Beams - Design of Steel Structures

Beams - Design of Steel Structures

RegisterLast Date : Aug 01 2017

Beams - Design of Steel Structures

Start Date	**: 22/08/2017 14:00:00**
End Date	**: 13/09/2017 16:00:00**

Topic Outline

Beams– Prof Satish Kumar, IIT Madras

Relevant course: Design of Steel Beams

Relevant department: Civil Engineering

Pre requisite: Strength of Materials

Course outline:

Beams are an important class of members in Structural Steel Design. Beams can fail in a variety of ways and it is important to understand the behavior and failure of beams to be able to design them safely. In this module, the design of beams with rolled and built-up sections will be covered adhering to the provisions of the code IS800:2007.

Session Schedule

Name	Start	End
Session 1	22/08/2017 14:00:00	22/08/2017 16:00:00
Session 2	23/08/2017 14:00:00	23/08/2017 16:00:00
Session 3	24/08/2017 14:00:00	24/08/2017 16:00:00

Quiz

Assignment

Delivered by

Prof. S R Satish Kumar **IIT Madras**

Compass Surveying and Plane Table Surveying - Surveying

Compass Surveying and Plane Table Surveying - Surveying

Compass Surveying and Plane Table Surveying - Surveying

Start Date	: 05/08/2017 10:00:00
End Date	:

Topic Outline

Relevant course: Engineering Surveying

Relevant department: B.E./B.Tech Civil Engineering; Agriculture Engineering; Mining Engineering

Pre requisite: 1st Year Engineering courses, basics of Surveying

Course outline: My 5 hrs lecture will be cover the following aspects

1. Overview of Plane Table Surveying
2. Basics of Total Station and its various applications
3. Global Navigation Satellite System (GNSS) basics and applications in Civil Engineering

Session Schedule

Quiz

Assignment

Delivered by

<u>RAAJ Ramsankaran</u> IIT Bombay

Matrix Stiffness Method - Structural Analysis

$$\mathbf{k}_e^{\text{beam}} = \begin{bmatrix} 0 & \overset{d_2(v_1)}{\underset{\uparrow}{0}} & \overset{d_3(\theta_{z1})}{\underset{\uparrow}{0}} & 0 & \overset{d_5(v_2)}{\underset{\uparrow}{0}} & \overset{d_6(\theta_{z2})}{\underset{\uparrow}{0}} \\ & \dfrac{3EI_z}{2a^3} & \dfrac{3EI_z}{2a^2} & 0 & -\dfrac{3EI_z}{2a^3} & \dfrac{3EI_z}{2a^2} \\ & & \dfrac{2EI_z}{a} & 0 & -\dfrac{3EI_z}{2a^2} & \dfrac{EI_z}{a} \\ & & & 0 & 0 & 0 \\ & sy. & & & \dfrac{3EI_z}{2a^3} & -\dfrac{3EI_z}{2a^2} \\ & & & & & \dfrac{2EI_z}{a} \end{bmatrix} \begin{matrix} \\ \rightarrow d_2 = v_1 \\ \rightarrow d_3 = \theta_{z1} \\ \\ \rightarrow d_5 = v_2 \\ \rightarrow d_6 = \theta_{z2} \end{matrix} \qquad (6.3)$$

Matrix Stiffness Method - Structural Analysis

Matrix Stiffness Method - Structural Analysis

Start Date	: 21/08/2017 14:00:00

End Date	: 12/09/2017 12:00:00

Topic Outline

Relevant course:

Matrix Stiffness Method

Relevant department:

Civil Engineering

Pre requisite:

Engineering Mechanics, Strength of Materials, Structural Analysis (general course-bending moment and shear forces, deflections of statically determinate and indeterminate structures, strain energy etc.)

Course outline:

Day 1:

(1)   Definition and explanation of static and kinematic indeterminacy, force (flexibility) and displacement (stiffness) methods

(2)   Analysis of plane Trusses using stiffness approach- displacement and force transformation matrices- element and global stiffness matrices- member forces- stiffness matrix for space truss- thermal and fabrication error

Day 2:

(3)   Analysis of Continuous Beams- element and global stiffness matrices- intermediate loading- sinking of supports

(4)   Analysis of pin-jointed plane frames and rigid space frames – preliminary discussions.

Day 3:

(5)   Preliminaries to more complicated issues- oblique supports- virtual work principles- relations to finite element analysis- non-linear analysis of framed structures (only nominal discussion and introduction for future self study)
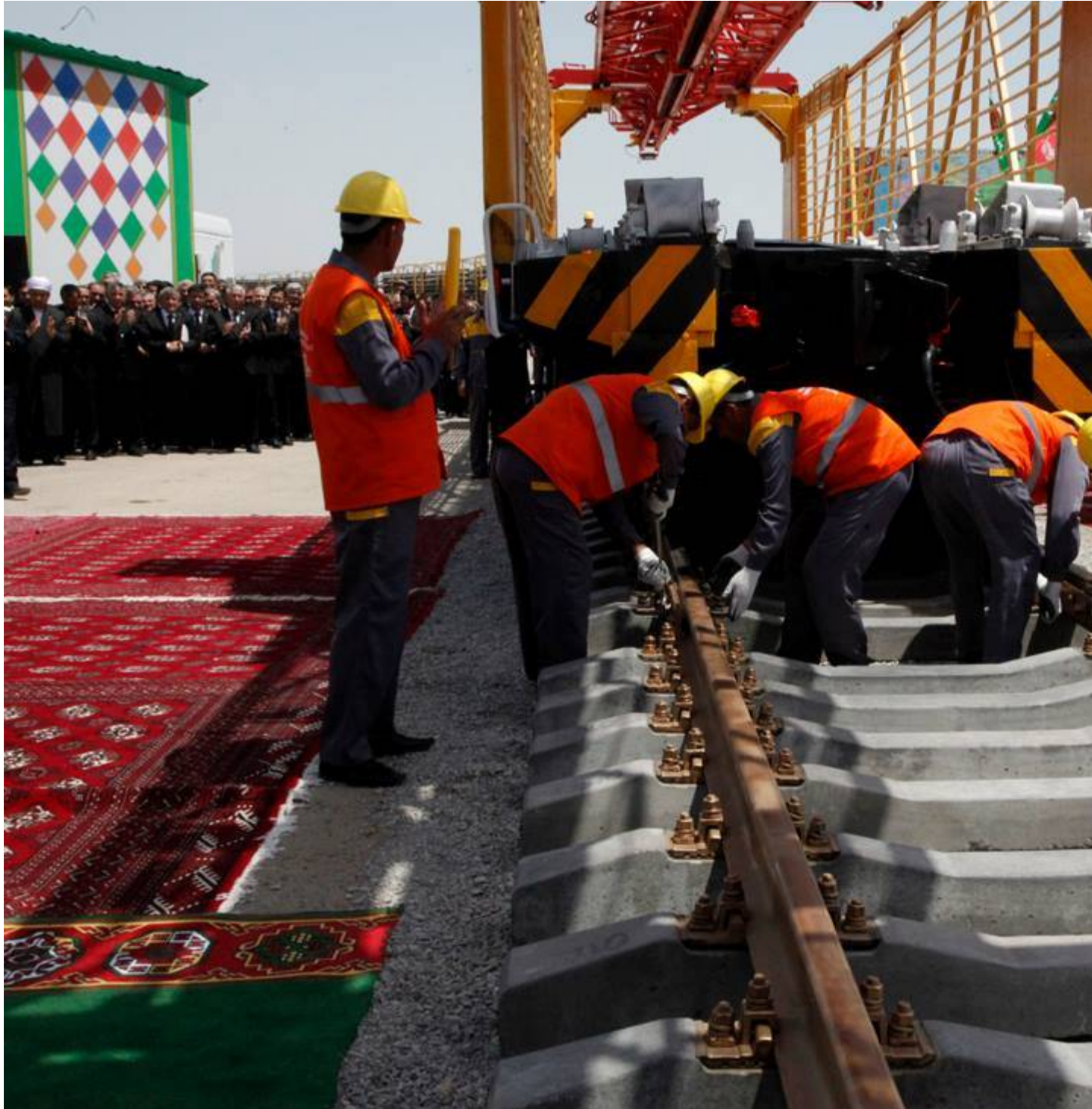
Session Schedule

Name	Start	End
Session 1	**21/08/2017 14:00:00**	**21/08/2017 16:00:00**
Session 2	**22/08/2017 14:00:00**	**22/08/2017 16:00:00**
Session 3	**23/08/2017 10:00:00**	**23/08/2017 12:00:00**

Quiz

Assignment

Delivered by

Prof. Sushanta ChakrabortyIIT Kharagpur

Railway Planning and Construction - Railways and Airports Engineering

Railway Planning and Construction - Railways and Airports Engineering

RegisterLast Date : Aug 01 2017

Railway Planning and Construction - Railways and Airports Engineering

Start Date	: 01/09/2017 14:00:00
End Date	: 26/09/2017 12:00:00

Topic Outline

Relevant course: Transportation Engineering

Relevant department: Civil Engineering

Pre requisite: Nil

Course outline:
(1) Introduction and elements of permanent way - Rails, sleepers, ballast,
rail fixtures and fastenings.
(2) Geometric design and alignment of railway tracks.
(3) Railway facilities (Stations, yards etc).
(4) Brief details about signalling and control system

Relevant course: Transportation Engineering

Relevant department: Civil Engineering

Pre requisite: Nil

Course outline:
(1) Introduction and elements of permanent way - Rails, sleepers, ballast,
rail fixtures and fastenings.
(2) Geometric design and alignment of railway tracks.
(3) Railway facilities (Stations, yards etc).
(4) Brief details about signalling and control system

Session Schedule

Name	Start	End
Session 1	01/09/2017 14:00:00	01/09/2017 16:00:00
Session 2	05/09/2017 10:00:00	05/09/2017 12:00:00
Session 3	06/09/2017 10:00:00	06/09/2017 12:00:00

Quiz

Assignment

Delivered by: <u>Prof. Nagendra R Velaga</u> IIT Bombay

Water Treatment - Water Supply Engineering

Water Treatment - Water Supply Engineering

RegisterLast Date : Aug 01 2017

Water Treatment - Water Supply Engineering

Start Date	: 31/08/2017 14:00:00
End Date	: 26/09/2017 16:00:00

Topic Outline

Water Treatment – Prof Ligy Philip, IIT Madras

Relevant course: Water Supply Engineering

Relevant department: Civil

Pre requisite: NIL

Course outline:

Water quality parameters, water quality standards, water quality indices, quality requirement for various beneficial uses.Water safety plan, Need and extent of treatment required, objectives of public water supply system. - 1 h

Unit operations and processes – Principles, functions and design of coagulation and flocculation systems,sedimentation and sand filters- 2h

Disinfection, disinfection byproducts, Iron and Manganese removal, DE fluoridation - Residue Management. 1h

Introduction to advanced water treatment technologies such as adsorption, ion exchange and membrane process, corrosive and scale forming water, water stabilization.1h

Point of use water treatment systems, Tertiary treatment systems for wastewater reuse - 1 h

Session Schedule

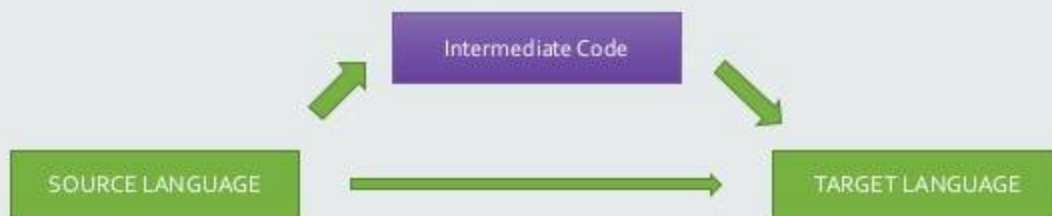| Name	Start	End
Session 1	**31/08/2017 14:00:00**	**31/08/2017 16:00:00**
Session 2	**05/09/2017 14:00:00**	**05/09/2017 16:00:00**
Session 3	**06/09/2017 14:00:00**	**06/09/2017 16:00:00**

Quiz

Assignment

Delivered by

Prof. Ligy Phillip **IIT Madras**

Intermediate Code Generation - Principles of Compiler Design

Intermediate Code Generation - Principles of Compiler Design

RegisterLast Date : Aug 01 2017

Intermediate Code Generation - Principles of Compiler Design

Start Date   **: 05/08/2017 10:00:00**

End Date   **:**

Topic Outline

Relevant Course: Principles of Compiler design

Relevant Department : Computer Science

Relevant Semester: 1st to 5th semster

Pre-requisite : This module assumes familiarity with scanning and parsing, particularly LR parsers. The earlier QEEE module delivered under Compiler Design : LR Parsing : Theory and practice, has all the background material.

Lecture 1 : Semantic analysis - concepts and examples; Syntax Directed Translation Scheme (SDTS); semantic analysis of declarations; semantic analysis of expressions in C/C++. Intermediate code forms. Illustration through examples.

Lecture 2 : Semantic analysis of assignment statement; translation of boolean expressions - partial and complete evaluation; translation of control flow statements. Illustration through examples.

Lecture 3 : Translation of procedure calls; runtime environments and activation records. Illustration through examples.
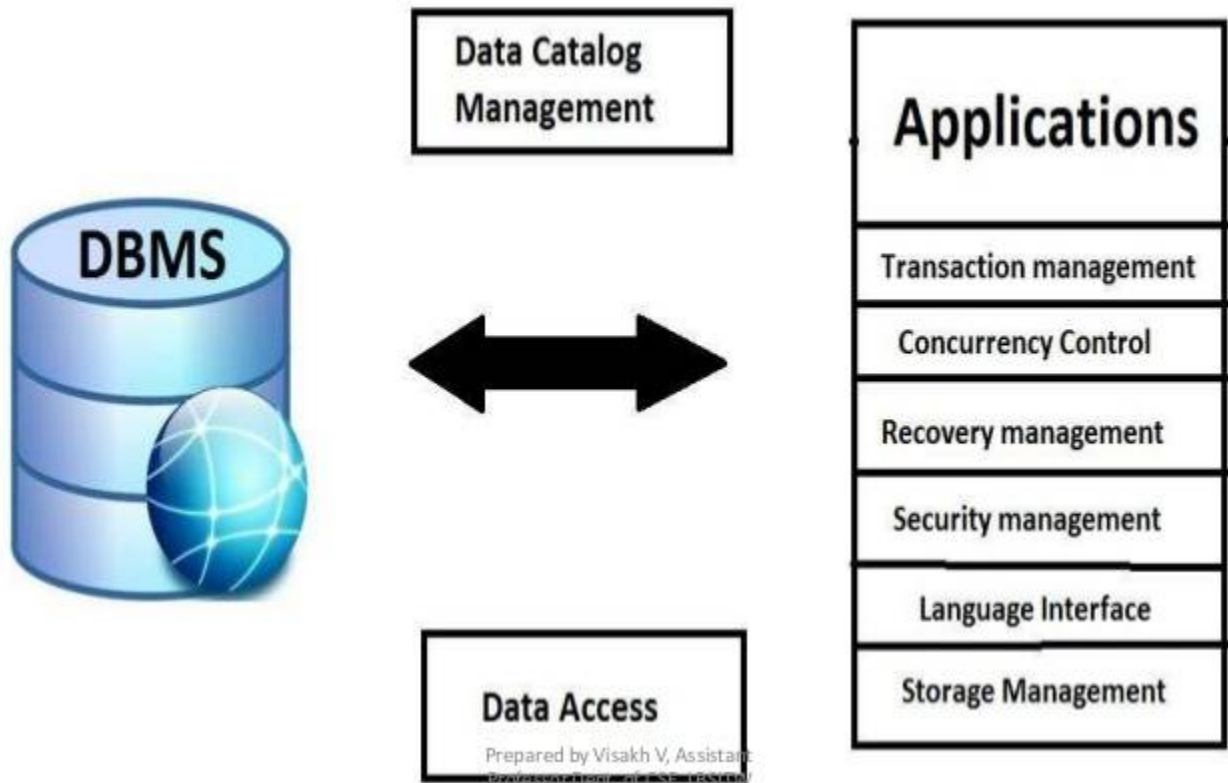
Session Schedule

Quiz

Assignment

Delivered by

<u>Prof. Supratim Biswas</u> IIT Bombay

Introduction to DBMS - Database Management Systems

Introduction to DBMS - Database Management Systems

RegisterLast Date : Aug 01 2017

Introduction to DBMS - Database Management Systems

Start Date	**: 25/09/2017 10:00:00**

End Date	**: 17/10/2017 12:00:00**

Topic Outline

Topic Name: Introduction to DBMS

Relevant Course Name: Database Management Systems

Relevant Department: Computer Science

Relevant Semester: 6th

IIT Faculty Name: Prof. Pabitra Mitra

IIT: Kharagpur

Topic Description and Outline:

Database system architecture Data Abstraction, Data Independence, Data Definition and Data Manipulation Languages.Data models Entity-relationship, network, relational and object oriented data models, integrity constraints and data manipulation operations.

Relational query languages Relational algebra, tuple and domain relational calculus, SQL and QBE.

Relational database design Domain and data dependency, Armstrong's axioms, normal forms, dependency preservation, lossless design.

Query processing and optimization Evaluation of relational algebra expressions, query equivalence, join strategies, query optimization algorithms.

Storage strategies Indices, B-trees, hashing.

Transaction processing Recovery and concurrency control, locking and timestamp based schedulers, multiversion and optimistic Concurrency Control schemes.

Advanced topics Object-oriented and object relational databases, logical databases, web databases, distributed databases, data warehousing and data mining.

Pre- requisites: Data Structure and Algorithm

Session Schedule

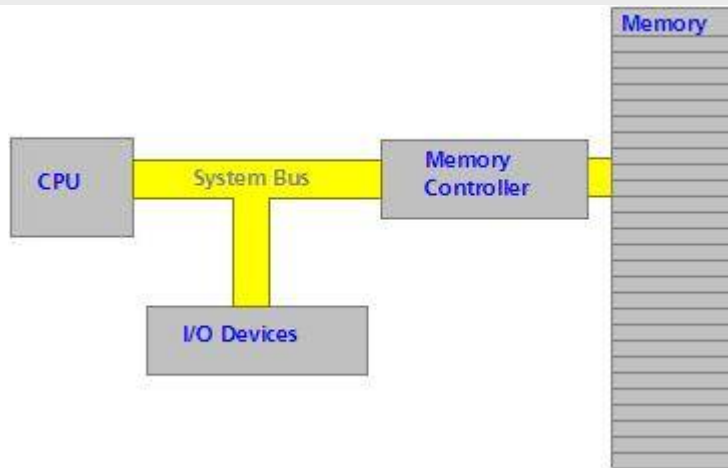| Name	Start	End
Session 1	**25/09/2017 10:00:00**	**25/09/2017 12:00:00**
Session 2	**26/09/2017 10:00:00**	**26/09/2017 12:00:00**
Session 3	**27/09/2017 10:00:00**	**27/09/2017 12:00:00**

Quiz

Assignment

Delivered by

Prof. Pabitra Mitra **IIT Kharagpur**

Memory and IO - Advanced Computer Architecture

Memory and IO - Advanced Computer Architecture

Memory and IO - Advanced Computer Architecture

Start Date	: 31/08/2017 10:00:00

End Date	: 04/10/2017 12:00:00

Topic Outline

Memory and IO – Prof TG Venkatesh, IIT Madras

Relevant course: Advanced Computer Architecture

Relevant department: EEE

Pre requisite: NIL

Course outline:

Memory subsystem: Main memory organization. RAM structure. Main memory and performance – Memory technology. Types of storage devices. The memory module and its interface. Memory interleaving. Memory hierarchy - operation of memory hierarchy Cache: Mapping function – Associative, direct and block set-associative. Cache Replacement policies. Cache read and write policies. Cache fetch policies. Unified and split cache. Cache coherence protocol – MESI. Cache performance- Average Memory Access Time, Reducing cache miss penalty and miss rate – Reducing hit time. Example memory hierarchy: ARM processor. Virtual memory: memory management- paged memory and segmented memory. Main Memory management policies- placement, replacement, fetch and secondary memory update policies.

Address translation - TLB design, implementation I/O subsystem: I/O bus structures. Programmed I/O. I/O interrupts – Interrupt hardware and software, interrupt priority. Direct Memory Access (DMA). I/O data format change and error control. RAID – Reliability, availability and dependability. I/O performance measures – Designing an I/O system.

Session Schedule

Name	Start	End
Session 1	**31/08/2017 10:00:00**	**31/08/2017 12:00:00**
Session 2	**07/09/2017 10:00:00**	**07/09/2017 12:00:00**
Session 3	**14/09/2017 10:00:00**	**14/09/2017 12:00:00**

Quiz
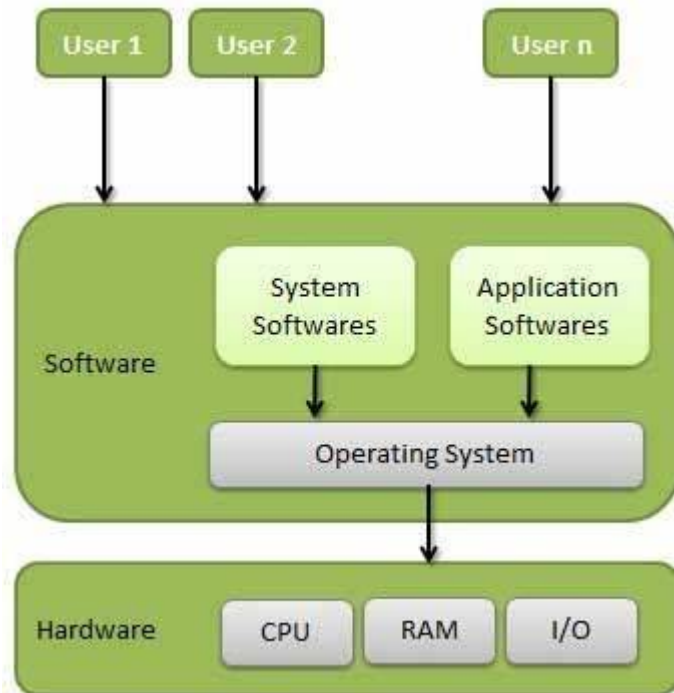
Assignment

Delivered by

Prof. Venkatesh TG **IIT Madras**

Operating Systems Overview - Operating Systems

Operating Systems Overview - Operating Systems

Operating Systems Overview - Operating Systems

Start Date   **: 11/09/2017 10:00:00**

End Date   **: 03/10/2017 12:00:00**

Topic Outline

Topic Name: Operating Systems overview

Relevant Course Name: Operating Systems

Relevant Department: Computer Science

Relevant Semester:

IIT Faculty Name: Prof.Sandip Chakraborty

IIT: Kharagpur

Topic Description and Outline:

Operating system basics – Types of Computer Systems – Computer-system operation – I/O structure – Hardware Protection – System components – System calls – System programs – System structure

Process concept – Process scheduling – Operations onprocesses – Cooperating processes – Interprocess communication – Communication inclient-server systems – Multithreading models – Threading issues – Pthreads

Process synchronization – Deadlock

Basics of memory management

Pre- requisites:

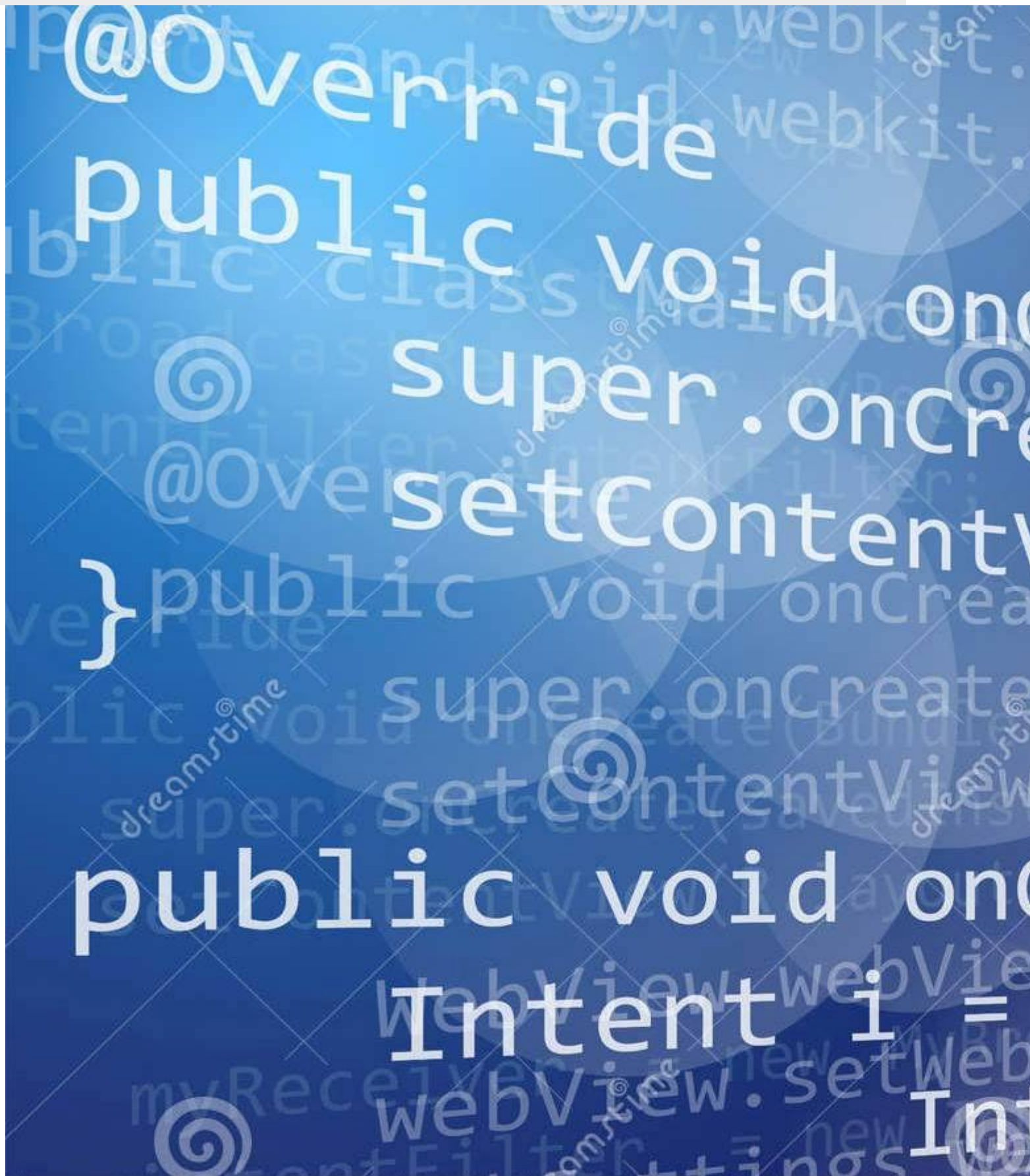Basic ideas of computer architecture and organization

Session Schedule

Name	Start	End
Session 1	**11/09/2017 10:00:00**	**11/09/2017 12:00:00**
Session 2	**12/09/2017 10:00:00**	**12/09/2017 12:00:00**
Session 3	**13/09/2017 10:00:00**	**13/09/2017 12:00:00**

Quiz

Assignment

Delivered by

Prof. Sandip Chakraborthy IIT Kharagpur

Programming Style - Programming and Data Structures

Programming Style - Programming and Data Structures

Start Date	**: 17/08/2017 10:00:00**

End Date	**: 13/09/2017 12:00:00**

Topic Outline

Relevant course: Programming and Data Structures

Relevant department: Especially CSE and IT, but usually all other Departments

also have this course as a basic course in the first year

Pre requisite: NIL

Course outline:

Programming Style: Names, expressions and statements, Consistency and idioms, Functions versus Macros, Magic numbers, Commenting, Control flow and program design

Program efficiency: time and space complexities

Basics of Data structures.

Linked Lists: Singly-linked, Doubly-linked, and circular lists

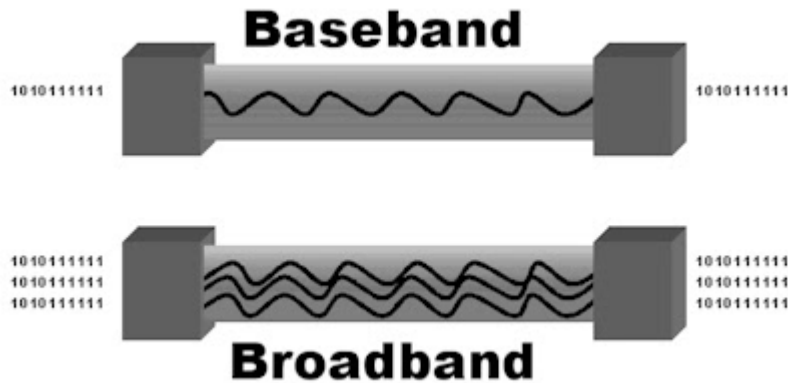**Stacks, and Queues** (If time permits)

Session Schedule

Name	Start	End
Session 1	**17/08/2017 10:00:00**	**17/08/2017 12:00:00**
Session 2	**22/08/2017 10:00:00**	**22/08/2017 12:00:00**
Session 3	**24/08/2017 10:00:00**	**24/08/2017 12:00:00**

Quiz

Assignment

Delivered by:- Prof.Rajib Mall IIT Kharagpur

Baseband Communication - Digital Communication Techniques

Baseband Communication - Digital Communication Techniques

RegisterLast Date : Aug 01 2017

Baseband Communication - Digital Communication Techniques

Start Date	**: 12/09/2017 10:00:00**
End Date	**: 04/10/2017 16:00:00**

Topic Outline

Base Band Communication – Prof. ArunPachaiKannu, IIT Madras

Relevant course: Digital Communication Techniques

Relevant department: ECE,EEE

Pre requisite: Fourier analysis, Shannon sampling theorem

Course outline:

Characteristics of Signals and Frequency domain respresentations

- Linear Modulation

- Power Spectral Density of linearly modulated signals
- Signaling in Bandlimited channels
- Inter-symbol interference (ISI)
- Nyquist criterion for ISI avoidance and Pulse Shaping
- Timing Errors and Eye Pattern
- M-ary Constellations and Power Efficiency
- Nonlinear modulation
- Modulation with memory

Session Schedule

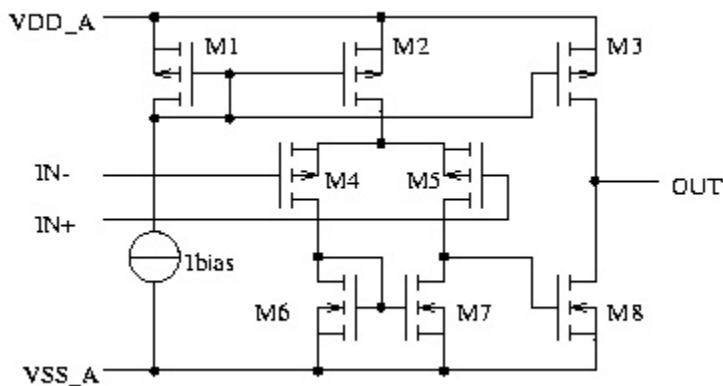| Name	Start	End
Session 1	**12/09/2017 10:00:00**	**12/09/2017 12:00:00**
Session 2	**13/09/2017 10:00:00**	**13/09/2017 12:00:00**
Session 3	**14/09/2017 14:00:00**	**14/09/2017 16:00:00**

Quiz

Assignment

Delivered by

Prof. Arun Pachai Kannu **IIT Madras**

Design with OPAMP - Linear Integrated Circuits

Design with OPAMP - Linear Integrated Circuits

Design with OPAMP - Linear Integrated Circuits

Start Date	: 25/10/2017 14:00:00

End Date	: 20/11/2017 16:00:00

Topic Outline

Topic Name: Design with OPAMP

Relevant Course Name: Linear Integrated Circuits

Relevant Department: Electrical Engg. and; Electronics and Communication Engg.

Relevant Semester: Final year BTech/BE (EE/EC/IN)

IIT Faculty Name: Prof. Hitesh Shirmali (**IIT Mandi)**

Pre- requisites: Opamp, Basic electronics (BJT understanding), control theory, signals and systems

Topic Description and Outline:

Lecture 1 (Opamp overview and oscillators)   **[2 hours]**

- Operational amplifier ICs (741 and TL082): pin diagram and comparison
- Oscillators: basic principle of oscillations, Opamp based RC oscillators: Wien bridge, phase shift and the quadrature oscillators, LC and crystal oscillators

Lecture 2 (Data converters) [2 hours]

- Introduction to data conversion specifications and terminologies
- Digital-to-analog converters (DAC): R-2R, current steering, charge and voltage-scaling DAC
- Analog-to-digital converters (ADC): Flash, SAR and integrating type

Lecture 3 (Passive/active filter design) [2 hours]

- Passive filter understanding: first, second and higher order filter understanding using RLC
- Design of active filter: Sallen and Key filter, Integrator-based biquads

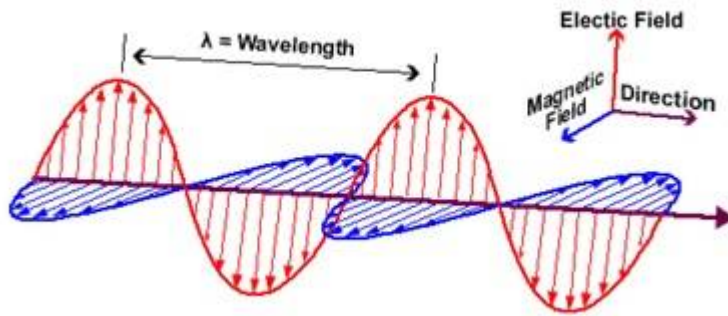Filter approximations: Butterwoth and Chebyshev response

Session Schedule

Name	Start	End
Session 1	**25/10/2017 14:00:00**	**25/10/2017 16:00:00**
Session 2	**27/10/2017 14:00:00**	**27/10/2017 16:00:00**
Session 3	**31/10/2017 14:00:00**	**31/10/2017 16:00:00**

Quiz

Assignment

Delivered by

Prof. Hitesh Shrimali IIT Mandi

Electromagnetic Waves - Electromagnetic Theory

Electromagnetic Waves - Electromagnetic theory

Electromagnetic Waves - Electromagnetic theory

Start Date	**: 24/08/2017 10:00:00**
End Date	**: 19/09/2017 16:00:00**

Topic Outline

Topic Name: Electromagnetic Waves, Prof Deepa Venkatesh, IITM

Relevant Course Name: Electromagnetic Theory

Relevant Department: Electrical

Pre Requisite- Understanding of Line integral, surface integral, volume integral, gradient, divergence, curl, electric field and magnetic field.

Outline:

Electromagnetics

Review of Faraday's Law, Equation of continuity, Lenz Law, Ampere's Law, Gauss Law (in both electric and magnetic field), Stokes theorem, Divergence Theorem. (1 Hour)

Review of Ampere's Law with Displacement current.(1 Hour)

Boundary conditions for Electric Field, Magnetic Field – dielectric boundaries, conductor boundaries.(1 Hour)

Application cases for boundary conditions. (1 Hour)

Derivation of electromagnetic wave equations. (1 Hour)

Discussion of Tutorial Problems on the above topics. (1 Hour)

Session Schedule

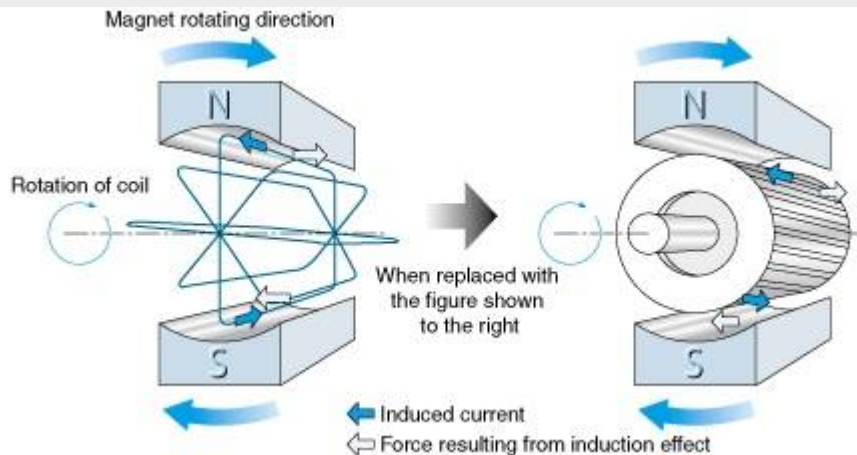| Name	Start	End
Session 1	24/08/2017 10:00:00	24/08/2017 12:00:00
Session 2	28/08/2017 14:00:00	28/08/2017 16:00:00
Session 3	30/08/2017 14:00:00	30/08/2017 16:00:00

Quiz

Assignment

Delivered by

Prof.Deepa Venkitesh IIT Madras

Induction Machines:Theory - Electrical Machines

Magnet rotating direction

N

Rotation of coil

S

When replaced with the figure shown to the right

N

S

← Induced current
⇐ Force resulting from induction effect

Induction Machines:Theory - Electrical Machines

RegisterLast Date : Aug 01 2017

Induction Machines:Theory - Electrical Machines

Start Date	: 18/09/2017 10:00:00

End Date	: 12/10/2017 16:00:00

Topic Outline

Relevant Course: Electrical Machines

Relevant Department : Electrical Engineering

Relevant Semester: 3rd sem or 4th sem

Pre-requisite: 1. Magnetic circuits 2. Basics of Transformers 3. Basics of 3-phase circuits 4. Biot-Savart's law and Lenz's law

Course Description & Outline :

1. Basic operating principle of 3 phase induction machines.
2. Construction, advantages and disadvantages over other machines, similarities and differences between transformers and induction machines.
3. Different mode of operations: Motoring, generating and plugging regions.
4. Development of equivalent circuit model, determination of eq.ckt parameter using free-running and blocked rotor tests.
5. Torque expression, slip-torque characteristics, expression for Tmax, Smax and influence of various parameters on slip torque curve of the machine

6. Starting methods for 3-phase induction machines
7. Basics of speed control and PF improvement.
8. Basics of braking of induction motors.

Session Schedule

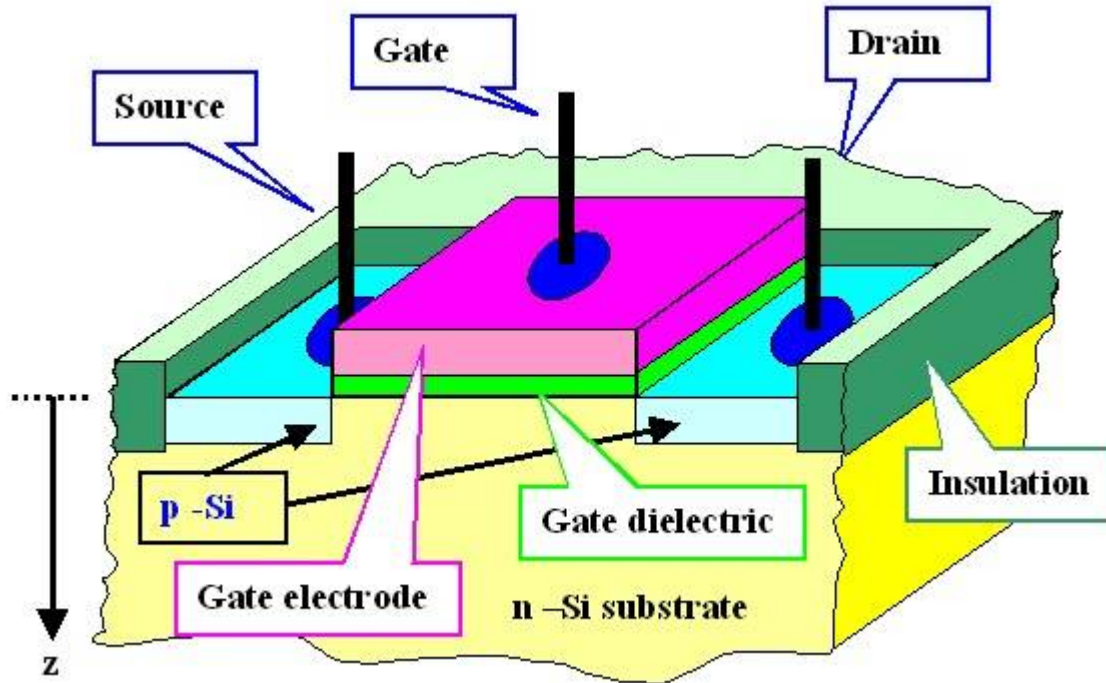| Name	Start	End
Session 1	18/09/2017 10:00:00	18/09/2017 12:00:00
Session 2	21/09/2017 10:00:00	21/09/2017 12:00:00
Session 3	22/09/2017 14:00:00	22/09/2017 16:00:00

Quiz

Assignment

Delivered by

Prof. Bhuvaneshwari G IIT Delhi

MOS Transistor Principle - Digital VLSI

MOS Transistor Principle - Digital VLSI

RegisterLast Date : Aug 01 2017

MOS Transistor Principle - Digital VLSI

Start Date   **: 17/10/2017 10:00:00**

End Date   **: 15/11/2017 12:00:00**

Topic Outline

MOS Transistor Principle – Prof Deleep R Nair, IIT Madras

Relevant course: Digital VLSI

Relevant department: EEE,ECE

Pre requisite: Basic knowledge of semiconductor device physics

Course outline:

MOS devices- Concept of Accumulation, depletion and inversion; Capacitance-voltage characteristics

MOS Transistors- Current-Voltage characteristics, Threshold Voltage and Body effect, DIBL and Short-channel effects, Brief introduction of FinFET

Session Schedule

Name	Start	End
Session 1	17/10/2017 10:00:00	17/10/2017 12:00:00
Session 2	24/10/2017 10:00:00	24/10/2017 12:00:00
Session 3	26/10/2017 10:00:00	26/10/2017 12:00:00

Quiz

Assignment

Delivered by

Prof. Deleep Nair **IIT Madras**

Stability Analysis of Nonlinear Systems – Control Systems

RegisterLast Date : Aug 01 2017

Stability Analysis of Nonlinear Systems - Control Systems

Start Date	**: 06/10/2017 14:00:00**
End Date	**: 05/11/2017 16:00:00**

Topic Outline

Stability Analysis of Non Linear Systems– Prof Tushar Jain, IIT Mandi

Relevant course: Control System

Relevant department: B.Tech (all branches) 3rd and 4th year - interested in control systems and stability analysis

Pre requisite: Network theory / Control systems intended for: B.Tech (all branches) 3rd and 4th year - interested in control systems and stability analysis

Course outline:

Preamble:

Most systems are nonlinear, and therefore, it is of general interest to investigate possible behaviors of nonlinear systems, investigate their stability, and to design control schemes. For example, there are many situations in Power systems where linear controllers are used. For these one would like to investigate behavior under "large signal conditions" when nonlinearities cannot be ignored. And there are areas like Robotics where designs based on linear models do not work well.

Intended learning outcomes:

- Get a feel for the qualitatively different trajectories possible in nonlinear systems.
- Understand when and how linearized models can be useful for studying behavior around equilibrium points, and near limit cycles.
- Master Lyapunov stability theory and its modern control theoretic extensions.

Course Outline:

Linear and nonlinear system behaviors - Quick recapitulation of linear differential equations, and their solutions. Qualitative properties of nonlinear systems. Existence and uniqueness of solutions to Ordinary differential equations. Linearizations. Phase portraits, limit cycles.

Lyapunov's stability theory - Notions of stability. Lyapunov's stability theorem. Lasalle's invariance principle. Circle criterion, Popov criterion. Lyapunov-Krasovskiifunctionals.

References:

1. Nonlinear Systems H. Khalil, 3rd edition, 2014, Pearson 2. Nonlinear Dynamical Systems and Control, W. Haddad, and V. Chellaboina, 2008, Princeton University press 3. Stability and Stabilization: An Introduction, W. J. Terrell, 2009, Princeton University press

Session Schedule

Name	Start	End
Session 1	**06/10/2017 14:00:00**	**06/10/2017 16:00:00**
Session 2	**13/10/2017 14:00:00**	**13/10/2017 16:00:00**
Session 3	**16/10/2017 14:00:00**	**16/10/2017 16:00:00**

Quiz

Assignment

Delivered by

Prof. Tushar Jain IIT Mandi

Basic Concepts and First Law of Thermodynamics - Engineering Thermodynamics

Basic Concepts and First Law of Thermodynamics - Engineering Thermodynamics

Basic Concepts and First Law of Thermodynamics - Engineering Thermodynamics

Start Date	: 05/08/2017 10:00:00

End Date :

Topic Outline

Topic Name: Basic Concepts & First Law of Thermodynamics

Relevant Course Name: Engineering Thermodynamics

Relevant Department: Mechanical Engineering

Relevant Semester: B.Tech 1st & 2nd Year

IIT Faculty Name: Prof. P.M.V. Subbarao

IIT: Delhi

Topic Description and Outline:

Heat and Work

- Definition of Thermodynamic Work
- Units for Work
- Forms of Work
- Definition of Heat
- Inter Convertibility of Heat/work into Work/heat
- Governing Principles
- Sign Convention

First Law of Thermodynamics : Basics

- Statement of First Law of Thermodynamics :
- First Law for Cyclic Process
- First Law for Change of State of A System :
- Internal Energy, A New Thermodynamic Property
- Enthalpy
- The Constant Volume and Constant Pressure Specific Heats
- The internal Energy, Enthalpy and Specific Heats of An Ideal Gas.

First Law of Thermodynamics : Flow Devices

- First Law as a Rate Equation
- First Law Applied to a Control Volume
- The SSSF and USUF Processes.
- Case Study of Engineering Devices

Session Schedule

Quiz

Assignment

Delivered by

Prof. P.M.V. SubbaraoIIT Delhi

# INTRODUCTION TO FLUID MECHANICS

SCOPE OF FLUID MECHANICS

Fluid mechanics is the study of fluids at rest or in motion.

It has traditionally been applied in areas as the design of canal and dam systems; the design of pumps, compressors, and piping and ducting used in the water and air conditioning systems of homes and businesses, piping systems needed in chemical plants; the aerodynamics of automobiles and sub- and supersonic airplanes; and the development of many different flow measurement devices such as gas pump meters.

Many exciting areas have developed in the last quarter-century. Some examples include environmental and energy issues (e.g., containing oil slicks, large-scale wind turbines, energy generation from ocean waves, the aerodynamics of large buildings, and the fluid mechanics of the atmosphere and ocean and of phenomena such as tornadoes, hurricanes, and tsunamis, biomechanics (e.g., artificial hearts and valves and other organs, sports, "smart fluids" (e.g., in automobile suspension systems to optimize motion under all terrain conditions, military uniforms containing a fluid layer that is "thin" until combat, when it can be "stiffened" to give the soldier strength and protection, and fluid lenses with humanlike properties for use in cameras and cell phones); and microfluids (e.g., for extremely precise administration of medications).

DEFINITION OF FLUID AND BASIC CONCEPTS

A fluid is a substance that deforms continuously under the application of a shear (tangential) stress no matter how small the shear stress may be. Fluids tend to flow when we interact with them while solids tend to deform or bend. We can also define a fluid as any substance that cannot sustain a shear stress when at rest.
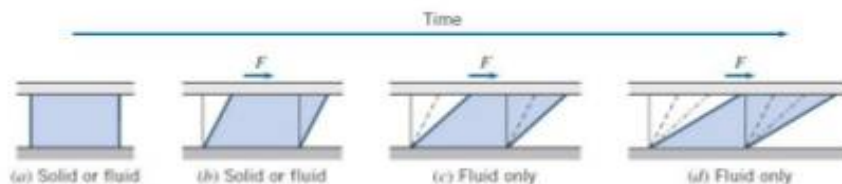
Concepts in Fluid Mechanics - Fluid mechanics

Start Date	**: 29/08/2017 14:00:00**

End Date	**: 21/09/2017 12:00:00**

Topic Outline

Relevant Course: Fluid Mechanics

Relevant Department: Mechanical Engineering, Civil Engineering, Aerospace Engineering, Automobile 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:

Fluid Kinematics: Eulerian and Lagrangian approach, concept of streamline, streakline, pathline, deformation and rotation, vorticity and angular velocity, constraint of incompressibility and continuity equation, stream function and velocity potential

Dynamics of inviscid flows: Euler and Bernoullis equation and their applications

Reynolds Transport Theorem (RTT): Derivation of Reynolds Transport Theorem, Application of RTT to Conservation of Mass and Momentum

Differential form of Conservation Equations: Continuity and Navier-Stokes equations and their derivation

Some exact solutions of Navier-Stokes equation for steady incompressible flows:Fully developed low 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), concept of friction factor and application to pipe flow design

Session Schedule

Name	Start	End
Session 1	29/08/2017 14:00:00	29/08/2017 16:00:00
Session 2	30/08/2017 10:00:00	30/08/2017 12:00:00
Session 3	31/08/2017 10:00:00	31/08/2017 12:00:00
Session 4	01/09/2017 10:00:00	01/09/2017 12:00:00

Quiz

Assignment

Delivered by

<u>Dr.Suman Chakraborty</u> IIT Kharagpur

Constitution of Alloys and Phase Diagrams - Engineering Material and Metallurgy

Constitution of Alloys and Phase Diagrams - Engineering Material and Metallurgy

Constitution of Alloys and Phase Diagrams - Engineering Material and Metallurgy

Start Date	: 14/08/2017 14:00:00
End Date	: 07/09/2017 12:00:00

Topic Outline

Constitution of Alloys and Phase Diagram:– Prof Sushanta Kumar Panigrahi, IIT Madras

Relevant course: **Engineering Material & Metallurgy**

Relevant department: Mechanical

Course outline:

Constitution of alloys – Solid solutions, substitutional and interstitials – Phase diagrams and microstructure development: Isomorphous, eutectic, peritectic, eutectoid and peritectroid alloy systems. Iron-Iron carbide equilibrium diagram.

Session Schedule

Name	Start	End
Session 1	**14/08/2017 14:00:00**	**14/08/2017 16:00:00**
Session 2	**16/08/2017 10:00:00**	**16/08/2017 12:00:00**
Session 3	**18/08/2017 10:00:00**	**18/08/2017 12:00:00**

Quiz

Assignment

Delivered by

Prof. Sushanta Kumar Panigrahi IIT Madras

Joining Processes - Manufacturing Technology

Joining Processes - Manufacturing Technology

RegisterLast Date : Aug 01 2017

Joining Processes - Manufacturing Technology

Start Date   **: 21/08/2017 10:00:00**

End Date   **: 18/09/2017 12:00:00**

Topic Outline

Joining processes – Prof Sushanta Kumar Panigrahi, IIT Madras

Relevant course: Manufacturing Technology

Relevant department: Mechanical

Course outline:

Fundamentals of welding, Fusion based and resistance based welding processes, Solid state welding processes, Brazing and soldering; Welding defect analysis.

Session Schedule

Name	Start	End
Session 1	**21/08/2017 10:00:00**	**21/08/2017 12:00:00**
Session 2	**28/08/2017 10:00:00**	**28/08/2017 12:00:00**
Session 3	**29/08/2017 10:00:00**	**29/08/2017 12:00:00**

Quiz

Assignment

Delivered by

Prof. Sushanta Kumar Panigrahi IIT Madras