and build settings in Unity.

- Explain the term Scripting in Unity.

- Explain the concept of Prefabs in Unity.

- State the difference between Update(), FixedUpdate() and start() methods in Unity script.

- Explain the concept of Sprites.

- Explain the following Unity concept terms: -
       a) Game object   b) Scene

- Write in brief about Asset store in Unity.

- Define the terms Assets and Materials in the Unity environment.

- Explain how physics materials are applied onto game object

- Explain about scripting collision events in Unity.

- Explain the primitive data types in Unity.

- Explain the canvas screen space in Unity.

- Explain the decision control statements in Unity.

- Explain the looping statements in Unity.

- Explain Audio source in Unity.

- Explain the use of key inputs in Unity.

- Describe about the UI elements in Unity.

- Write in brief about Particle effect in Unity.

- Explain unity software interface.

- Explain the steps to attach a script to a game object.

- Write a short note on Rect Transform.

- Write a short note on the physics component in unity.

- Explain in brief the steps of creating a game in unity.

- Explain the concept of multi scenes.

- Explain methods used for collision detection in unity.

- Explain various input handling events in unity.

Course Code:	USCS5051
Course Type:	Generic Elective
Course Name:	Project Management

Unit No: I

- What is a project? How to manage the project at company level.

- What are the needs of project management?

- What is a project? Explain its Characteristics.

- Explain Importance of Project management.

- Explain the project management process in detail.

- What are the different criteria and methods of project selection.

- How to identify and analyse the project stakeholders.

- Explain WBS development with an example.

- What are the project goals? Explain.

- What is EVM? Explain in detail.

- Discuss the different cost estimation techniques?

- What is project charter development?

- How to estimate the project activity duration and resources.

- Write a short note on project selection criteria.

- Explain project selection methods.

- Write a short note on stakeholder identification and analysis.

- What is the purpose of scope planning in project management? how does it contribute to successful project execution.

- Write a short note on work breakdown structure development.

- Write a short note on scope verification and change control.

- What is the purpose of activity definition in project management? How does it contribute to project planning and execution.

- What is the significance of estimating activity duration and resources in project management?

- Describe the process of defining project activities and their sequencing.

- What is the primary goal of schedule control and monitoring in project management and how does it contribute to project success?

- How to develop the project schedule?

- Write a short note on cost estimation techniques.

- Write a short note on budget development and monitoring.

- Explain the difference between cost control and cost analysis.

- What is the importance of cost control and analysis in project management?

- What is project management? Explain any 5 characteristics of project management.

- Explain any 5 Tools and Techniques for Activity Duration Estimating.

- What is the budget development process? Explain 7 types of budgeting

- What is a project schedule? Explain any 5 steps to create project schedule.

- What is cost estimate method in project management? Explain any 5 methods of cost estimation.

Unit No: II

- Explain six sigma concepts in details.

- What are the different quality planning and standards?

- Explain Risk identification and assessment in detail.

- What is procurement planning? Explain different kinds of contract. Types.

- How can project team members are sharing their opinion related to project in details.

- Explain project integration process in detail.

- Explain project integration activities.

- What is the different conflicts resolution in communication management?

- Explain the terms:
a) Change management
b) Project closure
c) Vendor management

- Explain the project improvement process in detail.

- Write a short note on response planning.

- How to identify and evaluate risk during different project phases?

- How do risk monitoring and control strategies influence the oral success of a project.

- How does effective team development contribute to the overall success of a project?

- Write a short note on staffing.

- How does effective communication management contribute to the oral success of the project?

- Explain different contract types in project management.

- What are the project integration process and activities in project management?

- What is the role of change management in the success execution of a project?

- How can lessons learned from previous projects influence the decision-making process in current projects?

- Explain Quality assurance in project management in Detail.

- What is Six sigma concept? Explain Six sigma concept in detail.

- Explain Risk monitoring and control.

- What is Procurement planning? Explain contract types.

- What is relationship building? Explain the same.

- What is source selection? Explain the same concept.

- What is change management? Explain the concept of knowledge transfer.

Unit No III

- What is the Agile project charter? how to create one?

- Write a short note on continuous integration and continuous delivery.

- What are the benefits of using virtual and distributed teams in project management?

- What are the different types of leadership?

- Why are leadership qualities valuable in project management and why are they important for project managers' success?

- How to form a high performing project team in project management?

- Explain motivation techniques.

- Explain emotional intelligence in project management.

- How emotional intelligence influences communication, conflict resolution and team dynamics?

- Explain ethical considerations in project management.

- What is the purpose of project government structures and accountability?

- What are the difference principles of Agile project?

- Explain the role of technology in project management.

- Explain different tools for project collaboration.

- What are the different leadership style and Characteristics of project management.

- Explain the benefits of virtual teams.

- Explain Agile project planning and its execution in details.

- How negotiation conflict will be resolve between team members in any project? Explain.

- What are the different professionals' responsibilities of project team members.

- Write a short note on incremental development model.

- Role of technology in project management explain in brief.

- What are the different Tools and software used for project planning explain it in brief.

- Explain the Leadership styles and characteristics.

- Write a short note on Conflict resolution.

- Write a short note on negotiation skills.

- What is Emotional intelligence in project management? Explain the same.

- Explain Ethical considerations in project management

- Explain Professional responsibility and codes of conduct.

Course Code:	USCS5052
Course Type:	Generic Elective
Course Name:	Operations Research

Unit No: I

- Discuss the models and modelling in Operation Research.

- What are the advantages and limitations of linear programming.

- Use simplex method to solve the following LPP.
  Max $Z = 3x_1 + 7x_2$
  Subject to constraints
  $$2x_1 + 5x_2 \leq 20$$
  $$x_1 + 2x_2 \leq 4, \quad x_1, x_2 \geq 0$$

- ABC Ltd. Manufactures two products P and Q. Profit per unit for P and Q is Rs. 40 and Rs. 80 respectively. One unit of P requires 2 machine hours and one unit of Q requires 3 machine hours. Availability of machine hours is 48. Maximum market demand for P is 15 units and for Q is 10 units. Formulate as LPP and solve by graphical method to obtain maximum total profit.

- Discuss about the application areas of LPP.

- Explain the use of slack, surplus and artificial variables in simplex method and explain what is redundant constraint in graphical solution.

- Explain the general structure of LPP.

- Discuss about the computer software in operation research.

- Discuss on the principle of complementary slackness.

- What are the features of operation research approach.

- Solve the following by simplex method

$$\text{Max } Z = x_1 - 3x_2 + 2x_3$$
$$\text{subject to } 3x_1 - x_2 + 3x_3 \leq 7$$
$$-2x_1 + 4x_2 \leq 12$$
$$-4x_1 + 3x_2 + 8x_3 \leq 10$$
$$\text{and} \quad x_1, x_2, x_3 \geq 0$$

- What is the role of operations research in decision-making?

- A company has two plants, each of which produces and supplies two products: A and B. The plants can each work up to 16 hours a day. In plant 1, it takes three hours to prepare and pack 1,000 gallons of A and one hour to prepare and pack one quintal of B. In plant 2, it takes two hours to prepare and pack 1,000 gallons of A and 1.5 hours to prepare and pack a quintal of B. In plant 1, it costs Rs 15,000 to prepare and pack 1,000 gallons of A and Rs 28,000 to prepare and pack a quintal of B, whereas in plant 2 these costs are Rs 18,000 and Rs 26,000, respectively. The company is obliged to produce daily at least 10 thousand gallons of A and 8 quintals of B. Formulate this problem as an LP model to find out as to how the company should organize its production
    so that the required amounts of the two products be obtained at the minimum cost.

- A company sells two different products A and B, making a profit of Rs 40 and Rs 30 per unit, respectively. They are both produced with the help of a common production process and are sold in two different markets. The production process has a total capacity
    of 30,000 man-hours. It takes three hours to produce a unit of A and one hour to produce a unit of B. The market has been surveyed and company officials feel that the maximum number of units of A that can be sold is 8,000 units and that of B is 2,000 units. Subject to these limitations, products can be sold

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in any combination. Formulate this problem as an LP model to maximize profit.

- Solve LPP graphically

    Maximize $Z = -x_1 + 2x_2$

    subject to the constraints

    (i) $x_1 - x_2 \le -1$;   (ii) $-0.5x_1 + x_2 \le 2$

    and $x_1, x_2 \ge 0$.

- A firm makes two products X and Y, and has a total production capacity of 9 tonnes per day. Both X and Y require the same production capacity. The firm has a permanent contract to supply at least 2 tonnes of X and at least 3 tonnes of Y per day to another company. Each tonne of X requires 20 machine hours of production time and each tonne of Y requires 50 machine hours of production time. The daily maximum possible number of machine hours is 360. All of the firm's output can be sold. The profit made is Rs 80 per tonne of X and Rs 120 per tonne of Y. Formulate this problem as an LP model and solve it by using graphical method to determine the production schedule that yields the maximum profit.

- Use graphical method to solve the following LP problem:

    Maximize $Z = 3x_1 + 2x_2$

    subject to the constraints

    (i) $x_1 - x_2 \ge 1$ (ii) $x_1 + x_2 \ge 3$

    and $x_1, x_2 \ge 0$.

- Anita Electric Company produces two products P1 and P2. Products are produced and sold on a weekly basis. The weekly production cannot exceed 25 for product P1 and 35 for product P2 because of limited

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available facilities. The company employs total of 60 workers. Product P1 requires 2 man-weeks of labour, while

P2 requires one man-week of labour. Profit margin on P1 is Rs. 60 and on P2 is Rs. 40. Formulate this problem as an LP problem and solve that using graphical method.

- Solve LPP graphically

Minimize $Z = 3x_1 + 2x_2$

subject to the constraints

(i) $5x_1 + x_2 \geq 10$, (ii) $x_1 + x_2 \geq 6$, (iii) $x_1 + 4x_2 \geq 12$

and $x_1, x_2 \geq 0$.

- Write steps to solve by simplex method.

- Use the simplex method to solve the following LP problem.

Maximize $Z = 3x_1 + 5x_2 + 4x_3$

subject to the constraints

(i) $2x_1 + 3x_2 \leq 8$, (ii) $2x_2 + 5x_3 \leq 10$, (iii) $3x_1 + 2x_2 + 4x_3 \leq 15$

and $x_1, x_2, x_3 \geq 0$

- Steps to solve two phase methods.

- Explain the various steps of the simplex method involved in the computation of an optimum solution to a linear programming problem

- Define slack and surplus variables in a linear programming problem.

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Unit No: II

- Explain the rules in constructing dual from primal and Hence, convert the following primal to dual:

  Max $Z = 8x_1 + 2x_2 + 3x_3$

  Subject to constraints

  $x_1 + 2x_2 + 5x_3 \geq 18$

  $4x_1 + 2x_2 + x_3 \geq 7$ $\qquad x_1, x_2, x_3 \geq 0$

- What is integer programming problem and what are the different types of integer programming problems.

- What is the application of zero one integer programming problem.

- Explain different types of integer programming problem.

- Write the properties of duality

  Solve the following by branch and bound method.

  Max $Z = 2x_1 + 3x_2$

  subject to

  $x_1 + 3x_2 \leq 9,$

  $3x_1 + x_2 \leq 7$

  $x_1 - x_2 \leq 1$

  and $x1, x2 \geq 0$ and integers.

- Discuss about sensitive analysis.

- Write the economic interpretation of dual constraints and dual variables.

- What are the rules for constructing the dual from primal.

- What are the advantages of duality.

- Write the dual of the following LP problem.

Minimize $Z_x = 3x_1 - 2x_2 + 4x_3$

subject to the constraints

(i) $3x_1 + 5x_2 + 4x_3 \geq 7$,   (ii) $6x_1 + x_2 + 3x_3 \geq 4$,   (iii) $7x_1 - 2x_2 - x_3 \leq 10$

(iv) $x_1 - 2x_2 + 5x_3 \geq 3$,   (v) $4x_1 + 7x_2 - 2x_3 \geq 2$

and $x_1, x_2, x_3 \geq 0$

- What is Principle of Complementary Slackness?

- Write the advantages of duality.

- What do you understand by the term 'sensitivity analysis?
- Discuss the effect of
  - (i)   variation of cj
  - (ii)   variation of bi and
  - (iii) addition of a new constraint.

Unit No III

- Write the difference between Linear programming problem and Goal Programming.

- A company has four warehouses, a, b, c and d. It is required to deliver a product from these warehouses to three customers A, B and C. The warehouses have the following amounts in stock:
  Warehouse: a b   c   d
  No. of units: 15 16 12 13 and the customers' requirements are
  Customer: A B C, No. of units: 18 20 18. The table below shows the costs of transporting one unit from warehouse to the customer.

Warehouse

		a	b	c	d
	A	8	9	6	3
Customer	B	6	11	5	10
	C	3	8	7	9

Find the optimal transportation routes.   (use VAM's Method)

- Write the transportation algorithm and explain different methods to find initial basic feasible solution.

- Explain different solution methods of assignment problems.

- A hospital wants to purchase three different types of medical equipment and five manufacturers have come forward to supply one or all the three machines. However, the hospital's policy is not to accept more than one machine from any one of the manufacturers. The data relating to the price (in thousands of rupees) quoted by the different manufacturers is given below:

		Machines		
		1	2	3
	A	30	31	27
	B	28	29	26
Manufacturers	C	29	30	28
	D	28	31	27
	E	31	29	26

Determine how best the hospital can purchase the three machines.

- Differentiate between assignment and transportation problem.

- A salesman estimates that the following will be the cost on his route, visiting 5 cities as shown in the table below. The salesman can visit each city once. Determine the sequence he should follow to minimize the total distance travelled.

Sources	Destination				
	1	2	3	4	5
1	∞	2	5	7	1
2	6	∞	3	8	2
3	8		∞	4	7
4	12	4	6	∞	5
5	1	3	2	8	∞

- Can there be multiple optimal solutions to an assignment problem? How would you identify the existence of multiple solutions, if any?

. Determine an initial basic feasible solution to the following transportation problem by using (a) NWCR, (b) LCM and (c) VAM.

Destination

		D_1	D_2	D_3	D_4	Supply
	S_1	21	16	15	3	11
Source	S_2	17	18	14	23	13
	S_3	32	27	18	41	19
	Demand	6	6	8	23	

Determine an initial basic feasible solution to the following transportation problem by using (a) NWCM, (b) LCM, and (c) VAM.

Destination

		D_1	D_2	D_3	D_4	Supply
	A	11	13	17	14	250
Source	B	16	18	14	10	300
	C	21	24	13	10	400
	Demand	200	225	275	250	

- Explain Hungarian method for solving assignment problems.

- Pharmaceutical company producing a single product sold it through five agencies situated in different cities. All of a sudden, there rouse a demand for the product in another five cities that didn't any agency of the company. The company is now facing the problem of deciding on how to assign the existing agencies in order to despatch the product to needy cities in such a way that the travelling distance is minimized. The distance between the surplus and deficit cities (in km) is given in the following table.

Deficit cities

Surplus Cities		a	b	c	d	e
	A	160	130	115	190	200
	B	135	120	130	160	175
	C	140	110	125	170	185
	D	50	50	80	80	110
	E	55	35	80	80	105

Determine the optimum assignment schedule.

- Distinction among Objectives, Goals and Constraints.

- State the Steps to formulate goal programming.

- Write the general mathematical model for transportation problem.

- Write the transportation algorithm and explain.

- With reference to a transportation problem define the following terms:
    - (i)   Feasible solution
    - (ii)   Basic feasible solution
    - (iii) Optimal solution
    - (iv)   Non-degenerate basic feasible solution

- What are the characteristics of transportation problem of linear
- programming?

- Explain in brief three, methods of initial feasible solution for
- transportation problem.

- What are the different solution methods of assignment problem.