National University of Sciences & Technology

UG & PG SYLLABUS
Computer Science Department

Military College of Signals
Pakistan

The Discipline of Software Engineering

Software Engineering is the discipline of creating high-quality software environment in a systematic, controlled and efficient manner, while maintaining it affordably. It involves the application of engineering concepts, techniques, and methods to develop the software systems. A software engineering program develops professionals who have a mastery of software development principles, theory, practice, and process. Software Engineering and Computer Science differ in much the same way as do Electrical Engineering and Physics. The goal of Computer Science, according to Parnas, is to *learn* and to extend the science. Software Engineering on the other hand aims to use the science and technology already available to create products and tools for use. Software Engineering derives its essence from computer science as other engineering disciplines do from natural or life sciences, with an emphasis on issues of process, design, measurement, analysis and verification providing a strong foundation in engineering principles and practices as applied to software development.

Vision

The SE education at MCS NUST is focused on imparting the knowledge and training to students which enable them to harmonize theory with practice, concept with application, and problem with solution. It prepares them to ably apply engineering principles, processes and practices to software components and systems, and their maintenance. The program also, in addition to students' professional growth, attends to development of their personal and interpersonal skills. It helps students to enhance their ability in oral and written communication, and their adaptability to group-work environments. The program strives to develop a capacity in the professionals for innovation and a passion for life long learning. SE curricula thus developed reflect the aim to satisfy professional demands of the industry and academia. The graduates thus produced are adequately equipped to exploit the opportunities and answer the challenges offered by the modern world.

Aim

The aim of Computer Science Department is to "Conduct Bachelor of Engineering in Software Engineering , Master of Science in Computer Sciences and Ph.D Programs Under (National University of Science and Technology), with the objective to produce competent Software Engineers and researchers to face the technological challenges of 21st century.

Software Engineering Degree Programs

Computer Science Department at MCS NUST presently running three programs of Software Engineering, these are:-

- Bachelor of Engineering in Software Engineering - BE Software Engineering - BE (SE)
- Master of Science in Software Engineering - MS Software Engineering - MS (SE)
- Doctor of Philosophy in Software Engineering - Ph.D. Software Engineering - Ph.D.

Area of Emphasis

The Computer Science Department focuses on conducting the Bachelor of Engineering Degree course in Software Engineering, consisting of 136 credits to be completed in 4 years. Last six months will be utilized for the completion of 7 credits of project work. The undergraduate and Masters program emphasis on the areas covering the subjects like**:**

- Algorithms & Formal Languages.
- Artificial Intelligence.

- Computer Architecture.
- Computer Graphics.
- Data Base Systems.
- Digital Electronics.
- Networking.
- Operating Systems.
- Software Engineering.
- Project Management.

Definitions and Keywords used in this Documents.

- **Pre Requisites** It is the subject or course that is essential to complete before taking the required subject or course.
- **Credits Hours** A lecture of one hour duration per week per semester for a subject countable towards a student's Cumulative Grade Point Average, will be considered as one credit hour. However, in case of seminars, tutorials and laboratory work, one credit hour may require two or three contact hours depending upon the nature of subject.
- **Contact Hours** A lecture of one credit hour duration per week is equal to one contact hour per week and a lab of one credit hour per week is equal to 2 to 3 contact hour per week depending on the subject.
- **Cumulative** Sum of contact hours for a lectures and its essential lab work for particular subject or course.
- **Subject or Course** A " Subject" or "Course" means a topic or a subject related to an academic programme, which is to be studied by a student for a fixed number of hours during a semester. Each subject will carry a specific faculty code and number.
- **Prefixes and Course Numbering.**
  - **CPS** Computer Science Courses
  - **CSE** Computer Software Engg Courses
  - **CE** Computer Engg Courses
  - **EE** Electrical Engg (University Elective) Courses
  - **BS** Basic Science Courses
  - **HSC** Humanities & Social Sciences Courses
- **Course Code Means**
  - 100-299 UG Courses
  - 300-499 Adv UG Courses
  - 500-799 PG Courses
  - 800-& Above Adv PG Courses

BE Computer Software Engineering Degree Requirements

COMPUTER SCIENCE -COURSES

	MCS#	PRE REQ	Course Title	Cr Hrs	
1	CPS-101	-	Introduction to Computing	2 (1,3)	
2	CPS-230	-	Programming in C++	3 (2,3)	
3	CPS-331	-	Data Structures & Algorithm	4 (3,3)	
4	CPS-232	-	Numerical Analysis	3 (2,3)	
5	CPS-360	CPS 3	Automata Theory and Formal Languages	3 (3,0)	
6	CPS-422	CPS 2,3	Computer Networks	4 (3,3)	
7	CPS-335	-	Object Oriented Prog Paradigm	3 (2,3)	
8	CPS-425	-	Network Security	3 (3,0)	
9	CPS-410	CE 2	Operating Systems	4 (3,3)	
10	CPS-440	CPS 2	Artificial Intelligence	4 (3,3)	
11	CPS-449	CPS 9	Theory of Intelligent Systems	4 (3,3)	
12	CPS-472	-	Computer Graphics	4 (3,3)	
13	CPS-480	-	Data Base Systems	4 (3,3)	
14	CPS-640	-	Advanced AI	4 (3,3)	
15	CPS-471	-	Media Processing & Multimedia Cptg	4 (3,3)	
16	CPS-622	CPS8,CE3	Distributed Computing	4 (3,3)	
17	CPS-499	-	Project	7 (0,21)	

SOFTWARE ENGG- COURSES

1	CSE-271	-	Software Engineering	3 (3,0)	
2	CSE-472	-	Software Construction	4 (3,3)	
3	CSE-473	CSE 1	Software Quality Assurance	3 (3,0)	
4	CSE-474	-	Software Design & Architecture	4 (3,3)	
5	CSE-475	CSE 1	Software Project Management	3 (3,0)	
6	CSE-476	-	Human Computer Interfacing	3 (2,3)	
7	CSE-277	-	Maintenance Management	2(2,0)	
8	CSE-278	-	Operational Management	2(2,0)	
9	CSE-279	-	Engineering Management	2 (2,0)	

COMPUTER ENGG- COURSES

1	CE-230	-	Digital Logic Fundamentals	4 (3,3)	
2	CE-420	CPS 3	Computer Org and Architecture	5 (4,3)	

UNIVERSITY ELECTIVE - COURSES

	MCS#	Pre Req	Course Title	Cr Hrs	
1	EE-280	BS 1,2,6	BEE	4 (3,3)	
2	EE-411	BS 1,2,6	Electronic Design Automation	4 (3,3)	
3	EE-313	BS 2,6	Control Systems	4(3,3)	
4	EE-474	BS 2,6	Analog and Digital Comm	3.5(3,1.5)	
5	EE-476	-	Electro Optics	4(3,3)	
6	EE-481	BS 5,8	Digital Image Processing	3.5(3,1.5)	
7	EE-466	BS 5,8	Digital Signal Processing	3.5(3, 1.5)	
8.	EE-302	-	Electronic Circuits & Devices	4 (3,3)	
9	EE-345	-	Digital Electronic	3.5 (3,1.5)	

BASIC SCIENCES- COURSES

1	MTH-132	-	Calculus	3 (3,0)	
2	MTH-133	-	Engineering Mathematics	3 (3,0)	
3	MTH-134	-	Discrete Mathematics	2 (2,0)	
4	MTH-234	BS 1,2	Multivariable Calculus	3 (3,0)	
5	MTH-314	-	Linear Algebra	3 (3,0)	
6	PHY-184	-	Applied Physics (Electromagnetism)	2.5(2,1.5)	
7	PHY-281	-	Advanced Physics	3(3,0)	
8	STT-351	-	Probability & Statistics	3 (3,0)	

HUMANITIES & SOCIAL SCIENCES- COURSES

1	ENG-110	-	Communication Skills	2 (1,3)	
2	ENG-111	-	Tech & Business Writing	3 (3,0)	
3	EC-201	-	Engineering Economics	2 (2,0)	
4	SS-102	-	Professional Ethics	2 (2,0)	
5	PS-101	-	Pakistan Studies	2 (2,0)	
6	ISL-101	-	Islamic Studies	2 (2,0)	
7	SS-213	-	Industrial Safety	2(2,0)	

SEMESTER SCHEDULE

Semester -1 (16.5 Credit hrs)

	Subjects		Credit Hrs	Contact Hrs	Cumulative
1.	CPS-101	Intro to Computing	1+1	1+3	4
2.	MTH-132	Calculus	3+0	3+0	3
3.	ENG-110	Communication Skills	1+1	1+3	4
4.	CPS-230	Programming in C++	2+1	2+3	5
5.	CE-230	Digital Logic Fundamentals	3+1	3+3	6
6.	PHY-184	Applied Physics (Electromagnetism)	2+0.5	2+1.5	3.5
		Total	12+4.5 16.5	12+13.5	25.5

Semester -2 (17 Credit hrs)

	Subjects		Credit Hrs	Contact Hrs	Cumulative
1.	CPS-335	Object Oriented Prog Paradigm	2+1	2+3	5
2.	MTH-133	Engineering Mathematics	3+0	3+0	3
3.	EE-280	BEE	3+1	3+3	6
4.	MTH-134	Discrete Mathematics	2+0	2+0	2
5.	CE-420	Comp Org & Arch	4+1	4+3	7
		Total	14+3 17	14+9	23

Semester -3 (20 Credit hrs)

	Subjects		Credit Hrs	Contact Hrs	Cumulative
1.	CPS-331	Data Structure & Algorithm	3+1	3+3	6
2.	CSE-271	Software Engg	3+0	3+0	3
3.	EE-302	Electronics Circuits &Devices	3+1	3+3	6
4.	CPS-480	Data Base Systems	3+1	3+3	6
5.	MTH-314	Linear Algebra	3+0	3+0	3
6.	PS-101	Pak Studies	2+0	2+0	2
		Total	17+3 20	17+9	26

Semester -4 (17 Credit hrs)

	Subjects		Credit Hrs	Contact Hrs	Cumulative
1.	STT-351	Probability & Statistics	3+0	3+0	3
2.	CPS-232	Numerical Analysis	2+1	2+3	5
3.	CSE-476	Human Computer Interfacing	2+1	2+3	5
4.	CPS-440	Artificial Intelligence	3+1	3+3	6
5.	CSE-474	Software Design & Arch	3+1	3+3	6
		Total	13+4 17	13+12	25

Semester -5 (18 Credit hrs)

	Subjects		Credit Hrs	Contact Hrs	Cumulative
1.	CSE-473	Software Quality Assurance	3+0	3+0	3
2.	CPS-422	Computer Network	3+1	3+3	6
3.	CPS-410	Operating System	3+1	3+3	6
4.	CPS-449	Theory of Intelligent Systems	3+1	3+3	6
5.	MTH-234	Multivariable Calculus	3+0	3+0	3
		Total	15+3 18	15+9	24

Semester -6 (17.5 Credit hrs)

	Subjects		Credit Hrs	Contact Hrs	Cumulative
1.	EE-345	Digital Electronics	3+0.5	3+1.5	4.5
2.	CPS-622	Distributed Computing	3+1	3+3	6
3.	CPS-360	Auto Theory Formal languages	3+0	3+0	3
4.	CSE-475	Software Project Management	3+0	3+0	3
5.	ISL-101	Islamic Studies	2+0	2+0	2
6.	SS-102	Professional Ethics	2+0	2+0	2
		Total	16+1.5 17.5	16+4.5	20.5

Semester -7 (16.5 Credit hrs)

	Subjects		Credit Hrs	Contact Hrs	Cumulative
1.	ENG-111	Tech & Business Writing	3+0	3+0	3
2.	CSE-472	Software Construction	3+1	3+3	6
3.	CPS-472	Computer Graphics	3+1	3+3	6
4.	EE-474	Ana log & Digital Comm	3+0.5	3+1.5	4.5
5.	CPS-449	Projects	0+2	0+6	6
		Total	12+4.5 16.5	12+13.5	25.5

Semester -8 (13.5 Credit hrs)

	Subjects		Credit Hrs	Contact Hrs	Cumulative
1.	CPS-425	Network Security	3+0	3+0	3
2.		Elective-I	3+0.5	3+1.5	4.5
3.		Elective-II	2+0	2+0	2
4.		Projects	0+5	0+15	15
		Total	8+5.5 13.5	8+16.5	24.5

Summary

Sem	Subjects	Credits	Contacts
1.	6	16.5	25.5
2	5	17	23
3	6	20	26
4	5	17	25
5	5	18	24
6	6	17.5	20.5
7	5	16.5	25.5
8	4	13.5	24.5
	42	**136**	**194**

Note : Students are offered either of the following subjects in the final semester:-

Elective-I

1. **EE-481 Digital Image Processing**
2. **EE-466 Digital Signals Processing**

Elective-II

1. **CSE-279 Engg Management**
2. **EC-201 Engg Economic**

Course Descriptions

Computer Science

Undergraduate Course Descriptions

Introduction to Computing

Pre Requisites**:** None

Course**:** **CPS-101**

Credits: 1+1 **Contact Hrs**: 1+3

Course Out Line Schedule

1 **Overview of computer system:** Overview of computer system, what is computer, hardware, software, data, user, system software, application software, types of computer system, standard methods of inputs, alternate methods of inputs, monitors and sound system, devices that output hard copy, CPU used in PCs, Types of storage devices, measuring drive performance, Operating system basics, PC OS review, Networking Basics at home and abroad.

2 **Programming Languages:** Programming Languages, Low Level, High Level, Programming Philosophy, Procedural Programming Concept, Object Oriented Programming Concept, Database and database management system, Creating computer Program.

3 **Introduction To Windows**: Introduction to Windows Operating Environment, Introducing Desktop etc., Installation & removal of programs, Moving of Files & Folders, Making Shortcuts, Renaming of Files & Folders, Printer Installation & Other Drivers Installation.

4 **IDE Environment**: Definition of Integrated Environment, Editing a Program & Working of IDE for Program Compilation & Execution.

5 **Hard Ware**: Assembly of PC, introduction to various components, slots, ports, Buses, storage media, processing unit, cards, Bios, ROM, RAM.

6 **Linux**: Installation, Directory Structure, Command Shell, XWindows, Accessing hardware CD ROM, Floppy, Programming in C++, User Accounts, Office.

7 **VC++**: General C++ language, Main windows components, Event Handling, Normal Windows Controls, Dialogues, ,SDI, MDI.

TextBook:
1. Introduction to Computers, by Peter Norton

Reference:
1. Object Oriented Programming in C++ ***by Robert Lafore***.
2. Computer Fundamentals by Pk Sinha
3. Computer Architecture by William Stallings

Programming in C++

Pre Requisites**:** None

Course**:** **CPS-230**

Credits: 2+1 **Contact Hrs**: 2+3

Course Out Line Schedule

1 **Introduction** Development of basic algorithms/ flowcharts. Analysis and testing of algorithms. Fundamental programming concepts, source file, object file, exe file.

2 **C++ Programming Basics** C++ Program Structure, program statement, white spaces, string constant, Variables, Input/output with cout and cin, Arithmetic operators, assignment and increment operators

3 **Loops and Decisions** Relational operators, loops for, do-while, while, decisions if , if-else, else-if, switch , logical operators and or not operators, control statement break, continue, go to statement

4 **Structures** Declaration, defining strict variables, and accessing structure members, nested strict, enumerations

5 **Functions** Declaration, defining functions, comparison with library functions, passing arguments constants variables value, structures as arguments, returning values from function, returning structure variables, passing data by reference, overloaded functions, inline functions, default arguments, variables and storage classes, auto external and static variables, const function arguments.

6 **Arrays and Strings** Definition, accessing elements, initialization, multidimensional arrays, passing array to function, array to structure, C-string variable constant, reading embedded blanks, multiple lines, copying strings

TextBook: 1. Object Oriented Programming in C++ ***by Robert Lafore***. 3/e SAMS

Reference: 1. C++ How to Program 4th Edition by Deitel & Deitel **.**

Data Structures and Algorithm

Pre Requisites**:**

Course: CPS-331

Credits: 3+1 **Contact Hrs**: 3+3

Course Out Line Schedule

1 **Recursion**: Definition of Recursion, Direct and Indirect Recursion, Examples of Recursive Functions.

2 **Pointers**: Definition of Pointers, Address constants and variables, Pointers and arrays, Memory Management, Pointers and objects.

3 **Queues & Lists**: Linear Queue & Its Features, Linear Queue Implementation, Circular Queue, Linked List & Its Features, Linked List Implementation, Doubly Linked List & its Implementation.

4 **The Stack**: Stack & Its Implementation, Postfix Notation Concept, Implementation Of Postfix Notation.

5 **Trees**: Binary Trees, Strictly Binary Tree, Complete Binary Tree, Almost Complete Binary Tree, Binary Tree Applications, Traversing Trees, Pre-Order Traversing In-Order Traversing, Post-Order Traversing.

6 **Sorting**: Bubble Sort, Quick Sort, Binary Sort, Merge Sort, Insertion Sort, Heap, Heap Construction, Heap Sort, Heap Sort Implementation. Hashing & its Implementation

7 **Searching**: Linear and Binary Search.

8 **Graphs**: What Are Graphs, Representation Of Directed Graphs, Graph Vocabulary, Graph Operations (Add Vertex, Add Edge), C++ Implementation.

TextBook:

1. Data Structures Using C++, Prentice Hall Inc., 1994, by ***Aaron M. Tenebaum, Yedidyah Langsam Moshe J. Augenstein***

Reference:

1. C++ How To Program, Prentice Hall Inc., 1994, by ***H.M. Deitel, P.J. Deital***
2. Data Abstraction & Problem Solving with C++ by ***Frank M. Carrano***.
3. ***Data Structures with C++ - Schaum Series.***.

Object Oriented Prog Paradigm

Pre Requisites**:** CPS-230

Course**:** **CPS-335**

Credits: 2+1 **Contact Hrs**: 2+3

Course Out Line Schedule

1 **Introduction** Procedural versus OO programming languages. Evolution of OO. OO concepts and principles. Characteristics and Advantages of OO approach.

2 **Objects and Classes** Classes and objects, declaration, calling member function, constructors, destructors, overloaded constructors, objects as arguments, default copy constructors, classes objects and memory, static class data, const and classes

3 **Arrays and Strings** Definition, accessing elements, initialization, multidimensional arrays, passing array to function, array to structure, C-string variable constant, reading embedded blanks, multiple lines, copying strings, standard C++ string class, defining assigning string objects, input/ output with string object

4 **Operator Overloading** Unary operators, binary operators, op arguments, return value, nameless temp objects, post fix notation, overloading binary op, arithmetic op, concatenating strings, multiple overloading, comparison op, arithmetic and subscript op, data conversion between object and basics types, object and different classes.

5. **Inheritance** Derive and base classes, specifying, accessing base class members, protected access specifier, derived class constructors, overriding member functions, class hierarchies abstract base class, public and private inheritance, multiple inheritance, containership classes within classes

6. **Pointers** Addresses and Pointers, Address-of Operator, Pointers and Arrays, Pointers and Functions, Memory management – new and delete operators, A linked list example.

7. **Streams and Files** Stream classes, stream errors. File I/O with streams.

TextBook: Object Oriented Programming in C++ ***by Robert Lafore***.3/e SAMS

Reference: *Understanding Object Oriented Programming*, Budd, Addison Wesley.
C++: How to Programme, Deitel and Deitel, 4/e, Pearson.
Thinking in C++, 2nd Edition, Bruce Eckel, Prentice Hall.

Numerical Analysis

Pre Requisites:
Course: CPS-332
Credits: 2+1 **Contact Hrs:**2+3
Course Out Line Schedule

1 **Introduction :** Sources of Errors in numerical methods. Error measurements, Significant Digits, Precision and Accuracy, Taylor's Series.
2 **Solution of Linear System of Equations:** Direct Methods (Matrix factorization, L-U decomposition methods). Indirect or Iterative Methods (Jacobi's Method, Gauss Siedal Method)
3 **Numerical Solution of Differential Equations :** Euler's Method, Error estimation in Euler's method, Euler's Modified Method, Runge Kutta Method.
4 **Eigen-Value and Eigen Vectors:** Computation using Characteristic Equation, Power method.
5 **Non-Linear System of Equations:** Bisection method, Method of False Position, Newton Raphson Method, Secant Method.
6 **Finite Differences :** Use of Difference Tables, Detection and Correction of Difference Tables, Difference Operators (Forward, Backward, Central, Average, Shift Operator).
7 **Interpolation :** Newton's Forward Difference and Backward Difference Interpolation Formula, Lagrange's Method.
8 **Numerical Differentiation :** Derivatives using Newton's Forward Difference and Backward Difference Formula.
9 **Numerical Integration :** Trapezoidal Rule, Simpson's 1/3 and 3/8 Integration rules.

Text Book : 1. Curtis F. Gerald, Applied Numerical Analysis, Addison-Wesley Pub Co, 1989

Reference:
1. Richard L. Burden, J. Douglas Faires, Numerical Analysis, Brooks/Cole Pub Co, November 1996.
2. Walter Gautschi, Numerical Analysis : An Introduction, Springer Verlag, April 1, 1997
3. Shoichiro Nakamura, Applied Numerical Methods, Prentice – Hall international Edition, 1991
4. Kamal B. Rojiani, Programming in C with Numerical Methods for Engineers, Prentice- Hall, 1996.
5. Numerical Analysis, 3 rd Edition Dr Saeed Akther

Pre Requisites**:** CPS-331

Course**:** **CPS-360**

Credits: 3+0 **Contact Hrs**: 3+0

Course Out Line Schedule

1 **Languages and Regular Expressions:** Defining languages, Kleene closure, Definition of regular expressions (RE's), Languages associated with regular expressions.

2 **Finite Automata (FA):** Definition of FA's, FA's and their languages, Transition Graphs (TG's), No determinism, Unification of RE's, FA's and TG's.

3 **Finite Automata with Output**: Moore machine, Mealy machines Equivalence of Moore and Mealy machines, Transducers

4 **Regular Languages**: Union, concatenation, Kleene closure, complementation and intersection of regular languages, Decision procedures for the finiteness, and equivalence, Nonregular languages Pumping lemma.

5 **Context-Free Grammars (CFG):** Symbolism for generative grammars, Regular grammars, Chomsky normal form, Leftmost derivations.

6 **Pushdown Automata (PDA):** Adding input tape and pushdown stack to FA's, Definition of PDA's, Non context free languages, Closure, intersection, and complement of context free languages, Decision problems, emptiness, uselessness, finiteness, The CYK algorithm, Parsing.

7 **Turing Theory:** Turing machines, Post machines, Two stack PDA, Recursively enumerable languages, Type 0 grammars, The universal Turing Machine.

TextBook:

1. Introduction to Computer Theory, 2nd Edition, by Daniel I A. Cohan John Wiley, 1997.

Reference:

1. An Introduction to the Theory of Computations, by Eitan M. Gurari Computer Science Press, 1989.
2. Automata Theory: Machine and Languages, by Richard Y. Kain McGraw Hill Book Company, 1972
3. Automata and Formal Languages: An Introduction, by Dean Kelley Prentice Hall, October 1995.
4. Automata and Computability, by Dexter C. Kozen Springer Verlag, 1997.
5. An Introduction to Automata Theory, by M.W. Shields Books Britain, 1988.

Operating Systems

Pre Requisites**:** CE-420

Course**:** **CPS-410**

Credits: 3+1 **Contact Hrs**: 3+3

Course Out Line Schedule

1 **Operating System**: Objectives & Functions of Operating System, Operating System Characteristics, Desirable Features of an Operating System, Fetch & Execute Cycle, Typical operations performed by the processor, Processor – Memory, Processor – I/O, Data – Processing, Control.

2 **I/O Management & Disk Scheduling:** Interrupts, Interrupts & the Execution Cycle, Short I/O Wait, Long I/O Wait, Kinds of Interrupts, Interrupt, Processing, Multiple Interrupts, Multi-Programming, I/O Organization, Generic Model of an I/O module, I/O Function, Requirement of an I/O Module, External Devices, Classification of the Devices, Difference Between These Devices, Model of an External Device, I/O Communication Techniques, Programmed I/O, Interrupt Driven I/O, DMA, Logical Structure of the I/O Function, Local Peripheral, Communication Port, File System, I/O Buffering, Disk Scheduling, Disk Performance Parameter, Disk Scheduling Policies.

3 **Process Management:** Process Management, Process States, Basic Two State Process Model, Three State Process Model, Five State Process Model, Creation & Termination of Processes Suspended Processes, Suspended States Model, Characteristics of Suspended State Model, Process Description, Operating System Control Structure, Process Control Structure, Process Location, Process Attributes, Process Identification, Processor State Information, Scheduling of State Information, Process Control Modes of Execution, Creation Of Processes, Process & Context Switching, Processes & Threads.

4 **Files:** Files, File Management System, Objectives of the File Management System, Minimum Requirements from user point of view for a File Management System, File System Architecture, Functions of File Management, File Directories, File Sharing, Record Blocking, Secondary Storage Management, File Allocation, Pre-allocation Vs Dynamic Allocation, Portion Size, File Allocation Methods, Free Space Management, Reliability, Disk Interleaving.

5 **Concurrency:** Motivation for Concurrency, Program Structuring Alternatives, Process Interaction, Competition Among Processes for Resources, Mutual Exclusion, Dead Lock, Starvation, Requirements for Mutual Exclusion.

6 **Memory Management:** Memory Management, Memory Management Requirements, Equal & Unequal Partitioning, Dynamical Loading & Swapping of Processes, Memory Management Schemes, Virtual Memory Concept, Paging & Segmentation.

7 **Introduction To Network & Distributed O/S:** Motivation, Topology, Communication, Network Types & Operating Systems.

TextBook: 1. Operating Systems by: ***William Stallings***

Reference: 1. Modern Operating System by: ***Tanenbaum***

2. Operating System Concepts by: ***L.J. Peterson***

Computer Networks

Pre Requisites**:** CPS-230,CPS-331

Course**: CPS-422**

Credits: 3+1 **Contact Hrs**: 3+3

Course Out Line Schedule

1. **Introduction:** Introduction to Networks protocols and standards line, configuration- Networks Topologies, Transmission Model, Categories of networks-Inter networks-The OSI Model Functions of layers-TCP/IP Protocol suite.
2. **Signals and Encoding**:- Annals and digital signals-periodic and a periodic signals –Time and Frequency domains signals-A to D conversion- D to D conversion, D to A conversion, A to A conversion
3. **Transmission of Digital Data** :- DTE-DCE Interface-Modems 56K Modems- Cable modems – Guided and unguided transmission Media- Transmission impairment- Performance, Shannon Capacity- Media comparison..
4. **Multiplexing, Error Detection and correction**:- FDM, TDM and WDM-Multiplexing applications _digital subscriber lines (DSL), FTTC- types of errors- Error detection- vertical, longitudinal and cyclic redundancy checks- Checksum-Error correction.
5. **Data Link Control and Protocols**:- Asynchronous protocols- character and Bit oriented protocol – Link Access procedures-link Discipline-flow control-Error control.
6. **Local and Metropolitan Area Networks:-** Project 802-Ethernet, token bus, Token Ring, FDDI-802.6 (DQDB), SMDS, circuit switching and Packet switching.
7. **Point-to point Protocol (PPP):-**Transition states- PPP Layers-Link control protocol- Authentication – Network control protocol.
8 **Frame Relay and ATM**:- Frame relay operation –Layers-congestion control leaky Bucket Algorithm – Traffic control- ATM design goals- Architecture –Switching and Switch Fabrics-ATM layers- service classes- ATM applications.
9 **Networking and Internetworking Devices:-** Repeaters- Bridges –Routers- Gate ways- Otherdevices- Routing Algorithms- Distance vector and link state routing, Congestion Control Algorithms.
10 **Transport Layer and Upper OSI Layers** :- Fructose of Transport layer-Commotion establishment termination- OSI transport layer- Application layer, Congestion Control
11 **TCP/IP Protocol Suite** :- Overview- Network layer- Addressing- Sunbathing protocols in Network Layer- Transport layer (UDP and TCP)- client server model- Boot P- DHCP-DNS-TELENET-FTP-TFTP-SMTP-SNMP HTTP-word wide web.
Introduction to Mobile Networks:- Mobile Adhoc Networks, Issues and Applications of MANETs, Reactive and Proactive Protocols
12 **Network Layer (Extension):-** Routing algorithms, Shortest-path problems, Optimality

TextBook: 1. Data Communications and Networking, Second Edition by Behrouz Forouzan

Reference: 1. Computer Networks by Andrew S. Tanenbaum

Sem Projects Computer Network Project

Networks Security

Pre Requisites**:**

Course**:** **CPS-425**

Credits: 3+0 **Contact Hrs**: 3+0

Course Out Line Schedule

1. **Introduction**; Cryptology and simple cryptosystems
2. Conventional encryption techniques
3. **Stream and Block Ciphers**; DES; More on Block Ciphers; The Advanced Encryption Standard. Confidentiality & Message authentication: Hash functions;
4. **Number Theory and Algorithm Complexity**; Public key Encryption. RSA and Discrete Logarithms
5. **Elliptic Curves**; Digital signatures. Key management schemes
6. **Identification Schemes**; Dial-up security. E-mail security, PGP, S-MIME; Kerberos and directory authentication. Emerging Internet security standards
7. **SET; SSL and IPsec**; VPNs; Firewalls; Viruses; Miscellaneous topics.

Text Book: W. Stallings, Cryptography and Network Security

Reference: Prentice Hall PTR, Upper Saddle

Sem Projects

Artificial Intelligence

Pre Requisites**:** CPS-230

Course**:** **CPS-440**

Credits: 3+1 **Contact Hrs**: 3+3

Course Out Line Schedule

1 **Introduction:** The Turing Test approach, The cognitive modelling approach, The laws of thought approach, The rational agent approach

2 **Solving Problems by Searching:** Breadth-first search, Uniform cost search, Depth-first search, Depth-limited search, Iterative deepening search, Bidirectional search

3 **Informed Search Methods:** Best-First Search, Heuristic Functions, Memory Bounded Search, Iterative Improvement Search

4 **Game Playing:** Alpha-Beta pruning, Mini max

5 **Knowledge and Reasoning:** A Knowledge-Based Agent, Propositional Logic

6 **First-Order Logic:** Syntax and Semantics, Extensions and Notational Variations, Using First-Order Logic, Deducing Hidden Properties of the world

7 **Building a Knowledge Base:** General Ontology, Representing Categories

TextBook:
1. Peter Norvig, "Paradigms of Artificial Intelligence Programming: Case studies in Common Lisp", Morgan Kaufman Publishers, Inc. 1992.

Reference:
1. Guy L. Steele Jr., "Common Lisp the Language", 2nd edition, Digital Press, 1990.
2. Peter Jackson, "Introduction to Expert Systems", Addison-Wesley Publishing Company, 1986.

Sem Projects Programming Projects

Theory of Intelligent Systems

Pre Requisites**:** CPS-410

Course**:** **CPS-449**

Credits: 3+1 **Contact Hrs**: 3+3

Course Out Line Schedule

1. **Introduction:** Well-Posed Learning Problems, Choosing the Training Experience, Choosing the Target Function, Choosing a Representation for the Target Function, Choosing a Function Approximation Algorithm, Issues in Machine Learning
2. **Concept Learning and the General-to-Specific Ordering:** A concept Learning Task: The Notation, The Inductive Learning Hypothesis, FIND-S: Finding a Maximally Specific Hypothesis, Version Spaces and the CANDIDATE-ELIMINATION Algorithm, Inductive Bias: An Unbiased Learner
3. **Decision Tree Learning:** Entropy and Information Gain, Building the Decision Tree, Hypothesis Space Search in Decision Tree Learning, Inductive Bias in Decision Tree Learning, Occam's Razor
4. **Artificial Neural Networks:** Biological Motivation, Neural Network Representations, The Basic Perceptron, Gradient Descent and the Delta Rule, Multilayer Networks and the Back propagation Algorithm
5. **Bayesian Learning:** Bayes Theorem and its significance in intelligent decision making, MAP Hypotheses and Consistent Learners, Bayes Optimal Classifier
6. **Evolutionary Algorithms:**
   Genetic Algorithms: Representing Hypotheses, Genetic Operators, Fitness Function and Selection, Mathematical Foundations
   Genetic Programming: Representing Programs
7. **Learning Set of Rules:** Learning First-Order Rules, Learning Sets of First-Order Rules: FOIL
8. **Reinforcement Learning:** Q Learning, Nondeterministic Rewards and Actions, Temporal Difference Learning, Generalizing from Examples

Text Book: 1. Tom M. Mitchell, "Machine Learning," McGraw-Hill, © 1997

Reference:

Sem Projects Programming Projects

Computer Graphics

Pre Requisites**:**

Course**:** **CPS-472**

Credits: 3+1 **Contact Hrs**:3+3

Course Out Line Schedule

1 **Introduction to Computer Graphics**

2 **Computer Graphics System:** Video Display Devices and Systems, Raster Scan System, Graphic Monitors & Workstation, Input and Output Devices, Graphic Software and Hardware.

3 **Output Primitive its Attributes.** Point and Line, Line, Circle Ellipse Algorithms and Functions. Loading Frame Buffer, Special Curve Drawing Algorithms, Pixel Addressing, Filled Algorithms. Attributes of line, curve, Area fill and Characters, Antialiasing.

4 **2D Geometric Transformation:** 2D, Composite and other Transformations, Matrix Representation, Transformation between Coordinate System. Affine and Raster Methods for Transformation.

5 **2D-Viewing:** Window to View-port Transformation, 2D Viewing Function, Clipping in Raster World, Clipping Lines, Curves & Polygons Text

6 **3D Geometrical Transformation & Viewing:** Projections, View Planes & Viewing Geometries, Co-ordinate Systems, Matrix Representation of 3D Transformations, Composite 3D Transformations, Visible Line & Surface Identification.

7 **Colour Model:** Properties of Light, Colour Models (RGB, YIQ, CMY(K), HSV), Conversion between Colour Models.

8 **Advance Topics:** Introduction to Sp line & Curves, Visible Surface Detection, Animation & Simulation.

Text Book: 1. Computer Graphics by ***Pauline Baker***

Reference: 2. Computer Graphics: Principles & Practice by ***Foley, Van Dam, Feiner & Huges***.

Sem Projects Software Project

Data Base Systems

Pre Requisites**:**

Course**:** **CPS-480**

Credits: 3+1 **Contact Hrs**: 3+3

Course Out Line Schedule

1 **Storage of and access** Data stored in files.

2 **Implementation of storage/accesses** algorithms like indexing, hashing and range accesses on data stored in independent files. Drawing conclusions regarding advantages/ disadvantages of data stored in files

3 **Concept of database**, Database Management Systems. Advantages of database management systems over file systems.

4 **Different database models** Implementation, storage and data retrieval strategies of Network three data models- Network, Hierarchical and relational data model, OODB, comparison with each other

5 **Query languages**, SOL

6 **Relational Algebra** - their syntax and use in Client server and single user environments

7 **Transaction processing**: Types and Different stages of transactions. Aborted/incomplete transactions, Roll Back and different techniques of recovery from the exceptional situation.

8 **Parallel execution of transactions**: their inherent problems, limitations. Serialisation of transactions.

9 **Distributed Database System & Advance Topics**

TextBook:
1. C. Ricardo, "Database Systems, Principles, Design & Implementation", Macmillan, 1990.
2. C.J. Date, " Database Systems", Mc Graw Hill, 1999.

Reference:
1. Tech Sig Movie ser 29, "What is Electronic Data Processing Concept" - 30 mins
2. Gen Trg Movies ser 8, "Data Communication" - 29 mins
3. Gen Trg Movies ser 8, " Data Representation" - 29 mins

Sem Projects Data Base Projects

Distributed Computing

Pre Requisites**:** CPS-425, EE-302

Course**:** **CPS-622**

Credits: 3+1 **Contact Hrs**: 3+3

Course Out Line Schedule

1. **Characterization of Distributed Systems**: Introduction to Distributed Systems, Examples of Distributed Systems, Resource Sharing and the web

2. **System Models**: Architectural Models, Fundamental Models
3. **Inter-process Communication:** External data representation and marshalling, Group communication, Case Study: Inter process Communication in UNIX
4. **Distributed Objects and Remote Invocation**: Communication between distributed objects, Remote procedure call, Events and notifications, Java RMI case study
5. **Operating System Support**: The operating system layer, Protection and address spaces, Processes and Threads, Communication and invocation, Operating system architecture
6. **Distributed File Systems**: File server architecture, Sun Network File System, The Andrew File System
7. **Name Services**: Name services and the Domain Name System, Directory and discovery services, Case study of the Global Name Service, Case study of the X.500 Directory Service
8. **Time and Global States**: Clocks, events and process states, Synchronizing physical clocks, Logical time and logical clocks, Global states, Distributed debugging
9. **Coordination and Agreement**: Distributed mutual exclusion, Elections, Multicast communication, Consensus and related problems
10. **Transactions and Concurrency Control:** Transactions, Nested transactions, Locks, Optimistic Concurrency Control, Timestamp ordering
11. **Distributed Transactions**: Flat and nested distributed transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery
12. **Replication**: System model and group communication, Fault-tolerant services, Highly available services, Transactions with replicated data
13. **Distributed Shared Memory**: Design and implementation issues, Sequential consistency and Ivy, Release consistency and Munin

TextBook: 1. Distributed Systems: Concepts and Design *Edition 3*

*b*y George Coulouris, Jean Dollimore and Tim Kindberg
Addison-Wesley, ©Pearson Education 2001.

Reference:

1. Tanenbaum, Andrew S. and van Steen, Maarten, Distributed Systems, Principles and Paradigms. Prentice-Hall, 2002 (ISBN 0-13-088893-1).

Sem Projects Software Project

Project

Pre Requisites**:**
Course**:** **CPS-499**
Credits: 0+7 **Contact Hrs**: 0+21
Course Out Line Schedule

BE thesis project in the final semester. Project identification and initial work will be started in the 6th semester

TextBook: As advised by Project Supervisor
Reference: As advised by Project Supervisor

Sequence for Degree Project

1. Syndicate formation and choosing Project Advisor in the 4th week of 5th Semester
2. Approval of Syndicate formation by the Dept in the 12th week of 5th Semester
3. Proposal Defence in the 16th week of 5th Semester
4. 1st Progress Presentation 2nd and 3rd week of 6th Semester
5. 2nd Progress Presentation 16th week of 6th Semester
6. 3rd Progress Presentation 13th week of 7th Semester
7. Final Presentation after Final Exams.

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Software Engineering

Pre Requisites**:**
Course**:** **CSE-271**
Credits: 3+0 **Contact Hrs**: 3+0
Course Out Line Schedule

1 **Concepts** Perspectives on Software ,What is Software Engineering, History, Software Process, Life Cycle Models

2 **Phases** Requirements Engineering, Analysis and Specification, Design Concepts, Software Architecture, Software Testing, Software Maintenance

3 **Management** Software Project Management, Measurement and Metrics, Project Planning, Software Quality Assurance, Risk Management, Configuration Management, Software Reliability

4 **Methodologies** Formal Methods, Algebraic Specification, Model-Based Specification, Clean room Software Engineering, Human Computer Interaction, Component-based Development, Real-Time Systems

5 **Knowledge Areas** Capability Maturity Model, Life Cycles Standard ISO/IEEE 12207, Software Engineering Body of Knowledge, Software Engineering as Profession, The Evolution of Software Engineering, Certifications

Text Book: 1. Software Engineering : A Practitioners Approach *by Goger S. Pressman*

Reference: 1. Software Engineering by Summerville

Sem Projects Project Management

Engineering Management

Pre Requisites**:** None

Course**:** **CSE-279**

Credits: 2+0 **Contact Hrs**: 2+0

Course Out Line Schedule

1 **Engineering Management** Introduction: Knowledge of Technology is not enough to be successful in the Industry of today.

2 **The management challenges in the Industry:** Product-Management, Process-Management, Total Quality-Management, Project-Management, What Organizations are and What They Do: Nature, Overview. Introduction & Aim of Organizations (Corporate Objectives), The legal establishment of organizations, Sole traders, Partnership, Co-operatives, Franchising. Strategies for survival, Strategies marketing, Simultaneous Engineering, Manufacturing strategies. Functions of Organizations, Purchasing, Operations, manufacturing, Marketing and sales, Finance, Product Development, Research, Quality control, Personnel, Company operation and the role of engineers.

3 **The Management of Engineering:** Finance, The need for monetary control, Inadequate financial systems-a case study, The ideal financial system, Investment appraisal, Depreciation. Business Plan, The purpose of the plan, What should be in the plan?, Preparation of the plan.

4 **Product Development:** Overview, Customers and product development, Product life cycles and GAP analysis, The ideal product development process, Managing the product Development process, Management techniques in product development,

5 **Operations Management:** Overview, Organization of manufacturing, Job production, Batch production, Flow production, Group Technique, Production planning and control, Operational data, Product data, Scheduling, Capacity planning. Material management, Stores, Purchasing, Materials requirements planning (MRP), Just in Time, The principles of JIT, JIT techniques

6 **Quality Management:** Introduction, Inspection and test, Quality control, Quality assurance, Total quality management. Quality assurance and ISO 9000, What is a standard?, ISO 9000, ISO 9001,

7 **Project Planning and Management:** Introduction, Defining & Specifying the project, The implication of the project, Constraints, The project proposal. Planning the project, Project activities,

8 **The Management of Engineers:** Personnel Management, Structure of organizations, Organization charts, Methods of company organization, Development of personnel, Factors that affect company organization. Employing people, Recruitment, Selection processes. Making o job offer, Legal aspects of recruitment and selection, The induction process, Termination of employment. Motivation and Leadership, Motivation, Leadership. Appraisal of employees, Training and Development, Job design and payment systems, Job design, Payment systems

9 **Team Working and Creativity:** Introduction, Team working, Holistic tears, Optimizing team composition-theory, Optimizing team composition-practice. Group dynamics, The needs of the group, Meeting these needs –group dynamics. Managing the creative process, Planning innovation, Problem solving, Decision-making

10 **Personal Management:** Overview, Introduction, Personal Organization, Time management, Good desk keeping, The boss-subordinate relationship. Objective setting, The need for objectives, Writing objectives. Maintaining progress. Self-appraisal, Career planning, Curriculum vitae, General Wellbeing

11 **Engineering management in practice:** Industry today is Faces Severe Challenges: Merging markets of Information, Telecommunications and Media, Liberalization, deregulation, globalization, Driving forces by Internet-based and by mobile applications, Short technology cycles and short time-to market , Over-investment and disillusion after hype, The vocation of engineering management,

TextBook: 1.Management in engineering By Gail Freeman Belt, James Balkwill Prentice Hall Co

Reference:

Software Construction

Pre Requisites**:**

Course: CSE-472

Credits: 3+1 **Contact Hrs**: 3+3

Course Out Line Schedule

1 Basics of formal languages; syntax and semantics; grammars; Backus Naur Form. Parsing; regular expressions and their relationship to state diagrams

2 Lexical Analysis; tokens; more regular expressions and transition networks; principles of scanners

3 Using tools to generate scanners; applications of scanners. Relation of scanners and compilers

4 Parsing concepts; parse trees; context free grammars, LL Parsing

5 Overview of principles of programming languages. Criteria for selecting programming languages and platforms

6 Tools for automating software design and construction. Modelling system behaviour with extended finite state machines

7 SDL

8 Representing concurrency, and analyzing concurrent designs

Sample labs and assignments:

- Use of software engineering tools to create designs
- Use of parser generators to generate languages

TextBook: Software Engineering by Roger S. Pressman

Reference:

Sem Projects

Software Quality Assurance

Pre Requisites**:** CPS 370, CPS-480

Course**:** **CSE-473**

Credits: 3+0 **Contact Hrs**: 3+0

Course Out Line Schedule

1 Introduction to software quality assurance
2 Inspections and reviews
3 Principles of software validation
4 Software verification
5 Software testing
6 Specification based test construction techniques
7 White-box and grey-box testing
8 Control flow oriented test construction techniques
9 Data flow oriented test construction techniques
10 Cleanroom approach to quality assurance
11 Software process certification

TextBook: *CMM In Practice: Processes for Executing Software Project at Infosys* by Jalote, Pankaj..

Reference: *Software Testing in the Real World: Improving the Process* by Kit, Edward

Sem Projects Software Project Management

Software Design & Architecture

Pre Requisites**:**

Course**:** **CSE-474**

Credits: 3+1 **Contact Hrs**: 3+3

Course Out Line Schedule

1 In-depth study of design patterns, building on material learned previously.
2 Application of design patterns to several example applications
3 In-depth study of middleware architectures including COM, Corba, and .Net
4 Extensive case studies of real designs.
5 Basics of software metrics; measuring software qualities
6 Reengineering and reverse engineering techniques.

Text Book: *Software Architecture in Practice* by Len Bass

Reference: *Evaluating Software Architectures* by Paul Clements
2. Ed Roman, "Mastering Enterprise Java Beans & java2 Platform"

Sem Projects Programming Projects

Software Project Management

Pre Requisites**:** CSE-271

Course**:** **CSE-475** **Contact Hrs**: 3+0

Credits: 3+0 Schedule

Course Out Line

1 Introduction to Software Project Management
2 Step Wise: An Overview of Project Planning
3 Project Evaluation: Strategic and Technical
4 Project Evaluation: Cost Benefit Analysis and evaluation
5 Project Evaluation: Risk Assessment and evaluation
6 Selection of an appropriate project approach
7 Software Prototyping, Software Effort Estimation, Activity Planning
8 Critical Path, Risk Management, PERT, Resource Allocation
9 Monitoring and Control ,Managing Contracts
10 Managing people and organizing teams, Software Quality

TextBook 1. Personal Web Site at http://msaeed.net

2. Mike Cotterell and Bob Hughes, Software Project Management, 2nd Edition, McGraw Hill, 1999. ISBN 0-07-709505-7

Reference: 1. Chris F. Kemerer, Software Project Management – Readings and Cases, McGraw Hill, 1997. ISBN 0-256-18545-X

Sem Projects Planning Software Projects

Human Computer Interfacing

Pre Requisites**:**

Course**:** **CSE-476**

Credits: 2+1 **Contact Hrs**: 2+3

Course Out Line Schedule

1. Background to human-computer interaction. Underpinnings from psychology and cognitive science
2. More background. Evaluation techniques: Heuristic evaluation
3. More evaluation techniques: Videotaped user testing; cognitive walkthroughs
4. Task analysis. User-centred design
5. Usability engineering processes; conducting experiments
6. Conceptual models and metaphors
7. Designing interfaces: Coding techniques using colour, fonts, sound, animation, etc.
8. Designing interfaces: Screen layout, response time, feedback, error messages, etc.
9. Designing interfaces for special devices. Use of voice I/O
10. Designing interfaces: Internationalization, help systems, etc. User interface software architectures

Text Books: *HCI Models, Theories, and Frameworks: Toward a Multidisciplinary Science* by John Carroll *Usability Engineering: Scenario-Based Development of Human Computer* Interaction by

Reference: Mary Rosson, John Carroll, Mary Beth Rosson

Sem Projects

Digital Logic Fundamentals

Pre Requisites**:** None

Course**:** **CE-230**

Credits: 3+1 **Contact Hrs**: 3+3

Course Out Line Schedule

1 **Binary Systems:** Number Systems, Bin, Octal and Hex numbers, Base conversions, Compliments, Binary codes, Bin Addition, subtraction, Multiplication, Division, Bin Logic.

2 **Binary Algebra:** Basic definitions, Basic theorems and properties, Functions, Venn Diagrams, Canonical and Standard forms, Conversion between canonical forms, Logic Operations, Digital Logic gates, Introduction to Logic families and their characteristics

3 **Simplification of Boolean Functions** Karanugh Map representation and simplification of Boolean Functions, Product of Sums simplification, NAND and NOR implementation, Two level implementations, Quine Mc Cluskey Method.

4 **Combinational Logic:** Design procedure, Adders, Subtractors, Code conversion, Analysis procedure, Multi level NAND and NOR circuits, Exclusive OR and Equivalence functions

5 **Combinational Logic with MSI & LSI:** Bin Parallel Adder, Decimal Adder, Magnitude comparator, Decoders, Multiplexers, ROM function implementation, PLAs.

6 **Sequential Logic** Basic flip-flops, RS flip-flops, D flip-flops, JK flip-flop, T flip-flop, Master-Slave and Edge triggered flip-flop, Analysis of clocked sequential circuits, State reduction and assignment, Design of sequential circuits.

7 **MSI-Sequential Circuits** Registers, Shift registers, Ripple counters, Synchronous counters, Timing sequences, Memory unit, Introduction to register transfer Logic.

TextBook:
1. M Morris Mano, "Digital Logic and Computer Design"

Reference:
1. Fredrick Hill & Gerald R Peterson "Digital Logic and Microprocessors"
2. B. Holdsworth "Digital Logic Design"
3. Edward J McClukey "Logic Design Principles"

Computer Organization and Architecture

Pre Requisites**:** CPS-331

Course**:** **CE-420**

Credits: 4+1 **Contact Hrs**: 4+3

Course Out Line Schedule

1. Introduction to Computer Architecture, Evolution of Computers, Types of Computers, Hardware, Firmware and Software. Future trends.
2. Programming model of 8086 family. Addressing Modes.
3. Data types, complements, fixed point representation, floating point representation, binary codes..
4. Register Transfer Language. Bus and Memory Transfer. Arithmetic Micro-operations, Logic Micro-operations, shift micro-operation, Arithmetic Logic Unit.
5. Instruction Codes, Computer Register, Computer Instruction, Timing and Control, Instruction Cycle, Memory-Reference Instruction, Input-Output, Interrupt, Complete description and design of Basic Computer. Design of Accumulator and ALU.
6. Assembly Language Programming with help of MASM and Debugger
7. Control Memory, Address Sequencing, Micro program, Computer Configuration, Microinstruction format, Symbolic Microinstruction. The Fetch Routine, Symbolic Micro program, Binary Micro program, Design of Control Unit, Micro program Sequencer.

8 Memory Hierarchy, Main Memory, Cache Memory, Virtual Memory, Memory Management.

9 General Register Organization, Stack Organization, Instruction format, Addressing Modes, Date transfer and manipulation, Program Control, RISC & CISC Computer and their characteristics.

10 Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, Vector Processing**.**

Text Book: 1. Computer Architecture and Organization by John P. Hayes, 3rd Edition, McGraw - Hill.

2. Computer System Architecture by M. Morris Mano, Third Edition

Reference: 1. Computer Architecture by Morio De Blasi.

2. Computer Architecture & Organization by A.J.Van De Goor.

Sem Projects Computer Architecture Projects

Basic Electrical Engineering

Pre Requisites**:** MTH-132, MTH-133, PHY-184

Course**:** **EE-280**

Credits: 3+1 **Contact Hrs**: 3+3

Course Out Line Schedule

1. **Introduction.** Electrical Components, Quantities, Units and Measuring Instruments
2. **Voltage, Current, Energy and Power** Voltage, Current, and Resistance, Electrical Charge, The Electric Circuit, Ohm's Law, Calculating Current, Voltage and resistance. Energy and Power, Power in an Electrical Circuit, Resistor Power Ratings, Energy Conversion and Voltage Drop in Resistance.
3. **Series, Parallel and Series-Parallel Circuits**
   Resistors in series,Circuit, Total Series Resistance, Ohm's Law , Voltage Sources in series, Kirchhoff's voltage Law, Power in a series Circuit. Resistors in parallel, Voltage Drop in parallel Circuits Kirchhoff's current Law, Total parallel Resistance, Power in parallel circuits, Analysis of series-parallel circuits, Voltage Dividers with Resistive Loads.
4. **Circuit Theorems and Conversions.** The voltage source, The Current Source, Source Conversions, The Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum power Transfer Theorem, Delta-to-why (A-to-Y) and Wye-to-Delta (Y-to-A) Conversions.
5. **Branch, Mesh, and Node Analysis**
   Branch Current Method, Determinants, Mesh Current Method, Node Voltage Method.
6. **Magentism and Electromagnetism, Introduction to Alternating Current and Voltage**
   The Magnetic Field, Electromagnetism, Electromagnetic Devices, Electromagnetic Induction, Applications of Electromagnetic Induction**.** The sine wave, Sinusoidal Voltage Sources, Voltage and Current Values of Sine Waves, Angular Measurement of a Sine Wave, The sine wave Formula, Ohm's Law and Kirchhoff's Laws in AC Circuits, Superimposed DC and AC Voltages, Non-sinusoidal Waveforms,
7. **Capacitors, Inductors,** The Basic Capacitor, Types of Capacitors, Series Capacitors, Parallel Capacitors, Capacitors in DC Circuits, Capacitors in AC Circuits, Capacitor Applications, The Basic inductor, Types of inductors, Series Inductors, Parallel inductors, Inductors in DC Circuits, Inductors in AC Circuits, Inductor Applications.
8. **RC , RL Circuits** . Series Reactive Circuits, Sinusoidal Response of RC and RL Circuits, Impedance and Phase Angle of Reactive Circuits, Analysis of Reactive Circuits, Parallel Reactive Circuits, Impedance and Phase Angle of Parallel Reactive Circuits, Analysis of parallel Reactive Circuits, Series-parallel Reactive Circuits
9. **RLC Circuits and Resonance**
   Series Reactive Circuits, Impedance of Series RLC Circuits, Analysis of series RLC Circuits, Series Resonance , Analysis of parallel RLC Circuits Parallel Resonance, Series parallel Reactive Circuits, Analysis of Series-parallel RLC Circuits.
10. **Pulse Response of Reactive Circuits**
    The RC integrator, Single pulse Response of RC Integrators, Repetitive-pulse Response of RC Integrators, Single-pulse Response of RC Differentiators, Repetitive-pulse Response of RC Differentiators, Pulse Response of RL Integrators, Pulse Response of RL

Differentiators, Amplitude and Phase response.

TextBook: 1. Principles of Electric Circuits By Thomas L. Floyd 6th Edition

Reference: 1. Electric Circuits (Shaums Series) by Joseph
2. Electrical Technology by B.L Theraja.
3. Tech Sig Movie ser 3, "Solders & Applications" - 60 mins

Electronic Circuits & Devices

Pre Requisites**:** None

Course**:** **EE-302**

Credits: 3+1 **Contact Hrs**: 3+3

Course Out Line Schedule

1. **Introduction to Semiconductors**:- Atomic Structure, Semiconductors, Conductors & Insulators. Covalent Bond., The N-Type & P-Type Semiconductors., The PN Junction, Biasing of PN Junction, Current -Voltage Characteristics of a PN Junction, The Diode.
2. **Diode Application** Half Wave Rectifier., Full Wave Rectifier. ,Power Supply Filters, Diode Limiting & Clamping Circuits.
3. **Bipolar Junction Transistor:** The Junction Transistor. The Ebers Moll Representation of The BJT, Large Signal Current Gains, Mode of Transistor Operation, Minority Carrier Concentration. Common Base Characteristics, Output Characteristic, Input Characteristic, The Early Effect. Common Emitter Configuration, Output Characteristics, Input Characteristics. DC Models. The BJT as a Switch. The BJT as an Amplifier. The BJT Small Signal Model, Low Frequency Model, High Frequency Model.
4. **Special Purpose Diodes** Zener Diodes., Varactor Diodes., Optical Diode..
5. **Bipolar Junction Transistors** Transistor Construction., Basic Transistor Operation., Transistor Characteristics & Parameters., Transistor as an Amplifier., Transistor as a Switch
6. **Transistor Bias Circuits** DC Operating Point , Base Bias., Emitter Bias., Voltage Divider Bias., Collector Feedback Bias..
7. **Small Signal Bipolar Amplifier .**Small Signal Amplifier Operation., Transistor AC Equivalent Circuits, Common Emitter Amplifiers., Common Collector Amplifiers., Common Base Amplifiers, Multistage Amplifiers.
8. **Field Effect Transistors and Biasing** . The Junction FET, JFET Characteristics & parameters, JFET Biasing, The Metal Oxide Semiconductor FET (MOSFET), MOSFET characteristics and parameters, MOSFET Biasing.
9. **Small- Signal FET Amplifier** . Small Signal FET Amplifier Operation., FET Amplification. , Common-Source Amplifier., Common –Drain Amplifier., Common-Gate Amplifier.,
10. **Amplifier Frequency Response** The Decibel., Low Frequency Amplifier Response., Miller Capacitance., High Frequency Amplifier Response., Total Amplifier Freq Response.
11. **Operational Amplifier** Introduction to Operational Amplifiers, The Differential Amplifier., Op-Amp Parameters., Negative Feedback , Op –Amp configurations with Negative feedback
12. **Oscillators** Oscillator principles., Oscillator with RC Feedback Circuit, Oscillator with LC Feedback Circuit, Non Sinusoidal Oscillators. 555 Timer as an Oscillator**.**

Text Book: 1. Microelectronics by Sedra and Smit 1997

Reference: 1. Microelectronics by J. Millman and A Grabel 4th Edition

2. Fundamentals of Electronic Devices by Ronald J Tocci & Mark E Oliver

Sem Projects Electronics Design Project

Digital Electronics

Pre Requisites**:**

Course**:** **EE-345**

Credits: 3+0.5 **Contact Hrs**: 3+1.5

Course Out Line Schedule

1. **Basic Logic Circuits:** Logic gate characteristics, NMOS inverter, propagation delay of an NMOS inverter, NMOS logic gates, CMOS inverter, CMOS logic gates, BJT inverter, TTL NAND, gate, TTL output stages, TTL logic families, ECL circuits, comparison of logic families
2. **Sequential Circuits:** Latches, Flip-flops, shift registers, counters and their applications.
3. **Shift Register:** Bi-directional Shift Registers, Shift Register Counters, Shift Register Application.. Introduction to CPLDs.
4. **Logic Programming with Verilog HDL:** Implementing Combinational Logic, Sequential Logic Circuits, Shift Registers and Counters with Verilog HDL. Introduction to FPGAs
5. **VLSI Systems:** Dynamic MOS shifters, rationales shift register stages, CMOS Domino logic, Random access Memory, Read write memory cell, Bipolar RAM, charged coupled device, Integrated injection logic, analog to Digital to analog converters, Programmable logic arrays
6. **Timing Circuits:**- Monostable and Astable Multivibrators using digital IC's.
7. **Signal Conditioning and Data Conversion:** Signals and Signal Processing, Sample-and Hold Systems, Analog Multiplexer and Demultiplexer, Digital-to Analog (D/A) Converters, Analog-to-Digital (A/D) Converters, Integrator and Differentiator Circuits
8. **Digital Filter Fundamentals:** Digital filter Structures, IIR Filters, SIR Filters.

TextBook:

1. Digital Fundamentals by Thomas L. Floyd, Eighth Edition
2. Digital Design by M. Morris Mano
3. Third Edietion Prentice Hall

Reference:

1. Verilog HDL A Guid to Digital Design and Synthesis by Samir Palnitkar
2. Digital Signal Processing, A Computer Based Approach by Sanjit A. Mitra Mcgraw Hill

Digital Signal Processing

Pre Requisites**:** MTH-314,STT-351

Course**:** **EE-466**

Credits: 3+0.5 **Contact Hrs**: 3+1.5

Course Out Line Schedule

1 **Introduction to Discrete Time Signals and Systems:** Analog to digital conversion, sampling theorem in time and frequency domain, sampled digital signal representation, LTI system and its properties, convolution and correlation operations and structures.

2 **Z-Transform:** Definition of Z-Transform, properties of Z-transform, Z-transform and LTI systems, LTI transfer function and its analysis in frequency domain using Z-transform.

3 **Discrete Fourier Transform (DFT)** Introduction to DFT and its definition, properties of DFT, time and frequency resolution, computation of DFT and the development of fast algorithms (FFT).

4 **Digital Filtering:** Introduction to FIR and IIR digital filters, their properties and applications. Design of low pass, high pass and band pass FIR filters using window, frequency sampling and CAD techniques. Comb filters, Hilbert transformer and differentiator design using FIR techniques.
Digital IIR filter design from equivalent analogue filters using bilinear Z-transformation.

5 **DSP Applications:** Direct digital synthesis, DTMF generation and detection. FFT applications.

6 **Digital Signal Processors (DSP)** Introduction to Digital Signal Processors (DSP), the key features and architectural review, word length issues in digital signal processing.

7 **Multi rate Digital Signal Processing** Introduction to multirate DSP systems. Introduction to decimation and interpolation operations using FIR filtering. Design of poly phase filter structures for sampling rate conversion.

Text Books:
1. Robert D. Strum, "First Principles of Discrete Systems and Digital Signal Processing".
2. Sanjit K. Mitra, "Digital Signal Processing: A computer based Approach".

Reference:
1. Johnathon Stein, "Digital Signal Processing: A Computer Science Prospective". www.dspguru.com/

Analog and Digital Communication

Pre Requisites**:** None

Course**:** **EE-474** PHY-184, MTH-133

Credits: 3+0.5 **Contact Hrs**: 3+1.5

Course Out Line Schedule

1. Introduction to communication systems, time domain and frequency domain representation of signals.
2. Modulation, Analog modulation and demodulation, AM, DSB, SSB, and USB communication
3. Frequency modulation demod comparison of AM & FM
4. Sampling theorem, PCM systems, differential pulse code modulation systems, delta modulation and adaptive delta modulation system.
5. Digital modulation, BPSK, QPSK, FSK techniques.
6. Multiplexing, FDM and TDM techniques, TDM hierarchy of T-1/CEPT system.

TextBook:
1. B.P. Lathi, "Modern Digital and Analog Communication"
2. Trab & Schilling, "Principle of Communication"

Reference:
1. Kamen, "Signal and System"

Digital Image Processing

Pre Requisites: MTH-314, STT-351

Course: **EE-481**

Credits: 3+0.5 **Contacts Hrs:** 3 + 1.5

Schedule

1 **Introduction** Digital Image Processing Computer Vision and Pattern Recognitions

2 **Field Usage of DIP**, Fundamental steps in DIP Component .

3 **Digital Image Fundamentals**. Element of visual Perception, Image Sensing and Acquisition Image Sampling and Quantization. Pixels operation, linear & Non lineate operation.

4 **Image Enhancement in spatial Domain**: Background, Grey level Transformation. Edge detection sharpening.

5 **Image Enhancing in Frequency Domain**, background, Frequency domain, Faired Transform smarting, Sharpening, Homo-morphic Filtering implementation.

6 **Image Restorations**. A model of the Image Degradation/ Restoration Process, Noise Model, Restoration in the Presence of Noise-spatial filtering, Periodic Noise Reduction by frequency Domain filtering.

7 **Linear, Position-Invariant Degradation** Estimating the Degradation. Inverse Filtering, Wiener filtering, Min Mean Squares Error, Filtering constrained least squares filtering Geometric mean filter and Transformation

8 **Colour Image Processing**: Colour fundamentals, Colour model pseudo-colour Image processing, Basics of full colour Image processing colour Transformation

9 **Colour Filtering** , Sharpening, Smoothing, Segmentation, Noise, and colour Image Compression.

10 **Image Compression**: Fundamental, Image compression models. Elements of information theory, Error free compression, Image Compression standards, lossy compression

11 **Image Segmentation**: Detection of Discontinuities, Edge linking, Boundary detection, Thresholding, Region Based segmentation

12 **3 D Imaging** : Pattern Recognitions classes, and decision making.

Text Book 1. Digital Image Processing using Matlab by Gonzalez, Woods and Eddins

Ref Book 1. Digital Image Processing by R. C. Gonzalez and R. E. Woods, Addison Wesley, Second Ed., 2002.

2. Computer Vision by Linda Shapiro and George Stockman, Prentice- Hall 2001.

Calculus

Pre Requisite

Course**:** **MTH – 132**

Credits: 3+0 **Contact Hrs**: 3+0

Course Out Line Schedule

1 **Derivatives.** Concept and idea of differentiation. Rules of differentiation. Rates of change. Derivatives of Trigonometric Functions. The Chain Rule, Implicit Differentiation. Related Rates of Change.

2 **Application of differentiation:** Extreme values of functions

3 **Integration** Concept and idea of Integration, Indefinite integrals, Initial value problems, Integration by substitution, Riemann sums and Definite Integrals, properties of definite integrals, Area under the curve, Mean value theorem.

4 **Techniques of Integration**, Basic integration formulas, Integration by parts, Partial Fractions, Trigonometric Substitutions, Improper Integrals

5 **Complex Numbers and Functions**, Complex Numbers, Complex Plane, Polar Form of Complex Numbers. Powers and Roots, Exponential Function, Trigonometric Functions, Hyperbolic Functions,

Text Book:
1. Calculus & Analytic Geometry, 9th Edition by Thomas & Finney
2. Advanced Engineering Mathematics, 7th Edition by Erwin Kreyszig

Reference:
1. Advanced Modern Engineering Mathematics, by Glyn James
2. Calculus, 6th Edition by E. W. Swokoski, M. Olinick, D. Pence, J. A. Cole.

Engineering Mathematics

Pre Requisites**:**

Course**:** **MTH – 133**

Credits: 3+0 **Contact Hrs**: 3+0

Course Out Line Schedule

1 **First Order Differential Equations** (Basic Concepts and Ideas). Separable Differential Equations. Modelling Separable Equations. Reduction to Separable Form. Exact Differential Equations. Integrating Factors. Linear Differential Equations. Modelling: Electric Circuits

2 **Second Order Linear Differential Equations**. Homogeneous Linear Equations. Homogeneous Equations with Constant Coefficients. Case of Complex Roots. Complex Exponential Functions. Euler-Cauchy Equations. Non homogeneous Equations. Solution by Undetermined Coefficients. Solution by Variation of Parameters. Modelling of Electric Circuits.

3 **Laplace Transforms**, Transforms of Derivatives and Integrals.

4 **Fourier Series, Integrals and Transforms**: Periodic Functions. Trigonometric Series. Fourier Series. Functions of Any Period. Even and Odd Functions. Half Range Expansion. Fourier Integrals. Fourier Transforms.

5 **Z – Transforms**

TextBook:
1. Calculus & Analytic Geometry, 9th Edition by Thomas & Finney
2. Advanced Engineering Mathematics, 7th Edition by Erwin Kreyszig

Reference:
1. Advanced Modern Engineering Mathematics, by Glyn James
2. Calculus, 6th Edition by E. W. Swokoski, M. Olinick, D. Pence, J. A. Cole.

Discrete Mathematics

Pre Requisites**:** None

Course: MTH-134

Credits: 2+0 **Contact Hrs**: 2+0

Course Out Line **Schedule**

1. **Logic:** logical Form and logical Equivalence, Conditional Statements, Valid and Invalid Arguments, Predicates and Quantifiers.
2. **Relations:** Relations and their properties, n-ary relations and their applications, Representing Relations, Closures of Relations, Equivalence Relations, and Partial Orderings.
3. **Graphs:** Introduction to Graphs, Graph Terminology, Representing Graphs and Graphs Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest Path Problems, Planner Graphs, and Graph Coloring.
4. **Trees:** Introduction to Trees, Applications of Trees, Tree Traversal, Trees and Sorting, Spanning Trees, and Minimum Spanning Trees.

Text Book: 1. Discrete Mathematics and its Applications, by Kenneth H. Rosen.
2. Discrete Mathematics and its Applications, by Susanna S. Epp.

Reference: 1. Discrete Mathematics, by Morman L. Biggs.

Multivariable Calculus

Pre Requisites**:** MTH-132, MTH-133

Course**:** **MTH-234**

Credits: 3+0 Contact Hrs: 3+0

Course Out Line Schedule

1 **Partial Differential Equations** (Basic Concepts and Ideas), Modelling Vibrating String, Wave Equation. Separation of Variables. Use of Fourier Series. D'Alembert's Solution of Wave Equation.

2 **Heat Equation**. Solution by Fourier Series. Solution by Fourier Integrals.

3 **Modelling Membrane**, Two-Dimensional Wave Equation. Rectangular Membrane, Use of double Fourier Series.

4 **Double Integrals**. Areas, Moments, and Centre of Mass. Double Integrals in Polar Form

5 **Triple Integrals in Rectangular Co-ordinates**. Masses and Moments in Three Dimensions.

6 **Cylindrical and Spherical Co-ordinates**. Triple integrals in Cylindrical and Spherical Co-ordinates.

7 **Line Integrals. Vector Fields**, Work, Circulation, and Flux. Green's Theorem in the Plane

8 **Surface Area and Surface Integrals**. Stokes's Theorem The Divergence Theorem.

TextBook:
1. Calculus & Analytic Geometry, 9th Edition by Thomas & Finney
2. Advanced Engineering Mathematics, 7th Edition by Erwin Kreyszig

Reference:
1. Calculus, 6th Edition by E. W. Swokoski, M. Olinick, D. Pence, J. A. Cole.

Linear Algebra

Pre Requisites**:**

Course**:** **MTH – 314**

Credits: 3+0 **Contact Hrs**: 3+0

Course Out Line Shedule

1 **Introduction** Linear Systems. Matrices. Basic Concepts and Idea

2 Matrix Algebra

3 **Solution of Linear Equations**: Gauss Elimination, Gauss-Jordan Method

4 **Determinants** Cofactor Expansion and Applications. Inverse of a Matrix, Kramer Rule

5 **Vectors in the Plane**, n- Vectors Cross Product in R^3

6 **Vector Spaces and Subspaces**, Linear Independence, Rank, and Bases.

7 **Linear Transformations** The Kernel and Range of a Linear Transformation. The Matrix of a Linear Transformation.

8 **Eigen Values and Eigen Vectors**. Diagonalization. Application. Lines and Planes. Quadratic Form. Linear Economic Models. Graph Theory. Least Squares.

TextBook:

1. Introduction to Linear Algebra with Applications by Bernard Kolman.

Reference:

1. A First Course in Linear Algebra, 2nd Edition by Hal G. Moore and Adil Yaqub.
2. Introduction to Linear Algebra, 2nd Edition by Lee W. Johnson, R. Dean Riess and Jimmy T. Arnold.
3. Advanced Engineering Mathematics, 7th Edition by Erwin Kreyszig

Applied Physics (Electromagnetism)

Pre Requisites**:** None

Course**:** **PHY-184**

Credits: 2+0.5 **Contact Hrs**: 2+1.5

Course Out Line **Schedule**

1 **Electrostatics:** Coulomb's Law and its application.

2 **The Electric Feld. :** Calculation of electric field, Gauss's Law & its applications

3 **Potential. :** Relation between potential energy, work, potential difference, potential gradient, the electron volt etc.

4 **Capacitance & Dielectrics. :** Molecular Theory of induced charges Current, resistance& EMF, voltage & power in electrical circuits.

5 **The Magnetic Field:** Motion of charges in electromagnetic field.

6 **Semiconductor/Solid State Physics. :** Free electron theory of solids, the band theory of solids. Intrinsic semiconductors, extrinsic semiconductors. Properties of current carriers, PN Junction, Doping, PN Diodes transistors.

7 **Thermodynamics. :** First& second law, application

8 **EM Waves. :** Introduction, speed of an electromagnetic wave, energy in electromagnetic waves, electromagnetic waves in matter, sinusoidal waves, standing waves, radiation from an antenna.

9 **Nature & Propagation of Light. :** The electromagnetic spectrum, light spectrum, waves, wave fronts, reflection& refraction, total internal reflections, Huggen principle/dispersion, absorption of light laser, laser diods.

10 **Projected Practical/Research.** Practical work to include detailed description of the instruments in electronics lab. In addition available practical on light, connecting up a circuit..

TextBook:

1. University Physics by G.W. Sears
2. Electronic Devices by Dr Manzer Saeed
3. Essentials of Engineering Chemistry by Dr M. Amjad
4. Physics for engineers and scientists by D.Elwell and A.J. Pointon

Reference:

1. Solomon Gratenhaus "Physics, Basic Principles"
2. McCormick "Fundamentals of Physics"
3. Keller "Physics, Classical and Modern
4. Halliday and Resnik "Physics"
5. Beiser "Perspectives of Modern Physics"
6. Leibof "Quantum Mechanics"

Probability and Statistics

Pre Requisites**:** None

Course**:** **STT- 351**

Credits: 3+0 **Contact Hrs**: 3+0

Course Out Line Schedule

1 **Introduction** Probability. The Sample Space. Simple Events, Events

2 **Combinatorial Theory** (permutations and combinations) Conditional Probability, Bayes Formula.

3 **Discrete Random Variables** , Introduction and Ideas

4 **Expected value for a Discrete Random Variable**. Probability Distributions for a Discrete Random Variables, The Binomial Probability Distributions, The Multinomial Probability Distributions, Negative binomial and Geometric Probability Dist. Hypergeometric Probability Distributions, Poisson Probability Distributions Moments and Moment Generating Functions.

5 **Continuous Random Variables**, Introduction and ideas, Expected value for a Continuous Random Variable Probability Distributions for a Continuous Random Variables, The Uniform Probability Distributions, The Normal Probability Distributions, Moments and Moment Generating Functions.

6 **Bivariate Probability** Distributions for Discrete and Continuous Random. Variables, Expected Value of functions of Two or More Random Variables. Independence, Covariance.

7 **Introduction to Statistics**, Types of Data, Population, Sample, Methods For Describing Data, Measures of Central Tendency, Estimation, Test of hypotheses.

TextBook:
1. Statistics foe Engineering and the Sciences, 3rd Edition by W. Mendenhall & Terry Sincich.
2. Advanced Engineering Mathematics, 7th edition by Erwin Kreyszig.

Reference:
1. Probability and Statistics for the Engineering, Computing, and Physical Sciences, by Edward R. Dougherty.
2. Probability and Statistics for Engineering and the Sciences, 3rd edition by Jay L. Devore.

Communication Skills

Pre Requisites**:** None

Course**:** **ENG-110**

Credits: 1+1 **Contact Hrs**: 1+3

Course Out Line Schedule

1 **Technical writing:** What is the technical writing? Functional and imaginative literature, Technical vs. non-technical writing.

2 **Characteristics of good technical writing:** Technically accurate, Useful, Concise, Complete, Clear, Consistent, Correct in spelling, punctuation and grammar, Targeted, Well organised Interesting

3 **Common formats for organising technical material:** Order of location, Order of increasing difficulty, Sequential order, Alphabetical order, Chronological order, Problem/solution method, Inverted pyramid method, Deductive order, Inductive order, List method

4 **Principles of technical communication:** Use of the active voice, Use plain rather than elegant or complex language, Delete words, sentences, and phrases that do not add to your meaning, Use specific and concrete terms rather than generalities, Use terms your reader can picture, Use the past tense to describe your experimental work and results, In most other writing use the present tense, Make the technical depth of your writing compatible with the background of your reader, Break up your writing into short sections, Keep ideas and sentence structures parallel, Opt for informal rather than formal style

5 **Elements of the Technical Report:** Cover and title page, Abstract, Table of contents, Summary, Introduction, Body, Results, Conclusions and recommendations, Nomenclature, Bibliography, Appendixes

TextBook: **Types of Reports:** Periodic reports, Progress report, Research report Field report, Field report, Recommendation report, Feasibility report

Reference:
1. Effective Teaching Comm by Anne Eisenberg
2. Survivor Guide to Tech Writing by David Ingre
3. Writing Analytically by David Rosenwasser, Jill Stephen

Engineering Economics

Pre Requisites**:** None

Course**:** **EC-201**

Credits: 2+0 **Contact Hrs**: 2+0

Course Out Line Schedule

1 **Introduction to Engineering Economics (EE)** Introduction, The decision making process, Origins of Engineering Economy, The relationship between Engineering & Management, Non-monetary factors and multiple objectives, Capital allocation and Engineering Economy, Principles of Engineering Economy

2 **Cost Concept and the Economic Environment** Introduction, Cost Terminology, Application of Cost Concept, Accounting and Engineering Economy Studies, Steps in an Engineering Economics Analysis

3 **The Time value of money** Return to Capital, Origins of Interest, Simple Interest, Compound Interest, Five basic methods for assessing economic worth, Present worth, Annual worth, Future worth, Internal rate of return

4 **More Time Value: Bond & Inflation** Bond price and yields, Bond Pricing, The yield to maturity, Bond Pricing, The yield to maturity, Interest rate risk, Reading the financial pages, Inflation and the time value of money, Inflation and interest rates

5 **Discounted cash flow analysis** **D**iscount cash flows, Discount incremental cash flows, include all incidental effects, Forget sunk costs, Remember working capital, Discount nominal cash flows by the nominal cost of capital, Separate investment and financing decision, Example: Blooper Industries

6 **Project Analysis** Capital budgeting in the large corporations, Stage 1: Capital Budget, Stage 2: Project authorizations, Problems and some solutions, Some 'what if' questions, Sensitivity, scenario, break even analysis, Flexibility in capital budgeting, Decision trees

7 **Introduction to risk, return & opporty cost of capital** Rate of return, View seventy years of capital market history, Market Indexes, Using historical evidences to estimate today's cost of capital

Measuring the variation in stock return, Risk & Diversifications, Thinking about Risks, Messages, Some risks look big and dangerous but really are diversifiable, Market risks are macro risks, Risk can be measured.

8 **Risk return and capital budgeting** Measuring market risk, Measuring betas, Betas for Microsoft and Boston Edison, Risk and Return, Why the CAMP works, Capital budgeting and project risk, Determinants for project risk

9 **The Cost of Capital** The cost of capital, The company cost of capital and the weighted average, Calculating cost of capital, Market versus book weight, Taxes and the weighted-average cost of capital, Measuring capital structure

Text Book: 1. Engineering economy (9^{th} edition) by E. Paul Degarmo, Sullivan Bitadelli Macmillan Publishing company

2. Fundamentals of Corporate Finance by Richard Brealy

Reference:

Pakistan Studies

Pre Requisites**:** None

Course**:** **PS 101**

Credits: 2+0 **Contact Hrs**: 2+0

Course Out Line Schedule

1 **Origins And Development Of Pakistan Movement** Part - I: The basic and relevance of the Ideology of Pakistan to Islam & Muslim freedom struggle. Part-II The flow of events, political actors and interactions from the 1857 'War of independence' and the role of Syed Ahmed Khan to the demand of Pakistan, its ultimate fulfilment under the able leadership of Quaid-i-Azam.

2 **Development Of Political & Constitutional System In Pakistan**
Society, State, Elements of State; i.e. Executive, Legislature and judiciary. History of Constitutional development in Pakistan from 1947 to 2004, different political System experimented so for , Political crisis.

3 **Economic Development In Pakistan** Indian Muslim's conditions during the British Period & Economic Problems at the time of independence. Pakistan's planning experience: Five-year plans, National Income, savings and investments, Monetary theory and fiscal policy, inflation, balance of payments foreign assistance.

4 **Foreign Policy & Relations of Pakistan** The Geo-strategic importance of Pakistan. The basic principles and broad goals of Pakistan foreign policy. Need to redefine the goals and direction of Pakistan's foreign policy. Constructive and mutually rewarding relations with India, Pakistan's role in central Asia and Afghanistan, Relations with U.S, China, Iran and Russia.

5 **Educational & Technological Progress In Pakistan** Status of Education in Pakistan. Impact of information technology and satellites on education. Development of an educational system.

6 **Social & Environmental Problems in Pakistan** Poverty, Gender discrimination, Water management, Pollution, populations & others

Text Book: 1. The Emergence of Pakistan By Chaudhary Muhammad Ali

Reference:
1. Economic and Social Progress in Asia. Umar Noman, Karachi, 99
2. Pakistan's Foreign policy: An Historical analysis: S.M. Burke, 1993
3. Pakistan Political Roots & Development: Safdar Mahmood, Lahore,94
4. Newspapers editorial and selected journalistic writings.

Professional Ethics

Pre Requisites**:** None

Course**:** **SS-102**

Credits: 2+0 **Contact Hrs**: 2+0

Course Out Line Schedule

1 **Sociology & Society** Introduction to Sociology, Social Science & Common Sense, Scientific Observation, Characteristics of Scientific Observation, The Scientific Method of Investigation, Research Exercise

2 **Society & Individual** Culture & Society, Social & Cultural Development, Culture as a system of norms, Real & Ideal Culture, Ethnocentrism, Xenocentrism, Culture & Human Adjustment.

3 **Socialisation:** The role of socialisation, The self and socialisation, Socialisation and the life cycle, Agent of socialisation, Social policy and socialisation

4 **Islamic concept of Society & Individual** Introduction, How Islamic concept is different from other concepts? Basic Principles. Sociological approach of religion, Religions behaviour,

5 **Deviance and social control:** Social control, Deviance, Crime, Social policy and criminal justice

6 **Stratification:** Understanding stratification, Stratification by social class, Social mobility, Stratification within nation. Stratification by gender and age:Gender identity and gender role, Ageing and society, Age Stratification

7 **Personality & Socialization** The meaning of Personality, Factors in the development of personality, Socialization and the self.

8 **Role & Status** Introduction, Ascribed & Achieved Statuses, Master Status, Socialization through role and status, Role Strain, The final status : Death. Family : Functions of family,

9 **The Family** Structure of the family, Functions of the Family, Marriage and family, Divorce, Alternative life style The Pakistani Family Today

10 **Government and economy:** Economic system, Politics and government, Political behaviour, Aspect of the economy, Social policy, Government and economy

12 **Racial and Ethnic Inequality:** Prejudice and discrimination, Race and ethnicity

TextBook: 1. Sociology by Paul B. Horton & Chester L. Hunt MC – Graw. Hill

Reference: 2. Sociology a brief introduction By Richard T Schaefer, Robert P Lamn, McGraw Hill. Inc

Islamic Studies

Pre Requisites**:** None

Course**:** **ISL-101**

Credits: 2+0 **Contact Hrs**: 2+0

Course Out Line Schedule

1 **Study of Quran** Fazail –e-Quran, The Miricles of Quran,Compilation of Quran, Usool-e-Quran, Study of Sura Al-Hujurat (The Chambers),Study of Sura Al-Furqan (The Criterion), Ayat.ul Kursi, Sura Al Akhlas

2 **Study of Haddees** Definition , Difference between Hadees and Sunnah, The types of Hadees, Parts of Hadees, The compilation, Importance of Hadees , Six books of Hadees, Study of Slected Ahadees

3 **Sirat-Un-Nabi** Life of Holly Prophet (PBUH) before Prophet hood , and after Prophethood, Reasons /Causes of migeration, Establishment of Islamic State , The Pact of Madina, Selected Bettless, Treaty of Hudaibia, Conquest of Mekkah, The last Sermon, Death.

4 **The Philosophy of Islamic Beliefs**-a The Articles of Faith.One ness of Allah, The Angles, The Prophets, Revealed books, The day of Judgment, Life after death.
b. **The Pillars of Islam:** Tawheed, Namaz, Roza, Hajj, Zakat, and Jihad.

5 **Different Topics** The characteristics of Islamic ideology, Huqooq Aallah, Huqooq-ul- Ebad, Place of Women in Islam, The Rights of Elders, Kasbe-Halal, Truthfulness, Taqwa Tawakul

TextBook: 1. Islami Taleemat by Prof Abdul Hameed Tigga, A One Publisher

Reference: 1. Islamic Education by Dr MD Zafar
2. Translation by Abdullah Yousaf Ali
3. Islamic Lectures by Prof Abdul Qayyum

Tech & Business Writing

Pre Requisites**:** None

Course**:** **ENG-111**

Credits: 3+0 **Contact Hrs**: 3+0

Course Out Line Schedule

1 **Overview of Technical Reporting**, use of library and information gathering, administering questionnaires, reviewing the gathered information.

2 **Technical Exposition**; topical arrangement, exemplification, definition, classification and division, casual analysis, effective exposition, technical narration, description and argumentation, persuasive strategy.

3 **Organizing Information and Generation Solution**: brainstorming, organizing material, construction of the formal outline, outlining conventions, electronic communication, generation solutions

4 **Polishing Style**: paragraphs, listening sentence structure, clarity, length and order, pomposity, empty words, pompous vocabulary

5 **Document Design**: document structure, preamble, summaries, abstracts, table of contents, footnotes, glossaries, cross-referencing, plagiarism, citation and bibliography, glossaries, index, appendices, typesetting systems, creating the professional report; elements, mechanical elements and graphical elements

6 **Reports**: Proposals, progress reports, Leaflets, brochures, handbooks, magazines articles, research papers, feasibility reports, project reports, technical Research reports, manuals and documentation, thesis. Electronic documents, Linear verses hierarchical structure documents.

TextBook: 1. Greenfield, T., Research Methods, Guidance for Postgraduates, Arnold, 1996, 034064629.

MS COMPUTER SCIENCE SYLLABUS

Programme of Study and Admission Requirements

Computer Science

The department of Computer Science offers graduate study leading to Master of Science degree. Due to the importance of research work, only option open to the students is completing MS degree requirements with thesis. For bridging any gaps of desired level in the intake, a pre-course of four weeks is arranged with emphasis on the basic computer skills.

MS Admission Requirements

a. **Pre-requisites:**
First Division, B grade or above (minimum of 60 % marks in aggregate / GPA (3.0) in one of the following:

- BSc Computer Science (4 years Programme).
- BSc Engineering
- MSc Natural Sciences

b. **Selection:**

- Military Students: Final Selection by Selection board at GHQ according to existing procedures.
- All admissions for civilian students shall be recommended by the NUST Admission Committee.

MS Degree Requirements

a. A Student must take a minimum of 30 credit hours with a minimum of 24 course credits at 800 level excluding CPS 899.

b. 6 to 8 credits of CPS 899 applied towards a supervised thesis.

Course Description

Pattern Recognition

Pre Requisites**:** MTH 314 ,STT 351,CPS

Course: CPS-802

Credits: 3+0 **Contact Hrs**: 3+0

Course Out Line Schedule

1 **Introduction** Pattern Recognition, Statistical Decision Theory
2 **Applications**: Text/script classification; fingerprint classification
Parameter Estimation
3 **Curse of Dimensionality** Component analysis and Discriminants
4 **Nonparametric Techniques**
5 **Linear Discriminant functions** Support Vector Machines, Neural Networks
6 **Error Rate Estimation** Bagging, Boosting, Classifier CombinationFeature Selection
7 **Unsupervised Learning and Clustering**

TextBook: 1. Duda, Hart and Stork, Pattern Classification, Second Edition, Wiley, 2001.

Reference: 1. Computer Vision by Linda Shapiro and George Stockman, Prentice- Hall 2001
2. Computer Vision: a modern approach, Forsyth and Ponce, Prentice- Hall 2002

Computer Vision

Pre Requisites**:** CPS-330, MTH-314, STT-351

Course: CPS-803

Credits: 3+0 **Contact Hrs**: 3+0

Course Out Line Schedule

1 **Introduction** CV and IP; applications ; images and imaging devices ; perspective projection ; binary image processing

2 **Pattern Recognition Concepts**; filtering and edge detection; color and shading , including 3D effects

3 **Texture**, IBM Veggie Vision, image database, motion, motion vectors, optical flow

4 **Segmentation**, 2D matching

5 **3D perception**; stereo and structured light; shape from shading, 3D sensing; 3D Transformations, Camera calibration

6 **3D reconstruction**, 3D Object modelling and matching

7 **Augmented reality**, review entire course

TextBook: 1. Computer Vision by Linda Shapiro and George Stockman, Prentice- Hall 2001

Reference: 1. Computer Vision, D Ballard and C Brown, Prentice- Hall 1982

2. Computer Vision: a modern approach, Forsyth and Ponce, Prentice- Hall 2002

Object Oriented Programming

Pre Requisites: CPS-230

Course: **CPS-811**

Credits: 3+0 **Contact Hrs**: 3+0

Course Out Line Schedule

1. **Classes and Objects** Introduction to Classes and Objects, Constructors, Destructors, Objects as Function Arguments, Overloaded constructors
2. **Arrays and Strings** Array fundamentals, Array as Class member data, Arrays of Objects, Strings, Arrays of Strings, Strings as Class members Standard C++ string class, string functions
3. **Operator Overloading** Over loading Unary and Binary Operators, Data conversion, Multiple overloading
4. **Inheritance** Derived class and Base class, Derived Class Constructors, Overriding member functions, Public and Private Inheritance, Access Combinations, Levels of Inheritance, Multiple Inheritanc, Containership – Classes Within Classes
5. **Pointers** Addresses and Pointers, Address-of Operator &, Pointers and Arrays, Pointers and Functions, Memory Management – new and delete operators, Pointers to Objects, Linked List, Pointers to Pointers
6. **Virtual Functions** Virtual Functions, Friend functions, Static Functions, this Pointer.

Textbooks: 1. Object Oriented Programming in C++

(3rd Edition) by Robert Lafore – Waite Group

Reference: 1. C++ How to Program (3rd Edition) by Deitel & Deitel – Prentice Hall

Advance Operating System

Pre Requisites**:** None

Course**:** **CPS-812**

Credits: 3+0 **Contact Hrs**: 3+0

Course Out Line Schedule

1 **Introduction .** Major issues in distributed OS, historical perspective

2 **Communications Issues .** FPC and group communications

3 **Timing, Consensus, and Synchronization .**Clock synchronization Election algorithms, Mutual exclusion, Snapshots, transaction models

4 **Issues of fault-tolerance .** Issues with faults in asynchronous systems failure detectors , check pointing and recovery , detectors and correctors Issues of automation

5 **Security** Symmetric/Asymmetric cryptography, Integrity, Confidentiality, Kerberos, SSL

6 **Distributed File Systems .** NFS , AFS and Coda, Disk Arrays, Wide, area network file sys

7 **Process Models .** Threads , Processor allocation, Real-time scheduling

8 **Case Studies .** Linux, Windows NT

TextBook: 1. Modern Operating System, 2nd Edition, by Tanenbaum, Prentice Hall, 2001

Reference: 1. Operating System, by William Stallings

Advanced Computer Architecture

Pre Requisites**:** CPS-320

Course: CPS-820

Credits: 3+0 **Contact Hrs**: 3+0

Course Out Line Schedule

1 **Review of computer architecture & an introduction to RISC design:** RISC design philosophy vs CISC design philosophy. RISC concepts/characteristics: single cycle instructions, pipelining, pipeline hazards, fixed format instructions, register based instructions, example RISC instruction set (MIPS), delay slots, (non)interlocking instructions, addressing modes, immediates, variable length multiply/divide, alignment, RISC calling conventions, register windows, condition codes, superscalar architectures, very long instruction words, interrupts

2 **Parallel/Multiprocessor Architectures:** Master/slave designs, symmetric/asymmetric multiprocessors, SIMD, MIMD, SISD, systolic arrays, vector processors, PFGAs (programmable fast gate arrays)(?), bit sliced architectures(?), parallel performance measures, speedup performance laws

3 **NUMA architectures - Hierarchical memory organizations:** Private/shared memories, private/shared memory addressing, virtual physical memory architectures (e.g., KSR), Cache coherency (sequential and weak coherency (e.g., beehive)). fetch-and-fi (e.g., test-and-set) instructions

4 **Multiprocessor Interconnection Networks:** Shared buses, crossbar networks, hpyercube networks, butterfly networks, and shuffle exchanges. Fault Tolerant Designs. Example Parallel applications/techniques

5 **Peripheral Device Architectures:** Caching disks, disk arrays (RAIDs), introductions to ethernet/token ring/atm, video/audio devices, device driver design, interrupt processing, context saving, polling, disabling/enabling interrupts, device control

6 **System Software:** Advanced assembly language concepts and techniques, assemblers, linkers, loaders, libraries

TextBook: 1. High-performance Computer Architecture, 3rd edition, **H.** S. Stone, Addison-Wesley, 1993

Reference:

1. Advanced Computer Architecture**,** K. Hwang,McGraw Hill, 1993
2. High-performance Computer Architecture, 3rd edition, H. S. Stone, Addison-Wesley, 1993.

Computer Networks Design and System Security

Pre Requisites: CPS-330, CPS-422, CPS-230

Course: **CPS-825**

Credits: 3+0 **Contact Hrs**: 3+0

Course Out Line Schedule

1. **Introduction:** Uses of Computer Networks – Network Hardware Local Area Network, Metropolitan Area Networks, Network Software, Protocol Hierarchies, Design Issues for the layers, Interfaces and Services, Connection-oriented and connection less Services, Service Primitives Relationship of services to protocols OSI and TCP/IP Reference Models.
2. **The Physical Layer**: Data Communications Basics, Guided Transmission Media, Twisted Pair, Coaxial Cable, Fibre optics, Unguided Transmission Media, Radio, Microwave, Infrared and Light wave Transmission. Communication Satellites, PSTN, Mobile Telephone System, Modems, ADSL technology and Cable Television.
3. **The Data Link Layer:** Design Issues, Services Provided to the Network Layer, Framing, Error Control and Flow Control. Error detection and Correction, Elementary DLL Protocols, Sliding Window Protocols, Protocol Specification and Verification, Example Data Line Protocols.
4. **The Medium Access Sub Layer:** Channel Allocation Problem, Multiple Access Protocols, Ethernet, Wireless LANs, Broadband Wireless, Bluetooth and Data Link Layer Switching.
5. **Network Layer:** Network Layer Design Issues, Routing Algorithms, Congestion Control Algorithms, Quality of Service, Internetworking and The Network Layer in the Internet.
6. **Transport Layer:** The Transport Service, Elements of Transport Protocols, A Simple Transport Protocol, The Internet Transport Protocols – UDP and TCP, Performance Issues.
7. **The Application Layer:** Domain Name System, Electronic Mail, World Wide Web, Static and Dynamic Web Pages, HTTP, Multimedia, Digital Audio, Audio Compression, Streaming Audio, Voice Over IP, Video and Video Compression, Multicast Backbone.
8. **Network Security:** Cryptography, Symmetric Key Algorithms, Public Key Algorithms, Digital Signatures, Management of Public Keys, Communication Security, IPSec, Firewalls, VPNs, Authentication Protocols, Mail Security, Web Security and SSL.

TextBook: 1. Computer Network by Andrew S. Tanenbaum Prentice Hall Fourth Edition

Reference: 1. Computer Network Protocol By Black

2 Data Communications and Computer Networks by Behrouz Forouzan, McGraw-Hill Second Edition

Adv Algo Analysis

Pre Requisites**:** CPS-210, CPS-230, CPS-330, CPS-331, CPS-811

Course: CPS-830

Credits: 3+0 **Contact Hrs**: 3+0

Course Out Line Schedule

1 **Preliminaries:** Mathematical Notation, Proof Techniques, Basic Combinatorics, Elementary Probability

2 **Elementary Algorithmics:** The efficiency of algorithms, Average and worst-case analysis

3 **Asymptotic Notation:** A notation for "the order of," Conditional asymptotic notation, Asymptotic notation with several parameters, Operations on asymptotic notation

4 **Data Structures:** Arrays, Stacks, Queues, Records and pointers, Lists, Graphs, Trees, Associative Tables, Heaps, Binomial Heaps, Disjoint set structures

5 **Greedy Algorithms:** General Characteristics of greedy algorithms, Minimum Spanning Trees (Kruskal's and Prim's), Shortest paths, The Kanpsack problem, Scheduling

6 **Dynamic Programming:** The principle of Optimality, The Knapsack Problem, Chained matrix multiplication, Approaches using recursion, Memory functions

7 **Exploring Graphs:** Traversing trees, Depth-first search (Undirected graphs, Directed graphs), Breadth-first search, Backtracking, Branch-and-bound, The minimax principle

8 **Probabilistic Algorithms:** Pseudorandom generation, Numerical probabilistic algorithms, Monte Carlo algorithms, Las Vegas algorithms

9 **Parallel Algorithms:** Basic Techniques, Parallel evaluation of expressions, Parallel sorting networks,

10 **Computational Complexity:** Information-theoretic arguments, Linear reductions, NP-completeness

11 **Heuristic and Approximate Algorithms:** Heuristic Algorithms, Approximate algorithms, NP-hard approximation problems, Approximation schemes

TextBook: 1. Fundamentals of Algorithms**,** Gilles Brassard & Paul Bratley, Prentice Hall, 1996

Reference: 1. Introduction to Algorithms, 2nd edition**,** Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, The MIT Press

Algorithmic Graph Theory

Pre Requisites**:** None

Course**:** **CPS-835**

Credits: 3+0 **Contact Hrs**: 3+0

Course Out Line Schedule

1 **Introduction .** Graphs and Graph Theory, Some Typical Applications

2 **Definitions & Notation** Labelled and Unlabeled Graphs, Invariants of a Graph, Order, Size, Degree, Computer representation of graphs/digraphs Adjacency and incidence matrices, Adjacency and incidence lists, Graphical Sequence, A characterization of graphical sequences, Walks, rails, Paths, Cycles, Sub graphs of a Graph, Induced Sub graphs, Spanning Sub graphs

3 **Special Graphs** Connected and Disconnected Graphs/Digraphs, Trees and Forests, Complete Graphs & Tournaments, Bipartite Graphs, A characterization of bipartite graphs, Hamiltonian Graphs, Eulerian Graphs/Digraphs, A characterization of Eulerian graphs, Iterative Graphs, Random Graphs, Other Special Graphs

4 **Trees** Some Properties of Trees, Spanning Trees of a Graph, Optimal Spanning Trees, Di_erent Optimality Criteria, Finding Optimal Spanning Trees, Some Applications,

5 **Directed Trees** Some Properties of Directed Trees
Counting Trees Counting Spanning Trees of a Labelled Graph
Searching Techniques Depth-First Search, Properties of DFS, Breadth-First Search, Properties of BFS, Some Applications

6 **Shortest-Paths Problems** Prob
lem Description, Single-Source Single-Destination Problem, Single-Source Multiple-Destination Problem, Multiple Source-Destination Problem, Some Applications,
Maximum Flow Problem Description, Evolution of Maximum-Flow Algorithms, Ford-Fulkerson Results, Edmond-Karp Algorithm, MPM Algorithm, Other MFAs

7 **Applications Of Maximum-Flow** Finding Arc-Disjoint paths, Finding edge-disjoint Paths, Finding vertex-disjoint paths
Graph Connectivities Problem Description, Evolution of Connectivity Algorithms, Computing _ of a Graph, Computing _ of a Graph, Computing _ of a Digraph,
Connectivity Generalizations Problem Description, Conditional Connectivity's, Restricted Connectivity's, Some Applications,
Matchings Problem Description, Matching Algorithms, Some Application

TextBook: 1. A Friendly Introduction to Graph Theory,by Fred Buckley and Marty Lewinter

Reference:
1. T.H. Cormen, C.E. Leiserson, R.L. Rivest, C. Stein: *»Introduction to Algorithms«*, The MIT Press 2001, 2nd edition
2. R. Sedgewick: *»Algorithms in C++: Part V. Graph Algorithms «*, Addison-Wesley Pub Co; 3rd edition (December 27, 2001).

Advance Artificial Intelligence

Pre Requisites**:** None

Course**:** **CPS-841**

Credits: 3+0 **Contact Hrs**: 3+0

Course Out Line Schedule

1 Administrivia, intro to AI, Agents
2 Search basics, Recent advances in search
3 Logic inference, Planning using logic
4 Managing uncertainty, Prob. Reasoning
5 Planning under uncertainty, Learning theory
6 Supervised learning, Reinforcement learning
7 Perception learning, Robotics
8 Mental development.

TextBook: 1. *Artificial Intelligence*, Russell and Norvig, Prentice-Hall, 2003 (edition 2)

Reference: 1. *Introduction to Artificial Intelligence :* Second, Enlarged Edition by Philip C. Jackson

Adv Software Engineering

Pre Requisites:

Course: **CPS-851**

Credits: 3+0 **Contact Hrs**: 3+0

Course Out Line Schedule

1. **Introduction:** . Software Engineering, System Engineering, Industry's Demands
2. **Background** SWEBOK (Software Engineering Body of Knowledge), ISO/IEEE 12207 (Life Cycle Standard), Contract acquisition, Best Practices
3. **Foundation** Software engineering Model, Project Management, Measurements, estimations, Risk Management
4. **Classics** Phases of Software Development, Requirements elicitation, analysis, negotiation and Specification, Architectural, structural and details design, Construction and Coding, Verification , validation and Test strategies
5. **Object Oriented** OO Methodologies, Frameworks, UML, OO Analysis and Design, OO Test
6. **Advanced** Components Based, Service based, Aspect based SE,CASE tool, Rational Rose, SW-CMM

Textbooks:

1. Software engineering, Ian Summerville
2. Object Oriented System Development, Ali Bahrami, McGraw-Hill.

Reference:

1. Essays on Object Oriented Software Engineering Vol 1, by Edward V Herard
2. Object Oriented Modelling and Design, Rumbaugh et.al, Prentice-Hall
3. Software Engineering, A Practitioners Approach, Roger S Pressman
4. Object Oriented and Classical Software Engineering by Stephen R Schach, 5^t

Sem Project Planning Programming Projects

Digital Image Processing

Pre Requisites**:** MTH-314, STT-351

Course: CPS-866

Credits: 3+0 **Contact Hrs**: 3+0

Course Out Line Schedule

1 **Digital Image Fundamentals**: Image acquisition, representation of gray-scale and color images, human visual perception, imaging geometry, image transforms.

2 **Image Enhancement**: Point processing methods, spatial filtering, frequency domain methods, pseudo-color and full-color processing.

3 **Image Restoration**: Degradation models, algebraic restoration techniques, spatial domain methods.

4 **Multi-resolution Processing**: Image pyramids, multi-resolution expansions, wavelet transforms.

5 **Image Compression**: Fundamentals of data compression and coding concepts, pixel coding, transform coding and hybrid methods, video compression, image and video coding standards.

6 **Image Segmentation**: Edge detection methods, thresholding, region-oriented segmentation.

7 **Image Representation and Description**: Representation schemes, boundary and regional descriptors, morphological techniques, relational descriptors.

TextBook: 1. Digital Image Processing by R. C. Gonzalez and R. E. Woods, Addison Wesley, Second Ed., 2002.

Reference: 1. Computer Vision by Linda Shapiro and George Stockman, Prentice- Hall 2001

2. Computer Vision: a modern approach, Forsyth and Ponce, Prentice- Hall 2002

Advance Database System

Pre Requisites**:** CPS-480

Course: CPS-880

Credits: 3+0 **Contact Hrs**: 3+0

Course Out Line Schedule

1 **Basics**: Introduction to Database Systems, The Entity-Relationship Model, The Relational Model, Relational Algebra and Calculus.
2 **SQL**: Queries, Programming, Triggers, Query-By-Example (QBE).
3 **Data Storage and Indexing**: File Organizations and Indexes, Tree-Structured Indexing, Hash-Based Indexing..
4 **Query Evaluation**: External Sorting, Evaluation of Relational Operators, Introduction to Query Optimization, A Typical Relational Query Optimizer.
5 **Database Design**: Schema Refinement and Normal Forms, Physical Database Design and Tuning, Security
6 **Transaction Management**: Transaction Management Overview, Concurrency Control, Crash Recovery.
7 **Advanced Topics**: Parallel and Distributed Databases, Internet Databases, Decision Support, Data Mining, Object-Database Systems, Spatial Data Management, Deductive Databases.
8 **A Database Design Case Study**: The Internet Shop

TextBook:
1. Database Management System by Raghu Ramakrishnan and Johannes Gehrke.

Reference:
1. Database System by Cathereine Ricardo

Design of Parallel and Distributed Systems

Pre Requisites: CPS-330, CPS-422

Course: **CPS-881**

Credits: 3+0 **Contact Hrs**: 3+0

Course Out Line Schedule

1. **Characteristics of Distributed Systems** Introduction to Distributed systems and Examples, Resource sharing and Challenges.
2. **Distributed System Models.** Architectural models and Fundamental models
3. **Networking and Internetworking** Types of network, Network principles, Internet protocols, Network case studies: ATM
4. **Interprocess Communication** APIs for the Internet protocols, External data representation and marshalling, Client-server communication, Group communication
5. **Distributed Objects and Remote Invocation** Communication between distributed objects, Remote procedure call, Events and notifications, Java RMI case study.
6. **Security** Overview of security techniques, Cryptographic algorithms, Digital signatures, Cryptography pragmatics, Case studies: Needham-Schroeder, Kerberos, SSL & Millicent
7. **Name Services** Name Services and Domain Name Systems, Directory and discovery Services, Case study of the global Name service
8. **Time and Global States** Clocks, events and process states, Synchronizing physical clocks, Logical time and logical clocks, Global states, Distributed debugging.
9 **Coordination and Agreements** Distributed mutual exclusion, elections, multicast communications, consensus, and related problems

TextBook: 1. Distributed Systems: Concepts and Design (Third Edition)
By George Coulouris, Jean Dollimore and Tim Kindberg Addison-Wesley, ©Pearson Education 2001

Reference: 1. Distributed Systems: Principles and Paradigms, By Andrew S. Tanenbaum and van Steen
2. Distributed Operating System and Algorithms, By Randy Chow & Theodore Johnson.
3. Distributed Systems Management, By Alwyn Langsford & Jonathan D. Moffet
4 Distributed Operating Systems, By Andrew S. Tanenbaum
5 Core Jini 2nd Edition by W. Keith Edwards Second edition

Software Development for Web

Pre Requisites:

Course: **883**

Credits: 3+0 **Contact Hrs**: 3+0

Course Out Line Schedule

1. **Introduction** Internet and soft dev, Basic HTML, Advance HTML
2. **Scripting & DHTML** JavaScript, Jscript & ECMA Script, VB Scripting, DHTML + CSS
3. **Server Side** ASP or JSP , Server Side Objects and Includes
4. **Databases** Data bases & Connectivity, Transactions
5. **Advanced Technologies** XML, DTD, XML-Schema, XSL, SOAP, WSDL, UDDI
6. **e-Commerce** e- Commerce & e-Business
7. **Security** Computer & Network Security, Web Security
8. **Latest Trends**

Textbooks:

1. e-Business & e-Commerce by Deitel, Deitel & Nieto
2. In-line/On-line Fundamentals of the Internet and World Wide Web by Raymond Green law and Ellen Hepp

Reference: ***www.w3schools.com***

www.w3c.org

Sem Project Web Development Programming Projects

Artificial Neural Network

Pre Requisites**:** None

Course**:** **CPS-885**

Credits: 3+0 **Contact Hrs**: 3+0

Course Out Line Schedule

1 **Biological Neural Networks** Neuron, Brain, Central Nervous System, Neural information, Processing, brief history

2 **The Classification Problem and Artificial Neuron** Statistical Learning, Classifier Construction , Linear vs. Nonlinear Models,

3 **Adaline** Basic structure, gradient method, weights update,
Perceptron, **Madaline** Learning, Error estimates, Parameters, Convergence, XOR example, Pocket's Algorithm

4 **MultiLayer Perceptron,** Basic definitions, structure, Activation Function, Learning, Back propagation, Choosing learning parameters, Generalization, Practical aspects on MLP: Momentum, overtraining

5 Practical aspects on MLP: Delta Delta Rule, Delta Bar Delta Rule, Speeding up convergence, BP Fuzzy Control

6 **Radial-Basis Function Networks**. RBF Network Structure, Function Approximation, Linear and non-linear mapping,
RBF: Cover's Theorem, polynomial reparability XOR example, Learning, MLP vs. RBF

7 **Self Organizing systems,** Biological systems, principles of SO, SOFM models ,
Kohonen's Map (SOFM) Essential processes, neighbourhood functions, learning
SOFM Properties, Examples, simulations

8 **Learning Vector Quantization,**VQ, Voronoi quantizer, LVQ1, LVQ2, LVQ3 ,
Recurrent Networks, Introduction, history, fully, partially
Hopfield network, Energy function, properties, Associative memory, CAM

9 Spurious states, stochastic neuron, spin-glass mode,
simulated annealing, Network's performance

10 **Boltzman Machine and Mean Field Theory Machine,**
Adaptive Resonance Theory stability-plasticity dilemma, adaptive networks,ART1's structure, ART2, ARTMAP
Other adaptive models Incremental model, RCE
Brain State in a Box model, properties

11 Temporal Processing, Neurodynamics, Spiking neurons , Hardware implementation of neural networks

TextBook: *1. NEURAL NETWORKS A Comprehensive Foundation by* Simon Haykin, 2nd edition, Prentice Hall, 1999

Reference: 1**.** ***Artificial Neural Networks*** by Robert J. Schalkoff, , McGraw-Hill, 1997

2**.** ***Neural Networks for Pattern Recognition*** Christopher M. Bishop, , Clarendon Press, Oxford.

Design and Selection of Data Structures

Pre Requisites**:** CPS-230

Course: CPS-831

Credits: 3+0 **Contact Hrs**: 3+0

Course Out Line Schedule

1 **Recursion**: Direct and Indirect Recursion.

2 **Pointers and Dynamic data** static allocation vs. stack allocation, dynamic memory management -allocation, deallocation

3 **Simple abstract data types and their implementations** stacks, queues – Circular queue, priority queue, Linked List – Singly and Doubly Linked List.

4 **Trees**: Binary Trees, Strictly Binary Tree, Complete Binary Tree, Almost Complete Binary Tree, Binary Tree Applications, Traversing Trees, Pre-Order Traversing In-Order Traversing, Post-Order Traversing. Heap Construction

5 **Sorting** and **Searching**: Quick Sort, Merge Sort, Insertion Sort, Heap Sort . Linear and Binary Search.

6 **Graphs**: What Are Graphs, Directed Graphs, General Graphs, Multigraphs, Graph Vocabulary, Graph Operations (Add Vertex, Add Edge). Implementation.

TextBook: 1. Data Structures Using C++, Prentice Hall Inc., 1994, by ***Aaron M. Tenebaum, Yedidyah Langsam Moshe J. Augenstein***

Reference: ***1.*** C++ How To Program, Prentice Hall Inc., 1994, by ***H.M. Deitel, P.J. Deital***

2. Data Abstraction & Problem Solving with C++ by ***Frank M. Carrano***.
3. ***Data Structures with C++ - Schaum Series.***.

CPS-822 Parallel Processing Computer Systems

Massively parallel SIMD processors, multiprocessor architectures, interconnection networks, synchronization and communication. Memory and address space management, process management and scheduling. Parallel compilers, languages, performance evaluation.

CPS 845 Knowledge-Based Systems 3(3+0).

Research literature examining model-based reasoning, design, or diagnosis. Effectiveness and potential for future developments.

CPS-891 Selected Topics (Variable from 1+0 to 3+0)

Selected topics in computer science of current interest and importance but not covered in a regular course.

CPS 899 Master's Thesis Research, 6 credits.

LAB EXPERIMENTS
UG SYLLABUS

Course Descriptions

Introduction to Computers
List of Practical

Computer Usage: Yes
Pre Requisites: None
Course:- CPS-101
Credits: 1 + 1 **Contacts:** 1 + 3

Practical List

1 Assembly of PC, introduction to various components, slots, ports, Buses, storage media, processing unit, cards, Bios, ROM, RAM, OS.
2 Introduction to Windows Operating Environment, Desktop etc., Installation & removal of programs, Moving of Files & Folders, Making Shortcuts, Renaming of Files & Folders, Printer Installation & Other Drivers Installation.
3 Integrated Environment, Editing a Program & Working of IDE for Program Compilation & Execution.
4 Linux Installation, Directory Structure, Command Shell, XWindows, Accessing hardware CD ROM, Floppy, Programming in C++, User Accounts, Office
5 Introduction to VC++ language, Main windows components
6 Introduction to Networking, types of networks, LAN, Hubs, switch
7 Introduction to Programming Language C++

Programming in C++

List of Practical

Computer Usage: Yes

Pre Requisites:

Course: CPS-230

Credits: 2+ 1 **Contact Hrs**: 2+3

List of Practical

1 Understanding and practicing basic C++ program, editing , compiling linking and executing programs in Various IDEs
2 Practicing various types of Loops (While, Do-While, For)
3 Practicing Decisions (If, Else If, Switch)
4 Understanding Functions, arguments , parameters, practicing call by value, call by reference
5 Understanding and Practicing Structures
6 Understanding and practicing Object & Classes, Setting various permission labels, Data hiding, and encapsulations
7 Understanding and practicing Arrays & Strings, C-string and object of string class
8 Understanding and practicing operators overloading
9 Understanding and practicing Inheritance

Numerical Analysis
List of Practical

Computer Usage: Yes
Pre Requisites:
Course: CPS-232
Credits: 2+1 **Contact Hrs**: 2+3

List of Practicals

1 Difference Table
2 Newton forward difference Interpolation
4 Newton Backward Difference Interpolation
5 Interpolation using Lagrange formula
6 Derivative using Newton Forward difference formula
7 Derivatives using Newton back ward Difference formula
8 Numerical Integration by using Trapozoidal Rule
9 Numerical Integration by using Simpson's 1/3 l Rule
10 Numerical Integration by using Simpson's 3/8 l Rule
11 Differential Equations by Euler's Method
12 Differential Equations by Euler's modified Method
13 Differential Equations by Runge-Kutta Method
14 Non Linear Equations by Newton Raphson Method
15 Non Linear Equations by Method of false position
16 Non Linear Equations by Bisection Method
17 Non Linear Equations by Secant Method
18 Solution of linear Systems of Equations by Cramer Rule
19 Solution of linear Systems of Equations by Gauss Elimination Method
20 Solution of linear Systems of Equations by LU Decomposition Method
21 Solution of linear Systems of Equations by Jacobi's Method
22 Solution of linear Systems of Equations by Gauss Siedal Method

Note : Instructor has the choice to select maximum possible Practicals from the above list.

Data Structures and Algorithm
List of Practical

Computer Usage: Yes
Pre Requisites:
Course: CPS-331
Credits: 3+1 **Contact Hrs**: 3+3

List of Practicals

1 Recursive Functions to return:
   a. Sum of the first n elements of an array.
   b. The maximum among the n elements of an array.
2 For a Singly Linked List, write member functions to:
   a. Create a Destructor.
   b. Delete the node with a value passed as an argument.
3 For a Doubly Linked List, write member function to add a structure at a specific position and on a specific side.
4 For a Stack class write a member function to reverse contents of the stack.
5 Implement Stack class using Array notation.
6 Program to input a mathematical expression in Infix notation, convert into Postfix and evaluate.
7 For a Queue class, write the following member function:
   void operator += (queue);

Operating Systems
List of Practical

Computer Usage: Yes
Pre Requisites: CE-420
Course: **CPS-410**
Credits: 3+1 **Contact Hrs**: 3+3

List of Practical

1 Simulation of processor fetch executes cycle without/with interrupts.
2 Simulation of Three state models.
3 Simulation of Five state models.
4 Simulation of seven state models.
5 Simulation of process control blocks (PCB).
6 Simulation of thread states.
7 Implementation of Decker's algorithm for mutual exclusion.
8 Implementation of Peterson's algorithm for mutual exclusion.
9 Implementation of Special machine instructions for mutual exclusion.
10 Implementation of Semaphores for mutual exclusion.
11 Implementation of The Producer/Consumer problem.
12 Implementation of mutual exclusion for Barber shop problem.
13 Implementation of mutual exclusion with Monitor-signal.
14 Implementation of deadlock avoidance algorithm (Banker's algorithm).
15 Implementation of deadlock detection algorithm.
16 Implementation of Dining Philosopher's problem.
17 Implementation of virtual memory strategies.
18 Implementation of scheduler algorithms.

Note : Instructor has the choice to select maximum possible Practicals from the above list.

Computer Networks
List of Practical

Computer Usage: Yes
Pre Requisites: CPS-230, CPS-331
Course: **CPS-422**
Credits: 3 + 1 **Contact Hrs**: 3+3

Practical List

1. Data Packetization and computation of over-head for addressing information appended.
2. Computation of checksum and CRC for data packet and appending the information in the packet header.
3. Simulation of error-prone physical layer(transmission media).
4. Implementation of Hamming code for single bit error correction.
5. Implementation of Dijekstra's Algorithm for shortest path through a graph.

Artificial Intelligence
List of Practical

Computer Usage: Yes
Pre Requisites: CPS-230
Course: CPS-440
Credits: 3+1 **Contact Hrs**: 3+3

List of Practical

1 Indexing a database Using Property Lists.
2 Implementing Simple Tables
3 Pattern Invoked Rules.
4 A Production Rule Handler
5 Term Unification.
6 Indexing a database Using property lists.
7 General Problem Solver.
8 Eliza.
9 Development of an Expert System.

Theory of Intelligent Systems
.List of Practical

Computer Usage: Yes
Pre Requisites: CPS-410
Course: CPS-449
Credits: 3+1 **Contact Hrs**: 3+3

List of Practicals

1 Implementation of Candidate elimination Algorithm.
2 Implementation of the ID3 Decision Tree Induction Algorithm
  a. Implementation of General to specific algorithm
  b. Implementation of Specific to general algorithm
  c. Implementation of Bi directional algorithm
3 Implementation of Artificial Neural Nets algorithms
4 Implementation of Genetic algorithms.
5 Development of a Decision support system (Expert System).

Computer Graphics
List of Practical

Computer Usage: Yes
Pre Requisites:
Course: CPS-472
Credits: 3+1 **Contact Hrs**: 3+3

List of Practicals

1 Implementation of Digital Differential Analyzer line algorithm
2 Implementation of Bresenham's line algorithm.
3 Implementation of Mid point circle algorithm.
4 Implementation of Ellipse generating algorithm.
5 Implementation of Cohen-Sutherland Line Clipping algorithm.
6 Implementation of Liang-Barsky line clipping algorithm (2D/3D).
7 Implementation of Sutherland-Hodgeman Polygon Clipping algorithm.
8 Implementation of Composite Transformation.
9 Implementation of Z buffer algorithm.

Data Base Systems
List of Practicals

Computer Usage: Yes
Pre Requisites: None
Course: CPS-480
Credits: 3+1 **Contact Hrs**: 3+3

List of Practicals

1 Microsoft Access Table creation and data entry
2 Microsoft Access Forms, Query, Reports
3 Microsoft Access Linkage of Tables and Macro Writing
4 Microsoft Access DB Practice
5 Microsoft Access DB Practice
6 Microsoft Access University Data base Project
7 SQL DDL and DML commands
8 SQL DB Practice
9 SQL Security and Backup commands
10 Oracle Command Set
11 Oracle Forms
12 Oracle Tables and linking
13 Oracle Reports
14 Oracle Adv commands incl triggers
15 Oracle DB Practice
16 Oracle University Data base Project Upgradation from MS Access
17 Individual Student Projects Initial Study, Analysis
18 Individual Student Projects Design and Development
19 Individual Student Projects Presentations

Note : Instructor has the choice to select maximum possible Practicals from the above list.

Project

Pre Requisites**:**
Course**:** **CPS-499**
Credits: 0+7 **Contact Hrs**: 0+21
Course Out Line Schedule

BE thesis project in the final semester. Project identification and initial work will be started in the 6th semester

Text Book: As advised by Project Supervisor
Reference: As advised by Project Supervisor

Sequence for Degree Project

1. Syndicate formation and choosing Project Advisor in the 4th week of 5th Semester
2. Approval of Syndicate formation by the Dept in the 12th week of 5th Semester
3. Proposal Defence in the 16th week of 5th Semester
4. 1st Progress Presentation 2nd and 3rd week of 6th Semester
5. 2nd Progress Presentation 16th week of 6th Semester
6. 3rd Progress Presentation 13th week of 7th Semester
7. Final Presentation after Final Exams.

Distributed Computing
List of Practical

Computer Usage: Yes
Pre Requisites: CPS-425,EE-302
Course: CPS-622
Credits: 3+1 **Contact Hrs**: 3+3

List of Practical

1. Implementation of Threads
2. Implementation of Inter-Thread Communication
3. Implementation of Networking (Client Server)
4. Implementation of RMI

Software Quality Assurance
List of Practical

Computer Usage: Yes
Pre Requisites:
Course: CSE-473
Credits: 3+1 **Contact Hrs**: 3+3

List of Practical

1 Use of automated testing tools
2 Testing of a wide variety of softwar
3 Application of a wide variety of testing techniques
4 Inspecting of software in teams; comparison and analysis of results

Additional teaching considerations:

5 User interface testing with end-users is covered in HCI Course, so it should not be covered here.
6 However the use of test harnesses that work through the user interface is an appropriate topic.
7 The reason why testing is to be emphasized so much is not that other techniques are less important, but because many other techniques (e.g., inspections) can more easily be learned on the job
8 whereas testing material tends to require course-based learning to be mastered properly

Human Computer Interfacing
List of Practicals

Computer Usage: Yes
Pre Requisites:
Course: **CSE-476**
Credits: 2+1 **Contact Hrs**: 2+3
List of Practicals

1. Evaluation of user interfaces using heuristic evaluation
2. Evaluation of user interfaces using videotaped observation of users
3. - Paper prototyping of user interfaces, then discussing design options to arrive at a consensus design
4. - Writers-workshop for style critiquing of prototypes presented by others
5. - Implementation of a system with a significant user interface component using a rapid prototyping environment

Software Construction
List of Practical

Computer Usage: Yes
Pre Requisites: None
Course: CSE-472
Credits: 3+1 **Contact Hrs**: 3+3

List of Practical

1 Revise and Practice C Language
2 Compiling and Executing Tiny Compiler
3 Introducing Flex and exercises
4 Flex Practice
5 Tiny Scanner Code Reverse Engineering
6 Recursive Descent Parser coding
7 small project on C- scanner
8 Tiny Parser Code Reverse Engineering & Practice
9 Recursive Descent Parser with Error Recovery
10 Introducing bison and exercises
11 Bison Practice
12 Tiny symbol table and analyzer Code Reverse Engineering

Note : Instructor has the choice to select maximum possible Practicals from the above list.

Software Design & Architecture
List of Practical

Computer Usage: Yes
Pre Requisites: None
Course: CSE-474
Credits: 3+1 **Contact Hrs**: 3+3

List of Practicals

1 Sample labs and assignments:

2 - Building a significant project using one or more well known middleware architectures.

Digital Logic Fundamentals
List of Practical

Computer Usage: None
Pre Requisites: None
Course: **CE-230**
Credits: 3 +1 **Contact Hrs**: 3+3

Practical List

1 Demonstrate the operation and characteristics of typical circuit component and IC logic Inverter
2 Demonstrate the operation and characteristics of diode AND and OR gates
3 Demonstrate the operation and characteristics of typical discrete component transistor logic gate
4 Demonstrate the operation and characteristics of CMOS logic gate
5 Demonstrate the operation and characteristics of TTL logic gate and show how it can be used to perform any of three basic logic function
6 Show how TTL CMOS, NAND and NOR gates are used to implement any logic functions and to demonstrate the value of Boolean algebra in reducing logic circuit to minimum configuration
7 Demonstrate the operation and characteristics of set reset latch flip flop

Computer Organization and Architecture
List of Practical

Computer Usage: Yes
Pre Requisites: EE-302
Course: **CE-420**
Credits: 4+1 **Contact Hrs**: 4+3

List of Practicals

1. Use MASM to assemble Programs.
2. Use debugger to debug programs
3. Design and Fabricate an ALU
4. Design and Fabricate a four bit computer using discrete ICs

Digital Image Processing
List of Practical

Pre Requisites**:** MTH-314, STT-351

Course: EE-481

Credits: 3+0.5 **Contact Hrs**: 3+1.5

List of Practical Schedule

1 Introduction to Mat lab and DIP Toolbox
2 Image sampling and quantization
3 Image Enhancement
4 Image Filtering in Spatial Domain
5 Image Filtering in Frequency Domain
6 Image Segmentation
8 Image Compression
9 Final Exam

Electrical Engineering (Minor)

Undergraduate Course Description

Basic Electrical Engineering
List of Practical

Computer Usage: None
Pre Requisites: PHY-184,MTH-132, MTH-133
Course: EE-280
Credits: 4 + 1 **Contact Hrs**: 4+3

Practical List

1. Lab equipment Survey, identification of the basic eqpt used perform the eqpt. Fealires of electronic Trainee, Basic electronic measurements.
2. Measuring current/voltages, Operation of Heathkit Electronics Trainee Familiarization with various multi -meters. Measuring voltages avows different components.
3. Voltages thesis and drops, series voltage drops measurements, verification of sum of voltage drops is equal to the sum of the voltage supply, behavior of short and open cct voltages.
4. Reading and measuring resistances. Behavior of variable resistance in the DC cct.
5. Verification of ohms law.
6. Maximum power transfer theorem verification.
7. Verification of superposition, therein and Norton Theorem with AC and DC.
8. Charging and discharging of capacitor through resistor.
9. Observe the Behavior of capacitance is series and parallel capacitor.
10. Demo on use of oscilloscope, observe the peak value, p to p value in AC voltage, shape of since wave, and phase relation
11. Measuring inductance in series RL cct.
12. Observing the series and parallel resonance cct.

Note : Instructor has the choice to select / Perform Practical from the above list

Electronic Circuits & Devices
List of Practical

Pre Requisites: None
Course: EE-302
Credits: 3 + 1 **Contact Hrs**: 3+3

List of Practical

1. Bio matrix need of the time
2. "Semiconductor Junction
3. "Bipolar Junction Transistor"
4. Integrated Circuit Fabrication
5. Natural networks.
6. Transient Electromagnet Pulse Emanation standard
7 Global Positioning System
8 Mobile Networks
9 Tesla Coils
10 Switches and Relays
11 Light Emitting Diodes
12 Power Amplifier
13 Transistors and their application
14 Operational Amplifier.

Note : Instructor has the choice to select / Perform Practical from the above list

Digital Electronics
List of Practical

Computer Usage: None
Pre Requisites:
Course: EE-345
Credits: 3+0.5 **Contact Hrs**: 3+1.5

List of Practical

1. Design of Synchronous counter
2. Design of bi-directional Shift Register
3. Verilog Program Implementation of Combinational cct
4. Verilog Program Implementation of Sequential cct
5. Verilog Program Implementation of Shift Register cct.

Analog and Digital Communication
List of Practical

Pre Requisites: MTH-133, PHY-184
Course: EE-474
Credits: 3+0.5 **Contact Hrs**: 3+1.5

List of Practical

1. AM Transmitter
2. Balanced Modulator
3. Diode Detector
4. Pulse Amp Modulation

Basic Sciences
Undergraduate Course Descriptions

Applied Physics (Electromagnetism)
List of Practical

Pre Requisites: None

Course: **PHY-184**

Credits: 2+0.5 **Contact Hrs**: 2+1.5

List of Practical

1. Lab equipment survey and introduction to basic Electrical Components.
2. To familiarize with Multi meter and to use it for measuring resistances.
3. To measure voltage and current with Multi meter
4. Verify ohm's law.
5. Use of oscilloscopes (Analog/Digital)
6. Measuring curr4ent. AC/DC
7 Measuring Voltage AC/DC
8 Voltage Rises and Voltage Drops
9 Shorts and Opens
10 Measuring Resistance Characteristics of various devices.
11 Maximum Power Transfer Theorem
12 Verifying Ohm's Law
13 Series and parallel capacitors
14 Using capacitors

Note : Instructor has the choice to select / Perform Practical from the above list