CURRICULUM OF MASTER OF ENGINEERING (CIE)

Title of degree program

Master of Engineering in Computer and Information Engineering

Degree plan: Figure 2.1 shows the flow chart of courses offered in M.E (CIE) by department of Computer Systems Engineering.

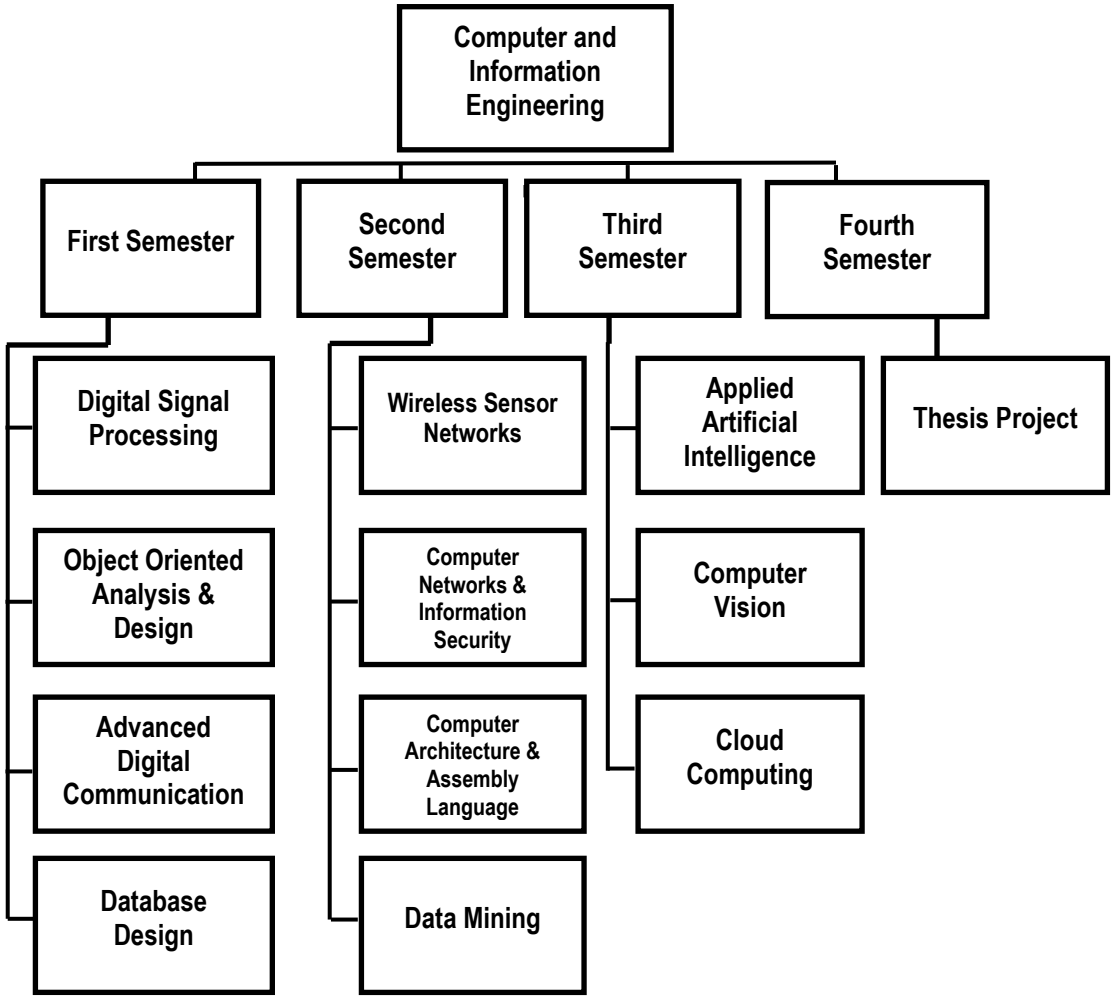

Figure 2.1: Flow-chart of M.E(CIE) Courses

The curriculum breakdown over four semesters is shown in Table 2.1

Table 2.1: Courses offered by Department of Computer Systems Engineering in M.E (CIE)

Sub No.	Course Code	Name of Subject	Credit Hours		
			Credits	Total	Marks
First Semester					
01	CIE 601	Digital Signal Processing	2+1	3	50 + 50
02	CIE 602	Object Oriented Analysis & Design	2+1	3	50 + 50
03	CIE 604	Advanced Digital Communication	2+0	2	50
04	CIE 605	Database Design	2+0	2	50
Total				**10**	**300**
Second Semester					
05	CIE 608	Wireless Sensor Networks	2+0	2	50
06	CIE 609	Computer Networks & Information Security	2+0	2	50
07	CIE 610	Computer Architecture & Assembly Language	2+1	3	50 + 50
08	CIE 613	Data Mining	2+0	2	50
Total				**09**	**250**
Third Semester					
09	CIE 701	Applied Artificial Intelligence	3+1	4	100 + 50
10	CIE 703	Computer Vision	2+1	3	50 + 50
11	CIE 704	Cloud Computing	2+1	3	50 + 50
Total				**10**	**350**
Fourth Semester					
12		Thesis Project	0+6	6	-
Total				**06**	**-**

Total Credit Hours = 35

Total Course Marks = 900

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DEPARTMENT OF COMPUTER SYSTEMS ENGINEERING

Title of Subject	Digital Signal Processing (CIE-601)
Disciplines	ME in Computer and Information Engineering
Pre-requisites	
Term Assessment	*First Semester* Sessional: 10%, Mid Semester: 30%, Final Examination: 60%
Effective Credit Hours:	14-Batch and onwards 2 + 1
Minimum Contact Hours:	28 + 42
Aims:	This subject enables the students to analyze and design discrete time systems.
Objectives:	After completion of this course, the students should be able to: Analyze a discrete time signal/system in time domain as well as frequency domain. Understand and apply Fourier, z-, discrete cosine and wavelet transform to solve real world problems. Design FIR and IIR digital filters Increase and decrease sampling interval Design adaptive and time variant discrete time systems.
Contents:	*Basic Concepts:* Introduction to discrete time signals and systems, A review of Fourier Transform and z-Transform. *Time Domain Analysis:* Convolution Sum and its properties, autocorrelation and cross correlation Sequences. *Continuous Time Filters:* Conditions for distortion-less transmission, Ideal frequency selective filters, Butterworth and Chebyshev approximations. *Sampling:* Ideal Sampling, Sampling Theorem, Practical Sampling effects. *Frequency Domain Analysis of Discrete Time Signals:* Stability Analysis, magnitude and phase response of discrete time signals, Short term Fourier Transform, The discrete Cosine Transform, Wavelet Transform and its applications. *Digital Filters:* Finite Impulse Response (FIR) filters, Infinite Impulse Response (IIR) filters, Design of FIR filters using Window method, Design of IIR filters using the Bilinear Transformation, Digital filter realization. Implementation Issues. *Multirate DSP:* Decimation, Interpolation, applications. *Adaptive DSP:* Least Mean Squares Algorithm, Recursive Least Squares Algorithm, Advanced Topics: Kalman Filtering, Wavelet Transform.
Note:	Practical will be based on theory

Books Recommended:

John G Proakis and Dimtris G Manolakis, "Digital Signal Processing Principles, Algorithms and Application", Latest Edition, PHI/Pearson Education.

Ifeachor M.; Jarvis B.W.; "Digital Signal Processing – A Practical Approach", Latest edition, Pearson Education.

Vaseghi S.V.; Advanced Digital Signal Processing and Noise Reduction, Latest Edition, Wiley.

Daubechies I.; Ten Lectures on Wavelets, Latest Edition, SIAM.

Approval:	Board of Studies	Resolution No. 1.2	Dated: 03.03.2014
	Advanced Studies and Research Board	Resolution No. 127.73	Dated: 10.03.2014
	Academic Council	Resolution No. 83.14	Dated: 30.06.2014

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Title of Subject:	Object Oriented Analysis and Design (CIE-602)	
Discipline:	M.E. in Information and Communication Technologies	
Pre-requisites:		
Semester: Assessment:	*First Semester* Sessional: 10%, Mid Semester: 30%, Final Examination: 60%	
Effective: Credit Hours:	14-Batch and onwards 2 + 1	
Minimum Contact Hours:	28 + 42	

This subject will develop an understanding of the principles underpinning object-oriented programming. The students will apply the object-based approaches to write effective computer programs.

After completion of this course, the students should be able to:
Understand concepts of object-oriented programming.
Design and implement a software project.
Design GUI using state patterns.
Design systems with distributed objects.

Introduction: Review of Basic Concepts, Implementing Classes, Programming with multiple classes, Interfaces, Abstract Classes.
Relationships between Classes: Association, Inheritance, Genericity,
Language Features for Object Oriented Implementation: Organizing the classes, Collection Classes, Run time Type Identification, GUI Programming Support, Long Term Storage of Objects.
Elementary Design Patterns: Iterator, Singlton, Adapter.
Design and Implementation: Major Subsystems, creating software classes, class diagram, User Interface, Data Storage, Implementing the design.
Advanced Concepts: Exploring inheritance, Type inheritance, making enhancements to the library class, multiple inheritance.
Modelling with finite state machines: An introduction to finite state machines, State pattern, Desiging GUI programs using the state pattern.
Designing with Distributed Objects: Client/server Systems, Java Remote Method Invocation, Object Oriented System on the web.

Practical will be based on theory

Books Recommended:

Dathan B.; Ramnath S.; "Object Oriented Analysis and Design", Latest Edition, Springer.
Booch G.; Maksimchuk R.A.; Engle M.W.; "Object Oriented Analysis and Design with applications", Latest Edition, Addison-Wesley.
Kahati A.; "Object Oriented Analysis and Design", Latest edition, McGraw-Hill.

Approval:	Board of Studies	Resolution No. 1.2	Dated: 03.03.2014
	Advanced Studies and Research	Resolution No. 127	Dated: 10.03.2014
Board:	Academic Council	Resolution No. 83.14	Dated: 30.06.2014

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES DEPARTMENT OF COMPUTER SYSTEMS ENGINEERING		
Title of Subject:	Advanced Digital Communication (CIE 604)	
Disciplines:	Computer and Information Engineering	
Pre-requisites:		
Semester: Assessment:	*First* Sessional: 10%, Mid Semester: 30%, Final Examination: 60%	
Effective: Credit Hours:	14-Batch and onwards 2 + 0	
Minimum Contact Hours:	28 + 0	
Aims:	To have a fundamental understanding of the design, performance and state of the art of Digital Communication Systems.	
Objectives:	After completion of this course, the students should be able to: understand and analyze baseband and passband modulation and demodulation techniques. have good insight and expertise in channel encoding techniques. have sound understanding of multiplexing, multiple access and spread spectrum techniques. analyze and address the problems of fading channels.	
Contents:	*Introduction:* Review of basic concepts, signal transmission through linear systems, Bandwidth of digital data. *Baseband Modulation and Demodulation:* Baseband Systems, Formatting Textual Data, Formatting Analogue Systems. Pulse Code Modulation: Uniform and Non-Uniform Quantization, PCM waveform types, Spectral attributes, Bits per PCM word and bits per symbol, M-ary Pulse Modulation waveforms. Detection of binary signals in white Gaussian noise, Maximum likely hood receiver structure, Matched filter, Intersymbol Interference, Equalization. *Bandpass Modulation and Demodulation:* Digital bandpass modulation techniques: Phase Shift keying, Frequency Shift Keying, Amplitude Shift Keying, Waveform Amplitude Coefficient, Coherent and Non-Coherent Detection, Error performance of binary signals, M-ary Signaling and Performance. *Channel :* The Channel, Received Signal Power and Noise Power, Noise Figure, Noise Temperature and System Temperature, System Tradeoffs. *Coding Techniques:* Source Coding, Channel Coding. *Multiplexing and Multiple Access:* Time Division Multiplexing, Frequency Division Multiplexing, Orthogonal Frequency Division Multiplexing, Multiple Access Communication System and Architecture. *Spread Spectrum Techniques:* Pseudo noise sequences, Processing gain and performance, Frequency Hoping, Synchronization, Code Division Multiple Access. *Fadding Channels:* Communication over fading channels, Characterizing Mobile Radio Propagation, Signal Time Spreading, Mitigating the degradation effects of fading.	

Recommended Books:

Sklar B.; Ray P.K.; "Digital Cmmunications – Fundamentals and Applications", Latest Edition, Pearson Education.

Madhow U.; "Fundamentals of Digital Communication", Latest Edition, Cambridge University Press.

Gallager R.G.; Principles of Digital Communication, Latest Edition, Cambridge University Press.

Approval:	Board of Studies	Resolution No. 1.2	Dated: 03.03.2014
	Advanced Studies and Research Board	Resolution No. 127.73	Dated: 10.03.2014
	Academic Council	Resolution No. 83.14	Dated: 30.06.2014

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DEPARTMENT OF COMPUTER SYSTEMS ENGINEERING

Title of Subject:	Database Design (CIE 605)	
Discipline:	M.E. in Computer and Information Engineering	
Pre-requisites:		
Term Assessment	*First* Sessional: 10%, Mid Semester: 30%, Final Examination: 60%.	
Effective Credit Hours:	14-Batch and onwards 2 + 0	
Minimum Contact Hours:	28+00	

This subject enables the students to analyze and design a database.

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

- have a detailed understanding of the principles of database processing.
- apply the required skills and techniques for the design and implementation of a database.
- have an awareness of future database applications and their requirements.

The Database Lifecycle*:* Data Modeling, database design and optimization, database quality, reviews and testing, database maintenance and enhancement.

System Architecture and Design: System architectures (Three-schema, Multitier); Data Architecture (relational, Object-Oriented, Object Rational).

Requirement Gathering and Modeling: Ambiguity and Persistence, Use case diagrams, UML activity diagrams, data elements and business rules. Entities and attributes, relationships, semantic relationships, ER business rules.

Building Class Models in UML: Packages, Classes, and attributes, Operations, Relationships, Object constraints and business rules.

Designing a Relational Database Schema: Turning the tables, Foreign Affairs (Binary Associations, Generalizations), Living by the rules, Normalizing relations.

***D*esigning an Object-Relational Database Schema:** Introduction to Object Oriented Database Management System, Object Diversity, Types, Persistent Classes, Operations.

Designing an Object-Oriented Database Schema: Introduction to Object Oriented Database Management System, Generalizations and realizations, Associations, Behavioral Problems of Objects, Setting Boundaries, Persistent Classes, Operations.

Advances in Databases: Active and Passive Databases and their design, Data Warehousing, Knowledge Discovery and Data Mining, Research Issues.

Books Recommended:

Muller R.J., "Database Design for Smarties – Using UML for Data Modeling", Latest Edition, Academic Press.

Stephens R.K.; Plew R.R.; "Digital Signal Processing – A Practical Approach", Latest Edition, Sams Publishing.

Approval:	Board of Studies	Resolution No. 1.2	Dated: 03.03.2014
	Advanced Studies and Research Board	Resolution No. 127.73	Dated: 10.03.2014
	Academic Council	Resolution No. 83.14	Dated: 30.06.2014

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Title of Subject:	Wireless Sensor Networks (CIE 608)			
Discipline:	M.E. Computer and Information Engineering			
Pre-requisites:				
Assessment:	Sessional: 10%, Mid Semester: 30%, Final Examination: 60%			
Semester:	*2nd Semester*			
Effective: Credit Hours:	14-Batch and onwards 2 + 0			
Minimum Contact Hours:	28+00			
Aims:	This course provides an essential study of issues and methods in wireless sensor networks. The course includes basic concepts, technologies, security and other open research issues in wireless sensor networks.			
Objectives:	After completion of this course, the students should be able To have a thorough introduction to the area of wireless sensor networks. To have a knowledge of network and component technologies. To have sound understanding of adhoc WSNs and their security issues. To develop a research project.			
Contents:	**Introduction:** Overview of WSNs, WSN applications, Limitations. **Location Estimation in WSNs:** Time of Arrival, Angle of Arrival, Received Signal Strength Indicator, Time Difference of Arrival, Mobility. **Network Technologies:** Routing, Medium Access Control, Data Management. **Component Technologies:** Radio Communication, Network Stack, Systems Infrastructure, QoS Support, Sensor Platforms. **Adhoc Wireless Sensor Networks:** Topologies, Strategies, Issues and Coverage, Applications. **Security Issues in WSNs:** Vulnerabilities, Threats WSN Attacks: Replay Attacks, Sybil Attacks, Wormhole attacks, Sink hole, Denial of Service Attacks, False Nodes, Node Malfunction Security Solutions: State of Art Algorithms, Research Solutions. **Open Research Issues in WSNs:** Routing Strategies, End to end data delivery, Secure communication, Unmanned WSNs, MAC layer issues in WSNs, Fault tolerance in WSNs, Energy Management Strategies.			

Books Recommended:

Raghavendra C.S.; Krishna M.; Sivalingham M; Znati T.; "Wireless Sensor Networks", Latest Edition, Springer.

Karl H.; Willig A.; Protocola and Architectures for Wireless Sensor Networks", Latest Edition, Wiley and Blackwell.

Li X-Y.; "Wireless Adhoc and Sensor Networks: Theory and Applications", Latest Edition, Cambridge University Press.

Approval:	Board of Studies	Resolution No. 01.02	Dated: 03..03.2014
	Advanced Studies & Research Board	Resolution No. 127.73	Dated: 10.03.2014
	Academic Council	Resolution No. 83.14	Dated: 30.06.2014

MEHRAN UNIVERSITY OF ENGINEERING ANDTECHNOLOGY, JAMSHORO
INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES
DEPARTMENT OF COMPUTER SYSTEMS ENGINERING

Title of Subject:	Computer Networks and Information Security (CIE 609)	
Disciplines:	Computer and Information Engineering	
Pre-requisites:		
Assessment: Semester:	Sessional: 10%; Mid Semester: 30%, Final Examination: 60% *Second*	
Effective: Credit Hours:	14-Batch and onwards 2+0	
Minimum Contact Hours:	28+00	
Aims:	To introduce the concepts, terminologies and technologies used in modern day data computer networking and ensuring security of the networks.	
Objectives:	Upon successful completion of this course, the students should be able to understand the functions of different layers of the OSI model. to be familiar with IEEE standards for wired and wireless networks. to be familiar with network connecting devices and protocols to understand different techniques of network security.	
Contents:	**Introduction:** Review of the basic concepts of networking, The OSI model, Transmission Media, Data Link Control and Protocols, Point to Point Access, Multiple Access. ***Ethernet:*** Traditional Ethernet, Fast Ethernet, Gigabit Ethernet **Wireless LANs:** IEEE 802.11, Bluetooth. **Connecting Networks:** Connecting Devices, Backbone Networks, Virtual LANs, Internetworks, Addressing, Routing. **Network Layer Protocols and Routing Protocols:** ARP, IP, ICMP, IPv6, Unicast and Multicast Routing Protocols. **Process to Process Delivery**: User Datagram Protocol, Transmission Control Protocol. **Congestion Control and Quality of Service:** Data traffic, Congestion, Congestion Control, Techniques to improve Quality of Service. **Security:** Symmetric-key Cryptography, Public-key Cryptography, Message Security, Digital Signature, User Authentication, Key Management, IP Level Security, Transport Level Security, Application Level Security, Firewalls, Virtual Private Networks.	

Books Recommended:

Schwartz M.; "Mobile Wireless Communications", Latest Edition, Cambridge University Press.
Gow G.A.; Smith R.K.; "Mobile and Wireless Communication: An Introduction", Latest Edition, Mc-Graw-Hill.
Rappaport T.S.; "Wireless Communications - Principles and Practice", Latest Edition, Prentice Hall.
Roshan P.; Leary J.; "Wireless LAN Fundamentals", Latest Edition, Cisco Systems Inc.

Approval:	Board of Studies	Resolution No. 1.2	Dated: 03.03.2014
	Advanced Studies & Research Board	Resolution No. 127.73	Dated: 10.03.2014
	Academic Council	Resolution No. 83.14	Dated: 30.06.2014

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Title of Subject:	Computer Architecture and Assembly Language (CIE 610)
Discipline:	M.E. in Information and Communication Technologies
Pre-requisites:	
Semester: Assessment:	*Second* Sessional: 10%, Mid Semester: 30%, Final Examination: 60%
Effective: Credit Hours:	14-Batch and onwards 2 + 1
Minimum Contact Hours:	28 + 42

Aim: To familiarize the students with the computer architecture and enable them to understand and write Machine language programs.

Objectives: After completion of this course, the students should be able to:
Understand essentials of Computer Architecture
Be familiar with terminology and syntax of Machine language.
Write and edit Machine language programs

Computer Architecture: Overview of Computer Architecture, Digital Logic, Interconnections (System Bus, Expansion Bus), Cache Memory, Internal Memory, External Memory, Input/Output, Instruction Set, Reduced Instruction Set (RISC), Parallel Architectures, Intel IA-64 Architecture,
Assembly Language: Assembly Language Concepts, Intel IA-32 Architecture, Binary Numbers and Big vs. Little Endian Numbers, Assembly Fundamentals, Using the Assembler, Data Transfer, Memory Addressing, Integer Arithmetic, Procedures, Conditional Processing, String and Arrays, Interrupts, Structures/Macros, Disk storage and File Processing.

Practical will be based on theory

Books Recommended:

Stallings W.; "Computer Organization and Architecture: Designing for Performance", Latest Edition, Prentice Hall.
Detmer R.C.; "Introduction to 80×86 Assemly Language and Computer Architecture", Latest Edition, Jones and Bartlett Publishers.
Dos Reis A.J.; "Computer Architecture and Assembly Language", Latest Edition,
Cengage learning.
Irvine B.; Kip R.; "Assembly language for Intel Based Computers", latest edition, Prentice Hall.

Approval:	Board of Studies	Resolution No. 1.2	Dated: 03.03.2014
	Advanced Studies and Research Board:	Resolution No. 127.73	Dated: 10.03.2014
	Academic Council	Resolution No. 83.14	Dated: 30.06.201

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Title of Subject:	Data Mining (CIE 613)
Disciplines:	Computer and Information Engineering
Pre-requisites:	
Assessment: Semester:	Sessional: 10%, Mid Semester: 30%, Final Examination: 60% *Second*

Effective: Credit Hours:	14-Batch and onwards 2+0		
Minimum Contact Hours:	28+00		
Aims:	The course will enable students to understand fundamental concepts and working principle of algorithms of data mining.		
Objectives:	Upon successful completion of this course, the students should be able to understand the basic concepts and importance of data mining. to be familiar with several classifiers. to understand and use the Association and Clustering algorithms.		
Contents:	**Introduction:** Data mining, motivating challenges, data mining tasks **Data:** Types of data, Data Quality, Issues related to data collection, Measures of similarity and dissimilarity **Classification:** Basic concepts, Decision Tree, Evaluating performance of classifier, Rule-based classifier, Bayesian classifier, Artificial Neural Network (ANN), Support Vector Machine (SVM) **Association Analysis:** Frequent itemset generation, Rule generation, Apriori algorithm, FP-growth algorithm, Evaluation of association rules **Cluster Analysis:** Clustering, K-means algorithm, Hierarchical algorithm, DBScan algorithm, Cluster Evaluation		
Books Recommended: Schwartz M.; "Mobile Wireless Communications", Latest Edition, Cambridge University Press. Gow G.A.; Smith R.K.; "Mobile and Wireless Communication: An Introduction", Latest Edition, Mc-Graw-Hill. Rappaport T.S.; "Wireless Communications - Principles and Practice", Latest Edition, Prentice Hall. Roshan P.; Leary J.; "Wireless LAN Fundamentals", Latest Edition, Cisco Systems Inc.			
Approval:	Board of Studies	Resolution No. 1.2	Dated: 03.03.2014
	Advanced Studies & Research Board	Resolution No. 127.73	Dated: 10.03.2014
	Academic Council	Resolution No. 83.14	Dated: 30.06.2014

MEHRAN UNIVERSITY OF ENGINEERING ANDTECHNOLOGY, JAMSHORO INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES DEPARTMENT OF COMPUTER SYSTEMS ENGINERING				
Title of Subject:	Applied Artificial Intelligence (CIE 701)			
Disciplines:	M.E. Computer and Information Engineering			
Pre-requisites:				
Assessment:	Sessional: 10%, Mid semester: 30%, Final Examination: 60%.			
Semester:	*Third*			
Effective: Credit Hours:	14-Batch and onwards 3 + 0			
Minimum Contact Hours:	42 + 00			
Aims:	This course aims at developing computer applications, which encompass perception, reasoning and learning and to provide an in-depth understanding of major techniques used to simulate intelligence.			

Objectives:	After completion of this course, the students should be able To have a strong foundation of fundamental concepts in Artificial Intelligence. To have a basic exposition to the goals and methods of Artificial Intelligence. To apply these techniques in applications which involve perception, reasoning and learning.
Contents:	***Introduction:*** Review of Basic Concepts, Historical Review, An introduction to LISP, PROLOG. ***Intelligent Agents:*** Intelligent Agents, Agents and environments, Good behaviour, The nature of environments, structure of agents. ***Search Techniques:*** Problem Solving, problem solving agents, example problems, searching for solutions, uniformed search strategies, avoiding repeated states, searching with partial information, Informed search strategies, AND-OR graphs, Game Theory. ***Knowledge Representation:*** Propositional Logic, Predicate Logic, Fuzzy Logic, Semantic Networks, Frames, Scripts, Procedural Representation. ***Learning:*** Supervised Learning, Unsupervised Learning, Reinforcement Learning, Hebbian Learning, Baysian Networks, Neural Networks, Genetic Algorithms. ***Applications:*** Expert Systems, Natural Language Processing, Robotics.

Recommended Books:

Russell S.; Norvig P.; "Artificial intelligence – A Modern Approach", Latest Edition, Prentice Hall.
Luger G.F.; Artificial Intelligence – Structures and Strategies for Complex Problem Solving", Latest Edition, Pearson Higher Education.

Approval:	Board of Studies	Resolution No. 1.2	Dated: 03.03.2014
	Advanced Studies and Research Board	Resolution No. 127.73	Dated: 10.03.2014
	Academic Council	Resolution No. 83.14	Dated: 30.06.2014

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Title of Subject:	Computer Vision (CIE 703)
Discipline:	M.E. in Computer and Information Engineering
Pre-requisites:	
Semester: Assessment:	*Third* Sessional: 10%, Mid semester: 30%, Final Examination: 60%.
Effective: Credit Hours:	14-Batch and onwards 2+1
Minimum Contact Hours:	28+42
Aims:	This subject introduces computer vision concepts, methods and algorithms with emphasis on applications and problem solving.
Objectives:	After completion of this course, the students should be able to: understand, analyze and compare image formation methods. apply complex transforms to solve computer vision related problems have an awareness of recent advances in computer vision research.
Contents:	Computer Vision Basics*:* Vision and Visual System, Colour Vision and Computer Vision, Application Areas of Computer Vision, Major steps involved in computer vision. Image Processing Basics: Image Acquisition, Image Representation, Image Resolution, Image Storage, Neighborhood of pixels and pixel connectivity, Image Geometry and Affine Transformation. Image Formation Methods: Monocular imaging system, Orthographic and Perspective Projection, Camera Model and Camera Calibration, Binocular Imaging Systems.

	Filtering, Image Representation and Texure Models: Image Representation, Filtering, Edge Detection, Statistical and Structural Texure Models. Image Processing and Transform Domain: 1-D and 2-D Fourier Transform, Properties of Fourier Transform, Fast Fourier Transform Algorithms, Walsh Transform, Discrete Cosine Transform. Object Recognition: Hough Transform and other object recognition methods, Shape Correspondence and shape matching, Principal Component Analysis, Shape prior for recognition. Advancements of Computer Vision: Clustering and Segmentation, Visual Surveillance and Activity Monitoring, Image based Rendering.
Note:	Practical will be based on theory

Books Recommended:

Forsyth D.A.; Ponce J. "Computer Vision – A Modern Approach", Latest Edition, Prentice Hall.
Gonzalez R.C.; Wintz P.; "Digital Image Processing", Latest Edition, Addison-Wesley
Umbaugh S.E.; Digital Image Processing and Analysis: Human and Computer Vision Applications with CVIPtools, Latest Edition, CRC Press.

Approval:	Board of Studies	Resolution No. 1.2	Dated: 03.03.2014
	Advanced Studies and Research Board	Resolution No. 127.73	Dated: 10.03.2014
	Academic Council	Resolution No. 83.14	Dated: 30.06.201

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES DEPARTMENT OF COMPUTER SYSTEMS ENGINEERING	
Title of Subject	Cloud Computing (CIE 704)
Disciplines	Computer and Information Engineering
Pre-requisites	None
Assessment	Sessional: 10%, Mid Semester: 30%, Final Examination: 60%.
Semester	*Second*
Effective	14-Batch & onwards
Credit hours Minimum Contact Hours	2+1 28+42
Aims:	This course aims to provide students with an in-depth analysis of the Cloud. It also addressed the deployment of large Cloud infrastructures such as Amazon, Google and Apple, and how they can be applied in fields such as healthcare, banking and science. Students will also learn to deploy a Cloud application across the enterprise using virtualization, resource management and the right amount of networking support, including content delivery networks and storage area networks.
Objective:	Understanding the design of Cloud platforms Identifying the applications of Cloud computing Deploying Cloud infrastructures Learning Cloud programming and Software platforms Developing Cloud application
Contents:	Computing on the Cloud History of Cloud Computing (Grid, Peer-to-Peer Computing) Distributed System Models Parallel Computing

	Service-Oriented Architectures Cloud Infrastructure Cloud Computing Applications and Paradigms Cloud Resource Virtualization Cloud Resource Management and Scheduling Networking support Storage Systems Cloud Security Complex Systems and Self Organization Cloud Application Development	
Note:	Practical will be based on theory	
BOOKS RECOMMENDED Marinescu D.; Cloud Computing: Theory and Practice, Latest Edition, Morgan Kaufmann Publishers. Erl T.; Cloud Computing, Concepts, Technology and Architecture, Latest Edition, Prentice Hall.		
Approval:	Board of Studies	Resolution No. 2.1 Dated: 03.03.2014
	ASRB Academic Council	Resolution No. 127.73 Dated: 03.03.2014 Resolution No. 83.14 Dated: 30.06.2014