COURSE CODE	COURSE NAME	L-T-P-C	YEAR OF INTRODUCTION
EC361	Digital System Design	3-0-0-3	2016

Prerequisite: EC207 Logic Circuit Design

Course objectives:

1. To study synthesis and design of CSSN
2. To study synthesis and design of ASC
3. To study hazards and design hazard free circuits
4. To study PLA folding
1. To study architecture of one CPLDs and FPGA family

Syllabus:

Clocked synchronous networks, asynchronous sequential circuits, Hazards, Faults, PLA, CPLDs and FPGA

Expected outcome:

The student will be able:

1. To analyze and design clocked synchronous sequential circuits
2. To analyze and design asynchronous sequential circuits
3. To apply their knowledge in diagnosing faults in digital circuits, PLA
4. To interpret architecture of CPLDs and FPGA

Text Books:

1. Donald G Givone, Digital Principles & Design, Tata McGraw Hill, 2003
2. John F Wakerly, Digital Design, Pearson Education, Delhi 2002
3. John M Yarbrough, Digital Logic Applications and Design, Thomson Learning

References:

1. Miron Abramovici, Melvin A. Breuer and Arthur D. Friedman, Digital Systems Testing and Testable Design, John Wiley & Sons Inc.
2. Morris Mano, M.D.Ciletti, Digital Design, 5th Edition, PHI.
3. N. N. Biswas, Logic Design Theory, PHI
4. Richard E. Haskell, Darrin M. Hanna , Introduction to Digital Design Using Digilent FPGA Boards, LBE Books- LLC
5. Samuel C. Lee, Digital Circuits and Logic Design, PHI
6. Z. Kohavi, Switching and Finite Automata Theory, 2nd ed., 2001, TMH

Course Plan

Module	Course content	Hours	End Sem. Exam Marks
I	Analysis of clocked Synchronous Sequential Networks(CSSN)	2	15
	Modelling of CSSN – State assignment and reduction	1	
	Design of CSSN	2	
	Iterative circuits	1	
	ASM Chart and its realization	2	
II	Analysis of Asynchronous Sequential Circuits (ASC)	2	15
	Flow table reduction- Races in ASC	1	
	State assignment problem and the transition table- Design of AS	2	
	Design of Vending Machine controller.	2	

FIRST INTERNAL EXAM			
III	Hazards – static and dynamic hazards – essential	1	**15**
	Design of Hazard free circuits – Data synchronizers	1	
	Mixed operating mode asynchronous circuits	1	
	Practical issues- clock skew and jitter	1	
	Synchronous and asynchronous inputs – switch bouncing	2	
IV	Fault table method – path sensitization method – Boolean difference method	2	**15**
	Kohavi algorithm	2	
	Automatic test pattern generation – Built in Self Test(BIST)	3	
SECOND INTERNAL EXAM			
V	PLA Minimization - PLA folding	2	**20**
	Foldable compatibility Matrix- Practical PLA	2	
	Fault model in PLA	1	
	Test generation and Testable PLA Design.	3	
VI	CPLDs and FPGAs - Xilinx XC 9500 CPLD family, functional block diagram– input output block architecture - switch matrix	3	**20**
	FPGAs – Xilinx XC 4000 FPGA family – configurable logic block - input output block, Programmable interconnect	3	
END SEMESTER EXAM			

Question Paper Pattern (End semester exam)

Max. Marks: 100 **Time : 3 hours**

The question paper shall consist of three parts. Part A covers modules I and II, Part B covers modules III and IV, and Part C covers modules V and VI. Each part has three questions uniformly covering the two modules and each question can have maximum four subdivisions. In each part, any two questions are to be answered. Mark patterns are as per the syllabus with 50 % for theory, derivation, proof and 50% for logical/numerical problems.

COURSE CODE	COURSE NAME	L-T-P-C	YEAR OF INTRODUCTION
EC360	Soft Computing	3-0-0 -3	2016

Prerequisite: NIL

Course objectives:

1. To familiarize various components of soft computing like fuzzy logic, neural networks and genetic algorithm.
2. To give an overview of fuzzy Logic and to understand the concepts and terminologies of fuzzy systems
3. To give a description on artificial neural networks with its advantages and application.
4. To study the fundamentals of Genetic Algorithm (GA).
5. To understand the concepts of hybrid systems.

Syllabus:

Fuzzy sets and systems. Neural Networks - Applications - typical architecture, pattern Classification and pattern Association. Fundamentals of Genetic Algorithm, AI search algorithm and hybrid structure.

Expected outcome:

The students will be able to:

1. Identify and describe soft computing techniques and their roles in building intelligent Machines.
2. Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems
3. Recognize the feasibility of applying a soft computing methodology for a particular Problem.
4. Apply neural networks to pattern classification and regression problems.
5. Apply genetic algorithms to combinatorial optimization problems

Text Books:

1. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley,N.Y, 1989.
2. Laurene V. Fausett, (1993) “Fundamentals of Neural Networks: Architecture, Algorithms and Applications", Prentice Hall.
3. Timothy J. Ross, “Fuzzy Logic with Engineering Applications” Wiley India.

References:

1. Ibrahim A. M., Introduction to Applied Fuzzy Electronics, PHI, 2013.
2. J. Yen and R. Langari, Fuzzy Logic, Intelligence, Control and Information, Pearson Education.
3. K.H.Lee, First Course on Fuzzy Theory and Applications, Springer-Verlag.
4. Lin C. T. and C.S. G. Lee, Neural Fuzzy Systems, Prentice Hall, 1996.
5. S. Rajsekaran & G.A. Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications” Prentice Hall of India.
6. S.N. Sivanandan and S.N. Deepa, Principles of Soft Computing, Wiley India, 2007. ISBN: 10: 81-265-1075-7.

Course Plan			
Module	**Course content**	**Hours**	**End Sem. Exam Marks**
I	Soft computing: Introduction, soft computing vs hard computing, Fuzzy Computing, Neural Computing, Genetic Algorithms. applications of soft computing	2	**15**
	Introduction to fuzzy sets and systems-crispness, vagueness, uncertainty and fuzziness. Basics of fuzzy sets, membership functions, support of a fuzzy set height, normalized fuzzy set, alpha cuts.	3	
II	Type- 2 fuzzy sets. Operation on fuzzy set-complement, intersection, union, Demorgan's Law Equality & subset hood.	4	**15**
	Extension Principle and its application, Fuzzy relation-operations, projection, max-min, min-max composition, cylindrical extension.	3	
FIRST INTERNAL EXAM			
III	Reflexivity, symmetry and transitivity of fuzzy relations. Fuzzy prepositions, fuzzy connectives, linguistic variables, hedges.	4	**15**
	Approximate reasoning or fuzzy inference, Fuzzy rule based system. Fuzzification and defuzzification using centroid, centre of sums.	4	
IV	Introduction to Neural Networks - Applications –Biological neuron- Typical architecture of Artificial Neural Networks - Common activation function.	4	**15**
	McCulloh Pitts Neuron – Architecture, logic implementatons. Supervised and Unsupervised learning	4	
SECOND INTERNAL EXAM			
V	Linear Separability, Pattern Classification: Perceptrons	2	**20**
	Back propagation network and its architecture, Back propagation learning, back propagation algorithm	4	
VI	Genetic Algorithm Basic concepts, Initialization and selection, Survival of the Fittest - Fitness Computations.	5	**20**
	Operators - Cross over, Mutation.	3	
END SEMESTER EXAM			

Question Paper (End semester exam)

Max. Marks: 100 **Time : 3 hours**

The question paper shall consist of three parts. Part A covers modules I and II, Part B covers modules III and IV, and Part C covers modules V and VI. Each part has three questions uniformly covering the two modules and each question can have maximum four subdivisions. In each part, any two questions are to be answered. Mark patterns are as per the syllabus with 50 % for theory, derivation, proof and 50% for logical/numerical problems.

COURSE CODE	COURSE NAME	L-T-P-C	YEAR OF INTRODUCTION
EC363	Optimization Techniques	3-0-0-3	2016

Prerequisite: NIL

Course objectives:

1. To understand the need and origin of the optimization methods.
2. To get a broad picture of the various applications of optimization methods used in engineering.
3. To define optimization problem and its various components

Syllabus: Engineering applications of optimization, Formulation of design problems as mathematical programming problems, objective function, constraints, classification of optimization problems/techniques, necessary and sufficient conditions for optimality, uni-modality, convexity, Mathematical formulation of LP Problems, Reduction of a LPP to the standard form. Feasible solutions, Graphical solution methods, optimality conditions, degeneracy, Simplex algorithm, Duality in linear programming, Transportation Problem, Game theory, Network path models, Nonlinear unconstrained optimization, Modern methods of optimization, Genetic algorithm. Introduction to optimization tools and software.

Expected outcome:

The students will (i) have a thorough understanding of optimization techniques
(ii)l be able to formulate and solving the engineering optimization problems

Text Books:

1. H.A. Taha, " Operations Research", 5/e, Macmillan Publishing Company, 1992.
2. Kalynamoy Deb. "Optimization for Engineering Design- Algorithms and Examples", Prentice-Hall of India Pvt. Ltd., New Delhi
3. Singiresu S Rao, "Engineering optimization Theory and Practice", New Age International, 2009

References:

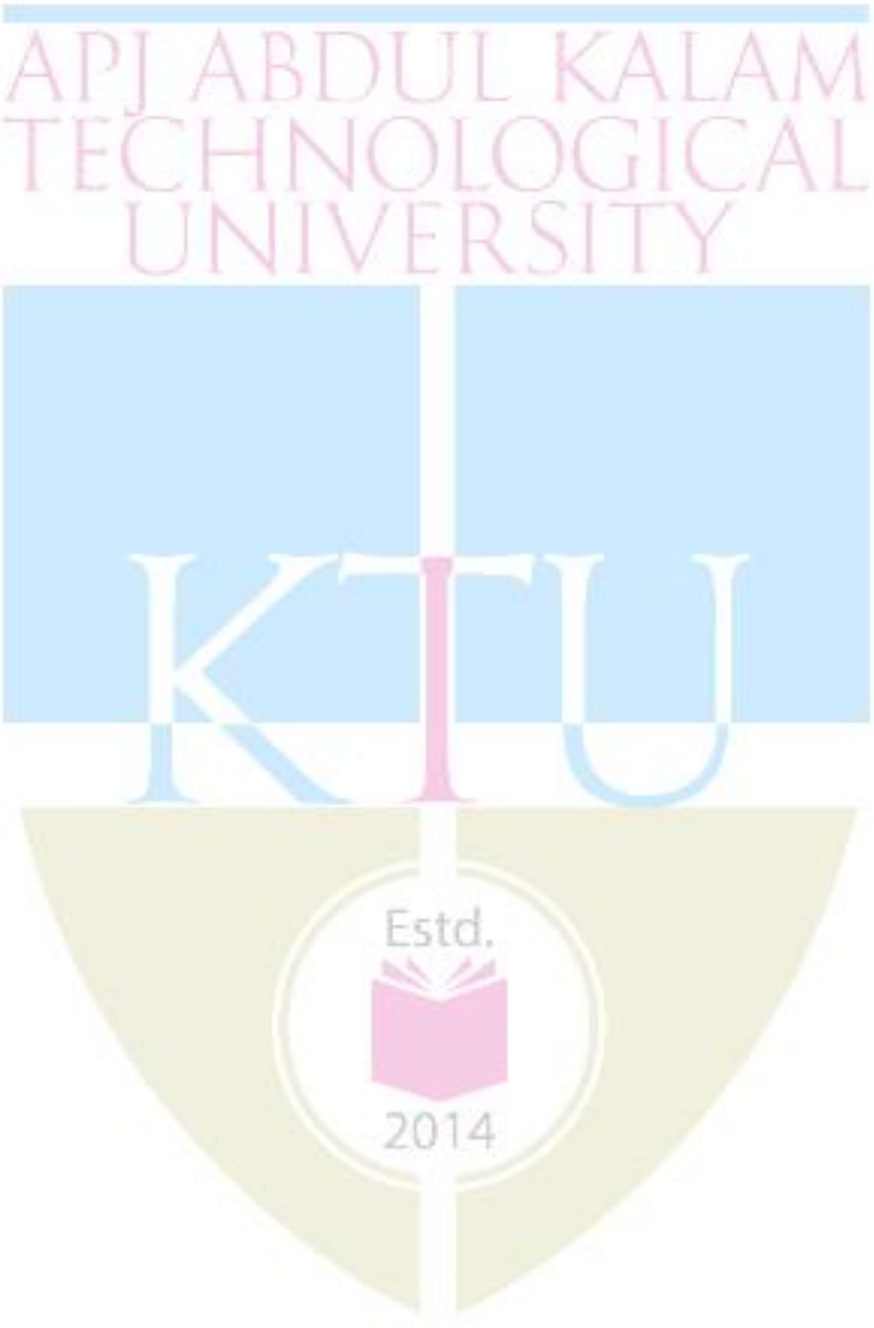
1. A. Ravindran, D. T. Phillips, J. J. Solberg, Operations Research – Principles and Practice, John Wiley and Sons.
2. Ashok D Belegundu, Tirupathi R Chandrupatla, "Optimization concepts and Application in Engineering", Pearson Education.
3. Hadley, G. "Linear programming", Narosa Publishing House, New Delhi
4. J. S. Arora, Introduction to Optimum Design, McGraw-Hill Book Company.
5. Kanti Swarup, P.K.Gupta and Man Mohan, Operations Research, Sultan Chand and Sons
6. Papalambros & Wilde, Principles of Optimal Design, Cambridge University Press, 2008

Course Plan			
Module	**Course content**	**Hours**	**End Sem. Exam Marks**
I	Introduction: Engineering applications of optimization, Formulation of design problems as mathematical programming problems, objective function, constraints, classification of optimization problems/techniques.	2	**15**
	Optimization techniques: Classical optimization, unconstrained single and multivariable minimization- necessary and sufficient conditions for optimality, uni-modality, convexity.	5	
II	Linear programming problems-I: Mathematical formulation of LP Problems, slack, surplus and artificial variables. Reduction of a LPP to the standard form, feasible solutions. Graphical solution method, simplex algorithm and solution using tabular method, optimality conditions and degeneracy. Duality in linear programming	7	**15**
FIRST INTERNAL EXAM			
III	Transportation Problem: Formulation of transportation problem, Basic feasible solution using different methods- East West corner method, Vogel approximation method, Optimality methods, MODI method, Unbalanced transportation problem	7	**15**
IV	Game Theory: Introduction, 2- person zero – sum game; Saddle point; Mini-Max and Maxi-Min Theorems (statement only); Graphical solution (2x n, m x 2 game), dominance property. Network path Models: Tree Networks – Minimal Spanning Tree - Prim's Algorithm. Shortest path problems- solution methods – Dijkstra's Method.	7	**15**
SECOND INTERNAL EXAM			
V	Nonlinear unconstrained optimization: Single variable optimization methods- Fibonacci search method, Newton-Raphson method. Multi-variable methods- Hook-Jeeves pattern search method, Cauchy's (steepest descent) method.	7	**20**
VI	Modern methods of optimization: Introduction to Genetic algorithm, Cross over, Mutation, Reproduction, Simple examples of applications in electronics engineering	5	**20**
	Introduction to optimization tools and softwares. Solution of optimization Problems using MATLAB.	2	**0**
END SEMESTER EXAM			

Question Paper Pattern (End sem. Exam.)

Max. Marks: 100 **Time : 3 hours**

The question paper shall consist of three parts. Part A covers modules I and II, Part B covers modules III and IV, and Part C covers modules V and VI. Each part has three questions uniformly covering the two modules and each question can have maximum four subdivisions. In each part, any two questions are to be answered. Mark patterns are as per the syllabus with 30 % for theory and 70% for logical/numerical problems, derivation and proof.


APJ ABDUL KALAM
TECHNOLOGICAL
UNIVERSITY
KTU
Estd.
2014

COURSE CODE	COURSE NAME	L-T-P-C	YEAR OF INTRODUCTION
EC365	Biomedical Engineering	3-0-0-3	2016

Prerequisite: Nil

Course objectives:

1. To introduce student to basic biomedical engineering technology
2. To understand the anatomy & physiology of major systems of the body in designing equipment for medical treatments.
3. To impart knowledge about the principle and working of different types of bio-medical electronic equipment/devices.

Syllabus:

Human body-overview, Physiological systems of body, Measurement of physiological parameters, Assisting and therapeutic devices, Medical laboratory equipments, Telemetry in patient care, Patient safety, Medical imaging system

Expected outcome:

The students will be able:

1. To understand diagnosis and therapy related equipments.
2. To understand the problem and identify the necessity of equipment for diagnosis and therapy.
3. To understand the importance of electronics engineering in medical field.
4. To understand the importance of telemetry in patient care

Text Books:

1. K S Kandpur, "Hand book of Biomedical instrumentation", Tata McGraw Hill 2nd e/d.
2. Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, Biomedical Instrumentation and Measurements, PHI, 2nd Edition, 2004

References:

1. Barbara Christe, Introduction to Biomedical Instrumentation, Cambridge University Press, 2008.
2. J. J. Carr, "Introduction to Biomedical Equipment Technology", Pearson Education 4th e/d.
3. John G Webster, "Medical Instrumentation application and design", John Wiley 3rd e/d.
4. Richard Aston, "Principle of Biomedical Instrumentation and Measurement". Merrill Education/Prentice Hall.

Course Plan

Module	Course content	Hours	End Sem. Exam Marks
I	Introduction to bio-medical instrumentation system, overview of anatomy and physiological systems of the body.	1	15
	Sources of bio-electric potential: Resting and action potential, propagation of action potentials. Bioelectric potentials examples (ECG, EEG, EMG, ERG, EOG, EGG, etc introduction only.)	2	
	Electrode theory: Nernst relation Bio potential electrodes: Microelectrodes, skin surface electrodes, needle electrodes.	1	

	Instrumentation for clinical laboratory: Bio potential amplifiers- instrumentation amplifiers, carrier amplifiers, isolation amplifiers, chopper amplifiers	2	
II	Heart and cardiovascular system (brief discussion), electro conduction system of the heart. Electrocardiography, ECG machine block diagram, ECG lead configurations, ECG recording system, Einthoven triangle, analysis of ECG signals.	3	**15**
	Measurement of blood pressure: Direct, indirect and relative methods of blood pressure measurement, auscultatory method, oscillometric and ultrasonic non-invasive pressure measurements.	2	
	Measurement of blood flow: Electromagnetic blood flow meters and ultrasonic blood flow meters.	2	
FIRST INTERNAL EXAM			
III	The human nervous system. Neuron, action potential of brain, brain waves, types of electrodes, placement of electrodes, evoked potential, EEG recording, analysis of EEG.	2	**15**
	Electromyography: Nerve conduction velocity, instrumentation system for EMG.	1	
	Physiology of respiratory system (brief discussion), Respiratory parameters, spirometer, body plethysmographs, gas exchange and distribution.	2	
	Instruments for clinical laboratory: Oxymeters, pH meter, blood cell counter, flame photometer, spectrophotometer	3	
IV	Therapeutic Equipments: Principle, block schematic diagram, working and applications of : pacemakers, cardiac defibrillators, heart–lung machine, dialyzers, surgical diathermy equipment, ventilators	6	**15**
SECOND INTERNAL EXAM			
V	Medical Imaging systems (Basic Principle only): X-ray imaging - Properties and production of X-rays, X-ray machine, applications of X-rays in medicine.	2	**20**
	Computed Tomograpy: Principle, image reconstruction, scanning system and applications.	2	
	Ultrasonic imaging systems: Basic pulse echo system, propagation of ultrasonic through tissues and reflections, display types, A-Scan, B-Scan, M-Scan, applications, real-time ultrasonic imaging systems and probes.	3	
VI	Magnetic Resonance Imaging – Basic NMR components, Biological effects and advantages of NMR imaging	3	**20**
	Biomedical Telemetry system: Components of biotelemetry system, application of telemetry in medicine, single channel telemetry system for ECG and temperature	2	
	Patient Safety: Electric shock hazards, leakage current, safety codes for electro medical equipments	1	
END SEMESTER EXAM			

Question Paper Pattern (End Sem. Exam)

Maximum Marks: 100 **Time : 3 hours**

The question paper shall consist of three parts. Part A covers modules I and II, Part B covers modules III and IV, and Part C covers modules V and VI. Each part has three questions uniformly covering the two modules and each question can have maximum four subdivisions. In each part, any two questions are to be answered. Mark patterns are as per the syllabus with 100 % for theory.