Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal
New Scheme of Examination as per AICTE Flexible Curricula
VIII Semester
Bachelor of Technology (B.Tech.) 3 D Animation & Graphics
Syllabus
(w.e.f. January, 2024)
AG 801 Game Design

Course Objective: To enable the students to apply the knowledge of game design process in new games development

Unit I
Definition of a Game, a taxonomy of computer games: combat games, maze games, sports games, race games, strategy games, war games, educational and children's games, puzzles versus games

Unit II
Game architecture, Application layer, Game logic, Game view for the human player, Networked game architecture, Game actors and component architecture, Game resources: formats and storage requirements, the resource cache

Unit III
Game design basics: The role of the game designer, iterative process for game design, the structure of games, working with formal elements, working with dramatic elements, Working with system dynamics

Unit IV
Designing a game: Conceptualization, Prototyping, Digital Prototyping, Playtesting, Functionality, Completeness and Balance, Fun and accessibility

Unit V
Team structures, Stages of Development, the project plan, Requirements gathering, the design document, Unified Modeling language, Technical design document, Time estimates, Task tracking Understanding the game industry, pitching your original ideas

References:

1. Game Coding Complete, Fourth Edition, MIKE, McShaffry and David Graham, Cengage Learning
2. The Art of Computer Game Design, Chris Crawford, Osborne/McGraw-Hill
3. Game Design Workshop, Tracy Fullerton, Elsevier
4. Game Development and Production, Erik Bethke, Wordware Publishing

Course Outcomes:
After the completion of this course, the students will be able to:
1. Understand the game design fundamentals
2. Develop game logic and manage game resources efficiently
3. Apply the acquired knowledge to design a game
4. Test the developed design
5. Pitch original game ideas

AG 802(A) 3D Printing and Design

Course Objective: To impart knowledge and skills related to 3D printing technologies, selection of material and equipment and develop a product using this technique in Industry 4.0 environment

Unit I 3D Printing (Additive Manufacturing): Introduction, Process, Classification, Advantages, Additive V/s Conventional Manufacturing processes, Applications. CAD for Additive Manufacturing: CAD Data formats, Data translation, Data loss, STL format.

Unit II Additive Manufacturing Techniques: Stereo- Lithography, LOM, FDM, SLS, SLM, Binder Jet technology. Process, Process parameter, Process Selection for various applications. Additive Manufacturing Application Domains: Aerospace, Electronics, Health Care, Defence, Automotive, Construction, Food Processing, Machine Tools

Unit III Materials: Polymers, Metals, Non-Metals, Ceramics Various forms of raw material- Liquid, Solid, Wire, Powder; Powder Preparation and their desired properties, Polymers and their properties, Support Materials.

Unit IV Additive Manufacturing Equipment: Process Equipment- Design and process parameters, Governing Bonding Mechanism, Common faults and troubleshooting, Process Design

Unit V Post Processing: Post Processing Requirement and Techniques. Product Quality: Inspection and testing, Defects and their causes

References:

1. Lan Gibson, David W. Rosen and Brent Stucker, "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, 2010.
2. Andreas Gebhardt, "Understanding Additive Manufacturing: Rapid Prototyping, Rapid Tooling, Rapid Manufacturing", Hanser Publisher, 2011.
3. Khanna Editorial, "3D Printing and Design", Khanna Publishing House, Delhi.
4. CK Chua, Kah Fai Leong, "3D Printing and Rapid Prototyping- Principles and Applications", World Scientific, 2017.
5. J.D. Majumdar and I. Manna, "Laser-Assisted Fabrication of Materials", Springer Series in Material Science, 2013.
6. L. Lu, J. Fuh and Y.S. Wong, "Laser-Induced Materials and Processes for Rapid Prototyping", Kulwer Academic Press, 2001.
7. Zhiqiang Fan And Frank Liou, "Numerical Modelling of the Additive Manufacturing (AM) Processes of Titanium Alloy", InTech, 2012.

Course Outcomes:

After the completion of this course, the students will be able to:
1. Develop CAD models for 3D printing.
2. Import and Export CAD data and generate .stl file.
3. Select a specific material for the given application.
4. Select a 3D printing process for an application.
5. Produce a product using 3D Printing or Additive Manufacturing (AM).

AG 802(B) Information Security

Course Objective: The objective of this course is to familiarize the students with the fundamentals of information security and the methods used in protecting both the information present in computer storage as well as information traveling over computer networks.

Unit I Introduction: Fundamental Principles of Information Security- Confidentiality, Availability, Integrity, Non Repudiation, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, a Model for Network Security; Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography

Unit II Block Ciphers and Data Encryption Algorithm: Block Cipher Principles, The Data Encryption Standard, The Strength of DES, Differential and linear cryptanalysis, Block Cipher Design Principles; Advanced Encryption Standard: Evaluation criteria of AES, The AES Cipher, Multiple Encryption and Triple DES, Block Cipher modes of operation, Stream Ciphers, Confidentiality using Symmetric Encryption

Unit III Public Key Encryption: Principles of Public Key Cryptosystems, The RSA algorithm, Key Management, Diffie-Hellman Key Exchange, Elliptic curve cryptography; Message Authentication and Hash Functions: Authentication requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security of Hash Functions and MACs; Hash and MAC algorithms: Secure Hash Algorithm, HMAC; Digital Signatures and Authentication Protocols, Digital Signature Standard

Unit IV Authentication Applications, Kerberos, X.509 Authentication Service, Public key infrastructure; Electronic Mail Security: Pretty Good Privacy; IP Security: IP Security Overview, Architecture, Authentication header, encapsulating security payload, Key management; Web Security: Web security considerations, Secure Socket Layer and Transport layer Security, Secure Electronic Transaction

Unit V System Security: Intruders, Intrusion Detection, Password management; Malicious Software: Different type of malicious software, Viruses and related threats, Virus Countermeasures, Threats and attacks on Information Security, DoS and DDos Attacks; Security controls required for Information Security, Firewalls: Firewall design principles, Trusted Systems, Common criteria for information technology security evaluation

References:

1. William Stallings, "Cryptography and Network Security", Fourth edition, PHI
2. Atul Kahate, “Cryptography and Network Security”, McGraw Hill.
3. V.K. Pachghare, “Cryptography and Information Security”, PHI Learning
4. Nina Godbole, “Information System Security”, Wiley

Course Outcomes:

After the completion of this course, the students will be able to:

1. Understand key terms and concepts in information security and Cryptography and evaluate the cyber security needs of an organization.
2. Acquire knowledge to secure computer systems, protect personal data, and secure computer networks in an organization
3. Apply knowledge of various encryption algorithms and authentication mechanisms to secure information in computer systems and networks
4. Understand principles of web security to secure network by monitoring and analyzing the nature of

attacks and design/develop security architecture for an organization.
5. Design operational and strategic information security strategies and policies.

AG 802(C) Natural Language Processing

Course Objective: To provide a broad introduction to NLP with a particular emphasis on core algorithms, data structures, and machine learning for NLP

Unit I Introduction to various levels of natural language processing, Ambiguities and computational challenges in processing various natural languages. Introduction to Real life applications of NLP such as spell and grammar checkers, information extraction, question answering, and machine translation

Unit II Character Encoding, Word Segmentation, Sentence Segmentation, Introduction to Corpora, Corpora Analysis

Unit III Inflectional and Derivation Morphology, Morphological Analysis and Generation using finite state transducers Introduction to word types, POS Tagging, Maximum Entropy Models for POS tagging, Multiword Expressions

Unit IV The role of language models. Simple N-gram models. Estimating parameters and smoothing. Evaluating language models. Introduction to phrases, clauses and sentence structure, Shallow Parsing and Chunking, Shallow Parsing with Conditional Random Fields (CRF), Lexical Semantics, Word Sense Disambiguation, WordNet, Thematic Roles, Semantic Role Labelling with CRFs.

Unit V NL Interfaces, Text Summarization, Sentiment Analysis, Machine Translation, Question answering, Recent Trends in NLP

References:

1. J. H. Speech and Language Processing, Jurafsky, D. and Martin, Prentice Hall, 2nd Edition, 2014
2. C. D. and H. Schütze: Foundations of Statistical Natural Language Processing, Manning, The MIT Press

Course Outcomes:

After the completion of this course, the students will be able to:

1. Identify and discuss the characteristics of different NLP techniques
2. Understand the fundamental mathematical models and algorithms in the field of NLP and apply these mathematical models and algorithms in applications in software design and implementation for NLP
3. Understand the complexity of speech and the challenges facing speech engineers
4. Understand approaches to syntax and semantics in NLP
5. Understand approaches to discourse, generation, dialogue and summarization within NLP

AG 803(A) Internet of Things

Course Objective: The objective of this course is to provide an understanding of the technologies and the standards relating to the Internet of Things and to develop skills on IoT technical planning.

Unit I IoT definition, Characteristics, IoT conceptual and architectural framework, Physical and logical design of IoT, IoT enablers, Modern day IoT applications, M2M communications, IoT vs M2M, IoT vs WoT, IoT reference architecture, IoT Network configurations, IoT LAN, IoT WAN, IoT Node, IoT Gateway, IoT Proxy, IPv4 vs IPV6

Unit II Sensor, Basic components and challenges of a sensor node, Sensor features, Sensor resolution; Sensor classes: Analog, Digital, Scalar, Vector Sensors; Sensor Types, bias, drift, Hysteresis error, quantization error; Actuator; Actuator types: Hydraulic, Pneumatic, electrical, thermal/magnetic, mechanical actuators, soft actuators

Unit III Basics of IoT Networking, IoT Components, Functional components of IoT, IoT service oriented architecture, IoT challenges, 6LowPAN, IEEE 802.15.4, ZigBee and its types, RFID Features, RFID working principle and applications, NFC (Near Field communication), Bluetooth, Wireless Sensor Networks and its Applications

Unit IV MQTT, MQTT methods and components, MQTT communication, topics and applications, SMQTT, CoAP, CoAP message types, CoAP Request-Response model, XMPP, AMQP features and components, AMQP frame types

Unit V IoT Platforms, Arduino, Raspberry Pi Board, Other IoT Platforms; Data Analytics for IoT, Cloud for IoT, Cloud storage models & communication APIs, IoT case studies

References:

1. Vijay Madisetti, Arshdeep Bahga, "Ïnternet of Things, A Hands on Approach", University Press
2. Dr. SRN Reddy, Rachit Thukral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs
3. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press
4. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi
5. Adrian McEwen, "Designing the Internet of Things", Wiley
6. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill
7. Cuno Pfister, "Getting Started with the Internet of Things", O Reilly Media

Course Outcomes:

After the completion of this course, the students will be able to:

1. Understand Internet of Things and its hardware and software components
2. Interface I/O devices, sensors & communication modules
3. Analyze data from various sources in real-time and take necessary actions in an intelligent fashion
4. Remotely monitor data and control devices
5. Develop real life IoT based projects

AG 803(B) Social Networks

Course Objective: Demonstrate proficiency in the use of social network concepts for solving real world issues.

Unit I Introduction to the Semantic web and Social Networks: Web 2.0, Semantic Web, Web 3.0, Types of social networks, Objectives of social networking, Advantages and disadvantages of social networking, Social Network Analysis: Key concepts and measures in network analysis, Electronic sources for network analysis

Unit II Graph Essentials: Graph Basics, Graph representation, Types of graphs, Paths and connectivity in graphs, Special graphs, Graph traversals and distances, Graph algorithms, Network Datasets

Unit III Network Measures: Centrality, Page rank, Transitivity and Reciprocity, Balance, Similarity, Network Models: Properties of real world networks, Random Graphs, Small world model, Preferential attachment model

Unit IV Community Analysis: Community Detection, Community Evolution, Community Evaluation, Information Diffusion in Social Media: Herd Behavior, Information Cascades, Diffusion of Innovations, Epidemics

Unit V Influence and Homophily, Recommendation in Social media: Challenges, Classical recommendation algorithms, Behavior Analytics: Individual behavior, collective behavior

References:

1. Introduction to the Semantic Web and Social Networks, Peter Mika, Springer
2. Social Media Mining, Reza Zafarani, Huan Liu, Cambridge University Press
3. Networks, Crowds and Markets, David Easley, Jon Kleinberg, Cambridge University Press
4. Social Network Analysis for Startups, Maksim Tsvetovat, Alexander Kouznetsov, O'Reilly

Course Outcomes:

After the completion of this course, the students will be able to:

1. Demonstrate proficiency and understanding of social networks
2. Use graph theory concepts for social network analysis
3. Demonstrate proficiency in the use of social network measures in analysis
4. Perform community analysis in social networks
5. Demonstrate proficiency in the use of social network concepts for solving real world issues.

AG 803(C) Blockchain Technology

Course Objective:
The objective of this course is to provide conceptual understanding of how block chain technology can be used to innovate and improve business processes. The course covers the technological underpinning of block Chain operations in both theoretical and practical implementation of solutions using block Chain technology

Unit I Introduction: Overview of Block chain, Public Ledgers, Bitcoin, Smart Contracts, Block in a Block chain, Transactions, Distributed Consensus, Public vs Private Block chain, Understanding Cryptocurrency to Block chain, Permissioned Model of Block chain, Overview of Security aspects of Block chain; Basic Crypto Primitives: Cryptographic Hash Function, Properties of a hash function, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography, A basic cryptocurrency

Unit II Understanding Block chain with Crypto currency: Bitcoin and Block chain: Creation of coins, Payments and double spending, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay. Working with Consensus in Bitcoin: Distributed consensus in open environments, Consensus in a Bitcoin network, Proof of Work (PoW) – basic introduction, HashCash PoW, Bitcoin PoW, Attacks on PoW and the monopoly problem, Proof of Stake, Proof of Burn and Proof of Elapsed Time, The life of a Bitcoin Miner, Mining Difficulty, Mining Pool

Unit III Understanding Block chain for Enterprises: Permissioned Block chain: Permissioned model and use cases, Design issues for Permissioned block chains, Execute contracts, State machine replication, Overview of Consensus models for permissioned block chain- Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, Lamport-Shostak-Pease BFT Algorithm, BFT over Asynchronous systems

Unit IV Enterprise application of Block chain: Cross border payments, Know Your Customer (KYC), Food Security, Mortgage over Block chain, Block chain enabled Trade, We Trade – Trade Finance Network, Supply Chain Financing, and Identity on Block chain

Unit V Block chain application development: Hyperledger Fabric- Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric, Writing smart contract using Ethereum, Overview of Ripple and Corda

References:
1. Melanie Swan, “Block Chain: Blueprint for a New Economy”, O’Reilly, 2015
2. Josh Thompsons, “Block Chain: The Block Chain for Beginners- Guide to Block chain Technology and Leveraging Block Chain Programming”
3. Daniel Drescher, “Block Chain Basics”, Apress; 1stedition, 2017
4. Anshul Kaushik, “Block Chain and Crypto Currencies”, Khanna Publishing House, Delhi.

5.Imran Bashir, “Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained”, Packt Publishing
6. Ritesh Modi, “Solidity Programming Essentials: A Beginner’s Guide to Build Smart Contracts for Ethereum and Block Chain”, Packt Publishing
7. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O’Dowd, Venkatraman Ramakrishna, “Hands-On Block Chain with Hyperledger: Building Decentralized Applications with Hyperledger Fabric and Composer”, Import, 2018

Course Outcomes:
After the completion of this course, the students will be able to:

1. Understand block chain technology
2. Acquire knowledge of crytocurrencies
3. Develop block chain based solutions and write smart contract using Hyperledger Fabric and Ethereum frameworks
4. Build and deploy block chain application for on premise and cloud based architecture
5. Integrate ideas from various domains and implement them using block chain technology in different perspectives

AG 804 Advanced 3D Animation Lab

Course Objective:
To enable students to prototype their own compositions and shots from concept to completion

Unit I 3D animation (character and creature), rigging, 3D modelling & sculpting, and texturing/surfacing.

Unit II Fundamentals of storytelling, look development and the basics of compositing.

Unit III Industry standard software, tools, processes, and workflows

Unit IV Animation principles, integrating rigging, basic scripting, cloth simulation, body mechanics and animation for characters, inanimate objects and creatures.

Unit V Software and hardware demonstration like : Maya, zBrush, Substance Designer, Substance Painter, Marvelous Designer, Blender, Arnold, Mari, Nuke, Shotgun, Davinci Resolve, Confluence, Adobe Photoshop, Adobe Premiere, Adobe Creative Suite, Microsoft Office 365