KL University

Course structure for IV semester

Mechanical Engineering

S. No	Course Code	Course Title	Offered in Even/ Odd Sem.	L-T-P	Credits	Pre-requisite	Compulsory / Option
1.	13-ES 204	Data Structures	**Even & Odd**	3-0-2	4	13-ES101	Compulsory
2.	13-ES 205	Digital Signal Processing	**Even & Odd**	3-0-2	4	13-BS102	Compulsory
3.	13-ES 202	Object Oriented Programming	**Even & Odd**	3-0-2	4	13-ES101	Compulsory
4.	13-BS-202	Complex Variable & Discrete Mathematics	**Even & Odd**	3-0-0	3	13-BS 101&102	Compulsory (ECE,EEE,ME)
5.	13-ME 202	Applied Thermodynamics	Even	3-0-2	4	13-ES 107	Compulsory
6.	13-ME 206	Mechanisms and Machine theory	Even	3-0-2	4	13-ES 106	Compulsory

KL UNVERSITY

II/IV B.Tech II Semester

(Common to EEE and ME)

COMPELX VARIABLES AND DISCRETE MATHEMATICS

Course code: 13BS111 **Syllabus** **L-T-P: 3-0-0**

Complex variables: Analyticity functions, Cauchy-Riemann equations in Cartesian and polar coordinates. Harmonic and conjugate harmonic functions, Milne – Thompson method. Line integral, Cauchy's integral theorem, Cauchy's integral formula, generalized integral formula. Expansion in Taylor's series, Maclaurin's series and Laurent series. Types of singularities. Residue, Cauchy's residue theorem, evaluation of integrals by using residues, bilinear transformation and its applications. (13)

Special functions: Bessel functions, recurrence relations for $J_n(x)$, orthogonality of Bessel functions, generating function for $J_n(x)$, integral form of Bessel's function, Jacobi's series, Legendre's equation, Rodrigues's formula, Legendre polynomials, generating function for $P_n(x)$, recurrence relation for $P_n(x)$, orthogonality of Legendre polynomials. (10)

Difference equations: introduction, definition, difference equation of first and second order, formation of difference equation, linear difference equation, rules for finding C.F and P.I, Simultaneous difference equation with constant coefficients, application to deflection of a loaded string.(9)

Graph theory: Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, multi-graphs, (Problems and Theorems without proofs) ,Planar Graphs, Euler's Formula, Graph Colouring and Covering, Chromatic Number,(Problems and Theorems without proofs)Trees, Directed trees, Binary Trees, Decision Trees,Spanning Trees: Properties, Algorithms for Spanning trees and Minimum Spanning Tree.(13)

Text Books:

1. Advanced Engineering Mathematics (Tenth Edition), Erwin Kreyszig.
2. Discrete Mathematical Structures with Applications to computer science J.P Tremblery, R.Manohar, TMH
3. Discrete Mathematical for computer Scientists & Mathematicians " J.L. Molt, A.Kandel T.P.Baker, PHI

Reference Books:

1. Higher Engineering Mathematics, By Dr. B.S. Grewal. Publisher: Khanna, New Delhi.
2. Discrete Mathematics, Malik, Sen, 6th ed., Cengage Learning, 2004
3. Discrete Mathematics for computer science, Bogart, Stein and Drysdale, Springer, 2005

K L UNIVERSITY

Course Code : 13-ES204
Course Title : DATA STRUCTURES
Course Structure : L-T-P : 3-0-2
Prerequisite : Problem solving through programming

Course Competencies:

1. Understand algorithm analysis, data structures, sorting, searching, merging and trees.
2. Understand the role of Data structures in development of computer applications.
3. Analyze linear data structures model its usage in an application implementation.
4. Analyze Non-linear data structures and model its usage in an application.
5. Apply sorting to model its usage in an application.
6. Design searching algorithms including Linear Search and Binary Search to search a given key element.
7. Create an application using appropriate techniques like divide and conquer recursion, hashing, collision resolution techniques.
8. Evaluate various algorithms implemented based on various data structures.

Syllabus :

Algorithm Analysis: Mathematical Background, Model, Analyze, Running Time Calculations, Lists**. Stacks and Queues:** Abstract Data Types (ADTs), The List ADT, vector and list in the STL, Implementation of vector, Implementation of list, The Stack ADT, The Queue ADT. **Trees:** Preliminaries, Binary Trees, The Search Tree ADT—Binary Search Trees, AVL Trees, Splay Trees, Tree Traversals (Revisited), B-Trees, Red black trees **Hashing:** General Idea, Hash Function, Separate Chaining, Hash Tables without Linked Lists, Rehashing, Hash Tables in the Standard Library, Extendible Hashing. **Priority Queues (Heaps):** Model, Simple Implementations, Binary Heap, Applications of Priority Queues. **Sorting:** Preliminaries, Insertion Sort, A Lower Bound for Simple Sorting Algorithms, Shell sort, Heap sort, Merge sort, Quick sort, Indirect Sorting, A General Lower Bound for Sorting, Bucket Sort, External Sorting. **Graph Algorithms:** Definitions, Topological Sort, Shortest-Path Algorithms, Minimum Spanning Tree.

TEXT BOOKS:

1) Data Structures and Algorithm Analysis in C, 2008 , Third Edition, by Mark Allen Weiss, Pearson Education.

REFERENCE BOOKS:

1. "Data Structures And Algorithms", Pearson Education, First Ed ition by A. V. Aho, J. E. Hopcroft, And J. D. Ullman, Reprint 2003.
2. "Data Structures", Second Edition, by R. F. Gilberg, B. A. Forouzan, Thomson India Ed ition, 2005
3. An Introduction to Data Structures with Applications by Jean-Paul Tremblay, Paul g. Sorenson, Tata Mc Graw hill Edition – Second Edition.
4. Theory and Problems of Data Structures by Seymour Lipschutz- Mc Graw hill Edition
5. Data Structures & Program Design in C by Robert Kruse, C.L. Tondo, Bruce Leung, Shashi Mogalla.
6. Data Structures and Algorithms in C++ by Michael T. Goodrich, Roberto Tamassia, David Mount.
7. Data Structures using C & C++ by Yedidyah Langsam, Moshe J. Augenstein, Aaron M. Tenebaum.

K L UNIVERSITY
COURSE HANDOUT DOCUMENT

Program Name : B.Tech (All Engineering Branches)
Semester :
Course No : 13ES205
Course Title : **DIGITAL SIGNAL PROCESSING**
Course Detail : Theory **(Common Subjects)**
Course Structure :
Credits : 4 L – T – P: 3--0--2
Pre-requisite :
Course Coordinator :
Team of Instructors :

I. COURSE CONTENT & OVERVIEW

The course presents an overview of the nature of signals, algorithms and techniques used to process those signals and the applications to which digital signal processing can be usefully employed. Signal Processing is concerned with developing and understanding of the concepts underlying signal processing. The concept, structure, organization and characteristics of signals are discussed with an examination of the spectrum of periodic signals and the frequency domain and the distinction between signal and noise, the causes of noise and the effects of noise and other factors on signal quality. Techniques for processing signals are examined including filtering and non-filtering processes. Architecture and algorithms for signal processing are presented; graphical and spectral analysis, Fast Fourier Transforms and the underlying concepts of digital signal processors. Example applications for signal processing are presented.

II. SCOPE AND OBJECTIVE

The objective of this course is to introduce basic concepts and different approaches for Signal Processing. To inculcate students to work and develop hands on knowledge over digital signal processing algorithms and filters.

III. COMPETENCIES

	COMPETENCY
C 1	The student will demonstrate and understand time and Frequency domain versions of signals
C 2	Distinguish and Classify Various types of signals and systems
C 3	Understanding Sampling and Convolution
C 4	Analyze and apply various transform techniques for processing and analysis.
C 5	Understanding the Discrete Fourier Transform and Fast Fourier Transform
C 6	Design digital IIR filters
C 7	The student will Design digital FIR filters.

IV. SYLLABUS

REPRESENTATION OF SIGNALS: Continuous and discrete time signals: Classification of Signals - Periodic aperiodic even - odd - energy and power signals - Deterministic and random signals - complex exponential and sinusoidal signals – periodicity. Observations of signals in daily life like voice, speech and audio, and electrical, mechanical, thermal, hydraulic, bio-medical signals and systems. **SAMPLING AND CONVOLUTION:** Sampling theorem, impulse sampling, Natural and flat top sampling, reconstruction of signals from its samples, effect of under sampling-Aliasing introduction to band pass sampling, Spectra of sampled signals. Parseval's theorem, power density spectrum, Convolution of continuous and discrete time signals in time and frequency domain, graphical representation of Convolution, convolution Property and Multiplication property. Comparison of circular convolution and linear convolution. **TRANSFORMS FOR SIGNAL PROCESSING APPLICATIONS:** A review of Fourier and Laplace transforms and continuous wavelet transform for signal processing and system analysis. **FILTERS AND DFT, FFT:** Ideal LPF, HPF and BPF characteristics, causality and Paley-wiener criterion for physical realization. Discrete Fourier Transform, Properties of DFT, FFT Introduction, DIT-FFT, DIF-FFT, and Computation of Inverse DFT, Introduction to Discrete wavelet transform. **DIGITAL FILTER-IIR DESIGN:** Introduction, properties of IIR filters, Design of Digital Butterworth

and Chebyshev filters using Bilinear transformation, Impulse invariance transformation methods, Design of digital filters using frequency transform method. **DIGITAL FILTER-FIR DESIGN:** Introduction, Characteristics of Linear Phase FIR filters, frequency Response, Designing FIR filters using Windowing Methods, Comparison of IIR & FIR Filters.

TEXT BOOKS

1. Alan V Oppenheim, Alan S Willsky, S Hamid Nawab, "Signals and Systems," Second Edition, PHI, 2006.
2. B.P.Lathi, "Signals, systems and communications" BSP, 2003.
3. John G Proakis, Dimtris G Manolakis, "Digital Signal Processing: Principles, Algonithms and Applications", Pearson Education, 2007.
4. Kumar, A. Anand, "Digital Signal Processing," PHI.
5. Raghuveer rao and Ajit S.Bopardikar, Wavelet transforms: Introduction, Theory and applications, Pearson Education Asia, 2000.

SOME SUGGESTED TEXTBOOKS/ REFERENCE BOOKS

1. Ludeman, "Fundamentals of Digital Signal Processing", Wiley India Pvt. Ltd, 1986.
2. Simon Haykin and Barry Van Veen, "Signals and Systems", John wiley, 1999.
3. Douglas K. Lindner, "Introduction to Signals and Systems", Mc-Graw Hill International, 1999.
4. Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems", John Wiley and Sons (SEA) Private Limited, 1995.

SIMULATION TEXT BOOKS

1. M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB," Tata Mc Graw Hill Edition, 2003.
2. Vinay . Ingle, John G Proakis, "Digital Signal Processing Using Matlab," PWS Publishing, 2010.
3. Paul Tobin, "Pspice for Digital Signal Processing," Morgan & ClayPool, 2007.
4. Nasser kehtarnavaz, Namjin kim, "Digital Signal Processing System Level Design using LabVIEW," Elsevier, 2005.

Course Code: 13-ES202

Course Title: OBJECT ORIENTED PROGRAMMING
Course Structure: L-T-P : 3-0-2
Prerequisite: problem solving through programming
Course Competencies:

1. Make the students understand the syntax and semantics of C++ programming Language
2. Make the students practice C++ development tool
3. Understand a specific domain and some real-life problems related to the domain
4. Write sample programs for practicing the concepts
5. Write full pledged programs that solves the real life problems in a specific domain
6. Be able to test the C++ programs to prove proper development of the same

Syllabus

Types and Declarations, Pointers, Arrays, and Structures, Expressions and Statements, Functions, Namespaces and Exceptions, Source Files and Programs. Classes, Operator Overloading, Derived Classes, Templates, Exception Handling, Class Hierarchies. Library Organization and Container, Standard Containers, Algorithms and Function Objects, Iterators and Allocators, Strings, Streams, Numeric's.

Textbook:

1. The C++ Programming Language by Bjarne Stroustrup, Addison-Wesley Professional; 4^{th} editions, 2012.

Reference Books:

1. C++ How to Program, Third Edition, Deitel HM and Deitel PJ: PHI.
2. Thinking in C++: Introduction to Standard C++, Volume One, by Bruce Eckel, Prentice Hall; 2 edition (March 25, 2000).
3. Object-Oriented Programming in C++ (4th Edition), by Robert Lafore, Sams Publishing; 4 edition (December 29, 2001).
4. Object-Oriented Programming using C++ by Joyce Farrell
5. Principles of Object-Oriented Programming by Stephen Wong
6. Professional C++ by Nicholas A. Solter, Scott J. Kleper.
7. Problem Solving with C++(6^{th} Edition) by Walter Savitch.
8. C++ Programming Design by Cohoon & Davidson- Third Edition.
9. Starting Out with C++ by Tony Gaddis- Sixth Edition.
10. C++ Primer – Third Edition by Stanley B. Lippman Josee Lajoie.

KL University
Academic Year: 2013-14

L – T - P
3 – 0 - 2

Course Code	:	13-ME 206
Course Title	:	Mechanisms and Machine Theory
Credits	:	4
Marks	:	40+60
PreRequisite	:	13-ES 106

Competencies:
At the end of the course the student should be able to:

1. Identify and distinguish basic and advanced mechanisms in the study and control of motion
2. Synthesis graphically multilink mechanisms.
3. Analyze to find the position, velocity, acceleration of multi-bar mechanisms.
4. Analyze and design Cams for various applications
5. Analyze gears
6. Analyze gear trains.
7. Perform static and dynamic balance of machinery.
8. analyze and apply gyroscopic principles for automobiles

Mechanisms and Machines: Kinematics and Dynamics, Mechanisms and Machines, Introduction to Plane and Space Mechanisms, Kinematic Pairs, Kinematic Chains, Kinematic Diagrams, Kinematic Inversion, Four Link Planar Mechanisms and their Inversions, Mobility and range of movement - Kutzbach and Grubler's criterion, Grashof's criterion. **Velocity analysis:** Instantaneous Centre (IC) of Velocity, Velocity analysis using IC and relative velocity method- four link mechanism, slider crank mechanism and crank and slotted lever mechanism, rubbing velocity. **Acceleration analysis:** Acceleration Diagrams, four link mechanism, slider crank mechanism Corioli's component of acceleration and crank and slotted lever mechanism. **Cams: C**lassification of cams and followers, nomenclature, Motion of follower, cam profiles of knife edge, roller and offset followers of reciprocating motion. **Gears and Gear trains:** Gears – terminology, fundamental law of gearing, involute profile. Interference and undercutting. **Gear Trains** – simple, compound and epicyclic gear trains. **Balancing:** Introduction, Static balancing, Dynamic balancing, Transferring of a Force from one plane to another, Balancing of Several Masses in Different planes, Balancing of Reciprocating Mass, Secondary Balancing. **Dynamic force analysis**: Force analysis of Slider crank mechanism. **Gyroscopes :** Angular Velocity, Angular Acceleration, Gyroscopic Torque, Gyroscopic Effect on Naval Ships, Stability of an Automobile, Stability of a Two-Wheel vehicle.

Text Book:

1. Machines and Mechanisms-Applied Kinematic Analysis by David H. Myszka, 4th Edition, Prentice Hall
2. Kinematics and Dynamics of Machinery by Robert Norton 1st Edition, Tata McGraw - Hill Education, 2009
3. Theory of Machines and Mechanisms by Shigley J.E., and Uicker J.J., McGraw Hill, 1995.

Reference books:

1. Theory of Machine by Thomas Bevan, CBS Publications.
2. The Theory of Machines through Solved Problems, Rao, J. S., New Age International.
3. Machanisms and Machine Theory by A.Ghosh and A.K.Mallik, 3rd edition, EWP Pvt.Ltd.
4. Theory of Machine by S.S.Rattan Mc.Graw Hill
5. NPTEL lectures : http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-Delhi/Kinematics_of Machine/index.htm

K L UNIVERSITY

MECHANICAL ENGINEERING DEPARTMENT

1. COURSE NAME : APPLIED THERMODYNAMICS
2. COURSE CODE : 13ME202
3. L – T – P – C : 3 – 0 – 2 – 4

COMPETENCIES: At the end of the course the student will acquire these competencies (Skills).

Competency Number	Competency	Cognitive Level
C1	Understand phase equilibrium of a pure substance	Understand
C2	Estimate efficiency of Rankine vapor power cycle	Estimate
C3	Estimate boiler performance	Estimate
C4	Estimate dimensional parameters of various steam nozzles including convergent and divergent nozzles	Estimate
C5	Determine overall efficiency of various steam turbines including impulse and reaction turbines	Estimate
C6	Compare various steam condensers including jet and surface condensers by estimating condenser vacuum, vacuum efficiency and condenser efficiency	Apply
C7	Compare various methods of refrigeration by understanding working principles	Apply
C8	Understand principle of psychrometry and air-conditioning process	Understand

SYLLABUS

Pure Substances: Pure substance vapor-liquid-solid phase equilibrium in a pure substance, Independent properties of a pure substance, Tables of thermodynamic properties, Mollier Chart.

Vapor Power Cycles: Rankine cycle, methods to improve performance of the Rankine cycle, Ideal regenerative cycle, practical regenerative system, Binary vapor power cycle.

Steam Generators: Function, classification, Mountings and accessories, Modern high pressure boilers , critical and super-critical boilers, Draught- natural& forced, calculation of boiler efficiency equivalent rate of evaporation.

Steam Nozzles:, Types of nozzles, isentropic flow through nozzles, effect of friction, nozzle efficiency, critical pressure ratio and maximum discharge, calculation of throat and exit areas using Mollier diagram, supersaturated flow.

Steam Turbines: Types of steam turbines, impulse turbines, pressure and velocity compounding, velocity diagrams, work output, power, blade efficiency and stage efficiency, Reaction turbines, velocity diagrams, degree of reaction, work output, power, blade efficiency and stage efficiency, Governing of turbines, overall efficiency and reheat factor.

Steam Condensers: Jet and surface condensers, condenser vacuum and vacuum efficiency, condenser efficiency, thermodynamic analysis, air pumps, capacity of air extraction pumps.

Refrigeration: Need for refrigeration, definitions, Methods of refrigeration, vapor compression refrigeration system, vapor absorption refrigeration cycle air refrigeration system.

Psychrometry: Psychrometric properties, psychrometric chart and air-conditioning process.

TEXT BOOKS:

1. Applied Thermodynamics- T.D.Eastop-6E- Longman scientific & Technical & John Wiley, New York.

REFERENCE BOOKS:

1. Engineering Thermodynamics - Cengel & Boles
2. Engineering Thermodynamics - P.K.Nag, TMH, New Delhi
3. Applied Thermodynamics - R.Yadav-CBH, Allahabad
4. Power Plant Engineering (Steam & Nuclear) - P.K.Nag, TMH.
5. Steam Turbines Theory & Practice - Kearton, ELBS

Note: *use of steam tables and R&AC tables is permitted in university examinations.*