

B.Tech. + M.Tech. - Artificial Intelligence & Robotics

Syllabus - First Semester

INTRODUCTION TO COMPUTERS AND PROGRAMMING IN C

Course Code: AIE6104

Credit Units : 03

Course Objective:

The objective of this course module is to acquaint the students with the basics of computers system, its components, data representation inside computer and to get them familiar with various important features of procedure oriented programming language i.e. C.

Course Contents:

Module I: Introduction

Introduction to computer, history, von-Neumann architecture, memory system (hierarchy, characteristics and types), H/W concepts (I/O Devices), S/W concepts (System S/W & Application S/W, utilities). Data Representation: Number systems, character representation codes, Binary, octal, hexadecimal and their interconversions. Binary arithmetic, floating point arithmetic, signed and unsigned numbers, Memory storage unit.

Module II: Programming in C

History of C, Introduction of C, Basic structure of C program, Concept of variables, constants and data types in C, Operators and expressions: Introduction, arithmetic, relational, Logical, Assignment, Increment and decrement operator, Conditional, bitwise operators, Expressions, Operator precedence and associativity. Managing Input and output Operation, formatting I/O.

Module III: Fundamental Features in C

C Statements, conditional executing using if, else, nesting of if, switch and break Concepts of loops, example of loops in C using for, while and do-while, continue and break. Storage types (automatic, register etc.), predefined processor, Command Line Argument.

Module IV: Arrays and Functions

One dimensional arrays and example of iterative programs using arrays, 2-D arrays Use in matrix computations.

Concept of Sub-programming, functions Example of user defined functions. Function prototype, Return values and their types, calling function, function argument, function with variable number of argument, recursion.

Module V: Advanced features in C

Pointers, relationship between arrays and pointers Argument passing using pointers, Array of pointers. Passing arrays as arguments.

Strings and C string library.

Structure and Union. Defining C structures, Giving values to members, Array of structure, Nested structure, passing strings as arguments.

File Handling.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

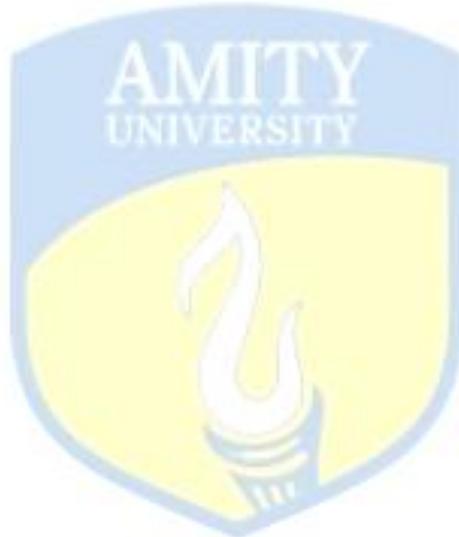
Text & References:

Text:

- “ANSI C” by E Balagurusamy
- Yashwant Kanetkar, “Let us C”, BPB Publications, 2nd Edition, 2001.
- Herbert Schildt, “C: The complete reference”, Osbourne Mcgraw Hill, 4th Edition, 2002.
- V. Raja Raman, “Computer Programming in C”, Prentice Hall of India, 1995.

References:

- ***Kernighan & Ritchie, “C Programming Language”, The (Ansi C Version), PHI, 2nd Edition.***
- ***J. B Dixit, “Fundamentals of Computers and Programming in ‘C’.***
- P.K. Sinha and Priti Sinha, “Computer Fundamentals”, BPB publication.



PROGRAMMING IN C LAB

Course Code: AIE6106

Credit Units : 01

Software Required: Turbo C

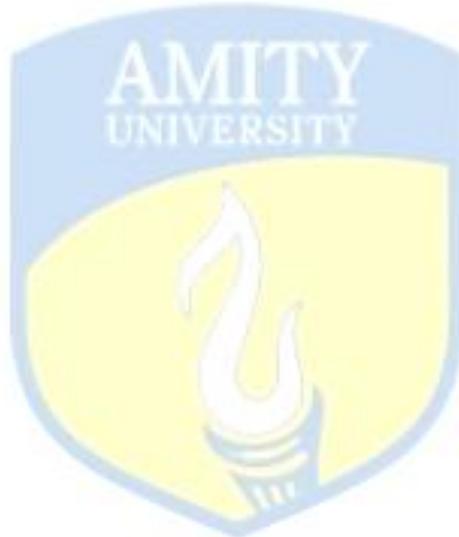
Course Contents:

- C program involving problems like finding the nth value of cosine series, Fibonacci series. Etc.
- C programs including user defined function calls
- C programs involving pointers, and solving various problems with the help of those.
- File handling

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.



OBJECT ORIENTED PROGRAMMING USING C++

Course Code: AIE6204

Credit Units: 03

Course Objective:

The objective of this module is to introduce object oriented programming. To explore and implement the various features of OOP such as inheritance, polymorphism, Exceptional handling using programming language C++. After completing this course student can easily identify the basic difference between the programming approaches like procedural and object oriented.

Course Contents:

Module I: Introduction

Review of C, Difference between C and C++, Procedure Oriented and Object Oriented Approach. Basic Concepts: Objects, classes, Principals like Abstraction, Encapsulation, Inheritance and Polymorphism. Dynamic Binding, Message Passing. Characteristics of Object-Oriented Languages. Introduction to Object-Oriented Modeling techniques (Object, Functional and Dynamic Modeling).

Module II: Classes and Objects

Abstract data types, Object & classes, attributes, methods, C++ class declaration, Local Class and Global Class, State identity and behaviour of an object, Local Object and Global Object, Scope resolution operator, Friend Functions, Inline functions, Constructors and destructors, instantiation of objects, Types of Constructors, Static Class Data, Array of Objects, Constant member functions and Objects, Memory management Operators.

Module III: Inheritance

Inheritance, Types of Inheritance, access modes – public, private & protected, Abstract Classes, Ambiguity resolution using scope resolution operator and Virtual base class, Aggregation, composition vs classification hierarchies, Overriding inheritance methods, Constructors in derived classes, Nesting of Classes.

Module IV: Polymorphism

Polymorphism, Type of Polymorphism – Compile time and runtime, Function Overloading, Operator Overloading (Unary and Binary) Polymorphism by parameter, Pointer to objects, this pointer, Virtual Functions, pure virtual functions.

Module V: Strings, Files and Exception Handling

Manipulating strings, Streams and files handling, formatted and Unformatted Input output. Exception handling, Generic Programming – function template, class Template Standard Template Library: Standard Template Library, Overview of Standard Template Library, Containers, Algorithms, Iterators, Other STL Elements, The Container Classes, General Theory of Operation, Vectors.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

Text & References:

Text:

- A.R. Venugopal, Rajkumar, T. Ravishanker “Mastering C++”, TMH, 1997
- R. Lafore, “Object Oriented Programming using C++”, BPB Publications, 2004.
- “Object Oriented Programming with C++” By E. Balagurusamy.
- Schildt Herbert, “C++: The Complete Reference”, Wiley DreamTech, 2005.

References:

- Parsons, “Object Oriented Programming with C++”, BPB Publication, 1999.
- Steven C. Lawlor, “The Art of Programming Computer Science with C++”, Vikas Publication, 2002.
- Yashwant Kanethkar, “Object Oriented Programming using C++”, BPB, 2004

OBJECT ORIENTED PROGRAMMING USING C++ LAB

Course Code: AIE6208

Credit Units: 01

Software Required: Turbo C++

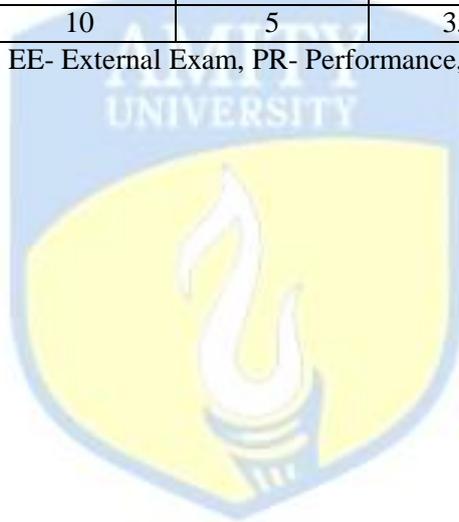
Course Contents:

- Creation of objects in programs and solving problems through them.
- Different use of private, public member variables and functions and friend functions.
- Use of constructors and destructors.
- Operator overloading
- Use of inheritance in and accessing objects of different derived classes.
- Polymorphism and virtual functions (using pointers).
- File handling.

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab



Syllabus - Third Semester

DATA COMMUNICATION AND COMPUTER NETWORKS

Course Code: AIE6301

Credit Units: 03

Course Objective:

The objective is to acquaint the students with the basics of data communication and networking. A structured approach to explain how networks work from the inside out is being covered. The physical layer of networking, computer hardware and transmission systems have been explained. In-depth application coverage includes email, the domain name system; the World Wide Web (both client- and server-side); and multimedia (including voice over IP).

Course Contents:

Module I: Introduction

Introduction to computer networks, evolution of computer networks and its uses, reference models, example networks

The physical layer: Theoretical basis for data communication, transmission media, wireless transmission, telecom infrastructure, PSTN, communication satellites, mobile telephone system

Module II: The data link layer

Data link layer design issues, error detection and correction, data link protocols, sliding window protocols, example of data link protocols- HDLC, PPP Access

Module III: Medium access layer

Channel allocation problem, multiple access protocols, ALOHA, CSMA/CD, CSMA/CA, IEEE Standard 802 for LAN and MAN, Bridges, Wireless LANs. Introduction to wireless WANs: Cellular Telephone and Satellite Networks, SONET/SDH, Virtual-Circuit Networks: Frame Relay and ATM.

Module IV: The network layer

Network layer concepts, design issues, static and dynamic routing algorithms, shortest path routing, flooding, distance vector routing, link state routing, distance vector routing, multicast routing, congestion control and quality of service, internetworking, Ipv4

Module V: The transport layer

The transport services, elements of transport protocols, TCP and UDP

The application layer: Brief introduction to presentation and session layer, DNS, E-mail, WWW

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & References:

Text:

- Computer networks: Tanenbaum, Andrew S, Prentice Hall
- Data communication & networking: Forouzan, B. A.

References:

- Computer network protocol standard and interface: Uyles, Black
- Data and Computer Communications, Seventh Edition (7th.) William Stallings Publisher: Prentice Hall
- Computer Networking: A Top-Down Approach Featuring the Internet (3rd Edition) by James F. Kurose

DATABASE MANAGEMENT SYSTEMS

Course Code: AIE6302

Credit Units: 04

Course Objective:

The objective of this course is to get students familiar with Databases and their use. They can identify different types of available database model, concurrency techniques and new applications of the DBMS.

Course Contents:

Module I: Introduction

Concept and goals of DBMS, DBMS Architecture, Database Languages, Database Users, Database Abstraction.

Basic Concepts of ER Model: Entity Type, Entity Set, Relationship type, Relationship sets, Constraints: Cardinality Ratio and Participation Constraint, Keys, Mapping, Design of ER Model

Module II: Hierarchical model & Network Model

Concepts, Data definition, Data manipulation and implementation.

Network Data Model, DBTG Set Constructs, and Implementation

Module III: Relational Model

Relational database, Relational Algebra, Relational Calculus, Tuple Calculus.

Module IV: Relational Database Design and Query Language

SQL, QUEL, QBE, Normalization using Functional Dependency, 1NF, 2NF, 3NF, BCNF, Multivalued dependency and Join dependency.

Module V: Concurrency Control and New Applications

Transaction basics: ACID property, Lifecycle of Transaction, Why Concurrency Control, Schedule, Serializability, Lock Based Protocols, Time Stamped Based Protocols, Deadlock Handling, Crash Recovery. Distributed Database, Objective Oriented Database, Multimedia Database, Data Mining, Digital Libraries.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- Korth, Silberschatz, "Database System Concepts", 4th Ed., TMH, 2000.
- Steve Bobrowski, "Oracle & Architecture", TMH, 2000

References:

- Date C. J., "An Introduction to Database Systems", 7th Ed., Narosa Publishing, 2004
- Elmsari and Navathe, "Fundamentals of Database Systems", 4th Ed., A. Wesley, 2004
- Ullman J. D., "Principles of Database Systems", 2nd Ed., Galgotia Publications, 1999.

OPERATING SYSTEMS

Course Code: AIE6303

Credit Units: 03

Course Objective:

Operating Systems serve as one of the most important courses for undergraduate students, since it provides the students with a new sight to envision every computerized systems especially general purpose computers. Therefore, the students are supposed to study, practice and discuss on the major fields discussed in the course to ensure the success of the education process. The outcome of this course implicitly and explicitly affects the abilities the students to understand, analyze and overcome the challenges they face with in the other courses and the real world.

Course Contents:

Module I: Introduction to operating system

Operating system and function, Evolution of operating system, Batch, Interactive, multiprogramming, Time Sharing and Real Time System, multiprocessor system, Distributed system, System protection. Operating System structure, Operating System Services, System Program and calls.

Module II: Process Management

Process concept, State model, process scheduling, job and process synchronization, structure of process management, Threads, Inter-process Communication and Synchronization: Principle of Concurrency, Producer Consumer Problem, Critical Section problem, Semaphores, Hardware Synchronization, Critical Regions, Conditional critical region, Monitor, Inter Process Communication.

CPU Scheduling: Job scheduling functions, Process scheduling, Scheduling Algorithms, Non Preemptive and preemptive Strategies, Algorithm Evaluation, Multiprocessor Scheduling.

Deadlock: System Deadlock Model, Deadlock Characterization, Methods for handling deadlock, Prevention strategies, Avoidance and Detection, Recovery from deadlock combined approach.

Module III: Memory Management

Single Contiguous Allocation: H/W support, S/W support, Advantages and disadvantages, Fragmentation, Paging, Segmentation, Virtual memory concept, Demand paging, Performance, Paged replaced algorithm, Allocation of frames, Thrashing, Cache memory, Swapping, Overlays

Module IV: Device management

Principles of I/O hardware, Device controller, Device Drivers, Memory mapped I/O, Direct Access Memory, Interrupts, Interrupt Handlers, Application I/O interface, I/O Scheduling, Buffering, Caching, Spooling,

Disk organization, Disk space management, Disk allocation Method, Disk Scheduling, Disk storage.

Module V: File System and Protection and security

File Concept, File Organization and Access Mechanism, File Directories, Basic file system, File Sharing, Allocation method, Free space management.

Policy Mechanism, Authentication, Internal excess Authorization.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

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Att: Attendance

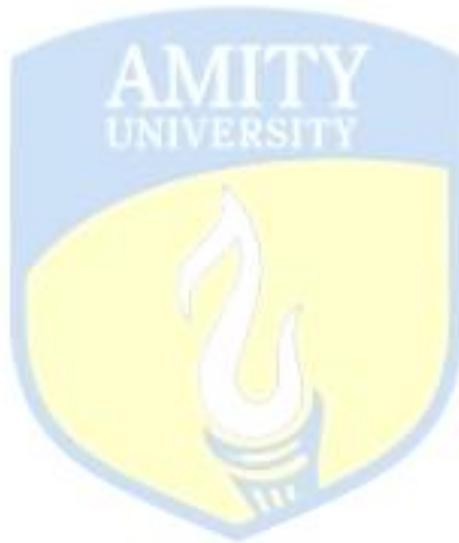
Text & References:

Text:

- Milenekovic, "Operating System Concepts", McGraw Hill
- A. Silberschatz, P.B. Galvin "Operating System Concepts", John Willey & son

References:

- Dietel, “An introduction to operating system”, Addison Wesley
- Tannenbaum, “Operating system design and implementation”, PHI
- Operating System, A Modern Perspection, Gary Nutt, Pearson Edu. 2000
- A. S Tanenbaum, Modern Operating System, 2nd Edition, PHI.
- Willam Stalling “ Operating system” Pearson Education
- B. W. Kernighan & R. Pike, “The UNIX Programming Environment” Prentice Hall of India, 2000
- Sumitabha Das “ Your UNIX The ultimate guide” Tata Mcgraw Hill
- “Design of UNIX Operating System “ The Bach Prentice – Hall of India



DATA STRUCTURES USING C

Course Code: AIE6304

Credit Units: 04

Course Objective:

Data structure deals with organizing large amount of data in order to reduce space complexity and time requirement. This course gives knowledge of algorithms, different types of data structures and the estimation space and time complexity.

Course Contents:

Module I: Introduction to Data structures

Data structures: Definition, Types. Algorithm design, Complexity, Time-Space Trade- offs. Use of pointers in data structures. Array Definition and Analysis, Representation of Linear Arrays in Memory, Traversing of Linear Arrays, Insertion And Deletion, Single Dimensional Arrays, Two Dimensional Arrays, Multidimensional Arrays, Function Associated with Arrays, Character String in C, Character String Operations, Arrays as parameters, Implementing One Dimensional Array, Sparse matrix.

Module II: Introduction to Stacks and queue

Stack: Definition, Array representation of stacks, Operations Associated with Stacks- Push & Pop, Polish expressions, Conversion of infix to postfix, infix to prefix (and vice versa), Application of stacks recursion, polish expression and their compilation, conversion of infix expression to prefix and postfix expression, Tower of Hanoi problem.

Queue: Definition, Representation of Queues, Operations of queues- QInsert, QDelete, Priority Queues, Circular Queue, Deque.

Module III: Dynamic Data Structure

Linked list: Introduction to Singly linked lists: Representation of linked lists in memory, Traversing, Searching, Insertion into, Deletion from linked list, doubly linked list, circular linked list, generalized list. Applications of Linked List-Polynomial representation using linked list and basic operation. Stack and queue implementation using linked list.

Module IV: Trees and Graphs

Trees: Basic Terminology, Binary Trees and their representation, expression evaluation, Complete Binary trees, extended binary trees, Traversing binary trees, Searching, Insertion and Deletion in binary search trees, General trees, AVL trees, Threaded trees, B trees.

Graphs: Terminology and Representations, Graphs & Multigraphs, Directed Graphs, Sequential representation of graphs, Adjacency matrices, Transversal Connected Component and Spanning trees.

Module V: Sorting and Searching and file structures

Sorting: Insertion Sort, Bubble sort, Selection sort, Quick sort, two-way Merge sort, Heap sort, Partition exchange sort, Shell sort, Sorting on different keys, External sorting.

Searching: Linear search, Binary search, File structures: Physical storage media, File Organization, Linked organization of file, Inverted file, Organization records into blocks, Sequential blocks, Hash function, Indexing & Hashing, Multilevel indexing, Tree Index, Random file, Primary Indices, Secondary Indices, B tree index files.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- Horowitz and Sahani, "Fundamentals of Data structures", Galgotia publications
- Tannenbaum, "Data Structures", PHI
- R.L. Kruse, B.P. Leary, C.L. Tondo, "Data structure and program design in C" PHI
- "Data structures and algorithms" – Schaum Series.

DATA STRUCTURES USING C LAB

Course Code: AIE6305

Credit Units: 01

Software Required: Turbo C++

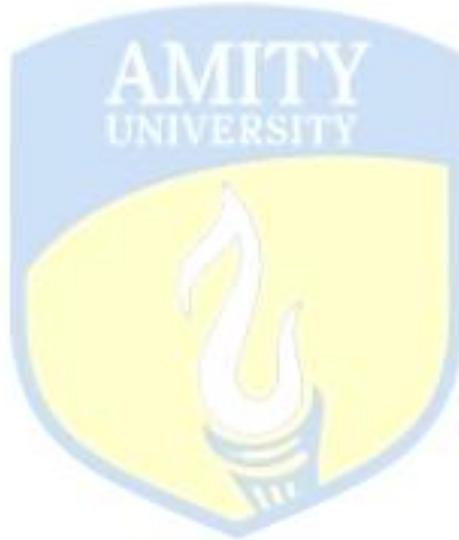
Assignment will be provided for following:

- Practical application of sorting and searching algorithm.
- Practical application of various data structure like linked list, queue, stack, tree

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.



DATA COMMUNICATION AND COMPUTER NETWORKS LAB

Course Code: AIE6306

Credit Units: 01

Equipments Required:

Switch Network Cables, Patch Chord- Fiber optical and twisted pair cable, LAN cards, RJ-45 connectors etc.

Platforms required: Linux Server

Course Contents:

- Introduction and Installation of Linux
- Administrating Linux
- Setting up a Local Area Network
- Connecting to the Internet
- Setting up Print Server
- Setting up File Server
- Setting up Mail Server
- Setting up FTP Server
- Setting up Web Server
- Setting up MySQL Database Server

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

DATABASE MANAGEMENT SYSTEMS LAB

Course Code: AIE6307

Credit Units: 01

Software Required: Oracle 9i

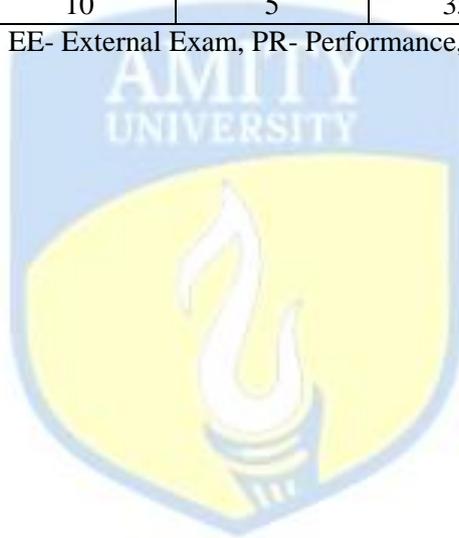
Topics covered in lab will include:

- Database Design
- Data Definition (SQL)
- Data Retrieval (SQL)
- Data Modification (SQL)
- Views
- Triggers and Procedures
- PL\SQL

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.



UNIX PROGRAMMING LAB

Course Code: AIE6308

Credit Units: 01

Software Required: UNIX SCO

Assignments will be provided for the following

- Introduction to UNIX Commands
- Introduction to vi editor
- Programming in shell script
- Introduction to programming in C Shell

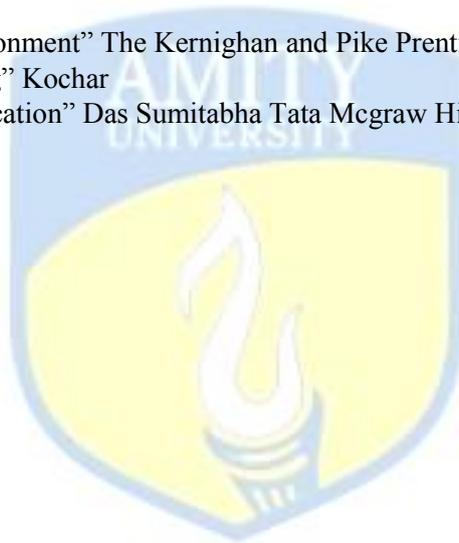
Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text & References:

- “Unix Programming Environment” The Kernighan and Pike Prentice – Hall of India
- “Unix –Shell Programming” Kochar
- “ Unix Concepts and application” Das Sumitabha Tata Mcgraw Hill



INTRODUCTION TO IOT

Course Code: AIE6309

Credit Units: 03

Course Objective:

The Internet is evolving to connect people to physical things and also physical things to other physical things all in real time. It's becoming the Internet of Things (IoT). The course enables student to understand the basics of Internet of things and protocols. It introduces some of the application areas where Internet of Things can be applied. Students will learn about the working of Internet of Things. To understand the concepts of Web of Things.

Course Contents:

Module I: IOT - What is the IoT and why is it important? Elements of an IoT ecosystem, Technology drivers, Business drivers, Trends and implications, Overview of Governance, Privacy and Security Issues.

Module II: IOT PROTOCOLS - Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE802.15.4–BACNet Protocol– Modbus – KNX – Zigbee– Network layer – APS layer – Security

Module III: IOT ARCHITECTURE - IoT Open source architecture (OIC)- OIC Architecture & Design principles- IoT Devices and deployment models- IoTivity : An Open source IoT stack - Overview- IoTivity stack architecture- Resource model and Abstraction, IoT and Big Data.

Module IV: WEB OF THINGS - Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence.

Module V: IOT APPLICATIONS - IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications. Study of existing IoT platforms /middleware, IoT- A, Hydra etc., Introduction to Fog Computing.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.
- Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
- David Easley and Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a Highly Connected World", Cambridge University Press, 2010.
- Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications and Protocols", Wiley, 2012.

References:

- Vijay Madiseti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014
- Francis da Costa, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013
- Cuno Pfister, Getting Started with the Internet of Things, O'Reilly Media, 2011, ISBN: 978-1-4493-9357-1

E-COMMERCE AND ERP

Course Code: AIE6310

Credit Units: 03

Course Objective:

This course examines the evolution of enterprise resource planning (ERP) systems - from internally focused client/server systems to externally focused e-business. This class studies the types of issues that managers will need to consider in implementing cross-functional integrated ERP systems. The objective of this course is to make students aware of the potential and limitations of ERP systems. This objective will be reached through hands-on experience, case studies, lectures, guest speakers and a group project. The course would equip students with the basics of E-Commerce, technologies involved with it and various issues associated with.

Course Contents:

Module I: Introduction E-commerce and ERP: E-commerce and its types, EDI and its basics, Digital payment systems, Enterprise-An Overview, Benefits of ERP, ERP and Related Technologies-Business Process Reengineering (BPR), Data Warehousing, Data Mining, On-line Analytical Processing (OLAP), Supply Chain Management, Management Information systems (MIS), Decision support system (DSS), Executive Information systems (EIS). ERP – A Manufacturing Perspective Materials Requirement Planning (MRP), Bill of Material (Bom), Distribution Requirements Planning (DRP), JIT & Kanban, CAD/CAM, Product Data Management (PDM), Benefits of PDM, MTO, MTS, ATO, ETO, CTO.

Module II: ERP Modules: Business Modules in an ERP Packag- Finance, Manufacturing (Production), Human Resources, Plant Maintenance, Materials Management, Quality Management, Sales and Distribution.

Module III: Benefits of ERP: Time Reduction, On time shipment, Improved Resource Utilization, Performance, Customer Satisfaction, Flexibility, information accuracy and decision making capability, reduction in quality costs, Accuracy.

Module IV: ERP Implementation: ERP Implementation Lifecycle, Implementation Methodology, In-house implementation-Pros and cons, Vendors, Consultants and Users and their roles, Project Management and Monitoring after ERP Implementation.

Module V: The ERP Market and Future Directions: ERP Market Place- SAP AG, PeopleSoft, Baan Company, JD Edwards World Solutions Company, Oracle Corporation, QAD, System Software Associates, Inc. (SSA).Future directions in ERP.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & References:

Text:

- Alexis Leon, "Enterprise Resource Planning", Tata McGraw Hill 2001
- Bajaj, Kamlesh K. and Nag, Debjani, E-Commerce: The Cutting Edge of Business, Tata McGraw-Hill Publishing Company

References:

- Loshin, Pete and Murphy, Paul, *Electronic Commerce*, Second edition, 1990, Jaico Publishing House, Mumbai.
- S. Sadagopan, "Enterprise Resource Planning", Tata McGraw Hill 2000

ELECTRONIC DEVICES & CIRCUITS

Course Code: AIE6311

Credit Units: 02

Course Objective:

This course builds from basic knowledge of Semiconductor Physics to an understanding of basic devices and their models. This course builds a foundation for courses on VLSI design and analog CMOS IC Design.

Course Contents:

Module I: Semiconductor physics: Mobility & conductivity, Charge densities in a semiconductor, Fermi dirac distribution, carrier concentration and Fermi levels in semiconductor, generation and recombination of charges, diffuse and continuity equations, Hall effect.

Module II: Semiconductor Diode and Diode Circuits

Junction diode, Diode as circuit element, Different types of diodes: Zener, Schottky, LED. Zener as voltage regulator, Diffusion capacitance, Drift capacitance, the load line concept, half wave, full wave rectifiers, clipping and clamping circuits.

Module III: Bipolar Junction Transistor

Bipolar junction transistor: Introduction, Transistor, construction, transistor operations, BJT characteristics, load line, operating point, leakage currents, saturation and cut off mode of operations. Bias stabilization: Need for stabilization, fixed Bias, emitter bias, self bias, bias stability with respect to variations in I_{co} , V_{BE} & β , Stabilization factors, thermal stability.

Module IV: Small signal Analysis of transistor and Multistage Amplifier

Hybrid model for transistors at low frequencies, Analysis of transistor amplifier using h parameters, emitter follower, Miller's theorem, THE CE amplifier with an emitter resistance, Hybrid π model, Hybrid π Conductances and Capacitances, CE short circuit current gain, CE short circuit current gain with R_L Multistage amplifier: Cascading of Amplifiers, Coupling schemes (RC coupling and Transformer coupling)

Module V: Field Effect Transistors

Field effect transistor (JFET, MOSFET): volt-ampere characteristics, small signal model –common drain, common source, common gate, operating point, MOSFET, enhancement and -depletion mode, Common source amplifier, Source follower

Module VI: Feedback Amplifiers

Feedback concept, Classification of Feedback amplifiers, Properties of negative Feedback amplifiers, Impedance considerations in different Configurations, Examples of analysis of feedback Amplifiers.

Module VII: Power Amplifiers

Power dissipation in transistors, difference with voltage amplifiers, Amplifier classification (Class A, Class B, Class C, Class AB) class AB push pull amplifier, collector efficiency of each, cross over distortion.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & References:

- Robert F. Pierret: Semiconductor Device Fundamentals, Pearson Education.
- Millman and Halkias: Electronic Devices and circuits, Tata McGraw.
- Boylestad: Electronic Devices and Circuits, Pearson Education.

ELECTRONIC DEVICES & CIRCUITS LAB

Course Code: AIE6312

Credit Units: 01

Course Contents:

- To study and plot the characteristics of a junction diode.
- To study Zener diode as a voltage regulator.
- To study diode based clipping and clamping circuits.
- To study half wave, full wave and bridge rectifier with filters.
- To study the input and output characteristics of a transistor in its various configurations.
- To study and plot the characteristics of a JFET in its various configurations.
- To study and plot the characteristics of a MOSFET in its various configurations.
- To study various types of Bias Stabilization for a transistor.
- To study the gain and plot the frequency response of a single stage transistor amplifier.
- To measure gain and plot the frequency response of double stage RC coupled amplifier.

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Syllabus - Fourth Semester

THEORY OF AUTOMATA AND COMPUTATION

Course Code: AIE6401

Credit Units: 04

Course Objective:

The course begins with the basic mathematical preliminaries and goes on to discuss the general theory of automata, properties of regular sets and regular expressions, and the basics of formal languages. Besides, sufficient attention is devoted to such topics as pushdown automata and its relation with context free languages, Turing machines and linear bounded automata, the basic concepts of computability such as primitive recursive functions and partial recursive functions.

Course Contents:

Module I: Introduction to Languages and Automata

Formal Grammars and Chomsky Hierarchy, Regular Expression Deterministic and Nondeterministic Finite Automata, Regular Expression, Two way Finite Automata, Finite Automata with output, Properties of regular sets, pumping lemma for regular sets, My-Hill-Nerode Theorem.

Module II: Context Free Grammars and Pushdown Automata

CFG: Formal Definition, Derivation and Syntax trees, E-removal, Ambiguous Grammar, Properties of CFL, Normal Forms (CNF and GNF)

Pushdown Automata: Definitions, Relationship between PDA and context free language, Decision Algorithms

Module III: Turing Machine

The Turing Machine Model, Language acceptability of Turing Machine, Design of TM, Universal TM, Church's Machine.

Recursive and recursively enumerable language, unrestricted grammars, Context Sensitive Language, Linear Bounded Automata (LBA).

Module IV: Undecidability

Turing machine halting Problem, undecidable problems for recursive enumerable language, Post correspondence problems (PCP) and Modified Post correspondence problems, Undecidable problems for CFL.

Module V: Computability

Partial and Total Functions, Primitive Recursive functions, Recursive functions.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- Hopcroft and Ullman, "Introduction to Automata Theory, languages and computation", Addison Wesley.
- "An introduction to formal languages and Automata (2nded)" by Peter Linz, D. C. Health and Company.

References:

- "Introduction to theory of computation (2nd Ed)" by Michael Sipser.
- Mishra & Chandrashekharan, "Theory of Computer Sciences", PHI.
- Zavi Kohavi, "Switching and finite Automata Theory"
- Kohan, "Theory of Computer Sciences".
- Korral, "Theory of Computer Sciences".

DIGITAL ELECTRONICS

Course Code: AIE6402

Credit Units: 02

Course Objective:

This course is an introduction to the basic principles of digital electronics. At the conclusion of this course, the student will be able to quantitatively identify the fundamentals of computers, including number systems, logic gates, logic and arithmetic subsystems, and integrated circuits. They will gain the practical skills necessary to work with digital circuits through problem solving and hands on laboratory experience with logic gates, encoders, flip-flops, counters, shift registers, adders, etc. The student will be able to analyze and design simple logic circuits using tools such as Boolean Algebra and Karnaugh Mapping, and will be able to draw logic diagrams.

Course Contents:

Module I: Boolean Functions

Analog & digital signals, AND, OR, NOT, NAND, NOR & XOR gates, Boolean algebra, Standard representation of logical functions, K-map representation and simplification of logical function, don't care conditions, XOR & XNOR simplifications of K-maps, Tabulation method.

Module II: Combinational Circuits

Adders, Subtractors, Multiplexer, de-multiplexer, decoder & encoder, code converters, Comparators, decoder / driver for display devices, Implementation of logic functions using multiplexer / de-multiplexer,.

Module III: Sequential Circuits

Flip-flops: SR, JK, D & T flip flops – Truth table, Excitation table, Conversion of flip-flops, race around condition, Master Slave flip flop, Shift registers: SIPO, PISO, PIPO, SIPO, Bi-directional; Counters: ripple & synchronous counters – up / down; Synchronous Sequential circuit: design procedure.

Module IV: Logic families

Logic families: RTL, DTL, TTL, ECL

Module V: Data Converters

Data converters: ADC – successive approximation, linear ramp, dual slope; DAC – Binary Weighted, R-2R ladder type

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Moris Mano: Digital Circuits Systems
- R. P. Jain: Digital Logic & Circuits
- Thomas L. Floyd: Digital Fundamentals
- Malvino and Leech: Digital Principles & Applications

DISCRETE MATHEMATICS

Course Code: AIE6403

Credit Units: 04

Course Objective:

This subject provides students with an in-depth education in the conceptual foundations of computer science and in engineering complex software and hardware systems. It allows them to explore the connections between computer science and a variety of other disciplines in engineering and outside. Combined with a strong education in mathematics, sciences, and the liberal arts it prepares students to be leaders in computer science practice, applications to other disciplines, and research.

Course Contents:

Module I: Formal Logic

Statement, Symbolic Representation and Tautologies, Quantifiers, Predicator and validity, Normal form. Propositional Logic, Predicate Logic, First Order Logic.

Module II: Proof & Relation

Techniques for theorem proving: Direct Proof, Proof by Contra position, Proof by exhausting cases and proof by contradiction, principle of mathematical induction, principle of complete induction. Recursive definitions, solution methods for linear, first-order recurrence relations with constant coefficients.

Module III: Sets and Combinations

Sets, Subsets, power sets, binary and unary operations on a set, set operations/set identities, fundamental set principles, principle of inclusion, exclusion and pigeonhole principle, permutation and combination, Pascal's triangles, Comparing rates of growth: big theta, little oh, big oh and big omega.

Module IV: Relation/function and matrices

Relation/function and matrices: Relation, properties of binary relation, operation on binary relation, closures, partial ordering, equivalence relation, Function, properties of function, composition of function, inverse, binary and n-ary operations, characteristic function, Permutation function, composition of cycles, Boolean matrices, Boolean matrices multiplication.

Module V: Lattices & Boolean Algebra

Lattices: definition, sub lattices, direct product, homomorphism Boolean algebra: definition, properties, isomorphic structures (in particular, structures with binary operations) sub algebra, direct product and homo-morphism, Boolean function, Boolean expression, representation & minimization of Boolean function.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

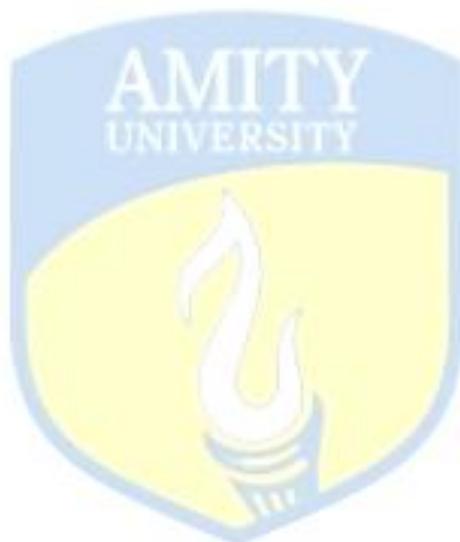
Text & References:

Text:

- J.P. Tremblay & R. Mamohan, "Discrete Mathematical Structure with Application to Computer Science," TMH, New Delhi (2000).
- Kolman, Busby & Ross "Discrete Mathematical Structures", PHI.
- Iyengar, Chandrasekaran and Venkatesh, "Discrete Mathematics", Vikas Publication.
- Peter Linz, "An Introduction to Formal Languages and Automata", Narosa Publishing House.

References:

- J. Truss, “Discrete Mathematics”, Addison Wesley.
- C.L. Liu, “Elements of Discrete Mathematics”, McGraw Hill Book Company.
- M. Lipson & Lipshutz, “Discrete Mathematics”, Schaum’s Outline series.
- J. E. Hopcroft & J. D. Ullman, “Introduction to Automata Theory, Languages and Computation”, Addison Weliy.



ARTIFICIAL INTELLIGENCE

Course Code: AIE6404

Credit Units: 03

Course Objective:

To develop semantic-based and context-aware systems to acquire, organize process, share and use the knowledge embedded in multimedia content. Research will aim to maximize automation of the complete knowledge lifecycle and achieve semantic interoperability between Web resources and services. The field of Robotics is a multi disciplinary as robots are amazingly complex system comprising mechanical, electrical, electronic H/W and S/W and issues germane to all these.

Course Contents:

Module I: Problem solving and Scope of AI

Introduction to Artificial Intelligence. Applications- Games, theorem proving, natural language processing, vision and speech processing, robotics, expert systems. AI techniques- search knowledge, abstraction.

Problem Solving

State space search; Production systems, search space control: depth-first, breadth-first search. Heuristic search - Hill climbing, best-first search, branch and bound. Problem Reduction, Constraint Satisfaction End, Means-End Analysis. LA* Algorithm, L(AO*) Algorithm.

Module II: Knowledge Representation

Knowledge Representation issues, first order predicate calculus, Horn Clauses, Resolution, Semantic Nets, Frames, Partitioned Nets, Procedural Vs Declarative knowledge, Forward Vs Backward Reasoning.

Module III: Understanding Natural Languages

Introduction to NLP, Basics of Syntactic Processing, Basics of Semantic Analysis, Basics of Parsing techniques, context free and transformational grammars, transition nets, augmented transition nets, Shanks Conceptual Dependency, Scripts ,Basics of grammar free analyzers, Basics of sentence generation, and Basics of translation..

Module IV

Expert System: Need and justification for expert systems, knowledge acquisition, Case studies: MYCIN,R1

Learning: Concept of learning, learning automation, genetic algorithm, learning by inductions, neural nets. **Programming Language:** Introduction to programming Language, LISP and PROLOG.

Handling Uncertainties: Non-monotonic reasoning, Probabilistic reasoning, use of certainty factors, Fuzzy logic.

Module V: Introduction to Robotics

Fundamentals of Robotics, Robot Kinematics: Position Analysis, Dynamic Analysis and Forces, Robot Programming languages & systems: Introduction, the three levels of robot programming, requirements of a robot programming language, problems peculiar to robot programming languages.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & References:

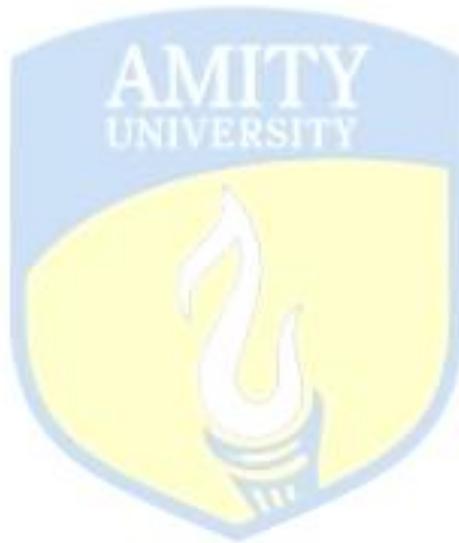
Text:

- E. Rich and K. Knight, "Artificial intelligence", TMH, 2nd ed., 1992.
- N.J. Nilsson, "Principles of AI", Narosa Publ. House, 1990.
- John J. Craig, "Introduction to Robotics", Addison Wesley publication

- Richard D. Klafter, Thomas A. Chmielewski, Michael Negin, “Robotic Engineering – An integrated approach”, PHI Publication
- Tsuneo Yoshikawa, “Foundations of Robotics”, PHI Publication

References:

- D.W. Patterson, “Introduction to AI and Expert Systems”, PHI, 1992.
- Peter Jackson, “Introduction to Expert Systems”, AWP, M.A., 1992.
- R.J. Schalkoff, “Artificial Intelligence - an Engineering Approach”, McGraw Hill Int. Ed., Singapore, 1992.
- M. Sasikumar, S. Ramani, “Rule Based Expert Systems”, Narosa Publishing House, 1994.



DIGITAL ELECTRONICS LAB

Course Code: AIE6405

Credit Units: 01

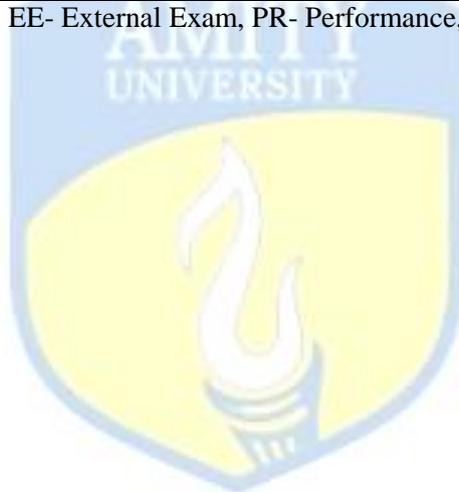
List of Experiments:

1. To verify the truth tables of OR, AND, NOR, NAND, EX-OR, EX-NOR gates.
2. To obtain half adder, full adder and subtractor using gates and verify their truth tables.
3. To verify the truth tables of RS, JK and D flip- flops.
4. To design and study a binary counter.
5. To design and study synchronous counter.
6. To design and study ripple counter.
7. To convert BCD number into excess 3 form
8. To design and study a decade counter.
9. To design and study a sequence detector.
10. To implement control circuit using multiplexer.

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.



ARTIFICIAL INTELLIGENCE LAB

Course Code: AIE6406

Credit Units: 01

Course Contents:

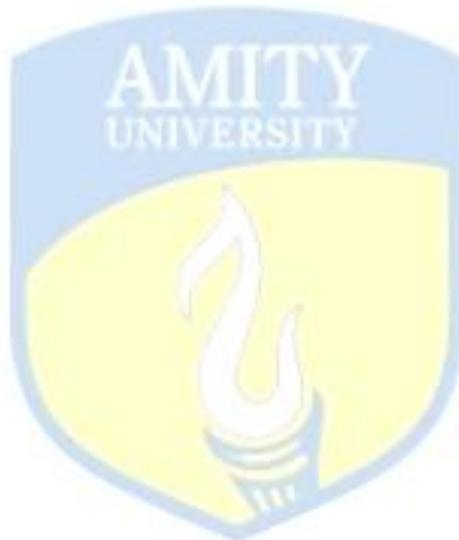
Assignments will be provided for the following:

- Programming in Prolog
- Programming for Robotics

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.



COMMUNICATION SYSTEMS

Course Code: AIE6407

Credit Units: 02

Course Objective:

The purpose of this course is to provide a thorough introduction to analog and digital communications with an in depth study of various modulation techniques, Random processes are discussed, and information theory is introduced.

Course Contents:

Module I: Introduction

Communication Process, Source of Information, Communication channels, base-band and pass-band signals, Review of Fourier transforms, Random variables, different types of PDF, need of modulation process, primary communication resources, analog versus digital communications

Module II: Amplitude modulation

Amplitude modulation with full carrier, suppressed carrier systems, single side band transmission, switching modulators, synchronous detection, envelope detection, effect of frequency and phase errors in synchronous detection, comparison of various AM systems, vestigial side band transmission.

Module III: Angle Modulation

Narrow and wide band FM, BW calculations using Carlson rule, Direct & Indirect FM generations, phase modulation, Demodulation of FM signals, noise reduction using pre & de-emphasis.

Module IV: Pulse Modulation

Pulse amplitude, width & position modulation, generation & detection of PAM, PWM & PPM, Comparison of frequency division and time division multiplexed systems, Basics of digital communications: ASK, PSK, FSK, QPSK basics & waveform with brief mathematical introduction

Module V: Noise

Different types of noise, noise calculations, equivalent noise band width, noise figures, effective noise temperature, noise figure.

Module VI: Introduction to Information Theory

Measurement of Information, mutual, Shannon's theorem, Source coding, channel coding and channel capacity theorem, Huffman code

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & References:

Text:

- B. P. Lathi: "Modern analog & digital communication", OXFORD Publications
- Wayne Tomasi: "Electronic Communication systems", Pearson Education, 5th edition

References:

- Simon Haykin, "Communication Systems", John Wiley & Sons, 1999, Third Edition.
- Taub and schilling, "Principles of Communication Systems" TMH

COMMUNICATION SYSTEMS LAB

Course Code: AIE6408

Credit Units: 01

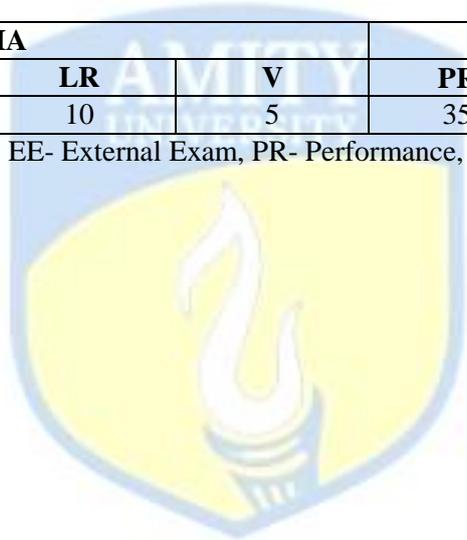
List of Experiments:

- To study the sampling and reconstruction of a given signal.
- To study amplitude modulation and demodulation.
- To study frequency modulation and demodulation.
- To study time division multiplexing.
- To study pulse amplitude modulation.
- To study delta and adaptive delta modulation and demodulation.
- To study carrier modulation techniques using amplitude shift keying and Frequency shift keying.
- To study carrier modulation techniques using binary phase shift keying and differential shift keying.
- To study pulse code modulation & differential pulse code modulation as well as relevant demodulations.
- To study quadrature phase shift keying & quadrature amplitude modulation.

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.



INTRODUCTION TO OPEN SOURCE TECHNOLOGIES (PHP and MySql)

Course Code: AIE6409

Credit Units: 02

Course Objective:

This course is aimed to provide a fundamental understanding of dynamic web site creation. PHP is the language used for development of most common web sites. Syllabus includes basic and advanced features of PHP which includes detailed introduction of PHP and MYSQL, Arrays, Loops and variables etc. It also gives an overview open source framework like JOOMLA, ZEND etc.

Course Contents:

Module I: Introduction to Open Source and PHP programming

Introduction to Open Sources Technologies, Introduction to PHP, installation and configuration, Advantages and Disadvantages of PHP, Client Side Scripting, Server Side Scripting, Variables, data types, various types of function, creating your own function, Strings in PHP, String Functions.

Module II: Operator, Loops, Array, Exception and Error Handling

Operators, Conditions, Loops, Using for each, Creating and Using Arrays, Multidimensional Array, Associative Array.

Error Handling in PHP, Errors and Exceptions, Exception class, try/catch block, throwing an exception, defining your own Exception subclass.

Module III: Classes, File system, Passing Information between pages

Object oriented programming with Php, Working with Datetime, code re-use, require (), include(), and the include_path; Understanding PHP file permissions, File reading and writing functions, File system functions, File uploads, Sending mail & use of email server.

HTTP, GET arguments, POST arguments, Using Session in PHP, cookies, The setcookie() function, Deleting Cookies and Reading Cookies.

Module IV: Working with database

HTML Tables and Database tables, Database manipulation (Select, Insert, Update, Delete), validating User Input using Javascript.

MYSQL, Introducing MySQL; database design concepts; the Structured Query Language (SQL); communicating with a MySQL backend via the PHP, MySQL API Building Database Applications, Developing PHP scripts for dynamic web page like feedback form, online admission form and online test.

Module V: Working with Frameworks

Working with Mambo, Working with Joomla, Working with framework. Working with wordpress, Working with drupal, Use of Joomla in rapid development of website. Developing of simple website using joomla.

Examination Scheme:

Components	CT1	A/C/Q	ATTD.	EE
Weightage (%)	15	10	5	70

Text & References:

Text:

- Beginning PHP, Apache, MySQL Web Development, Michael K. Glass, Yann Le Scouarnec, Elizabeth Naramore, Gary Mailer, Jeremy Stolz, Jason Gerner, published by Wiley, wrox
- PHP, MySQL and Apache Julie C Meloni Pearson Education ISBN : 81-297-0443-9

References:

- The Complete Reference PHP, by Steven Holzner, Tata McGraw-Hill Publication
- Beginning PHP and MYSQL, by W. Jason Gilmore, Apress Publication

INTRODUCTION TO OPEN SOURCE TECHNOLOGIES (PHP and MySql) LAB

Course Code: AIE6410

Credit Units: 01

Course Contents:

- Write the process of installation of web server.
- Write programs to print all details of your php server. Use phpinfo().
- Write a program to give demo of ECHO and PRINT command.
- Write a program to implement the string functions.
- Write a program to print Fibonacci series upto a given number using recursion.
- Write a menu driven program to implement a calculator which performs only addition, subtraction, multiplication and division. The operation should happen based on user choice.
- Write a program sort ten number by using array.
- Write a program to demonstrate the concept of associative array.
- Write a program to demonstrate the concept of multidimensional array.
- Write a program to demonstrate the concept of Classes & objects.
- Create a login form with two text fields called “login” and “password”. When user enters “Amity” as a user name and “university” as a password it should be redirected to a Welcome.HTML page or to Sorry.HTML in case of wrong username/password.
- How to work with sessions in PHP?
- Introduction to Mysql creating databases, tables, using command line and gui interface, phpmyadmin
- How to connect to MySQL using PHP ? Write programs for insertion, deletion updates and other sql queries. Design front end using html, css and write php scripts for processing of data. Try all different methods of connecting from php to MySQL
- Make a small project with mysql and php to perform CRUD operations. Use Session also.
- Create a form with a text box asking to enter your favorite city with a submit button when the user enters the city and clicks the submit button another php page should be opened displaying “Welcometo the city”.
- Write a program to design login form in which find the greatest number amongst three numbers.
- WAP for Marksheet generation.
- Design a webpage for entering the student details with all the validations applied on it.
- Write a php script to print current date and time.
- Write a pp script to use include and require functions.
- Write a php script including all the file handling functions.
- Design a website using Wordpress /Joomla/Drupal
- Introduction to Laravel frame work and one simple project.

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

ARTIFICIAL NEURAL NETWORK

Course Code: AIE6411

Credit Units: 02

Course Objective:

Aim of this course is to introduce the students fundamentals concepts of Nural network and its various application in computer science.

Course Contents:

Module I:-

Artificial Neural Networks (ANN) and biological neural networks, supervised and unsupervised learning rules, neural network applications.

Module II:-

Unsupervised learning:- Hebbian learning and competitive learning. Supervised learning:- Back propagation algorithms,

Learning rule:-

Delta learning rule, Widrow-Hoff learning rule, Winner-Take-All learning rule.

Module III:-

Feed forward neural network, feed backward neural network, Perceptron and its learning law, single-layer perceptron, multi-layer perceptron.

Module IV:-

Self organizing networks: Kohonen algorithm, Hopfield Networks: Hopfield network algorithm, Adaptive resonance theory: Network and learning rules.

Module V:-

Associative memory, auto-associative memory, bi-directional associative memory.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text Book:

- Kenji Suzuki (ed.) - InTech , 2013
- Todd Troyer - University of Texas at San Antonio , 2005

ARTIFICIAL NEURAL NETWORK LAB

Course Code: AIE6412

Credit Units: 01

Course Objective

The aim of this lab to gain the practical knowledge of basic neuron models and learning algorithms.

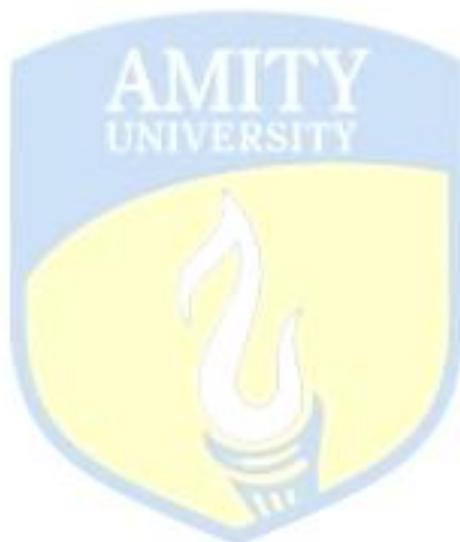
Lab Assignment

To study some basic neuron models and learning algorithms by using Matlab's neural network toolbox

Examination Scheme :

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.



Syllabus - Fifth Semester

SOFTWARE ENGINEERING

Course Code: AIE6501

Credit Units: 03

Course Objective:

The basic objective of Software Engineering is to develop methods and procedures for software development that can scale up for large systems and that can be used to consistently produce high-quality software at low cost and with a small cycle time. Software Engineering is the systematic approach to the development, operation, maintenance, and retirement of software. The course provides a thorough introduction to the fundamental principles of software engineering. The organization broadly based on the classical analysis-design-implementation framework.

Course Contents:

Module I: Introduction

Software life cycle models: Waterfall, Prototype, Evolutionary and Spiral models, Overview of Quality Standards like ISO 9001, SEI-CMM

Module II: Software Metrics and Project Planning

Size Metrics like LOC, Token Count, Function Count, Design Metrics, Data Structure Metrics, Information Flow Metrics. Cost estimation, static, Single and multivariate models, COCOMO model, Putnam Resource Allocation Model, Risk management.

Module III: Software Requirement Analysis, design and coding

Problem Analysis, Software Requirement and Specifications, Behavioural and non-behavioural requirements, Software Prototyping Cohesion & Coupling, Classification of Cohesiveness & Coupling, Function Oriented Design, Object Oriented Design, User Interface Design Top-down and bottom-up Structured programming, Information hiding,

Module IV: Software Reliability, Testing and Maintenance

Failure and Faults, Reliability Models: Basic Model, Logarithmic Poisson Model, Software process, Functional testing: Boundary value analysis, Equivalence class testing, Structural testing: path testing, Data flow and mutation testing, unit testing, integration and system testing, Debugging, Testing Tools, & Standards. Management of maintenance, Maintenance Process, Maintenance Models, Reverse Engineering, Software RE-engineering

Module V: UML

Introduction to UML, Use Case Diagrams, Class Diagram: State Diagram in UML Activity Diagram in UML Sequence Diagram in UML Collaboration Diagram in UML, Domain, Component Diagram and Deployment Diagram

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

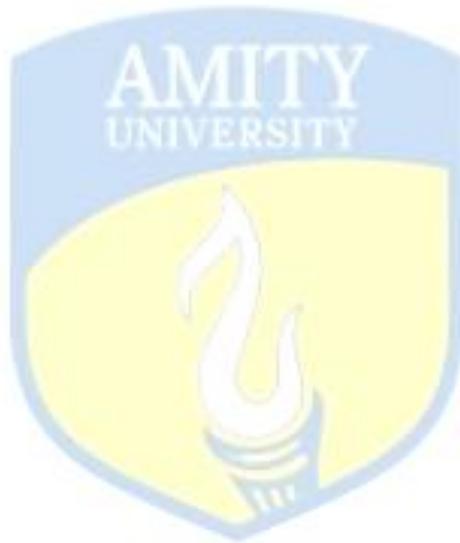
Text & References:

Text:

- K. K. Aggarwal & Yogesh Singh, "Software Engineering", 2nd Ed, New Age International, 2005.
- R. S. Pressman, "Software Engineering – A practitioner's approach", 5th Ed., McGraw Hill Int. Ed., 2001.

References:

- R. Fairley, “Software Engineering Concepts”, Tata McGraw Hill, 1997.
- P. Jalote, “An Integrated approach to Software Engineering”, Narosa, 1991.
- Stephen R. Schach, “Classical & Object Oriented Software Engineering”, IRWIN, 1996.
- James Peter, W. Pedrycz, “Software Engineering”, John Wiley & Sons.
- Sommerville, “Software Engineering”, Addison Wesley, 1999.



COMPUTER ARCHITECTURE

Course Code: AIE6502

Credit Units: 04

Course Objective:

This course deals with computer architecture as well as computer organization and design. Computer architecture is concerned with the structure and behaviour of the various functional modules of the computer and how they interact to provide the processing needs of the user. Computer organization is concerned with the way the hardware components are connected together to form a computer system. Computer design is concerned with the development of the hardware for the computer taking into consideration a given set of specifications.

Course Contents:

Module I: Register Transfer Language

Register Transfer, Bus and Memory Transfers, Arithmetic Micro-operations, Logic Micro-operations, Shift Micro-operations, Arithmetic Logic shift Unit.

Module II: Basic Computer Organizations and Design

Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt, Design of Accumulator Logic. Hardwired and Microprogrammed control: Control Memory, Address Sequencing, Design of Control Unit

Module III: Central Processing Unit

Introduction, General Register Organization, Stack Organization, Instruction representation, Instruction Formats, Instruction type, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer RISC and CISC. Computer Arithmetic: Introduction, Addition and Subtraction Algorithm, Multiplication Algorithms, Booth Multiplication, Division Algorithms, Floating-Point Arithmetic Operations

Module IV: Memory and Intrasystem Communication and Input output organisation

Memory: Memory types and organization Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory with mapping techniques, Virtual Memory, Memory Management Hardware, **Intrasystem communication and I/O:** Peripheral Devices, Input-Output, Controller and I/O driver, IDE for hard disk, I/O port and Bus concept, Bus cycle, Synchronous and asynchronous transfer, Modes of Transfer, DMA, DMA Transfer, DMA Controller, I/O Processor, CPU-IOP Communication

Module V: Introduction to Pipelining and Multi-Processor

Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Multiprocessors: Characteristics of Multiprocessors

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

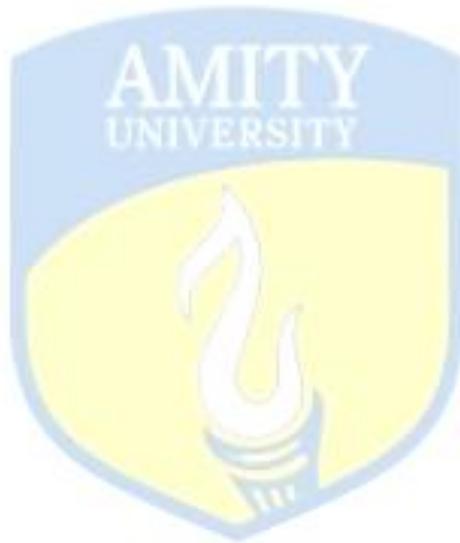
Text & References:

Text:

- Morris Mano, Computer System Architecture, 3rd Edition – 1999, Prentice-Hall of India Private Limited.
- Harry & Jordan, Computer Systems Design & Architecture, Edition 2000, Addison Wesley, Delhi.

References:

- William Stallings, Computer Organization and Architecture, 4th Edition-2000, Prentice-Hall of India Private Limited.
- Kai Hwang-McGraw-Hill, Advanced Computer Architecture.
- Kai Hwang & Faye a Briggs, McGrew Hill, inc., Computer Architecture & Parallel Processing.
- John D. Carpinelli, Computer system Organization & Architecture, Edition 2001, Addison Wesley, Delhi
- John P Hayes, McGraw-Hill Inc, Computer Architecture and Organization.
- M. Morris Mano and Charles, Logic and Computer Design Fundamentals, 2nd Edition Updated, Pearson Education, ASIA.
- Hamacher, "Computer Organization," McGraw hill.
- Tennenbaum," Structured Computer Organization," PHI
- B. Ram, "Computer Fundamentals architecture and organization," New age international Gear C. w., "Computer Organization and Programming, McGraw hill



JAVA PROGRAMMING

Course Code: AIE6503

Credit Units: 03

Course Objective:

The objective is to impart programming skills used in this object oriented language java. The course explores all the basic concepts of core java programming. The students are expected to learn it enough so that they can develop the web solutions like creating applets etc.

Course Contents:

Module I: Java Basics

Concepts of OOP, Features of Java, How Java is different from C++, Environmental setup, Basic syntax, Objects and classes, Basic Data Types, Variable Types, Modifier Types, Basic operators, Loop Control, Decision Making, Strings and Arrays, Methods, I/O.

Module II: Java Object Oriented

Inheritance, Overriding, Polymorphism, Abstraction, Encapsulation, Interfaces, Packages, Exploring java.util package.

Module III: Exception Handling and Threading

Exception Hierarchy, Exception Methods, Catching Exceptions, Multiple catch Clauses, Uncaught Exceptions Java's Built-in Exception.

Creating, Implementing and Extending thread, thread priorities, synchronization suspending, resuming and stopping Threads, Multi-threading.

Module IV : Event Handling And AWT

Event handling Mechanism, Event Model, Event Classes, Sources of Events, Event Listener Interfaces, AWT: Working with Windows, AWT Controls, Layout Managers

Module V: Java Advanced

AppletClass, Architecture, Skeleton, Display Methods., Swings: Japplet, Icons, labels, Text Fields, Buttons, Combo Boxes., Socket Programming: Socket methods, Server Socket methods, Socket Client and Socket Server examples.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- JAVA The Complete Reference by Patrick Naughton & Herbert Schild, TMH
- Introduction to JAVA Programming a primar, Balaguruswamy.

References:

- "Introduction to JAVA Programming" Daniel/Young PHI
- Jeff Frentzen and Sobotka, "Java Script", Tata McGraw Hill, 1999

ADVANCE DATA STRUCTURE AND ALGORITHM

Course Code: AIE6504

Credit Units: 03

Course Objective:

The objective to this course is to equip students with advanced concepts of data structures like Huffman trees, Self organizing trees, different types of heaps and their time complexity. Advanced topics and graphs and graph algorithms, geometric algorithms and parallel algorithms.

Course Contents:

Module-I:

ADVANCED TREES: Definitions Operations on Weight Balanced Trees (Huffman Trees), 2-3 Trees and Red- Black Trees, Splay Tree. Augmenting Red-Black Trees to Dynamic Order Statistics and Interval Tree Applications. Operations on Disjoint sets and its union-find problem Implementing Sets. Dictionaries, Priority Queues and Concatenable Queues using 2-3 Trees.

Module-II:

MERGEABLE HEAPS: Mergeable Heap Operations, Binomial Trees Implementing Binomial Heaps and its Operations, 2-3-4. Trees and 2-3-4 Heaps. Amortization analysis and Potential Function of Fibonacci Heap Implementing Fibonacci Heap. SORTING NETWORK: Comparison network, zero-one principle, bitonic sorting and merging network sorter.

Module-III:

GRAPH THEORY DEFINITIONS: Definitions of Isomorphic Components. Circuits, Fundamental Circuits, Cut-sets. Cut-Vertices Planer and Dual graphs, Spanning Trees, Kuratovski's two Graphs.

Module-IV:

GRAPH THEORY ALGORITHMS: Algorithms for Connectedness, Finding all Spanning Trees in a Weighted Graph and Planarity Testing, Breadth First and Depth First Search, Topological Sort, Strongly Connected Components and Articulation Point. Single Min-Cut Max-Flow theorem of Network Flows. Ford-Fulkerson Max Flow Algorithms.

Module-V:

Geometric algorithms: Point location, convex hulls and Voronoi diagrams, Arrangements. Parallel algorithms: Basic techniques for sorting, searching, merging

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & References:

Text:

- Rivest Cormen, "Introduction to Algorithms"; PHI

References:

- Tammasia, "Algorithm Design", Willey

ANALYSIS AND DESIGN OF ALGORITHM

Course Code: AIE6505

Credit Units: 03

Course Objective:

The designing of algorithm is an important component of computer science. The objective of this course is to make students aware of various techniques used to evaluate the efficiency of a particular algorithm. Students eventually should learn to design efficient algorithm for a particular program

Course Contents:

Module I: Introduction

Algorithm Design paradigms - motivation, concept of algorithmic efficiency, run time analysis of algorithms, Asymptotic Notations. Recurrences- substitution method, recursion tree method, master method

Module II: Divide and conquer

Structure of divide-and-conquer algorithms: examples; Binary search, quick sort, Merge sort, Strassen Multiplication; Analysis of divide and conquer run time recurrence relations.

Greedy Method

Overview of the greedy paradigm examples of exact optimization solution (minimum cost spanning tree), Approximate solution (Knapsack problem), Single source shortest paths, traveling salesman

Module III: Dynamic programming

Overview, difference between dynamic programming and divide and conquer, Applications: Shortest path in graph, chain Matrix multiplication, Traveling salesman Problem, longest Common sequence, knapsack problem

Module IV: Graph searching and Traversal

Overview, Representation of graphs, strongly connected components, Traversal methods (depth first and breadth first search)

Back tracking

Overview, 8-queen problem, and Knapsack problem

Branch and bound

LC searching Bounding, FIFO branch and bound, LC branch and bound application: 0/1 Knapsack problem, Traveling Salesman Problem

Module V: Computational Complexity

Complexity measures, Polynomial Vs non-polynomial time complexity; NP-hard and NP-complete classes, examples.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & References:

Text:

- E. Horowitz, S. Sahni, and S. Rajsekaran, "Fundamentals of Computer Algorithms," Galgotia Publication
- T. H. Cormen, Leiserson, Rivest and Stein, "Introduction of Computer algorithm,"

References:

- Sara Basse, A. V. Gelder, "Computer Algorithms," Addison W
- J.E Hopcroft, J.D Ullman, "Design and analysis of algorithms"
- D. E. Knuth, "The art of Computer Program

SOFTWARE ENGINEERING LAB

Course Code: AIE6506

Credit Units: 01

Software Required: Rational Rose

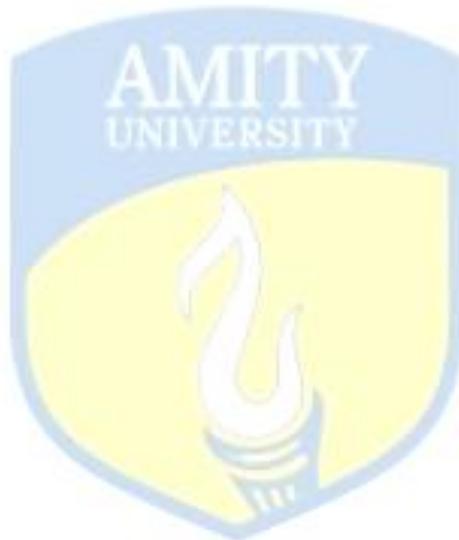
Assignments will be provided for the following:

- Use of Rational Rose for visual modeling.
- Creating various UML diagrams such as use case, sequence, collaboration, activity, state diagram, and class diagrams.

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.



JAVA PROGRAMMING LAB

Course Code: AIE6507

Credit Units: 01

Software Required: JDK1.3

Assignments will be provided for the following:

- Java programs using classes & objects and various control constructs such as loops etc, and data structures such as arrays, structures and functions
- Java programs for creating Applets for display of images and texts.
- Programs related to Interfaces & Packages.
- Input/Output and random files programs in Java.
- Java programs using Event driven concept.
- Programs related to network programming.

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.



ADVANCE DATA STRUCTURES AND ALGORITHM LAB

Course Code: AIE6509

Credit Units: 01

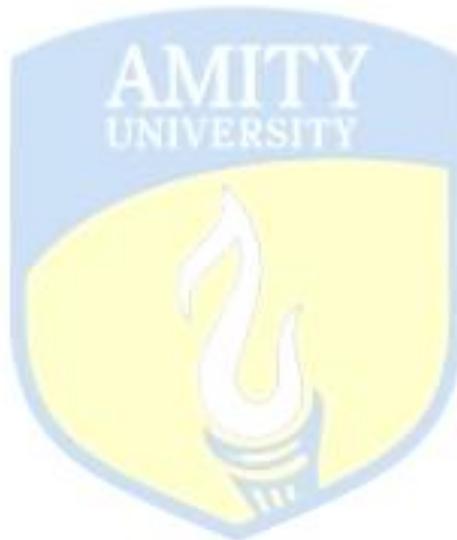
Programs based on Implementation of Graphs using Adjacency Matrix, Linked List , implementation of graph algorithms like BFS,DFS, Minimum Spanning Tree, Binary Search Tree, Knapsack Problem using Greedy Algorithm, Dynamic Programming, Shortest Path Algo (Dijkstra's), Implementing B-Tree,AVL Tree ,Red Black Tree. Implementing Sets, Dictionaries, Priority Queue using Heap.

Recommended Software: Java/C++/C/Python

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.



ANALYSIS AND DESIGN OF ALGORITHM LAB

Course Code: AIE6510

Credit Units: 01

Lab assignment will be based on the following:

Programs for binary search and Quick sort by using divide and conquer techniques.

Programs on algorithm based on greedy method.

Programs on algorithm based on Dynamic programming.

Programs on Depth First and Breadth Search traversals of graphs.

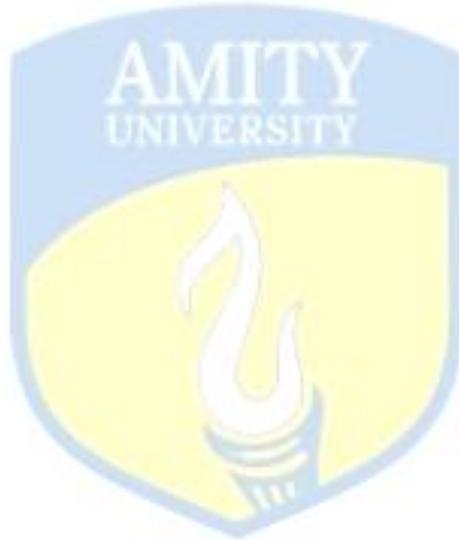
Programs on algorithm based on backtracking.

Programs on algorithm based on Brach and Bound.

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.



PYTHON PROGRAMMING LAB

Course Code: AIE6508

Credit Units: 01

Course Contents:

- Setting up python on Windows/Linux/Mac
- First program in python
- Programs related to basic input/output.
- Programs related to variables, strings, numbers
- Programs related to Lists and Tuples
- Programs related to Functions
- Programs related to If Statements
- Programs related to While Loops and Input
- Programs related to Basic Terminal Apps
- Programs related to Dictionaries
- Programs related to Classes
- Programs related to Exceptions
- Programs related to GUI programming
- Using Word, Excel, PDF files in python.
- Web programming in python,
- Case study of application areas of python.

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

SUMMER INTERNSHIP EVALUATION-I

Course Code: AIE6535

Credit Units: 03

Course Objective:

The objective of this course is to provide practical training on some live projects that will increase capability to work on actual problem in industry. This training may undergo in an industrial environment or may be an in house training on some latest software which is in high demand in market. This training will be designed such that it will be useful for their future employment in industry.

Examination Scheme:

Feedback from industry/work place	20
Training Report	40
Viva	15
Presentation	25
Total	100



FUZZY LOGIC & GENETIC ALGORITHM

Course Code: AIE6511

Credit Units: 03

Course Objective:

This course is intended to mathematical introduction to the analysis, synthesis, and design of control systems using fuzzy logic and Genetic Algorithm. A study of the fundamentals of fuzzy sets, operations on these sets, and their geometrical interpretations. Methodologies to design fuzzy models and feedback controllers for dynamical systems, Various applications and case studies.

fuzzy inference systems, fuzzy logic control, parallel processors, multilevel optimization- real life problem and other machine intelligence applications of fuzzy logic and Genetic Algorithm.

Course Contents:

Module I: Introduction

Crisp sets: Overview, Fuzzy sets : Basic types and concepts, Characteristics and significance of paradigm shift, Fuzzy sets vs Crisp sets, Representation of fuzzy sets

Module II: Fuzzy operations and Fuzzy arithmetic

Types of operations, Fuzzy complements, Fuzzy intersection: t-norms, Fuzzy union: t-conorms, Combination of operations, Aggregation operation, Fuzzy numbers, Linguistic variables, Arithmetic operations on intervals, Arithmetic operations on Fuzzy numbers, Lattice of Fuzzy numbers, Fuzzy equation.

Module III: Fuzzy systems And Applications

General discussion, Fuzzy controller: Overview and example, Fuzzy systems and neural networks, Fuzzy neural network, Fuzzy automata. Pattern recognition in fuzzy logic, Database and information retrieval in fuzzy logic, decision making in fuzzy logic, engineering applications and fuzzy logic, Fuzzy logic in Medicine and Economics

Module- IV: Introduction to Genetic Algorithm

Fundamentals of genetic algorithm: A brief history of evolutionary computation, biological terminology, search space encoding, reproduction elements of genetic algorithm genetic modeling, comparison of GA and traditional search methods. The Fundamental Theorem, Schema Processing at work, Two-armed and k-armed Bandit problem, The Building block hypothesis.

Module-V: Genetic Technology

Genetic technology:- steady state algorithm, fitness scaling, inversion. Genetic programming:- Genetic Algorithm in problem solving, Implementing a Genetic Algorithm:- computer implementation, operator (reproduction, crossover and Mutation, Fitness Scaling, Coding, Discretization). Knowledge based techniques in Genetic Algorithm. Advanced operators and techniques in genetic search:- Dominance, Diploidy and Abeyance. Inversion and other reordering operators, Niche and speciation.

Module- VI: Applications

5 lecture hours

Genetic Algorithm in engineering and optimization-natural evolution –Simulated annealing and Tabu search -Genetic Algorithm in scientific models and theoretical foundations. Applications of Genetic based machine learning-Genetic Algorithm and parallel processors- composite laminates- constraint optimization- multilevel optimization- real life problem.

Modes of Evaluation: Quiz/Assignment/ Seminar/Written Examination

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

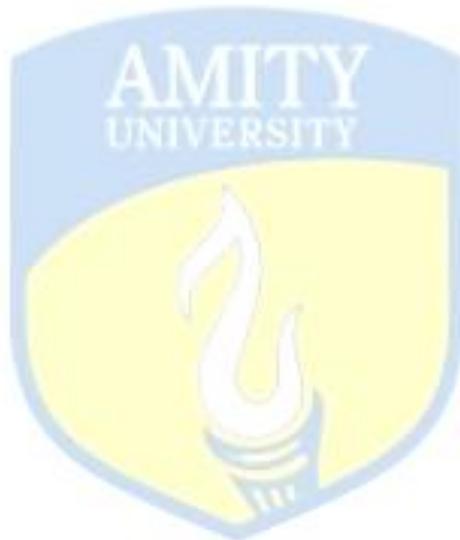
Text & References:

Text:

- Fuzzy sets and fuzzy logic theory and application by George. j. klir , Bo Yuan
- David E. Goldberg, "Genetic Algorithms in search, Optimization & Machine Learning"

References:

- A First Course in Fuzzy and Neural Control by Nguyen, Prasad, Walker, and Walker. CRC 2003
- Artificial Intelligence by Negnevisky. Addison-Wesley
- Automatic Control Systems by Colnaraghi and Kuo. 9th edition. Wiley Publisher. 2010
- William B. Langdon, Riccardo Poli, "Foundations of Genetic Programming"
- 2. P. J. Fleming, A. M. S. Zalzal "Genetic Algorithms in Engineering Systems “



VHDL PROGRAMMING

Course Code: AIE6512

Credit Units: 02

Course Objective:

VHDL is commonly used as a design-entry language for field-programmable gate arrays and application-specific integrated circuits in electronic design automation of digital circuits. The course aims to discuss the syntax of the language to model a digital system.

Course Contents:

Module I

Fundamental VHDL Units, LIBRARY Declarations, ENTITY, ARCHITECTURE, Introductory Examples, Specification of combinational systems using VHDL, Introduction to VHDL, Basic language element of VHDL, Behavioural Modeling, Data flow modeling, Structural modeling, Subprograms and overloading, VHDL description of gates.

Module II

Data Types; Pre-Defined Data Types, User-Defined Data Types, Subtypes, Arrays, Port Array, Records, Signed and Unsigned Data Types, Data Conversion

Module III: Sequential codes

PROCESS: Signals and Variables, IF, WAIT, CASE, LOOP, CASE versus IF, CASE versus WHEN, Bad Clocking, Using Sequential Code to Design Combinational Circuits
Description and design of sequential circuits using VHDL,

Module IV

Standard combinational modules, Design of a Serial Adder with Accumulator, State Graph for Control Network, design of a Binary Multiplier, Multiplication of a Signed Binary Number, Design of a Binary Divider.

Module V

Micro programmed Controller, Structure of a micro programmed controller, Basic component of a micro system, memory subsystem. Overview of PAL, PLA, FPGA, CPLD.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & References:

Text:

- J. Bhaskar, "A VHDL Primer", Addison Wesley, 1999.
- Volnei A. Padroni, "Circuit Design with VHDL."
- M. Ercegovac, T. Lang and L.J. Moreno, "Introduction to Digital Systems", Wiley, 2000
- C. H. Roth, "Digital System Design using VHDL", Jaico Publishing, 2001

References:

- VHDL Programming by Examples by Douglas L. Perry, TMH, 2000
- Hardware Description Languages by Sumit Ghose, PHI, 2000
- The Designer Guide to VHDL by P.J. Ashendern; Morgan Kaufmann Pub. 2000
- Digital System Design with VHDL by Mark Zwolinski; Prentice Hall Pub. 1999
- Designing with FPGA & CPLDs by Zeidman; CMP Pub. 1999
- HDL Chip Design by Douglas J. Smith; Doone Pub. 2001

VHDL PROGRAMMING LAB

Course Code: AIE6513

Credit Units: 01

Software Required: Mentor Graphics

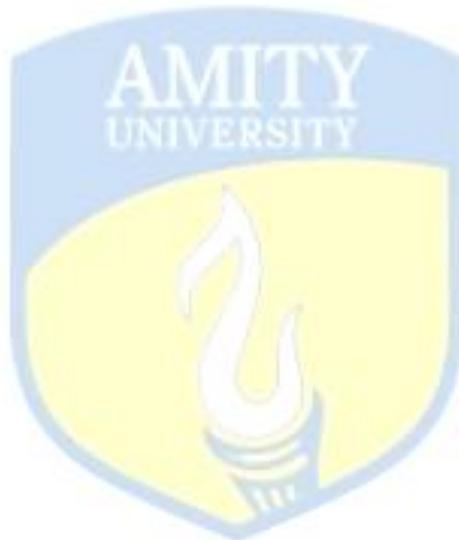
Topics covered in lab will include:

- Designing Basic Gates.
- Designing Combinational circuits like adder, multiplexer, PLA
- Designing Sequential Circuits like flip-flops, counters, registers.

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.



DISTRIBUTED OPERATING SYSTEM

Course Code: AIE6514

Credit Units: 03

Course Objective:

This Subject provides students with an in-depth knowledge about the operating system. The former treats the standard principles of single processor system, including processes, synchronization, I/O , deadlocks, mutual exclusion, fault tolerance , Memory Management, File Management systems, security and so on. This subject covers distributed operating system in detail, including communication process, file system and memory management synchronization and so on but this time in the context of distributed systems

Course Contents:

Module I: Introduction

Functions of an Operating System, Design Approaches, Review of Network Operating System and Distributed Operating System, Issue in the design of Distributed Operating System, Overview of Computer Networks, Modes of communication, System Process, Interrupt Handling, Handling Systems calls, Protection of resources, Micro-Kernel Operating System, client server architecture.

Module II: Distributed Mutual Exclusion

Lamport's Algorithm, The Critical Section Problem, Other Synchronization Problems, Language Mechanisms for Synchronization, Axiomatic Verification of Parallel Programs, Inter process communication (Linux IPC Mechanism), Remote Procedure calls, RPC exception handling, security issues, RPC in Heterogeneous Environment, Case studies.

Module III: Synchronization in Distributed System

Deadlocks in Distributed Systems, Centralized Deadlock- Detection Algorithms, Distributed Deadlock Detection Algorithm' Path Pushing Algorithm, Edge Chasing Algorithm, Diffusion Computation Based Algorithm.

Clock Synchronization: Logical clocks, Physical clocks, Vector Clock, clock synchronization algorithms, Mutual Exclusion, Non-Token Based Algorithms – Lamport's Algorithm, Token-Based Algorithms, Suzuki-Kasami's Broadcast Algorithm, Election Algorithms,

Module IV: Distributed Shared Memory

Introduction, Architecture & Motivation Algorithms for Implementing DSM: The Central – Server Algorithms, The Migration Algorithms, The Read – Replication Algorithms, The Full- Replication Algorithms. Memory Coherence, Coherence Protocols: Write Invalidate Protocol, Write Update Protocol, Design Issues: Granularity , Page Replacement

Module V: Concurrency Control Algorithms

Basic Synchronization Primitives, Two –Phase Locking Protocol, Timestamp Based Algorithms, Two –Phase Commit Protocol. Voting Protocols: Static Voting, Majority Based Dynamic Voting Protocol.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- A. S. Tanenbaum, Distributed Operating Systems, Prentice-Hall, ISBN 0-13-219908-4.
- SinghalShivratri Advanced Concepts in Operating Systems TMH 1994.
- M. Beck et al Linux Kernal, Internal Addition Wesley, 1997.
- B. W. Kernighan and R Pide, The Unix Programming Environment Prentice Hall of India - 2000.
- A. Silberschatz P.B Galvin Operating System Concept, John Wiley & Sons (Asia) 2000.
- Cox K, "Red Hat Linux Administrator's Guide". PHI (200).

Syllabus - Sixth Semester

MICROPROCESSOR

Course Code: AIE6601

Credit Units: 03

Course Objective:

This course deals with the systematic study of the Architecture and programming issues of 8085-microprocessor family. The aim of this course is to give the students basic knowledge of the above microprocessor needed to develop the systems using it.

Course Contents:

Module I: Introduction to Microcomputer Systems

Introduction to Microprocessors and microcomputers, Study of 8 bit Microprocessor, 8085 pin configuration, Internal Architecture and operations, interrupts, Stacks and subroutines, various data transfer schemes.

Module II: ALP and timing diagrams

Introduction to 8085 instruction set, advance 8085 programming, Addressing modes, Counters and time Delays, Instruction cycle, machine cycle, T-states, timing diagram for 8085 instruction.

Module III: Memory System Design & I/O Interfacing

Interfacing with 8085. Interfacing with input/output devices (memory mapped, peripheral I/O), Cache memory system. Study of following peripheral devices 8255, 8253, 8257, 8255, 8251.

Module IV: Architecture of 16-Bit Microprocessor

Difference between 8085 and 8086, Block diagram and architecture of 8086 family, pin configuration of 8086, Minimum mode & Maximum mode Operation. Internal architecture of 8086, Bus Interface Unit, Register Organization, Instruction Pointer, Stack & Stack pointer, merits of memory segmentation, Execution Unit, Register Organization.

Module V: Pentium Processors

.Internal architecture of 8087, Operational overview of 8087, Introduction to 80186, 80286, 80386 & 80486 processors, Pentium processor.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- Ramesh. S. Gaonkar, "Microprocessor architecture Programming and Application with 8085" Penram International Publishing, 4th Edition
- B. Ram, "Fundamentals of microprocessors and microcomputer" Dhanpat Rai, 5th Edition.]
- Douglas V Hall.

References:

- M. Rafiquzzaman, "Microprocessor Theory and Application" PHI – 10th Indian Reprint.
- Naresh Grover, "Microprocessor comprehensive studies Architecture, Programming and Interfacing" Dhanpat Rai, 2003.
- Gosh, "0000 to 8085" PHI.

SYSTEM PROGRAMMING AND COMPILER CONSTRUCTION

Course Code: AIE6602

Credit Units: 03

Course Objective:

This course provides knowledge to design various system programs.

Course Contents:

Module I: Introduction

Definition, Evolution, Components, Editors: Introduction to system Programming Line editor, Full screen editor and multi window editor. Case study MS-Word, DOS Editor and vi editor.

Module II: Assemblers

First pass and second pass of assembler and their algorithms. Assemblers for CISC Machines: case study x85 & x86 machines.

Module III: Compilers & Macro Processor

Introduction to various translators. Various phases of compiler. Bootstrapping for compilers, Introduction to. Design of a compiler in C++ as Prototype. Basic Macro Processor functions- Macro definition & expansion – Macro Processor Algorithm & Data Structures, conditional – Macro Expansion, Keyword Macro Parameters, Macro with in Macro Implementation, case study MASM and ANSI C Macro language.

Module IV: Debuggers, Loaders and Linkers

Introduction to various debugging techniques. Case study:- Debugging in Turbo C++ IDE. Linkers and Loaders Concept of linking. Case study of Linker in x86 machines. Loading of various loading schemes.

Module V: Operating System

Booting techniques and sub-routines. Design of kernel and various management for OS. Design of Shell and other utilities, (Overview of Unix OS, Difference Between Unix and Linux, Commands in Unix.)-changes made

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & References:

Text:

- Donovan J.J., Systems Programming, New York, Mc-Graw Hill, 1972.
- Dhamdhare, D.M., Introduction to Systems Software, Tata Mc-Graw Hill 1996.

References:

- Aho A.V. and J.D. Ullman Principles of compiler Design Addison Wesley/ Narosa 1985.

ADVANCED JAVA PROGRAMMING

Course Code: AIE6603

Credit Units: 03

Course Objective:

The objective is to equip the students with the advanced feature of contemporary java which would enable them to handle complex programs relating to managing data and processes over the network. The major objective of this course is to provide a sound foundation to the students on the concepts, precepts and practices, in a field that is of immense concern to the industry and business.

Course Contents:

Module I: Distributed Computing

Introduction to Java RMI, RMI services, RMI client, Running client and server, Introduction of Swing, Swing Components, Look and Feel for Swing Components, Introduction to Multimedia Programming.

Module II: Database Connectivity

ODBC and JDBC Drivers, Connecting to Database with the java.sql Package, Using JDBC Terminology, JDBC with mysql, postgresql.

Module III: Servlet Programming

Introduction to Servlets, Servlet Life Cycle, Servlet based Applications, Servlet and HTML.Filters, jdbc with servlets, session Management techniques in detail.

Module IV: JSP Programming

JSP: Introduction to JSP, JSP implicit objects, JSP based Applications, Java. Net. Login & Logout Example, jdbc with jsp.

Module V: JEE Web Application

The Model-View-Controller Architecture What is Struts, Struts Tags, Creating Beans, Other Bean Tags, Bean Output, Creating HTML Forms, The Action Form class The Action class, Simple Struts: a simple Struts application; Introduction to EJB.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- Java 2 Unleashed (Techmedia – SAMS), Jamie Jaworski
- Professional Java Server Programming (a Press), Allamaraju
- Developing Java Servlets (Techmedia – SAMS), James Goodwill sing Java 1.2 Special Edition (PHI), Webber

References:

- David Flanagan, Jim Parley, William Crawford & Kris Magnusson, Java Enterprise in a nutshell - A desktop Quick reference - O'REILLY, 2003
- Stephen Ausbury and Scott R. Weiner, Developing Java Enterprise Applications, Wiley-2001
- Jason Hunder & William Crawford, Java Servlet Programming, O'REILLY, 2002
- Dietal and Deital, "JAVA 2" PEARSON publication

ADVANCE DATABASE MANAGEMENT SYSTEM

Course Code: AIE6604

Credit Units: 03

Course Objective:

The objective of this course is to expose the students to the implementation techniques of database system. This course explains techniques for query processing and optimization with transaction and concurrency control techniques

Course Contents:

Module I: Relational Databases

Integrity Constraints revisited, Extended ER diagram, Relational Algebra & Calculus, Functional, Multivalued and Join Dependency, Normal Forms, Rules about functional dependencies.

Module II: Query Processing and Optimization

Valuation of Relational Operations, Transformation of Relational Expressions, Indexing and Query Optimization, Limitations of Relational Data Model, Null Values and Partial Information.

Object Oriented and Object Relational Databases

Modeling Complex Data Semantics, Specialization, Generalization, Aggregation and Association, Objects, Object Identity, Equality and Object Reference, Architecture of Object Oriented and Object Relational Databases

Module III: Parallel and Distributed Databases

Distributed Data Storage – Fragmentation & Replication, Location and Fragment

Transparency Distributed Query Processing and Optimization, Distributed Transaction Modeling and concurrency Control, Distributed Deadlock, Commit Protocols, Design of Parallel Databases, Parallel Query Evaluation.

Advanced Transaction Processing

Nested and Multilevel Transactions, Compensating Transactions and Saga, Long Duration Transactions, Weak Levels of Consistency, Transaction Work Flows, Transaction Processing Monitors.

Module IV

Multimedia databases, Databases on the Web and Semi-Structured Data

Case Study: Oracle Xi

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- Elmarsi, Navathe, Somayajulu, Gupta, “Fundamentals of Database Systems”, 4th Edition, Pearson Education, 2007
- Garcia, Ullman, Widom, “Database Systems, The complete book”, Pearson Education, 2007
- R. Ramakrishnan, “Database Management Systems”, McGraw Hill International Editions, 1998

References:

- Date, Kannan, Swaminathan, “An Introduction to Database Systems”, 8th Edition Pearson Education, 2007
- Singh S.K., “Database System Concepts, design and application”, Pearson Education, 2006.
- Silberschatz, Korth, Sudarshan, “Database System Concepts”, Mcgraw Hill, 6th Edition, 2006
- W. Kim, “Modern Database Systems”, 1995, ACM Press, Addison – Wesley,
- D. Maier, “The Theory of Relational Databases”, 1993, Computer Science Press, Rokville, Maryland
- Ullman, J. D., “Principals of database systems”, Galgotia publications, 1999
- Oracle Xi Reference Manual
- Dietrich, and Urban, “An Advanced Course in Database Systems”, Pearson, 2008.

DIGITAL COMPUTER ORGANIZATION

Course Code: AIE6605

Credit Units: 03

Course Objective:

The Objective of this course is to expose the students to the fundamentals and the concepts of Digital & Computer Organization and Representation of Information and Basic Building Blocks, Basic Organization, Memory Organization, Input-Output Organization, Processor Organization etc. This course is designed to understand the concepts of Computer Organization for Research & Development as well as for application.

Course Contents:

Module I: Representation of Information and Basic Building Blocks

Number Systems, Binary, Octal, Hexadecimal, Character Codes (BCD, ASCII, EBCDIC), Logic gates, Boolean algebra, K-map Simplification, Half adder, Full adder, Decoders, Multiplexes, Binary Counters, Flip/Flops: SR FF, JK FF, Master Slave FF, T and D FF, Registers: Parallel and Serial Registers, Counters (Synchronous & Asynchronous), ALU, Micro-Operation, ALU-chip.

Module II: Basic Organization

Von Neumann Machine (IAS Computer), Operational flow chart (Fetch, Execute), Instruction Cycle, Organization of Central Processing Unit, Hardwired and Micro programmed control unit, Single Organization, General Register Organization, Stack Organization, Addressing Modes, Instruction Formats, Data transfer & Manipulation, I/O organization, Bus Architecture, Programming Registers.

Module III: Memory Organization

Memory hierarchy, Main Memory (RAM/ROM chips) with mapping, Auxiliary memory, Associative memory and its mapping, Virtual memory, Cache memory with mapping techniques, Memory management hardware.

Module IV: Input-Output organization

Peripheral devices, I/O interface, Direct memory access, Modes of transfer, Priority Interrupt, I/O Processors, Serial Communication, Asynchronous data transfer, Strobe Control, Handshaking, I/O Controllers, CPU-IOP Communication.

Module V: Processor Organization

Introductory Concept of pipeline, Flynn's Classification, Parallel processing. RISC and CISC characteristics, arithmetic pipeline with example.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & References:

Text:

- Computer System Architecture: M. Mano (PHI Publication)
- William Stalling, "Computer Organization & Architecture", Pearson education Asia.
- B. Ram, "Computer Fundamental Architecture & Organization" New Age.

References:

- Computer Organization: Vrsarie, Zaky & Hamacher (TMH Publication).
- Tannenbaum, "Structured Computer Organization", PHI.

MICROPROCESSOR LAB

Course Code: AIE6606

Credit Units: 01

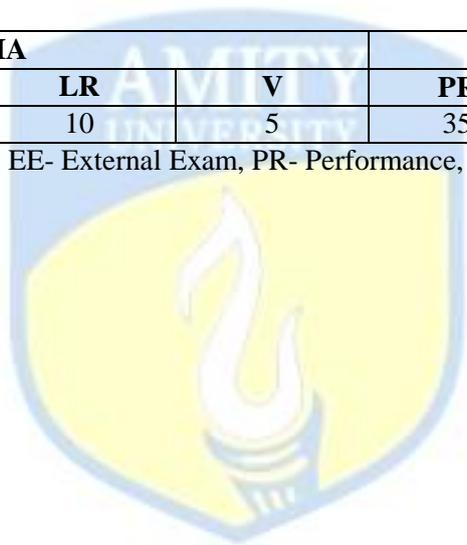
Course Contents:

- To load the numbers 49H and 53H in the memory location 9510 and 9511 respectively and add the contents of memory location 9601
- To write assembly language programming for 8 bit addition with and without carry.
- To write assembly language programming for 8 bit subtraction with and without borrow.
- To write assembly language programming for 8 bit multiplication and division.
- To write assembly language programming for sorting an array of numbers in ascending and descending order.
- To write assembly language programming with additional instructions.
- To write and execute a program using stacks.
- To study and program the programmable peripheral interface (8255) board.
- To study and program the programmable interval timer (8253) board.
- To study and program the programmable DMA controller (8257) board.
- To study and program the programmable interrupt controller (8259) board.

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.



SYSTEM PROGRAMMING AND COMPILER CONSTRUCTION LAB

Course Code: AIE6607

Credit Units: 01

Software Required: Turbo C++

Assignment will be provided for following:

- WAP to determine the length of the machine instructions.
- WAP to differentiate between symbols, literals and tokens.
- WAP to implement Symbol table.
- WAP to implement base table.
- WAP to find the relative addresses.
- Design a macro to perform add operation.
- On the basis of above program display the values of PC, LC and IR.
- Perform programming on loader based programme.
- Perform programming on linker based programme.
- Perform Programming on editor based programme.

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

ADVANCED JAVA PROGRAMMING LAB

Course Code: AIE6608

Credit Units: 01

Programming Language: Java

1. WAP to display label on a frame with the help of JFrame
2. WAP to display six buttons on a panel using JFrame.
3. WAP. To display an image and a string in a label on the JFrame.
4. WAP that implement a JApplet that display a simple label
5. WAP that implement a JApplet and display the following frame
 - a. Customer name
 - b. Customer number
 - c. Age
 - d. Address
6. WAP to access a table Product Master from MS-Access using Java code.
7. WAP that implement a simple servlet program.
8. WAP for authentication, which validate the login-id and password by the servlet code.
9. WAP to connecting a database using user-id and password.
10. WAP to insert data into the database using the prepared statement.
11. WAP to read data from the database using the ResultSet.
12. WAP to read data send by the client (HTML page) using servlet.
13. WAP to include a HTML page into a JSP page.
14. WAP to handle the JSPEXception.
15. WAP to read data send by a client (HTML page) using JSP.

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

ADVANCE DATABASE MANAGEMENT SYSTEM LAB

Course Code: AIE6609

Credit Units: 01

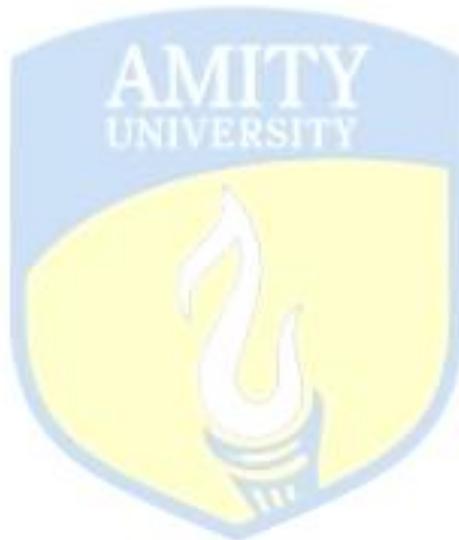
Programs should be based on following topics:

Quick Review of Simple SQL Statements, SQL Built-in Functions, Primary Key, Foreign Key, Normalization, Joins View, Union. **Emphasis** on PL/SQL, Cursors 8. Exception handling, Procedure, Functions, Trigger, concurrency control, transaction processing. Introduction to SQLite. Recommended Software: PostgreSQL, MySQL, Oracle.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance



CRYPTOGRAPHY AND NETWORK SECURITY

Course Code: AIE6610

Credit Units: 03

Course Objective:

The objective here is to acquaint the students with the application of networking. Detail description of the various TCP/IP protocols and the working of ATM and its performance, Network security and authentication, and various algorithms related to it has been dealt, to get a practical approach.

Course Contents:

Module I: Advanced TCP/IP

TCP Services, TCP format and connection management, Encapsulation in IP, UDP Services, Format and Encapsulation in IP, IP Services, Header format and addressing, Fragmentation and reassembly, Migration to IPv6, Protocols: BOOTP, DHCP, ICMP, IGMP; Internet Routing Protocols: OSPF, RIP, EIGRP, BGP.

Module II: High Speed Networks

Packet Switching Networks; Frame Relay Networks; Asynchronous Transfer Mode (ATM); ATM protocol Architecture; ATM logical connections; ATM cells; ATM Service categories; ATM Adaptation Layer; QoS in ATM and Frame Relay

Module III: High Speed LANs

LAN Ethernet, fast Ethernet, gigabit Ethernet, FDDI, DSL, ADSL

Module IV: Wireless communication

Wireless networks, wireless channels, channel access, network architecture, IEEE 802.11, Bluetooth, Satellite Networks.

Module V: Network Security and Management

Principles of cryptography, Authentication, integrity, key distribution and certification, Access control and Firewalls, attacks and counter measures, security in many layers. Infrastructure for network management, The internet standard management framework, SMI, MIB, SNMP, Security and administration.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- William Stallings, "High-Speed Networks and Internets, Performance and Quality of Service", Pearson Education.
- High performance communication networks by: J. Walrand & Pravin Varaiya, Morgan Kaufman, 1999.
- Internetworking with TCP/IP Vol.1: Principles, Protocols, and Architecture (4th Edition) by Douglas E. Comer
- ATM networks: Concepts, Protocols, Applications by: Handel, Addison Wesseley.
- Cryptography & Networks Security Stallings, William 3rd edition

References:

- Computer networks: Tanenbaum, Andrew S, Prentice Hall
- Data communication & networking: Forouzan, B. A.
- Computer network protocol standard and interface Uyles, Black

SOFTWARE TESTING AND QUALITY ASSURANCE

Course Code: AIE6611

Credit Units: 03

Course Objective:

To apply all the testing skills of software testing in such a way that it can provide and improve the software development methodology. Basic objective of Software Testing is to develop methods and procedures that can scale up for large systems and that can be used to consistently produce high-quality software at low cost and with a small cycle for the development.

Course Contents:

Module I

Software Testing Fundamentals - Software Testing Definition, Importance, objectives, why is it too hard? Errors, faults and failure. Testing process, STLC, QA and QC, Verification and Validation, Inspections and walkthroughs, Test Plan, test cases, drivers, stubs, Validation checks.

Module II

Black box testing - Definition, Equivalence Class, Boundary Value Analysis, Documentation testing, state based testing, White box testing – Definition, Difference between black box testing and white box testing, Path testing, Cyclomatic complexity, graph metrics, mutation testing.

Module III

Levels of testing- Low level testing- Unit testing and Integration testing. High level testing- System testing, performance testing, stress testing, load testing, volume testing, smoke and sanity testing, Installation testing, usability testing, website testing, security testing, recovery testing, Domain testing, Static testing and dynamic testing,

Module IV

Test cases– Designing, Execution. Reducing number of test cases- Prioritization guidelines, priority category, scheme, risk analysis, regression testing. Designing scripts, RTM, TRS.

Module V

Cohesion and coupling in class testing, GUI testing, integration and system testing, Automated Testing tools - Manual vs. Automated testing, Static and Dynamic Testing tools, Characteristics: Rational tools, Quality Standards- CMM, ISO, Six sigma, McCall's Quality Factors and Criteria, Quality Metrics

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & References:

Text:

- Software Testing, Srinivasan Desikan, Pearson Education
- Software Testing, R.B.Chopra
- Software Engineering: A Practitioner's Approach, Roger S. Pressman

References:

- Software Testing tools, K.V.K.K Prasad, Dreamtech
- Foundations of software Testing, ISTQB Certification, Dorothy Graham
- Software Test Engineer's Handbook, Graham Bahms

VLSI DESIGN

Course Code: AIE6612

Credit Units: 02

Course Objective:

In the recent years, IC manufacturing technology has gone through dramatic evolution and changes, continuously scaling to ever smaller dimensions. This scaling has a double impact on the design of ICs. First, the complexity of the designs that can be put on a single die has increased dramatically which led to new design methodologies. At the same time, this plunge into deep submicron space causes devices to behave differently and brings challenging issues to forefront. This course along with the course of Digital Circuits and Systems II and Analog CMOS IC design will give you many of the basic essentials to work in the area of Circuit Design. Since this course takes the latest trends in the industry into account, you will find yourself at a definite edge.

Course Contents:

Module I: Devices and the wire

Diode, dynamic and transient behaviour-diffusion capacitance, SPICE diode model.

MOSFET STATIC BEHAVIOUR: Threshold voltage and its dependence on V_{SB} MOSFET Operation in resistive and saturation region, channel length modulation, Velocity saturation and its impact on sub micron devices, sub threshold conduction, Model for manual analysis, Equivalent resistance for MOSFET in (velocity) saturated region, comparison of equations for PMOS and NMOS, depletion and enhancement device

DYNAMIC BEHAVIOUR: Channel capacitance in different regions of operation, junction capacitance, Level 1 SPICE MODELS for MOS transistors

The Wire: Interconnect parameters: resistance, capacitance and Inductance, Lumped RC model, Elmore Delay

Module II: CMOS Inverter

VTC of an ideal inverter, Switching Model of the CMOS inverter: nMOS /pMOS discharge and charge, VTC of CMOS inverter: PMOS AND NMOS operation in various regions including velocity saturation, Switching threshold, $(W/L)_p/(W/L)_n$ ratio for setting desired V_M with and without velocity saturation, Noise Margins, buffer

Ratioed logic: Pseudo NMOS inverter and PMOS to NMOS ratio for performance, tristate inverter, Resistive load inverter.

Load Capacitance calculations: fan out capacitance, self capacitance calculations: Miller effect, wire capacitance; Improving delay calculation with input slope, Propagation delay: first order analysis, analysis from a design perspective, sizing a chain of inverters for minimum delay, choosing optimum number of stages

Power, Energy and Energy Delay: Dynamic power consumption, Static power, Glitches and power dissipation due to direct path currents, power and delay trade off, Transistor sizing for energy minimization

Module III: Combinational circuits

CMOS LOGIC: Good 0 and poor 0, Good 1 and poor 1, series and parallel N and P switches, 2 and Higher input NAND and NOR gates, Functions of the type $(AB+C(D+E))$ and their complements, XOR and XNOR gates, 2 input Multiplexer, Full Adder; Transistor sizing in CMOS logic for optimal delay,

Pseudo NMOS NAND NOR and other gates and the transistor sizing, Introduction to DSVCL logic, CPL AND/NAND, OR/NOR, XOR/XNOR gates

Logical effort, Electrical Effort, Branching effort, Examples of sizing Combinational logic chains for minimum delay. Pass-transistor logic, pass gate configurations for nmos and pmos, 2 input and 4 input MUX, XOR, XNOR and implementation of general functions like $AB+AB*C+A*C*$, Robust and Efficient PTL Design, Delay of Transmission Gate chain

Dynamic CMOS design: Precharge and Evaluation, charge leakage, bootstrapping, charge sharing, Cascading Dynamic Gates, DOMINO Logic, Optimization of Domino Logic Gates, simple example circuit implementations of DOMINO logic

Module IV: Sequential Logic circuits

Principle of Bistability, NAND and NOR based SR latch, and clocked SR Latch, JK latch, example of master slave flip flop, CMOS D latch, MUX based Latches, master slave edge triggered register, non ideal clocks, clock overlap, C2MOS register, TSPCR Register, Schmitt Trigger, Pipelining and NORA CMOS

Module V: Layout Design Rules

Introduction to CMOS Process technology, Layout of CMOS inverter, CMOS NAND and NOR gates, Concept of Euler path, and stick diagrams for functions like $(AB+E+CD)^*$

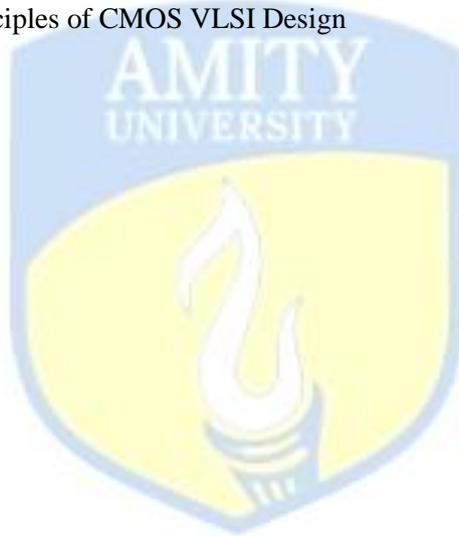
Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & References:

- Jan M Rabaey: Digital Integrated Circuits
- David Hodges et al: Analysis and Design of Digital ICs
- Kang: CMOS Digital ICs
- Weste and Harris: CMOS VLSI design
- Weste and Eshragian: Principles of CMOS VLSI Design



VLSI DESIGN LAB

Course Code: AIE6613

Credit Units: 01

Course Contents:

- Using Design architect and simulate V vs time for CMOS inverter using same W/L ratio for PMOS and NMOS.
- Design and simulate again by Sizing PMOS to NMOS appropriately and repeat experiment 1
- Design and simulate V vs t for 2 input NAND and Nor gates.
- Design and Simulation for general CMOS functions
- One bit full adder simulation
- 2:1 MUX using pass transistor logic
- Other functions using pass transistor logic
- Layout of CMOS inverter
- Layout of NAND and NOR gates
- Design and Simulation SR latch using NAND and NOR representations
- Design and simulate D flip flop

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.



Syllabus - Seventh Semester

DATA WAREHOUSING AND DATA MINING

Course Code: AIE6701

Credit Units: 03

Course Objective:

The objective of this course is to introduce students to Data Warehousing & Data mining technologies that will help To Inspect, Control and Secure Information through Databases.

Course Contents:

Module I: Introduction to Data Warehousing

The need for data ware housing, Operational & Informational Data Stores, Data Warehouse definition & Characteristics, Data Warehouse role & Structure, The cost of warehousing data, Foundation & Roots of Data,

Module II: Data Warehousing Components & Architecture:

Stores, warehouses and marts, Data warehouse database, Sourcing, acquisition, clean up & transformation tools, meta data, Access tools, Data ware house administration & management,. operational & External Database layer, Information access layer, data access layer, metadata layer, process management layer, Application messaging layer, Physical DW layer, Data staging layer.

Module III: Building a Data Warehouse:

Business, Design, Technical & Implementation Considerations, DW project plan. Overview of Mapping the DW to Multiprocessor Architecture, & DBMS Schemas for Decision Support.

Module IV: Metadata and OLAP:

METADATA: Definition, repository, management & trends.

OLAP: Need, guidelines, Multi Relational & Multi-Dimensional: MOLAP, ROLAP, OLAP Tools.

Module V: Data Mining & Visualization:

Techniques to mine the data, Market Basket analysis, Measuring data mining effectiveness, embedding data mining to business process, current limitations and challenges in DM.

Introduction to EIS, The future of Data Mining, Warehousing & Virtualization, Applications: PowerBuilder, Forte. Technical Exposure to Data Mining

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

TEXT BOOKS:

- Alex Berson, Data Warehousing, Data Mining, and Olap, Tata McGraw Hill.
- George M Marakas, Modern Data Warehousing, Mining & Visualization Core Concepts, Pearson Education.

References:

- (Berry, Michael) Data Mining Techniques.
- (Sharma, Gajendra) Data Mining, Data Warehousing and OLAP.
- (Gupta, GK) Data Mining with Case Studies.
- (Han & Kamber) Data Mining: Concepts and Techniques.
- (Paulraj Ponniah) Data warehousing Fundamentals.

COMPUTER GRAPHICS

Course Code: AIE6702

Credit Units: 03

Course Objective:

The objective of the course is to provide the understanding of the fundamental graphical operations and the implementation on computer, the mathematics behind computer graphics, including the use of spline curves and surfaces. It gives the glimpse of recent advances in computer graphics, user interface issues that make the computer easy, for the novice to use.

Course Contents:

Module I: Introduction to Graphics and Graphics Hardware System

Application of computer graphics, Video Display Devices, Raster Scan Display, Random Scan Display, Input Devices, Graphic Software and graphics standards, Numerical based on Raster and Random scan display, Frame buffer, Display processor.

Module II: Output Primitives and Clipping operations

Algorithms for drawing 2D Primitives lines (DDA and Bresenham's line algorithm), circles (Bresenham's and midpoint circle algorithm), Antialiasing and filtering techniques. Line clipping (cohen-sutherland algorithm), Curve clipping algorithm, and polygon clipping with Sutherland Hodgeman algorithm, Area fill algorithms for various graphics primitives: Scanline fill algorithm, boundary fill algorithm, flood fill algorithm, Polygon representation, various method of Polygon Inside test: Even-Odd method, winding number method, Character generation techniques.

Module III: 2D Geometric transformation

2D Transformation: Basic transformation, Translation, Rotation, Rotation relative to an arbitrary point, scaling, Matrix Representations and Homogeneous coordinates, window to viewport transformation.

Module IV: 3D Geometric transformation

3D Concepts: Parallel projection and Perspective projection, 3D Transformations, composite 3D transformation, co-ordinate transformation, Inverse transformation

Module V: object modeling and Visible Surface detection

fractal geometry methods, fractal dimensions, Geometric construction of deterministic self-similar fractals, Iterated function system to generate fractals. Bezier curves and Bezier surfaces, Bspline curves and surfaces, Visible surface detection method: Basic illumination, diffuse reflection, specular reflection, shadows. Ray tracing method, Depth-buffer method, A-buffer method, Depth-sorting method (painter's algorithm), Binary search partition method, Scan line method,

Module VI: Introduction to multimedia

Design of animation sequences, Computer Animation languages, Elementary filtering techniques and elementary Image Processing techniques, graphics library functions used in animation design

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

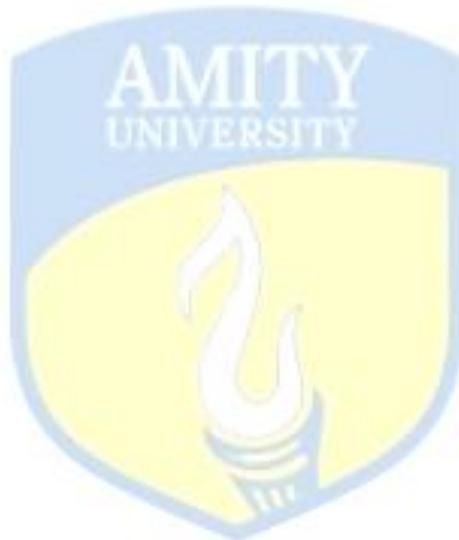
Text & References:

Text:

- Foley et. al., "Computer Graphics Principles & practice", 2nd ed. AWL, 2000.
- D. Hearn and P. Baker, "Computer Graphics", Prentice Hall, 1986.
- R. Plastock and G. Kalley, "Theory and Problems of Computer Graphics", Schaum's Series, McGraw Hill, 1986

References:

- R.H. Bartels, J.C. Beatty and B.A. Barsky, “An Introduction to Splines for use in Computer Graphics and Geometric Modeling”, Morgan Kaufmann Publishers Inc., 1987.
- C.E. Leiserson, T.H. Cormen and R.L. Rivest, “Introduction to Algorithms”, McGraw-Hill Book Company, 1990.
- W. Newman and R. Sproul, “Principles of Interactive Computer Graphics, McGraw-Hill, 1973.
- F.P. Preparata and M.I. Shamos, “Computational Geometry: An Introduction”, Springer-Verlag New York Inc., 1985.
- D. Rogers and J. Adams, “Mathematical Elements for Computer Graphics”, MacGraw-Hill International Edition, 1989
- David F. Rogers, “Procedural Elements for Computer Graphics”, McGraw Hill Book Company, 1985.
- Alan Watt and Mark Watt, “Advanced Animation and Rendering Techniques”, Addison-Wesley, 1992



ADVANCED COMPUTER ARCHITECTURE

Course Code: AIE6703

Credit Units: 03

Course Objective:

With increase in availability of system resources, concept of parallel architecture has obtained immense popularity. This course provides a comprehensive study of scalable and parallel computer architectures for achieving a proportional increase in performance with increasing system resources. In this course we have discussed the theory, technology, architecture (hardware) and software aspects of parallel computer and Vector computers.

Course Contents:

Module I: Parallel computer models

The state of computing, Multiprocessors and multicomputers, Multivector and SIMD computers, Architectural development tracks

Program and network properties: Conditions of parallelism, Data and resource dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain size and latency, Program flow mechanisms, Control flow versus data flow, Data flow architecture, Demand driven mechanisms, Comparisons of flow mechanisms

Module II: System Interconnect Architectures

Network properties and routing, Static interconnection networks, Dynamic interconnection Networks, Multiprocessor system interconnects, Hierarchical bus systems, Crossbar switch and multiport memory, Multistage and combining network.

Module III: Processors and Memory Hierarchy

Advanced processor technology, Instruction-set Architectures, CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors, VLIW Architectures, Vector and Symbolic processors

Memory Technology: Hierarchical memory technology, Inclusion, Coherence and Locality, Memory capacity planning, Virtual Memory Technology

Module IV: Backplane Bus System

Backplane bus specification, Addressing and timing protocols, Arbitration transaction and interrupt, Pipelining: Linear pipeline processor, Nonlinear pipeline processor, Instruction pipeline design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch handling techniques, Arithmetic Pipeline Design, Computer arithmetic principles.

Module V: Vector Processing Principles

Vector instruction types, Vector-access memory schemes.

Synchronous Parallel Processing: SIMD Architecture and Programming Principles, SIMD Parallel Algorithms

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & References:

Text:

- Kai Hwang, "Advanced computer architecture"; TMH, 2000.

References:

- J.P. Hayes, "computer Architecture and organization", MGH, 1998.
- M.J Flynn, "Computer Architecture, Pipelined and Parallel Processor Design", Narosa Publishing, 1998.
- D.A. Patterson, J.L. Hennessy, "Computer Architecture: A quantitative approach", Morgan Kauffmann, 2002.
- Hwang and Briggs, "Computer Architecture and Parallel Processing"; MGH,

ADVANCED COMPUTER NETWORKS

Course Code: AIE6704

Credit Units: 03

Course Objective:

The objective of the course is to provide thorough understanding & in-depth knowledge of concepts in computer networks Such as Internet protocols and routing, local area networks, wireless communications and networking, performance analysis, congestion control, TCP, network address translation, multimedia over IP, switching and routing, mobile IP, multicasting, IPv6. Peer-to-peer networking, network security, and other current research topics. A focus will be placed on wireless networking, reflecting rapid advances in this area. This course motivates the students to explore current research areas in the same field.

Course Contents:

Module I : Introduction to Networks

Networking introduction, Reference Models, TCP/IP, OSI, Addressing, Protocol Layering, Transmission impairment, performance, Switching, Transmission Media, Introduction to MAC, Channel allocation, MAC protocol classification for LAN's, MAN's, MAC protocols for Adhoc N/ws, MAC Protocol for WLAN's(adhoc and sensor n/ws), Introduction to Ethernet protocol (Fast, Gigabit and standard Ethernet).

Module II: Network Layer

Network Layer Design Issues, Routing Algorithms, Congestion Control Algorithms, Quality of Service, Internet Working, Network Layer in Internet.
IPv6 basic protocol, extensions and options, support for QoS, security, etc., Changes to other protocols, Application Programming Interface for IPv6.

Module III : Mobile IP

Mobile IP, IP Multicasting. Multicast routing protocols, address assignments, session discovery, etc.

Module IV : Transport Layer and Application Layer

The Transport Protocol: The Transport Service, Elements of transport protocol, a simple Transport Protocol, Internet Transport Protocols UDP, Internet Transport Protocols TCP, TCP extensions for high-speed networks, transaction-oriented applications Performance Issues.

The Application Layer: DNS-(Domain Name System), Electronic Mail, World Wide Web Multimedia.

Module V : Network Security

Overview of network security, Secure-HTTP, SSL, ESP, Key distribution protocols. Digital signatures, digital certificates-mail Security, Web security, Social Issues.

Examination Scheme:

Components	A	CT	H	V/S/O	EE
Weightage (%)	5	10	7	8	70

Text & References:

Text:

- Computer Networks - Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI
- Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

References:

- Computer Communications and Networking Technologies –Michael A.Gallo, WilliamM .Hancock - Thomson Publication.
- W. Stallings. Cryptography and Network Security: Principles and Practice, 2nd Edition, Prentice Hall, 1998.
- W. R. Stevens. TCP/IP Illustrated, Volume 1: The protocols, Addison Wesley, 1994.
- C. E. Perkins, B. Woolf, and S. R. Alpert. Mobile IP: Design Principles and Practices, Addison Wesley, 1997.

DATAWARE HOUSING & DATA MINING LAB

Course Code: AIE6705

Credit Units: 01

Course Contents:

Programming Language: Weka 3.6

List of Experiments/Programs:

- Defining Weather relation for different attributes
- Defining employee relation for different attributes
- Defining labor relation for different attributes
- Defining student relation for different attributes
- Exploring weather relation using experimenter and obtaining results in various schemes
- Exploring employee relation using experimenter
- Exploring labor relation using experimenter
- Exploring student relation using experimenter
- Setting up a flow to load an arff file (batch mode) and perform a cross validation using J48
- Design a knowledge flow layout, to load attribute selection normalize the attributes and to store the result in a csv saver.

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

ADVANCED COMPUTER NETWORKS LAB

Course Code: AIE6707

Credit Units: 01

Course Contents:

Various installations and connections of LAN, WAN, ETC

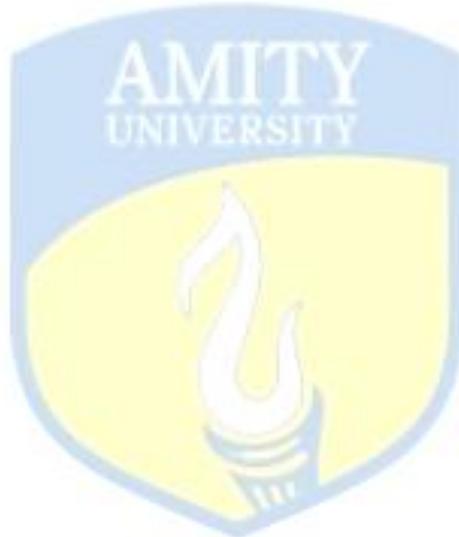
Working on NS2.

Socket Programming using C Language on Linux

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.



MATLAB

Course Code: AIE6708

Credit Units: 02

Understanding The MATLAB Environment, Using the Help System in MATLAB, MATLAB Basics, Linear Algebra; Vectors and Matrices and various operations on them, M files; Scripts and User-defined functions, Plotting, Flow Control and Loops; For and While Loops, If and Case statements, structures, writing basic programs using the above, study of various toolboxes available in matlab and case study of any one tool box.

Recommended Software: MATLAB/Octave

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.



SUMMER INTERNSHIP EVALUATION-II

Course Code: AIE6735

Credit Units: 03

Guidelines:

There are certain phases of every Intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship program can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal classroom situations. These attributes are intellectual ability, professional judgment and decision-making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc.

In order to achieve these objectives, each student will maintain a file (**Internship File**). The Internship File aims to encourage students to keep a personal record of their learning and achievement throughout the Programme. It can be used as the basis for lifelong learning and for job applications. Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development.

The File will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and their own personal contribution to the organization.

The **layout guidelines** for the Project & Seminar Report:

1. File should be in the following specification:

A4 size paper

Font: Arial (10 points) or Times New Roman (12 points)

Line spacing: 1.5

Top & bottom margins: 1 inch/ 2.5 cm

Left & right margins: 1.25 inches/ 3 cm

2. Report Layout: The report should contain the following components:

Front Page

Table of Content

Acknowledgement

Student Certificate

Company Profile (optional)

Introduction

Main Body

References / Bibliography

The File will include **five sections** in the order described below. The content and comprehensiveness of the main body and appendices of the report should include the following:

1. **The Title Page**--Title - An Internship Experience Report For (Your Name), name of internship organization, name of the Supervisor/Guide and his/her designation, date started and completed, and number of credits for which the report is submitted.
2. **Table of Content**--an outline of the contents by topics and subtopics with the page number and location of each section.
3. **Introduction**--short, but should include how and why you obtained the internship experience position and the relationship it has to your professional and career goals.
4. **Main Body**--should include but not be limited to daily tasks performed. Major projects contributed to, dates, hours on task, observations and feelings, meetings attended and their purposes, listing of

tools and materials and their suppliers, and photographs if possible of projects, buildings and co-workers.

5. **References / Bibliography** --This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system

ASSESSMENT OF THE INTERNSHIP FILE

The student will be provided with the Student Assessment Record (SAR) to be placed in front of the Internship File. Each item in the SAR is ticked off when it is completed successfully. The faculty will also assess each item as it is completed. The SAR will be signed by the student and by the faculty to indicate that the File is the student's own work. It will also ensure regularity and meeting the delaines.

STUDENT ASSESSMENT RECORD (SAR)

1. Range of Research Methods used to obtain information

2. Execution of Research

3. Data Analysis

- Analyse Quantitative/ Qualitative information
- Control Quality

4. Draw Conclusions

Examination Scheme:

Components	V	S	R	FP
Weightage (%)	20	20	20	40

V – Viva, S – Synopsis, FP – Final Presentation, R - Report

SOFT COMPUTING

Course Code: AIE6709

Credit Units: 03

Course Objective:

To develop semantic-based and context-aware systems to acquire, organise, process, share and use the knowledge embedded in multimedia content. Research will aim to maximise automation of the complete knowledge lifecycle and achieve semantic interoperability between Web resources and services.

Course Contents:

Module I: Soft Computing

Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing.

Module II: Neural Network

Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural net, Difference between ANN and human brain, characteristics and applications of ANN, single layer network, Perceptron training algorithm, Linear separability, Widrow & Hebb's learning rule/Delta rule, ADALINE, MADALINE, AI v/s ANN. Introduction of MLP, different activation functions, Error back propagation algorithm, derivation of BBPA, momentum, limitation, characteristics and application of EBPA

Module III

Counter propagation network, architecture, functioning & characteristics of counter Propagation network, Hopfield/ Recurrent network, configuration, stability constraints, associative memory, and characteristics, limitations and applications. Hopfield v/s Boltzman machine. Adaptive Resonance Theory: Architecture, classifications, Implementation and training. Associative Memory.

Module IV: Fuzzy Logic

Fuzzy set theory, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, Fuzzy systems: crisp logic, fuzzy logic, introduction & features of membership functions, Fuzzy rule base system : fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making & Applications of fuzzy logic.

Module V: Genetic algorithm

Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods.

Examination Scheme:

Components	CT	H	V/S/O	AT	EE
Weightage (%)	10	8	7	5	70

Text & References:

- S, Rajasekaran & G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & Applications, PHI Publication.
- S.N. Sivanandam & S.N. Deepa, Principles of Soft Computing, Wiley Publications
- Rich E and Knight K, Artificial Intelligence, TMH, New Delhi.
- Bose, Neural Network fundamental with Graph , Algo.& Appl, TMH
- Kosko: Neural Network & Fuzzy System, PHI Publication
- Klir & Yuan, Fuzzy sets & Fuzzy Logic: Theory & Appli.,PHI Pub.
- Hagen, Neural Network Design, Cengage Learning

MOBILE COMPUTING

Course Code: AIE6710

Credit Units: 03

Course Objective:

The objective of this consortium is to shape and expand a full-scale and sound mobile computing system market. To achieve this, cooperation is required of interests related to communication (network), computer hardware/software, system integrators (including service providers), and the media.

Course Contents:

Module I: Introduction to Personal Communications Services (PCS)

PCS Architecture, Mobility management, Networks signaling.

Global System for Mobile Communication (GSM) system overview: GSM Architecture, Mobility management, Network signaling.

Module II: General Packet Radio Services (GPRS) & Wireless Application Protocol (WAP)

GPRS Architecture, GPRS Network Nodes.

Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 standard, Mobile IP.

Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, wireless mark up Languages (WML).

Module III: Third Generation (3G) Mobile Services

Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G.

Wireless Local Loop (WLL): Introduction to WLL Architecture, wireless Local Loop Technologies.

Module IV: Global Mobile Satellite Systems

Global Mobile Satellite Systems; case studies of the IRIDIUM and GLOBALSTAR systems.

Module V: Enterprise Networks

Introduction to Virtual Networks, Blue tooth technology, Blue tooth Protocols. Advanced techniques in mobile computing.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- “Wireless and Mobile Networks Architectures”, by Yi-Bing Lin & Imrich Chlamtac, John Wiley & Sons, 2001.
- “Mobile and Personal Communication systems and services”, by Raj Pandya, Prentice Hall of India, 2001.

References:

- “Guide to Designing and Implementing wireless LANs”, by Mark Ciampa, Thomson learning, Vikas Publishing House, 2001.
- “Wireless Web Development”, Ray Rischpater, Springer Publishing, 2000.
- “The Wireless Application Protocol”, by Sandeep Singhal, Pearson Education Asia, 2000.
- “Third Generation Mobile Telecommunication systems”, by P.Stavronlakis, Springer Publishers, 2001.

GRID COMPUTING

Course Code: AIE6711

Credit Units: 03

Course Objective:

Grid computing (or the use of a *computational grid*) is applying the resources of many computers in a network to a single problem at the same time - usually to a scientific or technical problem that requires a great number of computer processing cycles or access to large amounts of data. The major objective of this course is to provide a sound foundation to the students on the concepts, percepts and practices in a field that is of immense concern to the industry and business.

Course Contents:

Module I: Introduction-Cluster to grid computing

Cluster computing models, Grid models, Mobile grid models, Applications.

Parset: System independent parallel programming on distributed systems: Motivation and introduction, Semantics of the parset construct, Expressing parallelism through parsets, Implementing parsets on a loosely coupled distributed system.

Anonymous remote computing model: Introduction, Issues in parallel computing on interconnected workstations, Existing distributed programming approaches, The arc model of computation, The two tired arc language constructs, Implementation

Module II: Integrating task parallelism with data parallelism

Introduction and motivation, A model for integrating task parallelism into data parallel programming platforms, Integration of the model into ARC, Design and implementation applications, performance analysis, guidelines for composing user programs, related work

Anonymous remote computing and communication model: Introduction, Location in dependent inter task communication with DP, DP model of iterative grid computations, Design and implementation of distributed pipes, Case study, and Performance analysis.

Module III: Parallel programming model on CORBA

Introduction, Existing works, notion of concurrency, system support implementation performance, suitability of CORBA: introspection.

Grid computing model: Introduction, a parallel computing model over grids, Design and implementation of the model, Performance studies, Related work.

Module IV: Introducing mobility into anonymous remote computing and communication model

Introduction, issues in mobile clusters and parallel computing on mobile clusters, model overview, model computation model, implementation, performance.

Module V: Parallel Simulated Annealing algorithms

Introduction, Simulated annealing (SA) Technique, Clustering algorithm for simulated annealing (SA), Combination of genetic algorithm and simulated annealing (SA) algorithm

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- “Grid Computing a Research Monograph” by D. Janakiram, Tata McGraw hill publications, 2005

References:

- “Grid Computing: A Practical Guide to technology and Applications” by Ahmar Abbas, Charles River media – 2003.
- “Grid Computing” Joshy Joseph & Craig Fellenstein, Pearson Education

TERM PAPER

Course Code: AIE6731

Credit Units: 02

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject.

The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

GUIDELINES FOR TERM PAPER

The procedure for writing a term paper may consist of the following steps:

1. Choosing a subject
2. Finding sources of materials
3. Collecting the notes
4. Outlining the paper
5. Writing the first draft
6. Editing & preparing the final paper

1. Choosing a Subject

The subject chosen should not be too general.

2. Finding Sources of Materials

- a) The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
- b) Begin by making a list of subject-headings under which you might expect the subject to be listed.
- c) The sources could be books and magazine articles, news stories, periodicals, scientific journals etc.

3. Collecting the Notes

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

- a) Get facts, not just opinions. Compare the facts with author's conclusion.
- b) In research studies, notice the methods and procedures, results & conclusions.
- c) Check cross references.

4. Outlining the paper

- a) Review notes to find main sub-divisions of the subject.
- b) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

5. Writing the first draft

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following:

- a) statement of purpose
- b) main body of the paper
- c) statement of summary and conclusion

Avoid short, bumpy sentences and long straggling sentences with more than one main idea.

6. Editing & Preparing the final Paper

- a) Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/ details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section.

- b) Read the paper to ensure that the language is not awkward, and that it "flows" properly.
- c) Check for proper spelling, phrasing and sentence construction.
- d) Check for proper form on footnotes, quotes, and punctuation.
- e) Check to see that quotations serve one of the following purposes:
 - (i) Show evidence of what an author has said.
 - (ii) Avoid misrepresentation through restatement.
 - (iii) Save unnecessary writing when ideas have been well expressed by the original author.
- f) Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

- 1) Title page
- 2) Table of contentsIntroduction
- 3) Review
- 4) Discussion&Conclusion
- 5) References
- 6) Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

Discussion

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

Conclusion

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

- a) summary of question posed
- b) summary of findings
- c) summary of main limitations of the study at hand
- d) details of possibilities for related future research

Reference

From the very beginning of a research project, you should be careful to note all details of articles gathered.

The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.

The key to a good bibliography is consistency. Choose a particular convention and stick to this.

Conventions

Monographs

Crystal, D. (2001), *Language and the internet*. Cambridge: Cambridge University Press.

Edited volumes

Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language*. Berlin/ NY: Mouton de Gruyter.

[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

Edited articles

Schmidt, R./Shimura, A./Wang, Z./Jeong, H. (1996), *Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea*. In: Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language*. Berlin/ NY: Mouton de Gruyter: 285-316.

Journal articles

McQuarrie, E.F./Mick, D.G. (1992), *On resonance: A critical pluralistic inquiry into advertising*

rhetoric. Journal of consumer research 19, 180-197.

Electronic book

Chandler, D. (1994), Semiotics for beginners [HTML document]. Retrieved [5.10.'01] from the World Wide Web, <http://www.aber.ac.uk/media/Documents/S4B/>.

Electronic journal articles

Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document]. German as a Foreign Language Journal [online] 1. Retrieved [12.09.'00] from the World Wide Web, <http://www.gfl-journal.com/>.

Other websites

Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document]. Retrieved [13.10.'01] from the World Wide Web, <http://olaf.hiof.no/~sverrev/eng.html>.

Unpublished papers

Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu.

Unpublished theses/ dissertations

Möhl, S. (1996), Alltagssituationen im interkulturellen Vergleich: Realisierung von Kritik und Ablehnung im Deutschen und Englischen. Unpublished MA thesis, University of Hamburg.
Walsh, R. (1995), Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language. Unpublished PhD dissertation, University College Dublin.

Appendix

The appendix should be used for data collected (e.g. questionnaires, transcripts, ...) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

Assessment Scheme:

Continuous Evaluation:

(Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)

40%

Final Evaluation:

(Based on the organization of the paper, objectives/ problem profile/ issue outlining, comprehensiveness of the research, flow of the idea/ ideas, relevance of material used/ presented, outcomes vs. objectives, presentation/ viva etc.)

60%

PROJECT

Course Code: AIE6732

Credit Units: 02

Course Objective:

The objective of this course is to provide practical training on some live/demo projects that will increase capability to work on actual problem in industry. It will be an in house training on some latest software which is in high demand in market. This training will be designed such that it will be useful for their future employment in industry.

STUDENT ASSESSMENT RECORD (SAR)

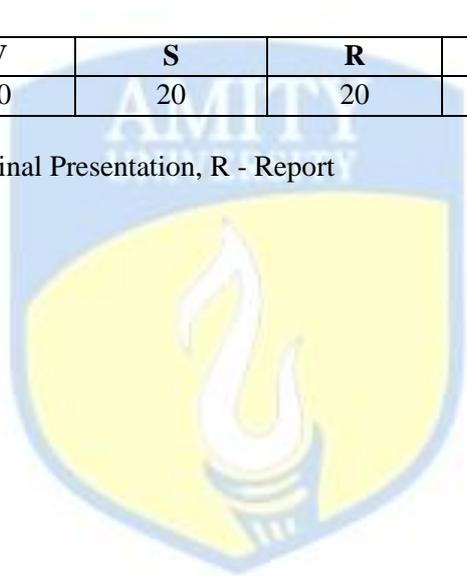
Record to be maintained by project guide.

- 1. Project Tools (Hardware/ Software) used for implementation.**
- 2. Project Evaluation & Execution.**

Examination Scheme:

Components	V	S	R	FP
Weightage (%)	20	20	20	40

V – Viva, S – Synopsis, FP – Final Presentation, R - Report



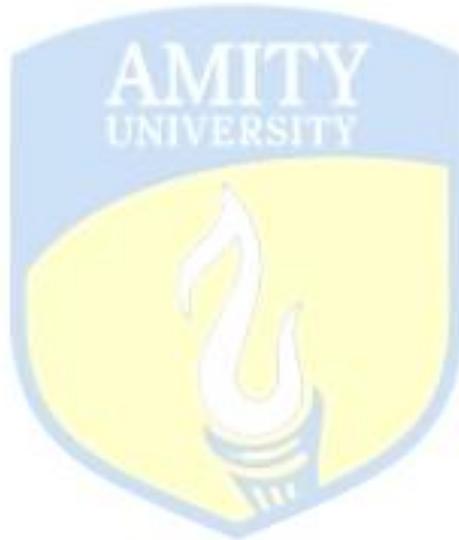
WORKSHOP/INDEPENDENT STUDY

Course Code: AIE6733

Credit Units: 02

This is an elective, self-directed course to investigate emerging areas of IT and Computer Science like Mobile Operating System, Cloud Computing, or from Current Research Areas etc. The primary goal of the course is to provide students with research exploration of a specific topic of interest to the individual student under the advisement of an instructor who will monitor and critique the student's progress.

Independent study provides students with the opportunity to work one-on-one with a Faculty on a particular topic. The student and faculty should discuss the aims and content of the study and present the proposal to Head of Department. The independent study proposal should include the study's title, theme, readings, work to be submitted, and syllabus. Faculty and student should meet for a minimum number of 2 hours per week. Student will give a seminar after completion of study.



Syllabus - Eighth Semester

FUNDAMENTALS OF ROBOTIC SYSTEM AND ROBOT PROGRAMMING

Course Code: AIE6801

Credit Units: 03

Course Objective:

The objective of this course is to enlighten the students about the fundamentals of robotic systems. To understand the basics of robot, Robot Transformations and Sensors, Micro/Nano robotic systems and to program them for functioning.

Course Content:

Module-I: INTRODUCTION

Robot anatomy-Definition, law of robotics, History and Terminology of Robotics-Accuracy and repeatability of Robotics-Simple problems- Specifications of Robot-Speed of Robot-Robot joints and links-Robot classifications-Architecture of robotic systems-Robot Drive systems- Hydraulic, Pneumatic and Electric system.

Module-II: END EFFECTORS AND ROBOT CONTROLS

Mechanical grippers-Slider crank mechanism, Screw type, Rotary actuators, cam type-Magnetic grippers-Vacuum grippers-Air operated grippers-Gripper force analysis-Gripper design-Simple problems-Robot controls-Point to point control, Continuous path control, Intelligent robot-Control system for robot joint-Control actions-Feedback devices-Encoder, Resolver, LVDT-Motion Interpolations-Adaptive control.

Module-III: ROBOT TRANSFORMATIONS AND SENSORS

Robot kinematics-Types- 2D, 3D Transformation-Scaling, Rotation, Translation- Homogeneous coordinates, multiple transformation-Simple problems. Sensors in robot – Touch sensors-Tactile sensor – Proximity and range sensors – Robotic vision sensor-Force sensor-Light sensors, Pressure sensors.

Module-IV: ROBOT CELL DESIGN AND MICRO/NANO ROBOTICS SYSTEM

Robot work cell design and control-Sequence control, Operator interface, Safety monitoring devices in Robot-Mobile robot working principle, actuation using MATLAB, NXT Software Introductions- Robot applications- Material handling, Machine loading and unloading, assembly, Inspection, Welding, Spray painting and undersea robot. Micro/Nanorobotics system overview-Scaling effect-Top down and bottom up approach- Actuators of Micro/Nano robotics system-Nanorobot communication techniques-Fabrication of micro/nano grippers-Wall climbing micro robot working principles-Biomimetic robot-Swarm robot-Nanorobot in targeted drug delivery system.

Module-V: BASICS OF ROBOT PROGRAMMING

Robot programming-Introduction-Types- Flex Pendant- Lead through programming, Coordinate systems of Robot, Robot controller- major components, functions-Wrist Mechanism-Interpolation-Interlock commands- Operating mode of robot, Jogging-Types, Robot specifications- Motion commands, end effectors and sensors commands.

Module-VI: VAL, VAL-II, RAPID AND AML LANGUAGE

Robot Languages-Classifications, Structures- VAL- language commands motion control, hand control, program control, pick and place applications, palletizing applications using VAL, Robot welding application using VAL program-WAIT, SIGNAL and DELAY command for communications using simple applications. RAPID- language basic commands- Motion Instructions-Pick and place operation using Industrial robot- manual mode, automatic mode, subroutine command based programming. Move-master command language- Introduction, syntax, simple problems. VAL-II programming-basic commands, applications- Simple problem using conditional statements-Simple pick and place applications-Production rate

calculations using robot. AML Language-General description, elements and functions, Statements, constants and variables-Program control statements- Operating systems, Motion, Sensor commands-Data processing.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

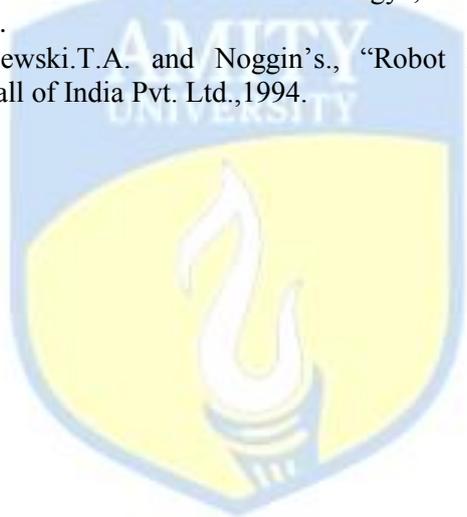
Text & References:

Text:-

- Craig. J. J. “Introduction to Robotics mechanics and control”, Addison- Wesley,1999.

References:-

- S.R. Deb, Robotics Technology and flexible automation, Tata McGraw-Hill Education., 2009
- Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, Technology programming and Applications, McGraw Hill, 2012
- Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, Robotics Engineering an Integrated Approach, Phi Learning.,2009.
- Deb. S. R. “Robotics technology and flexible automation”, Tata McGraw Hill publishing company limited, 1994
- Mikell. P. Groover, “Industrial Robotics Technology”, Programming and Applications, McGraw Hill Co, 1995.
- Klafter. R.D, Chmielewski.T.A. and Noggin’s., “Robot Engineering : An Integrated Approach”, Prentice Hall of India Pvt. Ltd.,1994.



ADVANCED CONTROL SYSTEMS DRIVERS FOR ROBOTS

Course Code: AIE6802

Credit Units: 03

Course Objective:

Course provides comprehensive and insight knowledge of Digital control systems. Objective of the course is to provide the students the core knowledge of Stability theory of Digital systems and State Variable analysis of Digital System

Course Contents:

Module I: Introduction

Configuration of the basic Digital Control Systems, types of sampling operations, Sample and Hold operations, Sampling theorem, Basic discrete time signals.

Module II: Stability Methods

Mapping between s-plane and z-plane, stability methods: Modified Routh Criterion, Jury's method, modified Schur-Cohn criterion.

Module III: Models of Digital Control Systems

Digital temperature control System, Digital position control system, stepping motors and their control. Design of Digital compensator using frequency response plots.

Module IV: Control Systems Analysis Using State Variable Methods

State variable representation, conversion of state variable models to transfer function and vice-versa, Eigen values and eigen vectors, Solution of state equations, Concepts of controllability and observability.

Module V: State Variable analysis of Digital Control Systems

State variable description of digital control systems, conversion of state variable models to pulse transfer function and vice versa, solution of state difference equations, controllability and observability.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & References:

- M. Gopal, Digital Control and State Variable Methods, Tata Mc-Graw-Hill.
- K.Ogata, Discrete Time Control Systems, Pearson Education, (Singapore) (Thomson Press India).
- B.C Kuo, Digital Control Systems, Prentice Hall.
- I.J. Nagrath & M.Gopal, Control System Engg., John Wiley & sons.
- K.K. Aggarwal, Control System Analysis and Design, Khanna Publishers.

MICROPROCESSOR AND INTERFACING

Course Code: AIE6803

Credit Units: 03

Course Objective:

This course deals with the systematic study of the Architecture and programming issues of microprocessor family and its applications. The aim of this course is to give the students detailed knowledge of the above microprocessor needed to develop the systems using it.

Course Contents:

Module I: Microprocessor

Intel 8085 - Introduction, register structure, memory Addressing, Addressing Modes, Instruction Set, Timing Methods, CPU Pins and Associated Signals, Instruction timing and execution. programming I/O. Interrupt System, DMA, SID & SOD lines, Instruction set, 8085 based system design.

Module II: Intel 8086

Introduction, Architecture, Addressing modes, instruction set, memory management, assembler dependent instructions, Input/Output, system design using 8086.

Module III: Pentium Processors

Internal Architecture of 8087, operational overview of 8087, Introduction to 80186,80286, 80386 & 80486 processors and Pentium Processors.

Module IV: Peripheral Interfacing

Parallel versus serial transmission, synchronous and asynchronous serial data transmission. Interfacing of hexadecimal keyboard and display unit, interfacing of cassette recorders and parallel, serial interface standards. Study of Peripheral Devices 8255, 8253,8257, 8251, 8259.

Module V: Microprocessor applications to Power Engineering

Protective Relaying: over-current, impedance, MHO, reactance, bi-directional relays.

Measurements: Frequency, power angle & power factor, Voltage and Current, KVA, KW, & KVAR, maximum demand. Resistance, Reactance, Temperature Controls.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & References:

- Rafiquzzaman, M. Theory & Applications PHI Publications 1993.
- Gaonkar R. S. Microprocessor Architecture, Programming and Applications John Wiley 1989.
- Ram B. Fundamentals of Microprocessors and Microcomputers, Dhanpat Rai & Sons 1995.
- Liu Yu Cheng and Gibson, G.A. PHI 1992.
- Leventhal, L.A. Introduction to Microprocessors: Software, Hardware, Programming.

KINEMATICS AND DYNAMICS OF ROBOTS

Course Code: AIE6804

Credit Units: 03

Course Objective:

Objective of this course is systematic study of the Architecture and programming issues of microprocessor family and its applications. And it focus on detailed knowledge of the above microprocessor needed to develop the systems using it.

Course Contents:

Module-I: INTRODUCTION

Introduction, position and orientation of objects, objects coordinate frame Rotation matrix, Euler angles Roll, pitch and yaw angles coordinate Transformations, Joint variables and position of end effectors, Dot and cross products, coordinate frames, Rotations, Homogeneous coordinates.

Module-II: DIRECT KINEMATICS

Link coordinates D-H Representation, The ARM equation. Direct kinematic analysis for Four axis, SCARA Robot and three, five and six axis Articulated Robots.

Module-III: INVERSE KINEMATICS

The inverse kinematics problem, General properties of solutions. Tool configuration, Inverse kinematics of four axis SCARA robot and three and five axis, Articulated robot.

Module-IV: WORKSPACE ANALYSIS AND TRACJECTORY PLANNING

Workspace Analysis, work envelope of a Four axis SCARA robot and five axis articulated robot workspace fixtures, the pick and place operations, Joint space technique - continuous path motion, Interpolated motion, straight line motion and Cartesian space technique in trajectory planning.

Module-V: MANIPULATOR DYNAMICS

Introduction, Lagrange's equation kinetic and potential energy. Link inertia Tensor, link Jacobian Manipulator inertia tensor. Gravity, Generalized forces, Lagrange-Euler Dynamic model, Dynamic model of a Two-axis planar robot, Newton Euler formulation, Lagrange - Euler formulation, problems.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Robert J. Schilling, Fundamentals of Robotics Analysis and Control, PHI Learning., 2009.
- Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, Robotics Engineering an Integrated Approach, Phi Learning., 2009.
- P.A. Janaki Raman, Robotics and Image Processing An Introduction, Tata Mc Graw Hill Publishing company Ltd., 1995.
- Francis N-Nagy Andras Siegler, Engineering foundation of Robotics, Prentice Hall Inc., 1987.
- Bernard Hodges, Industrial Robotics, Second Edition, Jaico Publishing house, 1993.

ADVANCED APPLIED MATHEMATICS FOR ENGINEERING

Course Code: AIE6805

Credit Units: 03

Course Objective:

Objective of this course is to develop analytical capability and to impart knowledge in Mathematical and Statistical methods and their applications in Engineering and Technology and to apply these concepts in engineering problems they would come across.

Course Contents:

Module-I: TRANSFORM METHODS

Laplace transform methods for one-dimensional wave equation - Displacements in a string - Longitudinal vibrations of an elastic bar – Fourier transform methods for one-dimensional heat conduction problems in infinite and semi-infinite rod.

Module-II: ELLIPTIC EQUATIONS

Laplace equation - Fourier transform methods for Laplace equation – Solution of Poisson equation by Fourier transform method.

Module-III: CALCULUS OF VARIATIONS

Variation and its properties - Euler's equation - Functionals dependent on first and higher order derivatives - Functionals dependent on functions of several independent variables - Some applications - Direct methods – Ritz methods.

Module-IV: NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS:

Numerical Solution of Partial Differential Equations - Solution of Laplace's and Poisson equation on a rectangular region by Liebmann's method - Diffusion equation by the explicit and Crank Nicholson implicit methods - Solution of wave equation by explicit scheme.

Module-V: REGRESSION METHODS

Principle of least squares - Correlation - Multiple and Partial correlation - Linear and non-linear regression - Multiple linear regression.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & References:

- Sankara Rao K., Introduction to Partial Differential Equations, 4th printing, PHI, New Delhi, April 2003
- Elsgolts L., Differential Equations and Calculus of Variations, Mir Publishers, Moscow, 1966
- S.S. Sastry, Introductory Methods of Numerical Analysis, 3rd Edition, PHI, 2001
- Gupta S.C. and Kapoor V.K., Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi, Reprint 2003

FUNDAMENTAL OF ROBOTICS SYSTEM AND ROBOT PROGRAMMING LAB

Course Code: AIE6806

Credit Units: 01

Course Contents:

- Study of different types of robots based on configuration and application.
- Study of different type of links and joints used in robots
- Study of components of robots with drive system and end effectors.
- Determination of maximum and minimum position of links.
- Verification of transformation (Position and orientation) with respect to gripper and world coordinate system
- Estimation of accuracy, repeatability and resolution.
- Robot programming exercises

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.



ADVANCED CONTROL SYSTEM& DRIVES FOR ROBOTS LAB

Course Code: AIE6807

Credit Units: 01

Course Contents:

List of Experiments:

1. Determination of Transfer functions of an Electrical System.
2. Time Response Characteristics of a Second order System (Typical RLC network).
3. Characteristics of Synchros:
 - (a) Synchro transmitter characteristics.
 - (b) Implementation of error detector using synchro pair.
4. Determination of Magnetic Amplifier Characteristics with different possible connections.
5. Process Control Simulator:
 - (a) To determine the time constant and transfer function of first order process.
 - (b) To determine the time response of closed loop second order process with Proportional Control.
 - (c) To determine the time response of closed loop second order process with Proportional-Integral Control.
 - (d) To determine the time response of closed loop second order process with Proportional-Integral-Derivative Control.
 - (e) To determine the effect of disturbances on a process.
6. To study the compensation of the second order process by using:
 - (a) Lead Compensator.
 - (b) Lag Compensator.
 - (c) Lead- Lag Compensator
7. Realization of AND, OR, NOT gates, other derived gates and ladder logic on Programmable Logic Controller with computer interfacing.
8. To determination of AC servomotor Characteristics.
9. To study the position control of DC servomotor with P, PI control actions.
10. Analog Computer:
 - (a) To examine the operation of potentiometer and adder.
 - (b) To examine the operation of integrator.
11. To solve a second order differential equation.

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

MICROPROCESSOR AND INTERFACING LAB

Course Code: AIE6808

Credit Units: 01

Course Contents:

List of Experiments:

1. To load the numbers 49H and 53H ion memory location 9510 & 9511.
2. Respectively and add the contents of memory location 9601.
3. To write the Assembly Language Programming for 8 bit addition with and without carry.
4. To write the Assembly Language Programming for 8 bit subtraction with and without borrow.
5. To write the Assembly Language Programming for 8 bit Multiplication and Division.
6. To write the Assembly Language Programming for sorting an array of numbers in Ascending & Decending order.
7. To write the Assembly Language Programming with Additional Instructions.
8. To write and execute a program using Stacks.
9. To study and program the programmable Peripheral interface (8255 board).
10. To study and program the programmable interval timer (8253 board).
11. To study and program the programmable DMA Controller (8257 board).
12. To study and program the programmable Interrupt Controller (8259 board).
13. To study of programmable Serial Communication interface (8251 board).

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

RESEARCH METHODOLOGY AND TECHNICAL REPORT WRITING

Course Code: AIE6809

Credit Units: 02

Course Objectives:

The course will enhance scientific, technical and research writing skills and impart knowledge about various stages of research process, statistical analysis, statistical tests and their applications in statistical decision making.

Course Contents:

Module I: Introduction to research: Definition, motivation, need, objectives, significance and characteristics of research; types of research; steps in research process; planning a research proposal; literature review, web searching.

Module II: Population and sample, parameter and statistic, sampling and data collection, sampling design: steps, types, sample size, sampling methods, large and small samples, primary and secondary data, data processing and analysis. Sample surveys and questionnaire designing, scaling techniques.

Module III: Dependent and independent variables, univariate, bivariate and multivariate analysis, means-arithmetic, geometric and harmonic; measure of dispersion of data, standard deviation, variance, coefficient of variation and degree of freedom. Hypothesis testing: null hypothesis and alternate hypothesis, errors in hypothesis testing, significance and confidence levels, parametric tests and non-parametric tests, one-tailed and two-tailed tests, analysis of variance. Regression analysis and curve fitting, method of least-squares, explained and unexplained variations, coefficient of correlation, coefficient of determination.

Module IV: Technical/scientific/research report writing: structure and components of scientific reports, formats of dissertations, research report, report writing skills, report preparation, referencing, bibliography and footnotes. Making presentation-use of visual aids and PPTs. Publication of research papers, citations,. Intellectual property rights and copy rights, plagiarism, patents and patent laws, commercialization and ethical issues.

Examination Scheme:

Attendance	Assignment/Library consultation / Thesis writing	Class test	Final Exam	Total
5	15	10	70	100

Text Books:

- Blake, G. and Bly, R.W. 1993, The Elements of Technical Writing. MacMillan, New York
- Booth, V. 1981. Writing a Scientific Paper and Speaking at Scientific Meetings. The Biochemical Society, London
- Chawla, D and Sondhi, N. 2016, Research Methodology- Concepts and Cases. Vikas Publishing House Pvt Ltd. New Delhi
- Kothari, C.R. 2008. Research Methodology- Methods and Techniques, 2nd.ed. New Age International Publishers, New Delhi.

Reference Books:

- Geode, Millian J. & Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi.
- Montgomery, Douglas C. (2007), 5th Ed. Design and Analysis of Experiments, Wiley India.
- Panneerselvam, R. 2009. Research Methodology, PHI Learning Pvt. Ltd., New Delhi-110001
- Ranjit Kumar 2009. Research Methodology- A step-by-step Guide for beginners; 2nd ed. Dorling Kindersley (India) Pvt. Ltd. Patpargang, Delhi- 110092

MINOR PROJECT

Course Code: AIE6837

Credit Units: 08

GUIDELINES FOR PROJECT FILE

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage.

The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

In general, the File should be comprehensive and include

A short account of the activities that were undertaken as part of the project;

A statement about the extent to which the project has achieved its stated goals.

A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;

Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project;

Any problems that have arisen that may be useful to document for future reference.

➤ **Report Layout**

The report should contain the following components:

➤ **Title or Cover Page**

The title page should contain the following information: Project Title; Student's Name; Course; Year; Supervisor's Name.

➤ **Acknowledgements(optional)**

Acknowledgment to any advisory or financial assistance received in the course of work may be given.

➤ **Abstract**

A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project

➤ **Table of Contents**

Titles and subtitles are to correspond exactly with those in the text.

➤ **Introduction**

Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

➤ **Materials and Methods**

This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.

➤ **Results and Discussion**

Present results, discuss and compare these with those from other workers, etc. In writing these section, emphasis should be given on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in

contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

Note that in writing the various sections, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary never write in “point” form.

➤ **Conclusion**

A conclusion should be the final section in which the outcome of the work is mentioned briefly.

➤ **Future prospects**

➤ **Appendices**

The Appendix contains material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

➤ **References / Bibliography**

This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Examples

For research article

Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157:H7. *Clin Microbiol Infect*, **8** (suppl 1): 116–117.

For book

Kowalski, M. (1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

ASSESSMENT OF THE PROJECT FILE

Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution.

Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project.

Project execution is concerned with assessing how much work has been put in.

The File should fulfill the following *assessment objectives*:

Range of Research Methods used to obtain information

Execution of Research

Data Analysis

Analyse Quantitative/ Qualitative information

Control Quality

Draw Conclusions

Examination Scheme:

Dissertation	50
Viva Voce	50
Total	100

FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE FOR ROBOTICS

Course Code: AIE6810

Credit Units: 03

Course Objective:

Objective of this course is to expose the students to the fundamentals of AI and expert systems and its application in Robotics and to familiarize the students with the Fundamental concept of AI and expert system

Course Contents:

Module-I: INTRODUCTION

Introduction – History, Definition of AI, Emulation of human cognitive process, Intelligent agents – The concept of rationality, the nature of environments, the structure of agents.

Module-II: SEARCH METHODS

Problem – Solving Agents : Problem Definitions, Formulating Problems, Searching for solutions – Measuring Problem – Solving Performance with examples. Search Strategies : Uninformed search strategies – Breadth – first Search, Uniform – Cost Search, depth –first search, depth – limited search, Iterative deepening depth – first search, bidirectional search, comparing uniformed search strategies. Informed search strategies – Heuristic information, Hill climbing methods, best – first search, branch – and – bound search, optimal search and A* and Iterative deepening A*.

Module-III: PROGRAMMING AND LOGICS IN ARTIFICIAL INTELLIGENCE

LISP and other programming languages – Introduction to LISP, Syntax and numerical function, LISP and PROLOG distinction, input, output and local variables, interaction and recursion, property list and arrays alternative languages, formalized symbolic logics – properties of WERS, non-deductive inference methods.

Module-IV: EXPERT SYSTEM

Expert system – Introduction, difference between expert system and conventional programs, basic activities of expert system – Interpretation, Prediction, Diagnosis, Design, Planning, Monitoring, Debugging, Repair, Instruction, Control. Basic aspects of expert system – Acquisition module, Knowledge base – Production rules, semantic net, frames. Inference engine – Backward chaining and forward chaining. Explanatory interface.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & References:-

- Russell Stuart, Norvig Peter, “*Artificial Intelligence Modern Approach*”, Pearson Education series in AI, 3rd Edition, 2010.
- Dan.W.Patterson, “*Introduction to Artificial Intelligence and Expert Systems*”, PHI Learning, 2009.
- Donald.A.Waterman, “*A guide to Expert Systems*”, Pearson, 2002.

ROBOTIC SIMULATION AND SIMULTANEOUS LOCALIZATION – MAPPING

Course Code: AIE6811

Credit Units: 03

Course Objective:

Objective of this course is to study the techniques of simulation for robot design and location mapping simulation.

Course Contents:

Module-I: INTRODUCTION

Robotics systems, robot movements, quality of simulation, types of simulation, robot applications, robotics simulation displays. Simulation notation, Auto lisp functions, Features, Command syntax, writing design functions.

Module-II: ROBOTIC PRINCIPLES

Straight lines, Angles and optimal moves circular interpolation, Robotic functions Geometrical commands, Edit commands. Selecting robot views, standard Robot part, using the parts in a simulation.

Module-III: LOCALIZATION AND MAPPINGS

Introduction, Robotic perception – localization, mappings planning to move – configuration space, cell decomposition methods, skeletonization methods, Planning uncertain movements – Robust methods. Moring –dynamics and control, Potential Field control, reactive control, Robotics software architecture, Applications.

Module-IV: ROBOTICS SIMULATION

Simulation packages, Loading the simulation, Simulation editors, delay, Resume commands. Slide commands, program flow control. Robot motion control, Analysis of robot elements, Robotic linkages.

Module-V: ROBOTIC MOTION

Solids construction, Solid animation. Types of motion, velocity and acceleration, Types of simulation motion Harmonic motion, parabolic motion, uniform motion velocity and acceleration analysis for robots.

Module-VI: ROBOT DESIGN

Linkages, Types, Transmission elements Flexible connectors, pulley-and- Belt drives, variable speed transmission. Design of Robot for particular applications – A case study.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & References:-

- Daniel L. Ryan, Robotics Simulation, CRC Press Inc., 1994.
- Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, Robotics Engineering an Integrated Approach, Phi Learning., 2009.
- Robert J. Schilling, Fundamentals of Robotics Analysis and Control, PHI Learning, 2009.
- Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, Technology programming and Applications, McGraw Hill, 2012.

Syllabus - Ninth Semester

AUTOMATION IN MANUFACTURING SYSTEMS

Course Code: AIE6901

Credit Units: 03

Course Objective:

Objective of this course is to highlight the basic concepts and procedure for Automation of Manufacturing systems and the technology behind the automation of a manufacturing system.

Course Contents:

Module-I: OVER VIEW OF MANUFACTURING AND AUTOMATION:

Production systems, Automation in production systems, Automation principles and strategies, Manufacturing operations, production facilities. Basic elements of an automated system, levels of automation; Hardware components for automation and process control, programmable logic controllers and personal computers.

Module-II: MATERIAL HANDLING AND IDENTIFICATION TECHNOLOGIES:

Material handling, equipment, Analysis. Storage systems, performance and location strategies, Automated storage systems, AS/RS, types. Automatic identification methods, Barcode technology, RFID.

Module-III: MANUFACTURING SYSTEMS AND AUTOMATED PRODUCTION LINES:

Manufacturing systems: components of a manufacturing system, Single station manufacturing cells; Manual Assembly lines, line balancing Algorithms, Mixed model Assembly lines, Alternative Assembly systems. Automated production lines, Applications, Analysis of transfer lines.

Module-IV: AUTOMATED ASSEMBLY SYSTEMS: Fundamentals, Analysis of Assembly systems. Cellular manufacturing, part families, cooling, production flow analysis. Group Technology and flexible Manufacturing systems, Quantitative Analysis.

Module-V: QUALITY CONTROL AND SUPPORT SYSTEMS: Quality in Design and manufacturing, inspection principles and strategies, Automated inspection, contact Vs non contact, CMM. Manufacturing support systems. Quality function deployment, computer aided process planning, concurrent engineering, shop floor control, just in time and lean production.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & References:-

- Automation, production systems and computer integrated manufacturing/ Mikell.P Groover/PHI/3 rd edition/2012.
- Automation, Production Systems and CIM/ Mike J P. Grower/PHI
- CAD/CAM/CIM/ P. Radha Krishnan & S. Subrahmanyarn and Raju/New Age International Publishers/2003.
- System Approach to Computer Integrated Design and Manufacturing/ Singh/John Wiley /96.
- Computer Aided Manufacturing/Tien-Chien Chang, Richard A. Wysk and Hsu-Pin Wang/ Pearson/ 2009.
- Manufacturing and Automation Technology / R Thomas Wright and Michael Berkeihiser / Good Heart/Willcox Publishers.

ROBOTIC SENSORS, VISION AND HARDWARE IMPLEMENTATION

Course Code: AIE6902

Credit Units: 03

Course Objective:

Objective of this course is to impart basic knowledge of robot vision, image processing sensors and hardware implementation

Course Contents:

Module-I: SENSORS IN ROBOTICS

An Introduction to sensors and Transducers, History and definitions, Smart Sensing, AI sensing, Need of sensors in Robotics. Position sensors – optical, non-optical, Velocity sensors, Accelerometers, Proximity Sensors – Contact, non-contact, Range Sensing, touch and Slip Sensors, Force and Torque Sensors. Different sensing variables – smell, Heat or Temperature, Humidity, Light, Speech or Voice recognition Systems, Tele-presence and related technologies.

Module-II: VISION IN ROBOTICS

The Nature of Vision- Robot vision – Need, Applications - image acquisition –illumination techniques- Point sensor, line sensor, planar sensor, camera transfer characteristic, Raster scan, Image capture time, volume sensors, Image representation, picture coding techniques. Robot Control through Vision sensors, Robot vision locating position, Robot guidance with vision system, End effector camera Sensor.

Module-III: ELEMENTS OF IMAGE PROCESSING TECHNIQUES

Discretization, Neighbors of a pixel-connectivity- Distance measures - preprocessing Neighborhood averaging, Median filtering. Smoothing of binary Images- Image Enhancement- Histogram Equalization-Histogram Specification –Local Enhancement-Edge detection- Gradient operator- Laplace operators-Thresholding-Morphological image processing

Module-IV: OBJECT RECOGNITION AND FEATURE EXTRACTION

Image segmentation- Edge linking-Boundary detection-Region growing- Region splitting and merging- Boundary Descriptors-Freeman chain code- Regional Descriptors- recognition-structural methods- Recognition procedure, mahalanobic procedure

Module-V: COLLISION FRONTS ALGORITHM

Introduction, skeleton of objects. Gradients, propagation, Definitions, propagation algorithm, Thinning Algorithm, Skeleton lengths of Top most objects.

Module-VI: MULTISENSOR CONTROLLED ROBOT ASSEMBLY

Control Computer, Vision Sensor modules, Software Structure, Vision Sensor software, Robot programming, Handling, Gripper and Gripping methods, accuracy – A Case study.

Examination Scheme:

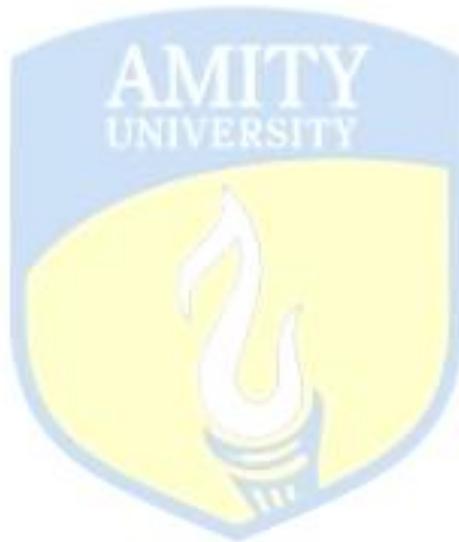
Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:-

- Paul W Chapman, “*Smart Sensors*”, an Independent Learning Module Series, 1996.
- Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, Robotics Engineering an Integrated Approach, Phi Learning., 2009.
- John Iovice, “*Robots, Androids and Animatrons*”, Mc Graw Hill, 2003.
- K.S. Fu, R.C. Gonzalez, C.S.G. Lee, “*Robotics – Control Sensing, Vision and Intelligence*”, Tata McGraw-Hill Education, 2008.

- Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, Technology programming and Applications, Tata McGraw-Hill Education, 2012.
- Sabrie Soloman, Sensors and Control Systems in Manufacturing, McGraw-Hill Professional Publishing, 2nd Edition, 2009.



PATTERN RECOGNITION AND IMAGE PROCESSING

Course Code: AIE6903

Credit Units: 03

Course Objective:

This course covers the theory and methods for learning from data, with an emphasis on pattern classification. Digital Image Processing is designed to give professionals and students a powerful collection of fundamental and advanced image processing tools on the desktop

Course Contents:

Module I: Introduction

Machine perception, pattern recognition example, pattern recognition systems, the design cycle, learning and adaptation

Bayesian Decision Theory

Introduction, continuous features – two categories classifications, minimum error-rate classification-zero-one loss function, classifiers, discriminant functions, and decision surfaces

Module II:

Normal density:

Univariate and multivariate density, discriminant functions for the normal density-different cases, Bayes decision theory – discrete features, compound

Bayesian decision theory and context

Module III: Un-supervised learning and clustering

Introduction, mixture densities and Identifiability, maximum likelihood estimates, application to normal mixtures, K-means clustering. Data description and clustering, similarity measures, criteria function for clustering

Module IV: Image Fundamentals and Transforms

Elements of visual perception – Image sampling and quantization, Basic relationship between pixels, Some basic grayscale transformations, Introduction to Fourier Transform and DFT, Properties of 2D Fourier Transform, FFT, Separable Image Transforms, Walsh, Hadamard, Discrete Cosine Transform, Haar, Slant, Karhunen, Loeve transforms.

Module V: Image Segmentation and Edge Detection:

Region Operations, Crack Edge Detection,

Edge Following, Gradient operators, Compass and laplace operators. Threshold detection methods, optimal thresholding, multispectral thresholding, thresholding in hierarchical data structures; edge based image segmentation- edge image thresholding, edge relaxation, border tracing, border detection,

Examination Scheme:

Components	CT	H	V/S/Q	EE
Weightage (%)	10	07	08	70

Text & References:

Text:

- “*Fundamentals of speech Recognition*”, Lawrence Rabiner, Biing – Hwang Juang Pearson education.
- “*Pattern classifications*”, Richard O. Duda, PeterE. Hart, David G. Stroke. Wiley student edition, Second Edition.
- R.C Gonzalez and R.E. Woods, “*Digital Image Processing*”, Addison Wesley.

References:

- “Pattern Recognition and Image Analysis” – Earl Gose, Richard John baugh, Steve Jost
- A.K.Jain, “Fundamentals of Digital Image Processing”, Prentice Hall of India.
- “Digital Image Processing” – M. Anji Reddy, BS Publications.

ROBOTICS SENSORS, VISION AND HARDWARE IMPLEMENTATION LAB

Course Code: AIE6904

Credit Units: 02

Course Objective:

Objective of this course is to impart basic knowledge of robot vision, image processing sensors and hardware implementation

Course Contents:

Generation in Robot Language –

Robot language structure, the textual robot languages. Online and Offline programming.

Cartesian Trajectories –

Joint space planning, Cartesian trajectories, path primitives. Coordinate system used to determine the position of TCP and direction of the tool.

Basic Syntax-

RAPID introduction, Constant, data objects and variables, data declaration, expressions , using data and aggregates in expression , Functions , function call in expression , priority between operators, Various Instructions, WAIT , SIGNAL and DELAY commands.

Routine and subroutine –

Input/output interrupts priority between interrupts, Program control and subroutine function call, task modules, error recovery, system and time, Builtin subroutines in RAPID, Inter-task Objects.

Optical sensors-

Photodiodes, phototransistors and photo resistors based sensors, light-to-light detectors, Infrared sensors (thermal, PIR, AFIR, thermopiles).

Magnetic and Electromagnetic Sensors and Actuators-

Motors as actuators (linear, rotational, stepping motors), magnetic valves, inductive sensors (eddy current, LVDT, RVDT, Proximity, switches), Hall Effect sensors, Magneto resistive sensors.

Mechanical Sensors-

Accelerometers, Force sensors (strain gauges, tactile sensors), Pressure sensors (semiconductor, piezoresistive, capacitive, VRP).

Industrial Networks & Fieldbus-

Types of bus – DN, PB, ProfiNet, Eth/IP Interfacing to Controller : Connecting sensors to controller directly or through fieldbus. Configuration of digital, group, and analog IO. Use of instructions and logic. Strobing and handshaking with PLC as master, Encoder and Resolvers.

PLC-

Various hardware types of PLC (CPU and I/O modules).Centralized configuration of PLC.On-line with PLC (using serial port).Various languages and its over-view. Sample program down-load, Task configuration. Configuration of IP address & sample program download. Decentralized configuration of PLC (Profibus protocol).Configuration I/O modules on Profi-bus protocol. Mod-bus configuration (Master & Slave configuration). Mod-bus RTU (Remote Telemetry Unit) and Mod-bus TCP/IP communication with PC based software .

***Student have to submit a Small Working Prototype Model.**

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

PATTERN RECOGNITION AND IMAGE PROCESSING LAB

Course Code: AIE6905

Credit Units: 01

Course Contents:

1. Study of functions in MATLAB.
2. Linear and Non-linear operations on Images.
3. Implementation of different geometric transformations (Scaling, Rotation, Translation, Shear).
4. Implementation of Identity transformation, Contrast Stretching, Threshold and Log Transformation.
5. Plotting of Histogram for Low contrast, High Contrast, Blurred Images, Black & white images and Gray Images.
6. Smoothing and Sharpening of Images using spatial filters.
7. Implementation of Fourier Transformation of different types of Images.
8. Implementation of Edge detection in different-2 images.
9. Implementation of clustering.
- 10 Implementation of different algorithms in pattern recognition.

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text & References:

- Rafael C. Gonzalez & Richard E. Woods, “Image Processing Using MATLAB”, 2nd edition, Pearson Education.
- “Pattern classifications”, Richard O. Duda, PeterE. Hart, David G. Stroke. Wiley student edition, Second Edition

OPTIMIZATION TECHNIQUES

Course Code: AIE6906

Credit Units: 03

Course Objective:

This course objective is to study the principles of optimization and various techniques which can be used for Engineering optimization along with applications.

Course Contents:

Module-I: INTRODUCTION

Introduction to optimization – adequate and optimum design – principles of optimization – statement of an optimization problem – classification – formulation of objective function, design constraints.

Module-II: CLASSICAL OPTIMIZATION TECHNIQUES

Single variable optimization –multivariable optimization with no constraints – exhaustive search, Fibonacci method, golden selection, Random, pattern and gradient search methods – Interpolation methods: quadratic and cubic, direct root method.

Module-III: MULTIVARIABLE – UNCONSTRAINED AND CONSTRAINED OPTIMIZATION: Direct search methods – descent methods – conjugate gradient method. Indirect methods – Transformation techniques, penalty function method

Module-IV: NON – TRADITIONAL OPTIMIZATION TECHNIQUES

Genetic Algorithms -steady state algorithm, fitness scaling, inversion. Genetic programming:- Genetic Algorithm in problem solving, Implementing a Genetic Algorithm:- computer implementation, operator (reproduction, crossover and Mutation, Fitness Scaling, Coding, Discretization). Knowledge based techniques in Genetic Algorithm. Advanced operators and techniques in genetic search:- Dominance, Diploidy and Abeyance. Inversion and other reordering operators, Niche and speciation and Tabu search methods.

Module-V: OPTIMUM DESIGN OF MACHINE

Desirable and undesirable effects – functional requirement – material and geometrical parameters – Design of simple axial, transverse loaded members for minimum cost and minimum weight.

Examination Scheme:

Components	CT	H	V/S/Q	EE
Weightage (%)	10	07	08	70

Text & References:

- Rao, S.S., “*Optimization – Theory and Applications*”, Wiley Eastern, New Delhi, 1978
- Fox, R.L., *Optimization Methods for Engineering Design*, Addition – Wesley, Reading, Mass, 1971.
- Wilde, D.J., “*Optimum Seeking Methods*”, Prentice Hall, Englewood Cliffs, New Jersey, 1964

COMPUTER NUMERICAL CONTROL (CNC) MACHINES AND ADAPTIVE CONTROL

Course Code: AIE6907

Credit Units: 03

Course Objective:

This course objective is to understand NC,CNC and DNC manufacturing and generate manual part program for CNC machining. Concept of adaptive control and its various applications

Course Contents:

Module-I:

Concepts of NC, CNC, DNC. Classification of CNC machines, Machine configurations, Types of control, CNC controllers characteristics, Interpolators. Cutting tool materials, carbide inserts classification, qualified, semi qualified and preset tooling, tooling system for Machining centre and Turning centre, work holding devices, of CNC Machines.

Module-II:

Programming CNC machines, Part print analysis and Process planning, Advanced Programming features , Canned cycles, Subroutines, Macros, special cycles etc. APT part programming using CAD/CAM, Parametric Programming. Manual part programming for CNC turning, milling and machining center. Computer assisted part programming techniques , Conversational and Graphics based software, Solids based part programming. Freeform surface machining. Simulation and Verification of CNC programs.

Module-III:

Robot anatomy, robot configuration, motions joint notation work volume, robot drive system, control system and dynamic performance, precision of movement. Robot activation and feedback components. MOTION ANALYSIS AND CONTROL: Manipulator kinematics, position representation forward transformation, homogeneous transformation, manipulator path control, robot dynamics, configuration of robot controller.

Module-IV:

END EFFECTORS: Grippers-types, operation, mechanism, force analysis, tools as end effectors consideration in gripper selection and design. SENSORS: Desirable features, tactile, proximity and range sensors, uses sensors in robotics. Positions sensors, velocity sensors, actuators sensors, power transmission system.

MACHINE VISION: Functions, Sensing and Digitizing-imaging, Devices, Lighting techniques, Analog to digital single conversion, image storage, Image processing and Analysis-image

Module-V:

Review of Lyapunov analysis, model Reference Adaptive Control, Composite Adaptation, Parameter Convergence: Persistency of Excitation /Uniform Complete Observe-ability, Adaptive Control in the Presence of Input Constraints, Direct MRAC for Nonlinear systems with Matched Structured Nonlinearities, Robustness of MRAC: Parameter Drift, Adaptive Control in the Presence of Uniformly Bounded Residual Nonlinearity, Disturbance Rejection, Input-to-State Stability, fast adaptation.

Examination Scheme:

Components	CT	H	V/S/Q	EE
Weightage (%)	10	07	08	70

Text & References:

- Krar, S., and Gill, A., "CNC Technology and Programming", McGraw Hill publ Co, 1990.
- Gibbs, D., "An Introduction to CNC Machining", Casell, 1987.
- Seames, W.S., "Computer Numerical Control Concepts and Programming", Delmar Publishers, 1986.
- Lynch, M., "Computer Numerical Control for Machining", McGraw Hill, 1992.
- Koren Y, "Computer Control of Manufacturing Systems", McGraw, 1986.

NEURAL NETWORK AND FUZZY LOGIC

Course Code: AIE6908

Credit Units: 03

Course Objective:

Fuzzy sets and fuzzy logic find many applications in the areas of stability theory, pattern recognition, controls etc. Neural Networks offer fundamentally alternative approaches to procedural programming. These systems proved their applicability to the problems where there are missing data or information or the problems which could not be defined in an algorithm. The integration of fuzzy systems and neural networks gives a tremendous potential which can be applied to many complicated problems of Artificial Intelligence and other applications in Real World Computing. This course provides a comprehensive treatment of neural network architectures and learning algorithms, with an in-depth look at problems in data mining and in knowledge discovery.

Course Contents:

Module I

Basic neural computation models: Network and node properties. Inference and learning algorithms. Unsupervised learning: Signal hebbian learning and competitive learning. Supervised learning: Back propagation algorithms.

Module II

Self organizing networks: Kohonen algorithm, bi-directional associative memories. Hopfield Networks: Hopfield network algorithm. Adaptive resonance theory: Network and learning rules. Neural network applications.

Module III

Fuzzy Sets: Operations and properties. Fuzzy Relations: Cardinality, Operations and properties. Value Assignments: Cosine amplitude and max-min method. Fuzzy classification: Cluster analysis and validity, Fuzzy e-means clustering, hardening the Fuzzy e-partition.

Module IV

Fuzzification, Membership value assignments: Inference, rank ordering and angular Fuzzy sets, defuzzification methods, fuzzy logic, approximate reasoning. Fuzzy –based systems: Canonical rule forms, decomposition of compound rules, likelihood and truth qualification, aggregation of Fuzzy rules, graphical techniques of inference.

Module V

Non linear simulation using Fuzzy rule-based systems, Fuzzy associative memories. Decision making under Fuzzy states and Fuzzy actions. Fuzzy grammar and syntactic recognition. General Fuzzy logic controllers, special forms of Fuzzy logic control system models, examples of Fuzzy control system design and control problems, industrial applications.

Mandatory Disclosure-2006

Muffakhm Jah College of Engineering and Technology, Hyderabad

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Limin Fu. "Neural Networks in Computer Intelligence" McGraw Hill, 1995.
- Freeman J. A., and Skapura D. Mu. "Neural Networks Algorithms applications and Programming Techniques", Addison Wesley New York, 1991.
- Timoty J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill 1997.
- Bart Kosho "Neural Network and Fuzzy Systems", Prentice Hall of India, 1994

NEURAL NETWORK AND FUZZY LOGIC LAB

Course Code: AIE6909

Credit Units: 01

Course Contents:

List of Experiments:

- Write a program to implement single layer perception algorithm.
- Write a program to implement back propagation learning algorithm
- Design multilayer feed forward network using back-propagation algorithm
- Study of fuzzy inference system
- To study fuzzy logic controller using fuzzy logic toolbox
- Write a program to implement SDPTA
- Write a program to implement RDPTA
- To Study various defuzzification techniques
- Write a program to implement of fuzzy set operation

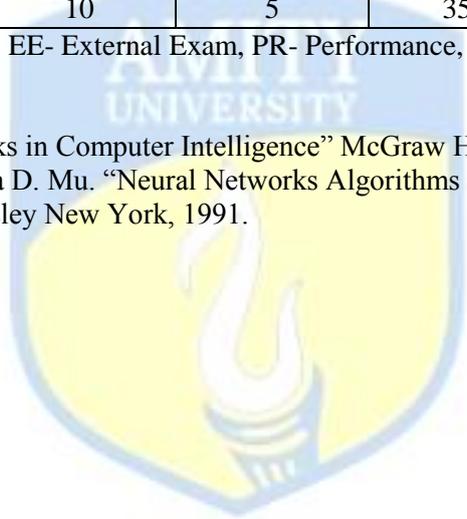
Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text & References:

- Limin Fu. “Neural Networks in Computer Intelligence” McGraw Hill, 1995.
- Freeman J. A., and Skapura D. Mu. “Neural Networks Algorithms applications and Programming Techniques”, Addison Wesley New York, 1991.



DECISION MAKING SYSTEM

Course Code: AIE6910

Credit Units: 03

Course Objective:

To develop semantic-based and context-aware systems to acquire, organize, process, share and use the knowledge embedded in multimedia content. Research will aim to maximize automation of the complete knowledge lifecycle and achieve semantic interoperability between Web resources and services.

Course Contents:

Module I: Introduction

Soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing. Artificial Intelligence : Introduction, Various types of production systems, characteristics of production systems, breadth first search, depth first search techniques, other Search Techniques like hill Climbing, Best first Search, A* algorithm, AO* Algorithms and various types of control strategies. Knowledge representation issues, Propositional and predicate logic, monotonic and non monotonic reasoning, forward Reasoning, backward reasoning, Weak & Strong Slot & filler structures, NLP.

Module II: Neural Network

Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural net, Difference between ANN and human brain, characteristics and applications of ANN, single layer network, Perceptron training algorithm, Linear separability, Widrow & Hebb;s learning rule/Delta rule, ADALINE, MADALINE, AI v/s ANN. Introduction of MLP, different activation functions, Error back propagation algorithm, derivation of BBPA, momentum, limitation, characteristics and application of EBPA

Module III

Counter propagation network, architecture, functioning & characteristics of counter Propagation network, Hopfield/ Recurrent network, configuration, stability constraints, associative memory, and characteristics, limitations and applications. Hopfield v/s Boltzman machine. Adaptive Resonance Theory: Architecture, classifications, Implementation and training. Associative Memory.

Module IV: Fuzzy Logic

Fuzzy set theory, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, Fuzzy systems: crisp logic, fuzzy logic, introduction & features of membership functions, Fuzzy rule base system : fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making & Applications of fuzzy logic.

Module V: Genetic algorithm

Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods.

Examination Scheme:

Components	CT	H	V/S/O	AT	EE
Weightage (%)	10	8	7	5	70

Text & References:

- S, Rajasekaran & G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & Applications, PHI Publication.
- S.N. Sivanandam & S.N. Deepa, Principles of Soft Computing, Wiley Publications
- Rich E and Knight K, Artificial Intelligence, TMH, New Delhi.
- Bose, Neural Network fundamental with Graph , Algo.& Appl, TMH
- Kosko: Neural Network & Fuzzy System, PHI Publication
- Klir & Yuan, Fuzzy sets & Fuzzy Logic: Theory & Appli.,PHI Pub.
- Hagen, Neural Network Design, Cengage Learning

DECISION MAKING SYSTEM LAB

Course Code: AIE6911

Credit Units: 01

Course Contents:

List of Experiments:

- Study of Biological Neural Network
- Study of Artificial Neural Network
- Write a program of Perceptron Training Algorithm.
- Write a program to implement Hebb's Rule
- Write a program to implement of Delta Rule.
- Write a program to implement back propagation learning algorithm.
- Study of fuzzy inference system
- To study fuzzy logic controller using fuzzy logic toolbox
- Write a program to implement SDPTA
- Write a program to implement RDPTA
- To Study various defuzziification techniques
- Write a program to implement of fuzzy set operation
- Study of genetic algorithm
- Study of Genetic programming and solve a real life problem

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text & References:

- Limin Fu. "Neural Networks in Computer Intelligence" McGraw Hill, 1995.
- Freeman J. A., and Skapura D. Mu. "Neural Networks Algorithms applications and Programming Techniques", Addison Wesley New York, 1991.
- S, Rajasekaran & G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & Applications, PHI Publication.
- S.N. Sivanandam & S.N. Deepa, Principles of Soft Computing, Wiley Publications
- Rich E and Knight K, Artificial Intelligence, TMH, New Delhi.

SUMMER INTERNSHIP EVALUATION-III

Course Code: AIE6935

Credit Units: 06

Guidelines:

There are certain phases of every Intern's professional development that cannot be effectively taught in the academic environment. These facets can only be learned through direct, on-the-job experience working with successful professionals and experts in the field. The internship program can best be described as an attempt to institutionalize efforts to bridge the gap between the professional world and the academic institutions. Entire effort in internship is in terms of extending the program of education and evaluation beyond the classroom of a university or institution. The educational process in the internship course seeks out and focuses attention on many latent attributes, which do not surface in the normal classroom situations. These attributes are intellectual ability, professional judgment and decision-making ability, inter-disciplinary approach, skills for data handling, ability in written and oral presentation, sense of responsibility etc.

In order to achieve these objectives, each student will maintain a file (**Internship File**). The Internship File aims to encourage students to keep a personal record of their learning and achievement throughout the Programme. It can be used as the basis for lifelong learning and for job applications. Items can be drawn from activities completed in the course modules and from the workplace to demonstrate learning and personal development.

The File will assess the student's analytical skills and ability to present supportive evidence, whilst demonstrating understanding of their organization, its needs and their own personal contribution to the organization.

The **layout guidelines** for the Project & Seminar Report:

1. File should be in the following specification:

A4 size paper

Font: Arial (10 points) or Times New Roman (12 points)

Line spacing: 1.5

Top & bottom margins: 1 inch/ 2.5 cm

Left & right margins: 1.25 inches/ 3 cm

2. Report Layout: The report should contain the following components:

Front Page

Table of Content

Acknowledgement

Student Certificate

Company Profile (optional)

Introduction

Main Body

References / Bibliography

The File will include **five sections** in the order described below. The content and comprehensiveness of the main body and appendices of the report should include the following:

- 1. The Title Page**--Title - An Internship Experience Report For (Your Name), name of internship organization, name of the Supervisor/Guide and his/her designation, date started and completed, and number of credits for which the report is submitted.
- 2. Table of Content**--an outline of the contents by topics and subtopics with the page number and location of each section.
- 3. Introduction**--short, but should include how and why you obtained the internship experience position and the relationship it has to your professional and career goals.
- 4. Main Body**--should include but not be limited to daily tasks performed. Major projects contributed to, dates, hours on task, observations and feelings, meetings attended and their purposes, listing of tools and materials and their suppliers, and photographs if possible of projects, buildings and co-workers.

5. **References / Bibliography** --This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system

ASSESSMENT OF THE INTERNSHIP FILE

The student will be provided with the Student Assessment Record (SAR) to be placed in front of the Internship File. Each item in the SAR is ticked off when it is completed successfully. The faculty will also assess each item as it is completed. The SAR will be signed by the student and by the faculty to indicate that the File is the student's own work. It will also ensure regularity and meeting the delaines.

STUDENT ASSESSMENT RECORD (SAR)

5. Range of Research Methods used to obtain information

6. Execution of Research

7. Data Analysis

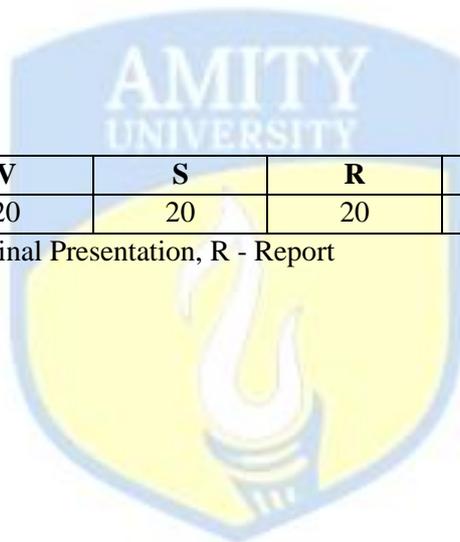
- Analyse Quantitative/ Qualitative information
- Control Quality

8. Draw Conclusions

Examination Scheme:

Components	V	S	R	FP
Weightage (%)	20	20	20	40

V – Viva, S – Synopsis, FP – Final Presentation, R - Report



Syllabus - Tenth Semester

PROJECT-DISSERTATION-II

Course Code: AIE6037

Credit Units: 15

GUIDELINES FOR DISSERTATION

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage.

The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

In general, the File should be comprehensive and include

A short account of the activities that were undertaken as part of the project;

A statement about the extent to which the project has achieved its stated goals.

A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;

Any activities planned but not yet completed as part of the DISSERTATION, or as a future initiative directly resulting from the project;

Any problems that have arisen that may be useful to document for future reference.

➤ Report Layout

The report should contain the following components:

➤ **Title or Cover Page**

The title page should contain the following information: Project Title; Student's Name; Course; Year; Supervisor's Name.

➤ **Acknowledgements** (optional)

Acknowledgment to any advisory or financial assistance received in the course of work may be given.

➤ **Abstract**

A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project

➤ **Table of Contents**

Titles and subtitles are to correspond exactly with those in the text.

➤ **Introduction**

Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

➤ **Materials and Methods**

This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.

➤ **Results and Discussion**

Present results, discuss and compare these with those from other workers, etc. In writing these section, emphasis should be given on what has been performed and achieved in the course of the

work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

Note that in writing the various sections, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary never write in “point” form.

➤ **Conclusion**

A conclusion should be the final section in which the outcome of the work is mentioned briefly.

➤ **Future prospects**

➤ **Appendices**

The Appendix contains material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

➤ **References / Bibliography**

This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Examples

For research article

Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157:H7. *Clin Microbiol Infect*, **8** (suppl 1): 116–117.

For book

Kowalski, M. (1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

ASSESSMENT OF THE DISSERTATION FILE

Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution.

Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project.

Project execution is concerned with assessing how much work has been put in.

The File should fulfill the following *assessment objectives*:

Range of Research Methods used to obtain information

Execution of Research

Data Analysis

Analyse Quantitative/ Qualitative information

Control Quality

Draw Conclusions

Examination Scheme:

Dissertation	50
Viva Voce	50
Total	100

ata, leading to production of a structured report.

Selecting the Dissertation Topic

It is usual to give you some discretion in the choice of topic for the dissertation and the approach to be adopted. You will need to ensure that your dissertation is related to your field of specialization.

Deciding this is often the most difficult part of the dissertation process, and perhaps, you have been thinking of a topic for some time.

It is important to distinguish here between ‘dissertation topic’ and ‘dissertation title’. The topic is the specific area that you wish to investigate. The title may not be decided until the dissertation has been written so as to reflect its content properly.

Few restrictions are placed on the choice of the topic. Normally we would expect it to be:

- relevant to business, defined broadly;
- related to one or more of the subjects or areas of study within the core program and specialisation stream;
- clearly focused so as to facilitate an in-depth approach, subject to the availability of adequate sources of information and to your own knowledge;
- of value and interest to you and your personal and professional development.

Planning the Dissertation

This will entail following:

- Selecting a topic for investigation.
- Establishing the precise focus of your study by deciding on the aims and objectives of the dissertation, or formulating questions to be investigated. Consider very carefully what is worth investigating and its feasibility.
- Drawing up initial dissertation outlines considering the aims and objectives of the dissertation. Workout various stages of dissertation
- Devising a timetable to ensure that all stages of dissertation are completed in time. The timetable should include writing of the dissertation and regular meetings with your dissertation guide.

The Dissertation plan or outline

It is recommended that you should have a dissertation plan to guide you right from the outset. Essentially, the dissertation plan is an outline of what you intend to do, chapter wise and therefore should reflect the aims and objectives of your dissertation.

There are several reasons for having a dissertation plan

- It provides a focus to your thoughts.
- It provides your faculty-guide with an opportunity, at an early stage of your work, to make constructive comments and help guide the direction of your research.
- The writing of a plan is the first formal stage of the writing process, and therefore helps build up your confidence.
- In many ways, the plan encourages you to come to terms with the reading, thinking and writing in a systematic and integrated way, with plenty of time left for changes.
- Finally, the dissertation plan generally provides a revision point in the development of your dissertation report in order to allow appropriate changes in the scope and even direction of your work as it progresses.

Keeping records

This includes the following:

- Making a note of everything you read; including those discarded.
- Ensuring that when recording sources, author’s name and initials, date of publication, title, place of publication and publisher are included. (You may consider starting a card index or database from the outset). Making an accurate note of all quotations at the time you read them.
- Make clear what is a direct a direct quotation and what is your paraphrase.

Dissertation format

All students must follow the following rules in submitting their dissertation.

- Front page should provide title, author, Name of degree/diploma and the date of submission.

- Second page should be the table of contents giving page references for each chapter and section.
- The next page should be the table of appendices, graphs and tables giving titles and page references.
- Next to follow should be a synopsis or abstract of the dissertation (approximately 500 words)
- Next is the 'acknowledgements'.
- Chapter I should be a general introduction, giving the background to the dissertation, the objectives of the dissertation, the rationale for the dissertation, the plan, methodological issues and problems. The limitations of the dissertation should also be hinted in this chapter.
- Other chapters will constitute the body of the dissertation. The number of chapters and their sequence will usually vary depending on, among others, on a critical review of the previous relevant work relating to your major findings, a discussion of their implications, and conclusions, possibly with a suggestion of the direction of future research on the area.
- After this concluding chapter, you should give a list of all the references you have used. These should be cross - references with your text. For articles from journals, the following details are required e.g.

Draper P and Pandyal K. 1991, The Investment Trust Discount Revisited, Journal of Business Finance and Accounting, Vol18, No6, Nov, pp 791-832.

For books, the following details are required:

Levi, M. 1996, International Financial Management, Prentice Hall, New York, 3rd Ed, 1996

- Finally, you should give any appendices. These should only include relevant statistical data or material that cannot be fitted into the above categories.

The Layout Guidelines for the Dissertation

- A4 size Paper
- Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5
- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

Guidelines for the assessment of the Dissertation

While evaluating the dissertation, faculty guide will consider the following aspects:

1. Has the student made a clear statement of the objective or objective(s).
2. If there is more than one objective, do these constitute parts of a whole?
3. Has the student developed an appropriate analytical framework for addressing the problem at hand.
4. Is this based on up-to-date developments in the topic area?
5. Has the student collected information / data suitable to the frameworks?
6. Are the techniques employed by the student to analyse the data / information appropriate and relevant?
7. Has the student succeeded in drawing conclusion form the analysis?
8. Do the conclusions relate well to the objectives of the project?
9. Has the student been regular in his work?
10. Layout of the written report.

Assessment Scheme:

Continuous Evaluation:

(Based on Abstract, Regularity, Adherence to initial plan, Records etc.)

40%

Final Evaluation: Based on,

Contents & Layout of the Report,	20
Conceptual Framework,	05
Objectives & Methodology and	05
Implications & Conclusions	10
Viva & Presentation	20

60%