RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Computer Science and Engineering, VIII-Semester

Open Elective – CS803 (A) Image Processing and Computer Vision#

Course Objectives: Students should be able to

- Understand practice and theory of computer vision.Elaborate computer vision algorithms, methods and concepts
- Implement computer vision systems with emphasis on applications and problem solving
- Apply skills for automatic analysis of digital images to construct representations of physical objects and scenes.
- Design and implement real-life problems using Image processing and computer vision.

Contents:

UNIT 1

Introduction to computer vision and Image processing (CVIP): Basics of CVIP, History of CVIP, Evolution of CVIP, CV Models, Image Filtering,Image Representations,Image StatisticsRecognition Methodology: Conditioning, Labeling, Grouping, Extracting, and Matching, Morphological Image Processing: Introduction, Dilation, Erosion, Opening, Closing, Hit-or-Miss transformation, Morphological algorithm operations on binary images, Morphological algorithm operations on gray-scale images, Thinning, Thickening, Region growing, region shrinking.

UNIT 2

Image Representation and Description: Representation schemes, Boundary descriptors, Region descriptors Binary Machine Vision: Thresholding, Segmentation, Connected component labeling, Hierarchal segmentation, Spatialclustering, Split& merge, Rule-based Segmentation, Motion-based segmentation. Area Extraction: Concepts, Data-structures, Edge, Line-Linking, Hough transform, Line fitting, Curve fitting (Least-square fitting).

UNIT 3

Region Analysis: Region properties, External points, Spatial moments, Mixed spatial gray-level moments, Boundary analysis: Signature properties, Shape numbers. General Frame Works For Matching: Distance relational approach, Ordered structural matching, View class matching, Models database organization

UNIT4

Facet Model Recognition: Labeling lines, Understanding line drawings, Classification of shapes by labeling of edges, Recognition of shapes, Consisting labeling problem, Back-tracking AlgorithmPerspective Projective geometry, Inverse perspective Projection, Photogrammetric -from 2D to 3D, Image matching: Intensity matching of ID signals, Matching of 2D image, Hierarchical image matching. Object Models And Matching: 2D representation, Global vs. Local features

UNIT 5

Knowledge Based Vision: Knowledge representation, Control-strategies, Information Integration. Object recognition-Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal component analysis , feature extraction, Neural network and Machine learning for image shape recognition

Reference Text

1. Robert Haralick and Linda Shapiro, "Computer and Robot Vision", Vol I, II, Addison-Wesley, 1993
2. David A. Forsyth, Jean Ponce, "Computer Vision: A Modern Approach" Pearson
3. Milan Sonka,VaclavHlavac, Roger Boyle, "Image Processing, Analysis, and Machine Vision" Thomson Learning.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

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Computer Science and Engineering, VIII-Semester

Open Elective – CS803 (B) Game Theory with Engineering applications#

THEORY:-

1. Overview: What is a Game, Game Design Schema, Game Design fundamentals, Engineering application of game theory, Design Process: Iterative design, Commissions, Design & Testing of the Board Game, Introduction to meaningful play, two kinds of meaningful play- discernable & integrated.

2. Introducing design, design & meaning, Semiotics: A brief overview, four semiotic Concepts, Context Shapes interpretations.

3. Introduction to Systems, elements of a System, Framing Systems, open & closed systems, Introduction to Interactivity, a multivalent model of interactivity, interaction & choice, choice molecules, anatomy of choice, space of possibility.

4. Defining games: overview of digital games, magic circle. Primary Schemas: conceptual framework, rule, play, culture.

5. Rules: defining rules, a deck of cards, quality of rules, rules in context, Rules on three levels: Operational, Constituative, Implicit, Identity of a Game, Specificity of Rules, Rules of Digital games. Case Studies: Tic Tac Toe, Deck of Cards.

TEXT BOOKS RECOMMENDED:-

1. Brathwaite, Brenda, and Ian Schreiber. Challenges for Game Designers: Non-digital Exercises for Video Game Designers. Boston, MA: Charles River Media/Course Technology, 2009. ISBN: 97815845058081

2. Game Design Workshop: A Playcentric Approach to Creating Innovative Games by Tracy Fullerton. ISBN-10: 1482217163.

3. Challenges for Game Designers by Brenda Brathwaite (now: Romero) and Ian Schreiber. ISBN-10: 158450580X

REFERENCE BOOKS:-

1. Rules of Play - Game Design Fundamentals, Katie Salen and Eric Zimmerman, The MIT Press Cambridge, Massachusetts London, England, book design and photography.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

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Computer Science and Engineering, VIII-Semester

Open Elective – CS803 (C) 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, Components of IoT ecosystems, 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, Review of Basic Microcontrollers and interfacing.

Unit II Define 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, Attacks in IoT system, vulnerability analysis in IoT, IoT case studies: Smart Home, Smart framing etc.

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

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Computer Science and Engineering, VIII-Semester

Open Elective – CS803 (D) Managing Innovation and Entrepreneurship#

COURSE OBJECTIVE

The aim of the course is to motivate students to innovate in business. In the first place, to achieve this goal, students will be introduced to the basic terminology, typology of innovations and historical context for better comprehension. Also issues of innovation management will be introduced. Students will become familiar with the impact of innovation, innovative processes and aspects that affect it, including applicable methods and innovation management techniques.

Course contents:

UNIT-1

Innovation, the basic definition and classification: The relationship of innovation and entrepreneurship, creation of competitive advantage based on innovation. Innovative models, Product, process, organizational and marketing innovation and their role in business development.

UNIT-II

Sources of innovation (push, pull, analogies), transfer of technology. Creative methods and approaches used in innovation management. Approaches to management of the innovation process (agile management, Six Thinking Hats, NUF test).

UNIT-III

Project approach to innovation management, method Stage Gate, its essence, adaptation of access to selected business models. In-house business development of the innovation process in the company. Open Innovation as a modern concept, the limits of this method and its benefits for business development.

UNIT-IV

Innovations aimed at humans, role of co-creation in the innovation process. The strategy of innovation process, types and selection of appropriate strategies.

UNIT-V

Measurement and evaluation of the benefits of innovation for business (financial and non-financial metrics, their combination and choice). Barriers to innovation in business, innovation failure and its causes, post-audits of innovative projects. Organization and facilitation of an innovation workshop.

REFERENCE BOOKS

1. CLARK, T. – OSTERWALDER, A. – PIGNEUR, Y. Business model generation: a handbook for visionaries, game changers, and challengers. Wiley Publications
2. BESSANT, J R. – TIDD, J. Managing innovation: integrating technological, market and organizational change. Wiley Publications