Prof TG Venkatesh, IIT-M, Electrical Dept

Course – Microprocessor and Microcontrollers

Topic: - 8085 and 8086 Microprocessor: architecture, assembly language programming and system design

Relevant Semester – 5

Lecture 1: The 8085 microprocessor architecture, Programmer's model, Instruction set, instruction Format, Addressing modes, Machine cycle, Timing diagrams, and memory map, interfacing memory and I/O devices.

Lecture 2: The 8085 assembly language programming, Looping, block transfer, bit manipulation, time delay routines, stack and subroutine, I /O programming, interrupt handling.

Lecture 3 : The 8086 microprocessor architecture, EU and BIU, Segmentation, instruction set, DMA, multiprocessor configuration, Basics of RISC processors.

Topic 1: Applications and concepts of Thermodynamics

Relevant course: Thermodynamics / Engineering Thermodynamics / Thermal Science

Relevant Department: Mechanical Engg., Aerospace Engg., Production Engg.,

Relevant Semester: This is for a beginning course which is typically offered in the 2nd,3rd or 4th semesters of the B.Tech. program.

Pre-requisite: None. A course in Physics that covers thermodynamics would be helpful.

Topic Description:

Session 1 –

Real life examples – Maps, video, pictures, statistics

Applications

- Propulsion: Internal combustion engine, gas turbine, rocket, nuclear plant

- Power generation: Nuclear, Solar, Geothermal, Ocean thermal, Gas turbine, ICE

- Fuel cell, battery

- Refrigeration, Air-conditioning, Cryogenics

- Reactions, Combustion, Metals processing,

- Biological applications

Environmental impact

- Greenhouse effect; Greenhouse Gases (GHG), Climate change

- Ozone layer depletion

- Smog, air quality

- Natural resources (coal, oil) depletion

What do we want to know? What is the process of answering these questions? Interpreting 'answers'?

Laws of Nature (Physics) + methodology for applying them.

Thermodynamics in Physics, Chemistry, Chemical engg., Aero-, ++

Apply Laws to a System that interacts with the Surroundings; System boundary.

Session 2 –

Concepts – their importance, necessity and clarity. The Continuum. Working substance.

System, System boundary, Surroundings - representation in sketches/drawings; What is included.

Thermodynamic concept of Heat, and Work. Examples of each.

Reservoir concept.

Open system. Closed system.

Mass crossing system boundary (not electrons, or photons! Coal, oil, blood?). Mass flow (rate) vs. mass transfer – difference; Diffusion? Steady (state) flow.

Energy crossing system boundary. Work done at system boundary.

Examples of system boundary – 'best', 'optimal', 'convenient'; mass and(or) energy transfer

Session 3 –

State – defined by Properties. Uniform / non-uniform state.

Properties

- extensive; total; units
- intensive; specific property; units

Microscopic approach (kinetic theory, 'nano',).

Macroscopic approach (molecules/atoms together as an 'element').

Equilibrium; Non-equilibrium; Quasi-equilibrium. (state) (system) (relation to surroundings).

Change of state. Sequence (series) of states (of a system) – Path, Process; Cycle. (cyclic device)

(Time) Rate of change of state – Static vs. Quasi-static.

Process – Reversible; Irreversible; Quasi-reversible.

Path function; Point function.

Topic 4: Applications, examples and problem solving approach of Thermodynamics

Relevant course: Thermodynamics / Engineering Thermodynamics / Thermal Science

Relevant Department: Mechanical Engg., Aerospace Engg., Production Engg.,

Relevant Semester: This is for a beginning course which is typically offered in the 2nd,3rd or 4th semesters of the B.Tech. program.

Pre-requisite: None. A course in Physics that covers thermodynamics would be helpful.

Topic Description:

Session 1 –

Vapour power cycles

- Rankine cycle.

- Superheat and reheat.

Applications to different power cycles: Fossil fuelled, Nuclear, Geothermal, Solar thermal, Ocean thermal,

etc. Current status. Overview of future developments.

Session 2 –

Gas power cycles

- Otto, Diesel, Brayton cycles.

Application to different types of internal combustion engines. Gas turbines for propulsion (air, land and sea) and power generation.

Combined cycle power plant.

Refrigeration cycles

- Rankine cycle and its modifications.

Applications to refrigeration (domestic, industrial, mobile) implications for food industry. Air-conditioner (domestic, industrial,).

Session 3 –

Rocket propulsion.

Co-generation (textile, petrochemicals, paper, food processing, etc. industries). District heating and cooling.

Fuel cells.Conclusion.

Topic: Bending and Stresses in Beam

Relevant Course: Strength of Materials / Mechanics of Solids / Solid Mechanics

Department: Mechanical Engg., Civil Engineering, Aerospace Engineering, Automobile Engineering

Relevant Semester: 3rd / 4^{th}

Pre-requisite: Engineering Mechanics

Topic Description: Euler-Bernoulli Beam assumptions, Shear Force and Bending Moment in Beam, Bending stress in beams, Beam Sections, Stresses in built-up beams,Differential equation of the the elastic line, Deflections of beams, Method of Superposition,Strain Energy in bending, Castigliano's theorem.

Reference: Elements of Strength of Materials by S. P. Timoshenko & D. H. Young

Course Name: Introduction to Signals and Systems

Topic 1: Classification of Signals and Systems:

Prof. Arun Pachai Kannu, IIT madras

Outline:

- Discrete and Continuous Signals
- Signals of Significance (Sinusoids, Exponentials, Step and Impulse Signals)
- Basic Operations on Signals
- Discrete and Continuous Systems
- Classification of Systems
    - Linear and Non-linear
    - Stable and Unstable
    - Causal and Non-causal
    - Time-varying and Time-invariant
- LTI Systems and Convolution

Prerequisites:

- Familiarity with basic mathematics (functions, exponential and sinusoidal functions)

Reference:

A.V. Oppenheim and A.S. Willksy, "Signals and Systems", 2nd edition, Prentice Hall India, 1996.

Semester: 3

Topic 1 : **Cloud Technology Overview**

Relevant Course: Cloud Computing

Relevant Department: Computer Engineering;

Relevant Semester: 7th or 8th Semester of 4 year B.Tech programme

Prerequisite: Course on Operating Systems

Reference : Yet to be decided

Topic Description :

- Concept of Virtualization
- Multiprogramming Vs Virtualization
- Virtualization Architecture
- Virtual Machine : Live Migration, Load Balancing, Consolidation Iaas, PaaS, SaaS
- Open Source Cloud
- Public Cloud

Combinational and sequential circuit design

Topics Name:Combinational and sequential circuit design

Relevant Course: Digital IC Design

Relevant Department: Electrical Engineering

Relevant Semester: 7th

Pre- requisite: Digital circuits

Course Description - Static CMOS design of combinational circuit elements

- Propagation delay, power consumption

- Static and dynamic latches

- Timing analysis

- Combinational modules: adders, shifters

IIT Faculty: Gopal Srinivasan, IIT Bombay
Department: Mathematics
Topic Name: Fourier Series
Relevant Course: Mathematical Methods
Relevant Department: Mathematics
Relevant Semester: Fourth Semester
Pre- requisite: Calculus and Linear Algebra

Course Description and Outline:
Fourier Analysis is an important component in Engineering Education and is pervasive throughout science and engineering. In this course we shall discuss the rudiments of Fourier Analysis focusing primarily on Fourier series.

List of Topics to be covered

Session 1:
1) Periodic Functions and the formal Fourier series
2) Issues of Convergence: The Dirichlet Kernel and the Riemann Lebesgue lemma
3) Failure of pointwise convergence and sufficient conditions for pointwise convergence - Dirichle't theorem.

Session 2:
4) Examples of Fourier series of Triangular waves, Square waves and sawtooth waves.
5) Mean Convergence (RMS) value
6) Bessel's inequality and Parseval Formula

Session 3:
7) Application of Parseval formula to solve a geometrical problem (the isoperimetric problem)
8) Least square approximations
9) Applications to PDEs.

Course Name: Introduction to Signals and Systems

Topic 2: Fourier Transforms:

Prof. ArunPachaiKannu, IIT madras

Outline:

- Eigen functions of LTI systems
- Continuous Time Fourier Transform
- Properties of Fourier Transform
    - Linearity
    - Convolution
    - Multiplication
    - Duality
    - Parseval's Theorem
- Application of Fourier Transforms
    - Amplitude Modulation in Communication Systems

Prerequisites:

- LTI Systems, Convolution

Reference:

A.V. Oppenheim and A.S. Willksy, "Signals and Systems", 2nd edition, Prentice Hall India, 1996.

Semester: 3

Relevant Course: Fluid Mechanics

Relevant Department: Mechanical Engineering, Civil Engineering, Aerospace Engineering, Chemical Engineering, Metallurgy and Materials Engineering, Biotechnology,Power Engineering, Energy Engineering, Physics, Applied Mathematics

Relevant Semester: 3rd

Pre- requisite : Engineering Mathematics with integral calculus, differential calculus and vector calculus

Course Description and Outline:

Dynamics of Inviscid Flows: Equation of motion for inviscid flow in cartesian coordinates, Pressure differential between two points in an inviscid flow field, Euler's equation of motion in streamline coordinate system.

Differential form of Conservation Equations: Navier-Stokes equations – derivations, Concept of Fully developed flow.

Some exact solutions of Navier-Stokes equation for steady incompressible flows:Flow between two infinite parallel plates (plane Poiseuille flow), Shear driven flow between two parallel plates, Thin film flow along an inclined wall, Flow through circular tube / pipe (Hagen Poiseuilleflow)

Finalized topic name: Fundamental Concepts in Fluid Dynamics

Relevant Course: Fluid Mechanics

Relevant Department: Mechanical Engineering, Civil Engineering, Aerospace Engineering, Chemical Engineering, Metallurgy and Materials Engineering, Biotechnology,Power Engineering, Energy Engineering, Physics, Applied Mathematics

Relevant Semester: 3rd

Pre- requisite : Engineering Mathematics with integral calculus, differential calculus and vector calculus

Course Description and Outline:

Kinematics of Fluid Flow: Lagrangian and Eulerian description, streamline, streakline and pathline, acceleration of a fluid element, Differential form of Conservation Equations: Continuity equation, stream-function, rotation and angular deformation, irrotational flow, velocity potential.

Finalized topic name: Fundamental Concepts in Fluid Kinematics

Topic: Gear

Relevant Course: Kinematics and Dynamics of Machinery / Theory of Machines

Relevant Department: Mechanical Engineering, Automobile Engineering

Relevant semester: 3rd/ 4th / 5th semester

Pre-requisite: Engineering Mechanics

Topic Description:
Nomenclature for spur gears, Fundamental law of gearing, Conjugate action for Involute tooth profile, Contact Ratio, Interference and Undercutting, Minimum number of teeth to avoid interference, Simple & Compound Gear train, Planetary Gear train

Reference: Theory of Mechanisms and Machines by A. Ghosh and A. K. Mallik

IIT Faculty Name: Prof. Rupesh Nasre

Email ID: rupesh0508@gmail.com

IIT: IIT Madras

Department: Computer Science

Semester: 3rd& 5th Semester

Course name: OOPS

Topic name: I/O STREAMS(INTERFACES, PACKAGES COLLECTIONS AND VECTORS, FILES)

Outline: This module would introduce students to perform input / output functions using C++. The I/O functions are organized such that the same interface can be used to output on standard output device, files on disk, for writing to strings etc. We will explore these interfaces and learn how to implement your own interface -- such as writing to a socket or to a database.

Prerequisites: Introduction to C++

IIT Faculty Name: Prof. RupeshNasre

Email ID: rupesh0508@gmail.com

IIT: IIT Madras

Department: Computer Science

Semester: 5th& 7th Semester

Course name: Complier Design

Topic name: Introduction to Compilers

Outline: The lectures would introduce students to the process of compiling programs. Students would know various phases of a compiler and would learn the brief functionality of each phase. The lectures would also introduce a few concepts useful for understanding the rest of the topics.

Prerequisites: Discrete Mathematics, Automata Theory.

Relevant Course: Heat Transfer

Relevant Department: Mechanical Engineering, Aerospace Engineering, Chemical Engineering, Power Engineering, Energy Engineering,Applied Mathematics

Relevant Semester: 5th

Pre- requisite: Engineering Mathematicsand Thermodynamics

Course Description and Outline:

Introduction to fundamental concept, Derivation of heat conduction equation, Discussion on boundary and initial conditions, One dimensional steady state heat conduction with and without heat generation: plane wall, cylindrical wall, and spherical wall, Concept of critical thickness of insulation, Heat transfer through extended surfaces: fins

Finalized topic name: Introduction to Conduction Heat Transfer

Relevant Course: Heat Transfer

Relevant Department: Mechanical Engineering, Aerospace Engineering, Chemical Engineering, Power Engineering, Energy Engineering, Applied Mathematics

Relevant Semester: 5th

Pre- requisite : Engineering Mathematics, Basic knowledge of Fluid Mechanics and Thermodynamics

Course Description and Outline:

Introduction to Convection, Recapitulation of the Fluid Flow Equations, Boundary layer over a flat plate, Derivation of energy equation and identification of dimensionless terms, Concept of thermal boundary layer and derivation of thermal boundary layer equation, Thermal boundary layer over a flat plate,Internal flow: concept of thermally fully developed flow, solution for thermally fully developed Hagen-Poiseuille flow with different boundary conditions – (a) constant heat flux, (b) constant wall temperature

Finalized topic name: Introduction to Convection Heat Transfer

Analog Devices IITM

DSP Learning Centre

PRE-REQUISITES FOR A COLLEGE TAKING QEEE DSP PROGRAM

- **Eligibility**: Basic knowledge of DSP, C/C++ and assembly language programming for the faculty and students
- **System Requirements**:

➢ **Operating System & Software-**

- Windows XP Professional SP3 (32-bit only) or any higher version of windows (including 64-bit)
- Google Chrome browser (default browser)
- Pdf reader
- Microsoft office

➢ **Hardware requirements-**

- Processor: Minimum of 3.3 GHz single core processor, 2 GHz dual core or higher is recommended.
- RAM: Minimum of 2 GB memory, 4 GB or higher is recommended.
- Hard Disk: Minimum of 320-500 GB hard disk with atleast 8Gb free space is required.
- Bandwidth: 2 Mb/s minimum, 4Mb/s or higher recommended uninterrupted
- Headphone with mic: Headphone should be present in each individual system for students to interact with the tutor through audio.

- Student count per batch per college is 30 (max)
- Minimum 2 hours per DSP Lab per week, preferably during the week days.

LAB PROCEDURE FOR COLLEGE

Pre Lab-

- Faculty duties-

  (Before the course starts – Should be done once)

  - The faculty must enroll the students according to the procedure given during the remote training
  - Login ID and password must be provided for all the enrolled students

  (Before every lab session)

  - Ensure that the students are prepared for each lab session

- Student Duties-

  - All the enrolled students must go through the materials (video lectures and notes/slides) and complete the quiz in the corresponding modules provided in the Coursepack prior to each lab session

During Lab-

- 2-3 hrs of lab session as previously scheduled.
- One student per system, worst case two.
- The faculty must take the attendance.
- Login to the QEEE website and use the chatbox or screenshare for any queries or problems during the programming session, to interact with the tutor

- The faculty must contact tutor to update the session status

Post Lab-

- The students must submit the assignments in the coursepack according to the given procedure
- The faculty must update the google form about the session stats, shared through mail

Prerequisites for Remote Training-Faculty:

- Installation of Software in all the systems in the lab
- Opening of the required ports
- Headphone with MIC (Microphone) for all systems

Remote Training session-Faculty:

- Mandatory testing of ports, software & audio in all the systems
- Checking connectivity from college to IITM DSP server
- Complete at least 2 experiments

IIT Faculty Name: Prof. C. Vijayan

Email ID: cvijayan@iitm.ac.in

IIT: IIT Madras

Department: Physics

Semester: 1st Semester

Course name: Engineering Physics

Topic name: Laser Physics

Outline: Basic physics of laser action is introduced and the differences between ordinary light and laser are highlighted. The working principles of a few commonly used laser systems are explained. Important applications of lasers in Science, technology, medicine and Industry are outlined with the principle used and the scope.

Topic 2: Laws of Thermodynamics

Relevant course: Thermodynamics / Engineering Thermodynamics / Thermal Science

Relevant Department: Mechanical Engg., Aerospace Engg., Production Engg.,

Relevant Semester: This is for a beginning course which is typically offered in the 2nd,3rd or 4th semesters of the B.Tech. program.

Pre-requisite: None. A course in Physics that covers thermodynamics would be helpful.

Topic Description:

Session 1 –

Laws of thermodynamics

Zeroth Law of Thermodynamics. Temperature. Equality of temperature. Applications.

First Law of Thermodynamics. Energy.

- Energy
- Internal energy.
- Enthalpy.
- Application to control mass / Non-flow processes.
- Application to control volume / Flow processes
- Steady State Steady Flow (SSSF) processes
- Uniform State Uniform Flow (USUF) processes

Session 2 –

Second Law of Thermodynamics.

- Heat engine, efficiency. Heat pump, coefficient of performance. Reservoir.
- Statements
- Carnot cycle. The processes. Efficiency. Why it is the most efficient.
- Clausius inequality.
- Entropy.

Session 3 –

Second Law application to control mass and control volume.

Property relations. Property diagrams.

Bernoulli's equation.

Application of laws to a process: Throttling, flow or reciprocating compressor / expander (turbine),

pump, heat exchanger, nozzle/diffuser, etc. Focus here will be on systematic approach up to developing

the governing equations for any working substance.

Module 1 : Linear Data Structures and Applications

Relevant Course: Data Structures and Algorithms

Relevant Department: Computer Engineering; Information Technology

Relevant Semester: Ideally in Semester 3 of 4 year B E / B Tech

Prerequisite: Familiarity with Programming in C / C++; basics of algorithms

Topic Description:

· Introduction to stack and queue data structures. Basic operations on these data structures; array implementation; problem solving using these structures.

· Linear list data structure, basic operations on a singly linked list: traversal(), length(), insertion(), deletion(), merge(); search(); sort(); time complexity of each operation.

· Dynamic memory based implementation : concepts of pointer, array of pointers, structure, class and dynamic memory allocation. Designing programs in C and C++ for representation and manipulation of stack, queue and list using singly linked data structure.

· Applications of stacks, queues and lists in problem solving – (a) balanced parentheses, (b) expression evaluation, (c) scheduling of processes, (d) sparse polynomial manipulation : addition and multiplication, and (e) arithmetic with long positive integers.

Topic1: Maxwell Equations

Relevant Course: Electromagnetic Fields

Relevant Department: ECE, EEE, EP (Engineering Physics) should have completed basic Physics Course

Relevant Semester: 3rd and above

Topic Description:

1. Maxwell equations and their derivations with their significance in static and dynamic fields
2. Equation 1,2,3,4 &5
3. Maxwell's Equation in static and time domain form and their derivations
4. Maxwell's Equation for static and EM Fields

Dates for Maxwell Equation:

- Sep 26th (2-4 PM)
- Sep 27th (2-4 PM)
- Sep 28th (2-4 PM)

Relevant Course: Microprocessor and Microcontrollers
Relevant Department : Electrical Engineering
Relevant Semester: 5
Pre-requisite: Nitty Gritty of Processor Design

Course Description & Outline

Processor Board and Memory mapping

- Recollecting earlier discussions.
- External memory as a bunch of addressable registers.
- Signals controlling an external memory.
- Peripheral controllers and adding different peripherals through a Peripheral Controller.
- Understanding the concept of Memory Mapping.
- Using Chip select for unique placements.
- Unmapped address spaces
- Best Practices in memory mapping.
- Demonstration of the concept of Regular mapping with an example
- Complexity of Irregular mapping explained with an example

Connecting Peripherals and concept of Polling and Interrupt

- Peripheral Interface Controller(PIC).
- Working of a 4*4 Keyboard.
- Use of Polling to detect Key press.
- Using Interrupts to detect Key press.
- Understanding General Interrupt handling
- Interrupt flow process and Nested Interrupts.

Peripheral Controllers, Display Controller and DMA

- Three types of PIC Registers.
- Understanding the Control, Status and Data Registers.
- A brief note on common Display Peripherals.
- Using Display controller to display appropriate pixels on Display Peripheral.
- Memory Bus Cycle.
- Dissecting the MOV Instruction.
- Comparing the access times of different types of memories.
- Processor handling different access times.
- Concept of DMA and its working.
- Understanding the Block transfer and Cycle Stealing modes of DMA.
- Advantages and disadvantages of DMA.

Peripherals: Communication, Disc & Mouse Controller and Timer

- Understanding Communication Peripheral Controller and Communication Fundamentals.
- Ethernet controller as a sample communication Controller
- The concept of disc controllers.
- Illustrating the Data storage on disks in tracks and sectors.
- Accessing the Disc and Reading/Writing on it.
- Mouse controller.
- Timer Peripheral and controller.

Schedule for Lecture Delivery
Session 1 : 15-Sep-2016 (10-12 pm)
Session 2 : 21-Sep-2016 (10-12 pm)
Session 3 : 22-Sep-2016 (2-4 noon)

Modern Wireless Communications – Why the Evolution from 2G to 4G?

K. Giridhar, IIT Madras (*giri@tenet.res.in*)

Wireless broadband access is the *only* solution to provide high-speed internet and data connections in many regions of the world. Cellular networks developed for supporting mobile users is increasingly seen as the bedrock of broadband access, with wireless LAN networks playing a supporting role, especially indoors.

Cellular mobile networks have evolved from 2G (TDMA based GSM with 200KHz bandwidth), to 3G (spread spectrum W-CDMA with 5MHz bandwidth), and currently to 4G (OFDM/OFDMA based LTE with 20MHz bandwidth). The key issue that we would like to address in our talks is: *Why did the bits-to-waveform mapping scheme change from TDMA to CDMA to OFDM when the bandwidth (and hence the bit-rate) of the wireless signal was increased?*

We motivate the reason for this evolution to OFDMA by focusing on four aspects of a modern cellular system: (a) Ability to handle time-of-flight differences between different mobile uplink signals connected to the base-station, (b) Complexity of the optimal receiver in multipath channels, (c) Ability to manage co-channel interference, and (d) Flexibility of resource allocation. We will interpret the above three mapping schemes using a "channel coding based framework" to show why OFDMA has become the scheme of choice for modern wireless communications. The five lectures will be done with minimal mathematics and notation, but will instead use simple figures, relevant properties of linear systems, and common sense, to bring home the main learnings.

Relevant Course: Analysis of Structures

Relevant Department: Civil Engineering

Relevant Semester: 4th Semester

Topic Description and Outline:

This topic would cover the following:

- Influence Lines for Statically Determinate Beams and Frames Tabulation Method
- Equation Method
- Muller Breslau Principle
- Calculation of critical stress resultants due to concentrated and distributed moving loads
- Floor Girders Trusses
- Influence Lines for Statically Indeterminate Structures Beams
- Frames

Pre- requisites:

Analysis of Statically Determinate Structures,

Analysis of Statically Indeterminate Structures by Force Method.

Students should be familiar with:

Analysis of statically determinate structures such as beams, frames and trusses i.e. they should be able to:

(i) Calculate reaction, shear force and bending moment of statically determinate beams and frames,

(ii) Calculate member forces of statically determinate truss members.

Analysis of Statically Indeterminate Structures using Force Method.

Module 2 : Non-linear Data structures and applications

Relevant Course: Data Structures and Algorithms

Relevant Department: Computer Engineering; Information Technology

Relevant Semester: Ideally in Semester 3 of 4 year B E / B Tech

Prerequisite: Material covered in Module 1- Linear Data Structures and Applications or equivalent

Topic Description:

· Hash table data structure with basic operations; hashing function and collision resolution; implementation using array and linked list; comparison of hash table with other searching algorithms.

· Doubly and multiply linked data structures with basic operations; use in implementating binary tree and graph data structures. Comparison of linked data structures with space and time cost for basic operations.

· Implementation of multiply linked lists in C++; template class implementation of a linked list.

· Applications of nonlinear data structures in problem solving – (a) search application using hash tables, (b) sparse polynomial manipulation : addition; subtraction; multiplication, (c) design of buffer cache for disk blocks.

Prof. Sanjeev Sabnis,IITB
Email id : **sabnissanjeev@gmail.com**
Dept: civil

Topic Name: Permutations and Combinations
Sem - Autumn 2016

Session 1 : Fundamental counting &Notion , Principles of Permutations and Combinations with examples

Session 2 : Distribution Problem - Arrangements and selection with repetitions with examples

Session 3 : Binomial Identities with examples

Topic 2 : Plane Waves

Relevant Course: Electromagnetic Fields

Relevant Department: ECE, EEE, EP (Engineering Physics) should have completed basic Physics Course

Relevant Semester: 3rd and above

Topic Description:

1. Wave propagation in various mediums

2. Power and pointing vectors

3. Reflection of plane wave at normal incidence.

Dates for Topic 2:

1. Sep29th (2-4 PM)
2. Sep 30th (2-4 PM)
3. Sep3rd (2-4 PM)

Topic – Predicate Logic/First Order Logic (FOL)

Relevant Course: Artificial Intelligence

Relevant Department:CSE

Relevant Semester: Sem 7

Topics for QEEE: Predicate Logic/ First Order Logic (FOL) (6 hours)

Module 1 (2 hours): Syntax, Semantics, Entailment and Models, Proof Systems, Knowledge Representation.

Module 2 (2 hours): Skolemization, Unification, Deductive Retrieval, Forward Chaining, Backward Chaining

Module 3 (2 hours): Resolution Refutation in FOL, Horn Clauses and Logic Programming

Topic – Priority Queues and Trees

Relevant Course: Data Structures
Relevant Department: Computer Engineering
Relevant Semester:3

Topic Outline:-

Quick review of abstract data types (ADTs), implementation of the tree ADT using arrays or lists, traversal of trees, complexity analysis

Priority Queues and Heaps: applications of heaps, binomial heaps, fibonacci heaps, pairing heaps.

Binary search trees (BST): applications of BST, AVL Trees, Red-Black trees, Splay trees.

Topic 3: Properties of a pure substance

Relevant course: Thermodynamics / Engineering Thermodynamics / Thermal Science

Relevant Department: Mechanical Engg., Aerospace Engg., Production Engg.,

Relevant Semester: This is for a beginning course which is typically offered in the 2nd,3rd or 4th semesters of the B.Tech. program.

Pre-requisite: None. A course in Physics that covers thermodynamics would be helpful.

Topic Description:

Session 1 –

Pure substance, mixture. Phase

Phases of a pure substance: solid, liquid and vapour.

Phase diagram, p-v-T surface. Triple point, Critical point.

Equilibrium between phases: Liquid-vapour, liquid-solid, Vapour-solid, Solid-liquid-vapour.

Saturated state: saturated liquid, saturated vapour.

Compressed / subcooled liquid.

Superheated vapour. Highly superheated vapour / gas

Ideal gas.

Session 2 –

Properties of a pure substance: Pressure (p), Specific volume (v), Temperature (T), Specific internal

energy (u), specific enthalpy (h), specific entropy (s), Specific Gibbs function (g), Specific Helmholtz

function (ψ).

Relations between properties. Maxwell's relations.

Equation(s) of state.

Properties required to specify state - pure substance. (mixture).

Evaluating properties. Property diagrams. Property charts.

Property software/web-based data.

Session 3 –

Property calculation examples.

Compressibility. Compressibility factor. Ideal gas equation of state and its modifications.

Property relations. Property diagrams.

Examples and applications.

Depicting processes with schematics (flow diagrams). Common symbols for equipment and fittings

IIT Faculty Name: Prof. Santiram Chatterjee

Email ID: sc@civil.iitb.ac.in

IIT: IIT Bombay

Department: Civil

Semester: 3rd and 4th Semester

Course name: Geotechnical Engineering

Topic name: Shear strength of soils

Outline: * Factors affecting shear strength of soil
* Mohr-Coulomb failure criterion
* Frequently used laboratory tests to measure soil shear strength parameters
* Concept of critical state
* Stress-strain behavior, volume change and shearing of soils in drainedloading condition
* Undrained shear strength
* Stress paths for different loading conditions

Prerequisites:

* Basic Engineering Mechanics
* Effective Stress Principle
* Consolidation

Course Curriculum for QEEE

MODULE: English for Employability

The objective of this module is to make learners understand how to communicate effectively with their prospective employers and never fall short of confidence and ideas. To reach this end, this program begins with an introduction to the process of communication, highlighting its importance and best techniques to be followed. This process is followed with sessions in developing speech skills and then highlighting the functional aspects while at an interview.

S. No.	Session Name	Key Concepts
1	Orientation & Introduction to Communication	Programme sessions and schedule Understand the process of communication Identify the components of communication Differentiate between verbal and non-verbal communication Identify the barriers to communication Importance of feedback Effective Communicate
2	Syllables and Syllable Stress	Introduction to syllables Syllable break-up Activity to practise up to 4 syllable words What is syllable stress Syllable stress with suffixes Difference in syllable stress between the Noun and Verb form
3	Word Stress and Modulation	What is word stress? Understanding word stress Understanding Modulation Practicing word stress and modulation
4	Enhancing Vocabulary	Significance of a good vocabulary bank Homonyms Homographs Various techniques to enhance vocabulary
5	SVA Agreement	Subject -Verb Agreement Person – first, second, and third Number – plural and singular

6	Telephone Etiquette	How to conduct effective telephonic conversations Politeness How to avoid misunderstandings How to refuse taking a call
7	Mid programme review	Free speech activity-quiz, debate
8	Why You Should be Hired	Talk about how qualifications, personality traits, and enthusiasm match the job requirements.
9	Talking about the Future	Be Ambitious Be Specific and Realistic Development Plan
10	Discussing Salary	Be firm yet polite Be flexible Negotiate Case Studies Research Industry Standards as per job profile and individual experience.
11	Strength and Weakness	Honest Relevant You weaknesses should not seem to go against the job Limited Don't sound boastful
12	Body Language	Body Language as communication Facial Expressions Gestures Gait Case Studies
13	Post programme discussion	Free speech activity-Q & A, discussion.

Topic – Test on Concrete

Prof Manu Santhanam, IITM, Civil Dept,

Email:-manusanthanam@gmail.com

Relevant Course: Concrete Technology

Relevant Department: Civil Engineering

Relevant Semster: 5th

The details for the modules are:

1. Tests on fresh concrete
- Workability tests for normal and self-compacting concrete
- Determination of setting and hardening of concrete
- Electrical and ultrasonic monitoring of early age concrete
- Plastic shrinkage testing
- Maturity method

2. Tests for mechanical properties
- Compressive and tensile strength
- Modulus of elasticity
- Creep an drying shrinkage
- Fracture properties

3. Durability test methods
- Chloride penetration tests
- Water penetration tests
- Gas penetration tests
- Tests for chemical attack
- Tests for corrosion

Topic: Vibration

Relevant Course: Theory of Vibration/ Dynamics of Machines/ Theory of Machines / Structural Dynamics

Department: Mechanical Engg., Civil Engineering, Aerospace Engineering, Automobile Engineering

Relevant Semester: 5th / 6th/ 7th / 8th semester

Pre-requisite: Engineering Mechanics, Engineering Mathematics

Topic Description:

Nature of Vibration – Harmonic and Transient Vibration, Lumped Parameter modeling for vibratory system, Phasor / complex exponential representation of harmonic quantities.

Single degree of freedom vibration analysis, Free vibration, Damped and Undamped vibration, Natural Frequency, Logarithmic decrement.

Forced harmonic vibration, Resonance, Support motion, Transmissibility

Reference: Theory of Vibration by Thomson, Dahleh&Padmanabhan.

Topic 2 : **Virtualization Technology**

Relevant Course: Cloud Computing

Relevant Department: Computer Engineering;

Relevant Semester: 7th or 8th Semester of 4 year B.Tech programme

Prerequisite: Course on Operating Systems

Reference : Yet to be decided

Topic Description :

- CPU Virtualization
  - Binary Translation
  - Para Virtualization
  - Hardware Assisted Virtualization
- Memory Virtualization
  - I/O Virtualization
  - Storage Virtualization
- Software Defined Storage
  - HDFS : Hadoop Distributed File System.
- Network Virtualization
  - Software Defined Networks