Third Year/ Second Part

S.N.	Course Code	Subject
1	EG3201CT	Multimedia System
2	EG3202CT	Internet of Things
3	EG3203CT	Information Security
4	EG3201MG	Entrepreneurship Development
		Elective – II
5	EG3204CT.1	a) E-Governance
	EG3204CT.2	b) Computer Simulation and Modeling
	EG3204CT.3	c) Artificial Intelligence
6	EG3205CT	Major Project

Multimedia System

EG3201CT

Year: III **Total: 6 hours /week**

Part: II **Lecture: 3 hours/week**

Tutorial: 1 hours/week

Practical: hours/week

Lab: 2 hours/week

Course description:

The main objective of this course is to give the fundamental knowledge of multimedia technologies and cover three main domains of Multimedia Systems: Devices, Systems and applications

Course objectives:

After completion of this course students will be able to:

1. Identify basics of multimedia and multimedia system and its architecture.
2. Understand different multimedia components.
3. Explain file formats for different multimedia components.
4. Analyze the different compression algorithms.
5. Apply different Designing techniques in multimedia system

Course Contents:

Theory

Unit 1. Introduction **[4 Hrs.]**

1.1. Definition
1.2. Uses of multimedia
1.3. Components of multimedia
1.4. Multimedia building blocks
1.5. Multimedia and Personalized Computing
1.6. Medium
1.7. Multimedia system and properties
1.8. Data Streams Characteristics
1.9. Data Stream Characteristics for Continuous Media, Information Units

Unit 2. Sound / Audio System **[3 Hrs.]**

2.1. Concepts of sound system
2.2. Music and speech
2.3. Speech Generation
2.4. Speech Analysis
2.5. Speech Transmission

Unit 3. Images and Graphics **[4 Hrs.]**

3.1. Digital Image Representation
3.2. Image and graphics Format
3.3. Image Synthesis
3.4. Analysis and Transmission

Unit 4. Video and Animation **[4 Hrs.]**

4.1. Video signal representation
4.2. Computer- Based animation
4.3. Animation Language

4.4. Methods of controlling Animation
4.5. Display of Animation
4.6. Transmission of Animation

Unit 5. Multimedia Applications Development [4 Hrs.]
5.1. Multimedia systems development cycle
5.2. Planning and costing
5.3. Designing
5.4. Developing and producing
5.5. Testing and debugging
5.6. Delivering
5.7. User Interface techniques

Unit 6. Data Compression [4 Hrs.]
6.1. Need for data compression
6.2. Compression basics
6.3. Lossless compression
6.4. Lossy compression
6.5. LZW Compression

Unit 7. Designing Multimedia [4 Hrs.]
7.1. Development phases and development team
7.2. Analysis phase
7.3. Design phase
7.4. Development phase
7.5. Implementation phase
7.6. Evaluation and testing phase

Unit 8. Application Subsystem [4 Hrs.]
8.1. Application Subsystem
8.2. Transport subsystem
8.3. Quality of service and resource management
8.4. Trends in collaborative Computing
8.5. Trends in Transport Systems
8.6. Multimedia Database Management System

Unit 9. User Interface [3 Hrs.]
9.1. Basic Design Issues
9.2. Video and Audio at the User Interface
9.3. User- friendliness as the Primary Goal

Unit 10. Synchronization [4 Hrs.]
10.1. Notation of Synchronization
10.2. Presentation Requirements
10.3. Model for Multimedia Synchronization
10.4. Specification of Synchronization

Unit 11. Abstraction for programming [4 Hrs.]
11.1. Abstractions Levels
11.2. Libraries

11.3. System Software
11.4. Toolkits
11.5. Higher Programming Languages
11.6. Object –oriented approaches

Unit 12. Multimedia Application [3 Hrs.]

12.1. Program and Structure
12.2. Media Preparation
12.3. Media Composition
12.4. Media Integration
12.5. Media Communication
12.6. Media Consumption
12.7. Media Entertainment
12.8. Trends in multimedia applications

Practical: [30 Hrs.]

Lab exercises are as follows:

1. To edit various format of Images and give the various effects in images using Adobe Photoshop
2. Vector-based drawing application using Macromedia FreeHand
3. To create different types of animation, use the action script to control the various objects using Macromedia Flash and swish Max
4. To edit and publish the movie in various formats using Adobe Premiere
5. To integrate all the multimedia objects like audio, video, images etc and will able to create different interactive presentations using Macromedia Director

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	4	7
2	Sound / Audio System	3	6
3	Images and Graphics	4	7
4	Video and Animation	4	7
5	Multimedia Applications Development	4	7
6	Data Compression	4	7
7	Designing Multimedia	4	7
8	Application Subsystem	4	7
9	User Interface	3	6
10	Synchronization	4	7
11	Abstraction for programming	4	7
12	Multimedia Application	3	5
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Multimedia: Computing, Communications and Applications, Ralf Steinmetz and Klara Nahrstedt, Pearson Education Asia
2. Multimedia Communications, Applications, Networks, Protocols and Standards, Fred Halsall, Pearson Education Asia

3. Multimedia Systems, John F. Koegel Buford, Pearson Education Asia
4. Multimedia Technologies, Ashok Banerji, Ananda Mohan Ghosh, Tata MCGraw Hill

Internet of Things

EG3202CT

Year: III **Total: 7 hours /week**

Part: II **Lecture: 3 hours/week**

Tutorial: 1 hours/week

Practical: hours/week

Lab: 3 hours/week

Course description:

This course provides theoretical as well as practical knowledge of fundamentals of Internet of Things to make students capable of designing, implementing and managing the issues of IOT in their personal as well professional life.

Course objectives:

After completion of this course students will be able to:

1. Design and implement fundamentals of IoT.
2. Manage privacy and security issues related to IoT.

Course Contents:

Theory

Unit 1. Introduction **[6 Hrs.]**

1.1. Definition
1.2. History of IoT
1.3. IoT Architecture
1.4. IoT Frameworks
1.5. Benefits of IoT
1.6. Applications of IoT

Unit 2. Fundamental Mechanisms and Key Technologies **[8 Hrs.]**

2.1. Identification of IoT Objects and Services
2.2. Structural Aspects of the IoT
2.3. Environment Characteristics
2.4. Traffic Characteristics
2.5. Scalability
2.6. Interoperability
2.7. Security and Privacy
2.8. Open Architecture
2.9. Key IoT Technologies
2.10. Device Intelligence
2.11. Communication Capabilities
2.12. Mobility Support
2.13. Device Power
2.14. Sensor Technology
2.15. RFID Technology
2.16. Satellite Technology

Unit 3. IoT Protocols **[6 Hrs.]**

3.1. Protocol Standardization for IoT
3.2. Efforts
3.3. M2M and WSN Protocols
3.4. SCADA and RFID Protocols
3.5. Unified Data Standards – Protocols

3.6. IEEE 802.15.4
3.7. BACNet Protocol
3.8. Modbus
3.9. Zigbee Architecture
3.10. Network layer
3.11. LowPAN
3.12. CoAP
3.13. Security

Unit 4. IoT with RASPBERRY PI [9 Hrs.]

4.1. Building IOT with RASPERRY PI
4.2. IoT Systems
4.3. Logical Design using Python
4.4. IoT Physical Devices & Endpoints
4.5. IoT Devices
4.6. Building blocks
4.7. Raspberry Pi -Board
4.8. Linux on Raspberry Pi
4.9. Raspberry Pi Interfaces
4.10. Programming Raspberry Pi with Python

Unit 5. IoT Privacy, Security and Governance [6 Hrs.]

5.1. Vulnerabilities of IoT
5.2. Security requirements
5.3. Threat analysis
5.4. Use cases and misuse cases
5.5. IoT security tomography and layered attacker model
5.6. Identity establishment
5.7. Access control
5.8. Message integrity
5.9. Non-repudiation and availability
5.10. Security model for IoT

Unit 6. Real-world applications and case studies [10 Hrs.]

6.1. Real world design constraints and challenges
6.2. Applications and Asset management
6.3. Industrial automation
6.4. Smart Metering Advanced Metering Infrastructure
6.5. Smart grid
6.6. e-Health Body Area Networks
6.7. Commercial building automation
6.8. Smart cities - participatory sensing
6.9. Data Analytics for IoT
6.10. Software & Management Tools for IoT
6.11. Cloud Storage Models & Communication
6.12. APIs
6.13. Cloud for IoT
6.14. Amazon Web Services for IoT

Practical: [45 Hrs.]

1. To Implement the IoT Frameworks

2. To Implement Cloud Storage Models & Communication
3. Interfacing sensors to Raspberry
4. Interfacing Arduino to Bluetooth Module
5. Communicate between Arduino and Raspberry PI using any wireless medium
6. To Design an IOT based system

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	6	11
2	Fundamental Mechanisms and Key Technologies	8	14
3	IoT Protocols	6	11
4	IoT with RASPBERRY PI	9	15
5	IoT Privacy, Security and Governance	6	11
6	Real-world applications and case studies	10	18
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118-47347-4, Willy Publications
2. ArshdeepBahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015
3. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), “Architecting the Internet of Things”, Springer, 2011. 3.
4. Honbo Zhou, “The Internet of Things in the Cloud: A Middleware Perspective”, CRC Press, 2012.
5. Jan Ho¨ ller, VlasiosTsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
6. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012
7. HakimaChaouchi, “ The Internet of Things Connecting Objects to the Web” ISBN : 978-1- 84821-140-7, Willy Publications
8. Daniel Kellmereit, Daniel Obodovski, “The Silent Intelligence: The Internet of Things”,. Publisher: Lightning Source Inc; 1 edition (15 April 2014). ISBN-10: 0989973700, ISBN-13: 978- 0989973700. 4. Fang Zhaho, Leonidas Guibas, “Wireless Sensor Network: An information processing approach”, Elsevier, ISBN: 978-81-8147-642-5.

Information Security

EG3203CT

Year: III **Total: 5 hours /week**

Part: II **Lecture: 3 hours/week**

Tutorial: hours/week

Practical: hours/week

Lab: 2 hours/week

Course description:

This course is designed to introduce basics of Information Security in digital world. It deals with elementary cryptography, protection mechanisms against threats and ways to administer security tools.

Course objectives:

After completion of this course students will be able to:

1. Find information vulnerability and attacks.
2. Use encryption techniques.
3. Get knowledge of program security, network security and database security.

Course Contents:

Theory

Unit 1. Introduction **[2 Hrs.]**

- 1.1. Information System
- 1.2. Data and Information
- 1.3. Vulnerability and attacks
- 1.4. Security Goals
- 1.5. Security services and mechanisms

Unit 2. Cryptographic Techniques **[10 Hrs.]**

- 2.1. Conventional Cryptographic Techniques
  - 2.1.1. Conventional substitution and transposition ciphers
  - 2.1.2. One-time pad
  - 2.1.3. Block cipher and stream cipher
  - 2.1.4. Steganography
- 2.2. Symmetric and Asymmetric Cryptographic Techniques
  - 2.2.1. Rivest, Shamir, and Adleman (RSA)
  - 2.2.2. Data Encryption Standard (DES)
  - 2.2.3. Advanced Encryption Standard (AES)

Unit 3. Authentication and Digital Signatures **[4 Hrs.]**

- 3.1. Use of Cryptography for authentication
- 3.2. Secure Hash function
- 3.3. Key management-Kerberos

Unit 4. Application Security **[4 Hrs.]**

- 4.1. Types
- 4.2. Security in cloud
- 4.3. Mobile application security
- 4.4. Web application security

Unit 5. Program Security **[4 Hrs.]**

5.1. Non-malicious Program errors
  5.1.1. Buffer overflow
  5.1.2. Incomplete mediation
  5.1.3. Time-of-check to Time-of-use errors
5.2. Viruses
5.3. Trapdoors
5.4. Salami attack
5.5. Man-in-the-middle attacks
5.6. Covert channels

Unit 6. Security in Networks **[8 Hrs.]**

6.1. Threats in networks
6.2. Network Security Controls
  6.2.1. Architecture
  6.2.2. Encryption
  6.2.3. Content Integrity
  6.2.4. Strong Authentication
  6.2.5. Access Controls (Physical and Logical)
  6.2.6. Wireless Security
  6.2.7. Honeypots
  6.2.8. Traffic flow security
6.3. Firewalls
  6.3.1. Design and Types of Firewalls
  6.3.2. Personal Firewalls
  6.3.3. Intrusion Detection System (IDS) and its types
  6.3.4. Intrusion Protection System (IPS)
6.4. Email Security
  6.4.1. PGP
  6.4.2. S/MIME

Unit 7. Database Security **[5 Hrs.]**

7.1. Security requirements
7.2. Reliability and integrity
7.3. Sensitive data
7.4. Inference
7.5. Multilevel database
7.6. Proposals for multilevel security

Unit 8. Security Administration **[8 Hrs.]**

8.1. Security Planning
8.2. Risk Analysis
8.3. Organizational Security policies
8.4. Physical Security
8.5. Legal Privacy and Ethical Issues in Computer Security:
  8.5.1. Protecting Programs and data
  8.5.2. Information and the law
  8.5.3. Rights of Employees and Employers
  8.5.4. Software failures
  8.5.5. Computer Crime

8.5.6. Privacy
8.5.7. Ethical issues in Computer Security
8.5.8. Case studies of ethics

Practical: **[30 Hrs.]**

1. Implement Caesar Cipher.
2. Implement substitution cipher.
3. Implement different cryptographic algorithm (RSA, DES, AES)
4. Implement Firewall.
5. Implement Access control.
6. Implement Digital Signature.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	2	4
2	Cryptographic Techniques	10	18
3	Authentication and Digital Signatures	4	7
4	Application Security	4	7
5	Program Security	4	7
6	Security in Networks	8	14
7	Database Security	5	9
8	Administering Security	8	14
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Security in Computing, Fourth Edition, by Charles P. Pfleeger, Pearson Education
2. Cryptography and Network Security Principles and Practice, Fourth or Fifth Edition, William Stallings, Pearson
3. Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall.
4. Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall.

Entrepreneurship Development

EG3201MG

Year: III **Total: 5 hours /week**

Part: II **Lecture: 3 hours/week**

Tutorial: hours/week

Practical: 2 hours/week

Lab: hours/week

Course Description:

This course is designed to provide the knowledge and skills on formulating business plan and managing small business. The entire course deals with assessing, acquiring, and developing entrepreneurial attitude; skills and tools that are necessary to start and run a small enterprise.

Course Objectives:

After completion of this course students will be able to:

1. Explain the concept of business and entrepreneurship.
2. Explore entrepreneurial competencies.
3. Analyze business ideas and viability.
4. Formulate business plan with its integral components.
5. Manage small business.

Course Contents:

Theory

Unit 1. Introduction to Business & Entrepreneurship [9 Hrs.]

1.1. Overview of entrepreneur and entrepreneurship
1.2. Wage employment, self- employment and business
1.3. Synopsis of types and forms of enterprises
1.4. Attitudes, characteristics & skills required to be an entrepreneur
1.5. Myths about entrepreneurs
1.6. Overview of MSMEs (Micro, Small and Medium Enterprises) in Nepal

Unit 2. Exploring and Developing Entrepreneurial Competencies [9 Hrs.]

2.1. Assessing individual entrepreneurial inclination
2.2. Assessment of decision-making attitudes
2.3. Risk taking behavior and risk minimization
2.4. Creativity and innovation in business
2.5. Enterprise management competencies

Unit 3. Business identification and Selection [4 Hrs.]

3.1. Sources and method of finding business idea(s)
3.2. Selection of viable business ideas
3.3. Legal provisions for MSMEs in Nepal

Unit 4. Business plan Formulation [18 Hrs.]

4.1. Needs and importance of business plan
4.2. Marketing plan
  4.2.1. Description of product or service
  4.2.2. Targeted market and customers
  4.2.3. Location of business establishment
  4.2.4. Estimation of market demand

4.2.5. Competitors analysis
4.2.6. Estimation of market share
4.2.7. Measures for business promotion

4.3. Business operation plan
4.3.1. Process of product or service creation
4.3.2. Required fix assets
4.3.3. Level of capacity utilization
4.3.4. Depreciation & amortization
4.3.5. Estimation office overhead and utilities

4.4. Organizational and human resource plan
4.4.1. Legal status of business
4.4.2. Management structure
4.4.3. Required human resource and cost
4.4.4. Roles and responsibility of staff

4.5. Financial plan
4.5.1. Working capital estimation
4.5.2. Pre-operating expenses
4.5.3. Source of investment and financial costs
4.5.4. Per unit cost of service or product
4.5.5. Unit price and profit/loss estimation of first year

4.6. Business plan appraisal
4.6.1. Return on investment
4.6.2. Breakeven analysis
4.6.3. Risk factors

Unit 5. Small Business Management [5 Hrs.]

5.1. Concept of small business management
5.2. Market and marketing mix
5.3. Basic account keeping

Practical: [30 Hrs.]

Unit 1: Introduction to Business & Entrepreneurship [2 Hrs.]

1. Collect business information through interaction with successful entrepreneur

Unit 2: Exploring and Developing Entrepreneurial Competencies [2 Hrs.]

1. Generate innovative business ideas

Unit 3: Product or service Identification and Selection [2 Hrs.]

1. Analyze business ideas using SWOT method

Unit 4: Business Plan Formulation [22 Hrs.]

1. Prepare marketing plan
2. Prepare operation plan
3. Prepare organizational and human resource plan
4. Prepare financial plan
5. Appraise business plan
6. Prepare action plan for business startup

Unit 5: Small Business Management [2 Hrs.]

1. Prepare receipt and payment account
2. Perform costing and pricing of product and service

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***

1	Introduction to Business & Entrepreneurship	9	16
2	Exploring and Developing Entrepreneurial Competencies	9	16
3	Business identification and Selection	4	7
4	Business plan Formulation	18	32
5	Small Business Management	5	9
	Total	**45**	**80**

E-Governance
Elective II
EG3204CT.1

Year: III **Total: 7 hours /week**
Part: II **Lecture: 3 hours/week**
Tutorial: 1 hours/week
Practical: hours/week
Lab: 3 hours/week

Course description:
This course deals with the introduction, different models for e-Governance, concept of e-Governance, different types of on-line business systems, techniques and implementation for electronics payment system, and legal considerations in e-Governance

Course objectives:
After completion of this course students will be able to:
1. Introduce e-Governance.
2. Explain security issues of e-Governance.
3. Describe the legal and ethical issues of e-Governance/ cyber law.
4. Impart knowledge in management and government projects

Course Contents:

Theory

Unit 1. Introduction **[4 Hrs.]**
- 1.1. History of e-Governance development
- 1.2. How e-Governance works
- 1.3. Categories of e-Governance
- 1.4. Applications
- 1.5. Global trading environment & adoption of e-Governance
- 1.6. Difference between traditional Government and e-Governance
- 1.7. Advantages and disadvantages of e-Governance
- 1.8. Benefits of e-Government
- 1.9. E-Government life cycle
- 1.10. Online service delivery and electronic service delivery
- 1.11. Maturity and adoption model

Unit 2. Models of e-Governance **[4 Hrs.]**
- 2.1. Major challenges of G2G
- 2.2. e-Governance
- 2.3. Governance to Business(G2B)
- 2.4. Development of G2B Governance
- 2.5. Difference between G2Cand G2B e-Governance
- 2.6. G2C, G2E

Unit 3. e-Governance Infrastructure **[4 Hrs.]**
- 3.1. Applications architecture
- 3.2. Support systems
- 3.3. Data center
- 3.4. Government gateway
- 3.5. Open-source software and free software
- 3.6. Electronic Data Interchange (EDI):

3.6.1. Components of EDI
3.6.2. protocol
3.6.3. EDI standards
3.6.4. Data standards used in EDI
3.6.5. Electronic funds transfer

Unit 4. Mobile Governance [4 Hrs.]

4.1. Application of M-Governance
4.2. Advantage of m-Governance
4.3. Wireless application protocol
4.4. WAP Browser
4.5. Mobile Commerce architecture

Unit 5. Technology for Online business [3 Hrs.]

5.1. IT Infrastructure
5.2. Internet
5.3. Intranet
5.4. Extranet
5.5. VPN, Firewall
5.6. Cryptography
5.7. Digital signature
5.8. Digital certificate
5.9. Hypertext
5.10. Hypermedia
5.11. HTTP

Unit 6. Electronic payment system (EPS) [8 Hrs.]

6.1. Online banking
6.2. Types of EPS
6.3. Security requirement of EPS
6.4. Secure socket layer (SSL)
6.5. Secure electronic
6.6. Transaction (SET)
6.7. Payment gateway
6.8. Online payment processing
6.9. Payment processing Network

Unit 7. Security Issues in e-Governance [4 Hrs.]

7.1. e-Governance Security Issues
7.2. Risks Involved in e-Governance
7.3. e-Governance Security tools
7.4. Protecting e-Governance System
7.5. Biometric
7.6. Client server Network security
7.7. Data and message security

Unit 8. Legal and Ethical Issues [3 Hrs.]

8.1. Issues related to e-Governance
8.2. Legal issues
8.3. Ethical issues

8.4. Taxation

Unit 9. Cyber law **[3 Hrs.]**

9.1. Aims of cyber law
9.2. Salient provisions of cyber law
9.3. Contracting and contract enforcement

Unit 10. Managing and implementing e-Governance **[8 Hrs.]**

10.1. Management and strategy of e-Government systems
10.2. Managing public Data
10.3. Managing and emerging issues for e-Government
10.4. e-Government system life cycle and project assessment
10.5. Analysis of current reality
10.6. Design of new e-Government system
10.7. e-Government Risk assessment and mitigation
10.8. e-Government system construction
10.9. Implementation and beyond
10.10. Developing e-Government hybrids

Practical: **[45 Hrs.]**

Case studies on developed and developing countries on e -Governance development (G2C, G2B and G2G) and report submission.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	4	7
2	Models of e-Governance	4	7
3	Infrastructure use in e-Governance	4	7
4	Mobile Governance	4	7
5	Technology for Online business	3	5
6	Electronic payment system (EPS)	8	15
7	Security Issues in e-Governance	4	7
8	Legal and Ethical Issues	3	5
9	Cyber law	3	5
10	Managing and implementing e-Governance	8	15
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Richard Heeks, Implementing and managing e-Government
2. C.S. R Prabhu, e-Governance: Concepts and Case studies, prentice hall of India Pvt. Ltd.
3. J. Satyanarayana, e-Government, prentice hall of India Pvt. Ltd

Computer Simulation and Modeling

Elective II

EG3204CT.2

Year: III **Total: 7 hours /week**

Part: II **Lecture: 3 hours/week**

Tutorial: 1 hours/week

Practical: hours/week

Lab: 3 hours/week

Course description:

This course introduces the simulation and modeling approaches which includes the modeling of a system, its validation and verification, and the analysis of simulation output. It also covers the concept of random number generation and queuing theory as well as the study of some simulation language and tools.

Course objectives:

After completion of this course students will be able to:

1. Create a computer simulation of a set of observations based on the physical characteristics of the system.
2. Explore the knowledge to develop and execute their own simulation models of continuous, discrete-event and other simulation methods.
3. Review basic simulation methods and principles applied to the architecting and engineering of complex systems

Course Contents:

Theory

Unit 1. Introduction **[8 Hrs.]**

1.1. System, Model and Simulation
1.2. Continuous and Discrete Systems
1.3. Models of a system and its types
1.4. Simulation study Phases
1.5. Model Development life cycle
1.6. Areas of Application, Advantages and Disadvantages
1.7. Physical and Mathematical Models: Static and Dynamic

Unit 2. Simulation of Continuous and Discrete System **[8 Hrs.]**

2.1. Differential and Partial Differential equations
2.2. Continuous System Models
2.3. Analog Computer, Analog Methods, Hybrid Simulation
2.4. Digital-Analog Simulators
2.5. Feedback Systems

Unit 3. Queuing System **[8 Hrs.]**

3.1. Characteristics and Structure of Basic Queuing System
3.2. Models and Types of a Queuing System
3.3. Queuing notation
3.4. Measurement of Queuing System Performance
3.5. Applications of queuing system

Unit 4. Random Number **[8 Hrs.]**

4.1. Random Numbers and its properties

4.2. Pseudo Random Numbers
4.3. Methods of generation of Random Number
4.4. Tests for Randomness: Uniformity and independence
4.5. Generating discrete distribution
4.6. Inversion, rejection, composition and Convolution

Unit 5. Verification and Validation [6 Hrs.]

5.1. Design of Simulation Models
5.2. Verification of Simulation Models
5.3. Calibration and Validation of the models
5.4. Three-Step Approach for Validation of Simulation Models
5.5. Accreditation of Models

Unit 6. Computer system Simulation and output analysis [4 Hrs.]

6.1. Estimation methods
6.2. Simulation run statistics
6.3. Replication of runs
6.4. Elimination of initial bias
6.5. Simulation tools
6.6. System simulation
6.7. CPU and memory simulation

Unit 7. Software use in Simulation [3 Hrs.]

7.1. Continuous system simulation language (CSSL)
7.2. Simulation in java
7.3. Simulation using GPSS
7.4. Simulation using SSF

Practical [45 Hrs.]

Practical should include the simulation of some real time systems (continuous and discrete event systems), Queuing Systems, Random Number generations as well as study of Simulation Tools and Language (Break down)

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	8	14
2	Simulation of Continuous and Discrete System	8	14
3	Queuing System	8	14
4	Random Number	8	14
5	Verification and Validation	6	11
6	Computer system Simulation and output analysis	4	8
7	Software use in Simulation	3	5
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Jerry Banks, John S. Carson, Barry L. Nelson, David M. Nicole, "Discrete Event system

2. simulation", 5th Edition, Pearson Education A.M. Law and W.D. Kelton: Simulation and Modeling and analysis
3. R. Y. Rubinstein, B. Melamed: Modern Simulation and Modeling
4. S. Shakya: Lab Manual on Simulation and modeling

Artificial Intelligence

Elective II

EG3204CT.3

Year: III **Total: 7 hours /week**

Part: I **Lecture: 3 hours/week**

Tutorial: 1 hour/week

Practical: 0 hours/week

Lab: 3 hours/week

Course description:

This course is designed to introduce basics of artificial intelligent. It covers fundamental concepts artificial intelligence, problem solving, knowledge representation, neural networks, machine learning, natural language processing, machine vision and expert systems.

Course objectives:

The objective of this course is to introduce the basic principles, techniques, and applications of Artificial Intelligence. Upon the completion students will be able to:

1. Gain fundamental concepts of principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
2. Investigate applications of AI techniques in expert systems, artificial neural networks and other machine learning models.

Course Contents:

Theory

Unit 1. Introduction [6 Hrs.]

1.1. Artificial Intelligence,
1.2. Hard vs. Strong AI, Soft vs. Weak AI
1.3. Foundations and Applications
1.4. Intelligent Agents:
  1.4.1. Introduction of agents
  1.4.2. Structure of Intelligent agent
  1.4.3. Properties of Intelligent Agents
  1.4.4. PEAS description of Agents
  1.4.5. Types of Agents: Simple Reflexive, Model Based, Goal Based, Utility Based, Learning agent, Environment Types: Deterministic, Stochastic, Static, Dynamic, Observable, Semi-observable, Single Agent, Multi Agent

Unit 2. Problem Solving Methods [12 Hrs.]

2.1. Definition of a Problem, Problem as a state space representation, Problem formulation, Well-defined problems
2.2. Constraint satisfaction problem
  2.2.1. Water jug problem
  2.2.2. N-Queen problem
  2.2.3. Cryptarithmetic problem
2.3. Problem solving by searching
2.4. Types of searching
2.5. Measuring problem solving performance
2.6. General State Space Search
2.7. Uninformed:
  2.7.1. Breadth-First Search

2.7.2. Depth-First Search
2.7.3. Depth-Limited Search
2.7.4. Iterative Deepening depth first Search.

2.8. Informed search:
2.8.1. Greedy Best-First Search
2.8.2. A* Search, Optimality of A*
2.8.3. Local search: Hill Climbing

2.9. Game Playing, Optimal Decisions in Games, Alpha – Beta Pruning, Minimax Algorithm, Tic-Tac –Toe Problem, Stochastic Games

Unit 3. Knowledge Representation and Reasoning [10 Hrs.]

3.1. Definition and importance of Knowledge
3.2. Issues in Knowledge Representation
3.3. Knowledge Representation Systems
3.4. Properties of Knowledge Representation Systems
3.5. Types of Knowledge
3.6. The Role of Knowledge
3.7. Knowledge representation techniques:
3.7.1. Rule Based
3.7.2. Logic based
3.8. Propositional Logic
3.8.1. Syntax and Semantic of propositional logic
3.8.2. Proof by Resolution
3.9. Predicate Logic:
3.9.1. FOPL, Syntax, Semantics, Quantification, horn clauses
3.9.2. Inference with FOPL: By converting into PL (Existential and universal instantiation)

Unit 4. Learning [5 Hrs.]

4.1. Concepts of machine learning
4.2. Rote learning
4.3. Learning by analogy
4.4. Inductive learning
4.5. Explanation based learning,
4.6. Supervised and unsupervised learning
4.7. Learning by evolution (genetic algorithm)

Unit 5. Neural Networks and Natural Language Processing [7 Hrs.]

5.1. Introduction to artificial neural network
5.2. Mathematical model of neural network
5.3. Types of neural network: feed-forward, feed-back, Gate realization using neural network
5.4. Learning in neural networks: Back propagation algorithm, Hopfield network
5.5. Concepts of natural language understanding and natural language generation
5.6. Steps in natural language processing:
5.6.1. Syntax analysis
5.6.2. Semantic analysis
5.6.3. Pragmatic analysis

Unit 6. Expert System and Machine Vision [5 Hrs.]

6.1. Expert System
6.2. Architecture of an expert system
6.3. Stages of expert systems development.
6.4. Concept of Machine Vision
6.5. Steps of machine vision
6.6. Application of machine vision

Practical **[45 Hrs.]**

Laboratory exercises can be conducted in PROLOG or any other high-level programming languages. Laboratory exercise must cover the concepts of:

1. Rule based intelligent agents
2. Inference and reasoning
3. Implementing DFS
4. Implementing BFS
5. Implementing A* search
6. Implementing Tic-Tac Toe
7. Implementing water jug problem
8. Implementing N-queen problem
9. Neural networks, etc. for solving practical problems.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	6	12
2	**Problem Solving Methods**	12	21
3	Knowledge Representation and Reasoning	12	21
4	Learning	4	7
5	Neural Networks and Natural Language Processing	7	12
6	Expert System and Machine Vision	4	7
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. R. Stuart and N. Peter, Artificial Intelligence A Modern Approach, Pearson
2. E. Rich, K. Knight, Shivashankar B. Nair, Artificial Intelligence, Tata McGraw Hill.
3. D. W. Patterson, Artificial Intelligence and Expert Systems, Prentice Hall

Major Project
EG3205CT

Year: III **Total: 8 hours /week**
Part: II **Lecture: … hours/week**
Tutorial: … hour/week
Practical: 8 hours/week
Lab: … hours/week

Course description:
The main aim of this course is to plan and complete project work, related with Computer Engineering under the supervision of an instructor or a supervisor.

Course objectives:
On completion of this course, the students will be able to:

1. Develop the ability to tackle individually a selected problem to a reasonable depth of understanding
2. Develop the ability to organize and produce a professional product using an engineering approach
3. Develop the ability to produce technical documentation to a high standard
4. Develop the ability to produce an analytical report which explains the work carried out by the students in the project and the final product they have developed

Project Overview:

1. Group formation (3-4 persons / group)
2. Project concept development
   a. Finding Project concept
   b. Scope of project
   c. Completion time
3. Proposal preparation and presentation-2 weeks
4. Mid-term defense (should complete literature review, methodology, project design and project progress report)-8 weeks after the proposal acceptance
5. Final defense (should deliver complete project and report)-4 weeks after mid-term defense
6. Project documentation (must follow project documentation guide line given by supervisor or the department)
7. Submission of hard cover project document to department-1 week after final defense

Description of the Project Work:
The work carried out must be a practical, problem-solving project. It should be a realistic project in the sense that the product should be useful practically as far as possible.

The project should:

- be intended to develop a Computer Engineering solution to a practical problem
- be carried out using an engineering approach
- emphasize design
- be carried out in a group (3-4 person/group)
- normally result in the production of a piece of software
- include technical documentation based on documentation guideline.
- be fully described from inception to completion in a written report produced to a good level of professional competence

Procedure:

1. A detailed project proposal to be submitted to the project supervisor for the approval of project work.
2. A mid-term progress report to be submitted to the supervisor. The supervisor must hold an oral presentation of about 10 minutes (including progress preview) to evaluate the mid-term progress of the project work.
3. A final written report will be submitted at the end of project work. There will be a final oral group presentation of about 15 minutes (including demonstration). The project coordinator, the supervisor and the external examiner nominated by the project coordinator will evaluate the submitted report as well as the presentation.

Requirements for report writing:

Font Name: Times New Roman
Top Margin: 1 inch
Left Margin: 1 inch
Right Margin: 1 inch
Bottom Margin: 1 inch
Gutter: 0.25 inch (left)
Header and Footer: 0.5 inch
Line Spacing: Single
Paragraph Spacing: 8 pt.
Font Size: 12 pt. (for normal text)
Follow following standard for headings

2. Heading1 (16pt, Bold)

2.1. Heading2 (14pt, Bold)

2.1.1. Heading3 (13pt, Bold)

2.1.1.1. Heading4 (12pt, Bold)

Arrangement of Contents in a report:

The sequence of contents in a major project report is as follows

1. Cover Page
2. Title Page
3. Certificate of Approval
4. Acknowledgment
5. Executive Summary

- Executive Summary should be one-page synopsis of the project report and it must clearly give the overview of the project.

6. Table of Contents

- The table of contents should list all material following it as well as any material which precedes it.

7. List of Figures (if any)

- The list should use exactly the same captions as they appear below the figures in the text.

8. List of Tables (if any)

- The list should use exactly the same captions as they appear above the tables in the text.

9. List of Symbols (if any)

- The list should provide the detail of the symbols used in the report.

10. Abbreviations (if any)

- Abbreviation list should provide the details of the abbreviations used in the report in alphabetical order.

11. Main body
    11.1. Chapter 1: Project Overview (Introduction, Objectives and Scope, Project Features,
    Feasibility, System Requirement)
    11.2. Chapter 2: Literature Review
    11.3. Chapter 3: Design and Methodology (e.g. System Design, methods used, tools, data source)
    11.4. Chapter 4: Result and Analysis
    11.5. Chapter 5: Conclusion, Recommendation and Limitations
12. References
    - The reference should be in IEEE format.
13. Appendices (if any)

    - Appendices are provided to give supplementary information, which is included in the main text may serve as a distraction and cloud the central theme. Appendices should be numbered using Arabic numerals, e.g. Appendix 1, Appendix 2, etc. Tables and References appearing in appendices should be numbered and referred to appropriate places just as in the case of chapters.

Page numbering: The preliminary parts (Acknowledgement, Executive Summary, Table of Contents, List of symbols, List of figures, List of tables) are numbered in roman numerals (i, ii, etc.). The first page of the first chapter (Introduction) onwards will be numbered in Arabic numerals 1 2 3 etc. at the bottom.

Figure and Table numbering: It is useful and convenient to number the figures also chapter-wise. The figures in chapter 4 will be numbered as Figure 4.1: Figure Name. This helps you in assembling the figures and putting it in proper order. Similarly, the tables are also numbered as Table 4.1: Table Name. All figures and tables should have proper captions. Usually, the figure captions are written below the figure and table captions on top of the table.

Evaluation Scheme:
The project coordinator, the supervisor and the external examiner should evaluate the project work and presentation by the following criteria:

S.N.	Topic	Marks Distribution
1	Proposal Defense	20
2	Mid-term progress report/presentation	60
3	Final project report/presentation	120 (Project coordinator =10 supervisor =30 external examiner =80)
	Total	**200**

Detailed Evaluation Scheme

S.N.	Topic	Marks Distribution
1	Presentation skill	20%
2	Team work	10%
3	Understanding of project work and related theory	20%

4	Project demonstration	20%
5	Project Applications	10%
6	Documentation	20%
	Total	**100%**