PUNE VIDYARTHI GRIHA'S

COLLEGE OF ENGINEERING AND TECHNOLOGY, PUNE-9

(AFFILIATED TO SAVITRIBAI PHULE PUNE UNIVERSIT, PUNE)

DEPARTMENT OF ELECTRONICS & TELECOMMUNICATION ENGINEERING

(Accredited By National Board of Accreditation (NBA), New Delhi)

CURRICULUM BOOK

ACADEMIC YEAR: 2016-17

FOR THE PROGRAMME

B. E. (ELECTRONICS & TELECOMMUNICATION ENGINEERING)

PUNE VIDYARTHI GRIHA'S

COLLEGE OF ENGINEERING AND TECHNOLOGY

VISION

TO ACHIEVE EXCELLENCE IN ENGINEERING EDUCATION

MISSION

- **To satisfy all stakeholders**
- **To develop ethical, highly motivated engineering professionals with good human values, requisite skills and competencies**
- **To adopt innovative teaching mechanisms**
- **To promote research culture**
- **To contribute to country's economic development**
- **To be responsive to changes in technology, socio-economic and environmental conditions**

DEPARTMENT OF ELECTRONICS & TELECOMMUNICATION ENGINEERING

VISION

To achieve academic excellence in the arena of Electronics Communication Technology and Embedded Systems.

MISSION

1. To provide students with practical knowledge of theoretical concepts through a series of lectures by industry experts.
2. To impart soft-skill techniques through a series of lectures by industry experts.
3. To provide students a platform to design and develop laboratory experiments.
4. To disseminate the knowledge acquired by faculty through different Faculty Development Workshops to improve teaching-learning process.
5. To motivate students to actively participate in interdisciplinary projects and participate in national and international level competition.

PROGRAM EDUCATIONAL OBJECTIVES

PEO1: Applying Electronics Engineering knowledge based on a solid foundation in Telecommunication Engineering areas for the needs of the stakeholders.

PEO2: Upholding the importance of professionalism and ethics in Electronics Engineering profession to form a cultured and more developed society.

PEO3: Possessing communication and interpersonal skills, to meet the nations and stakeholders' aspiration.

PEO4: Developing skills in research in Electronics Engineering particularly in the areas of Telecommunication Engineering to generate new knowledge to satisfy the needs of the stakeholders.

PROGRAMME OUTCOMES

The Programme Outcomes of the Department of Electronics and Telecommunication are:

PO1. Ability to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. Ability to conduct experiments, analyze and interpret data.

PO3. Ability to gather broad education necessary to recognize the impact of engineering solutions in global and societal context.

PO4. Ability to exercise professional and ethical responsibility in multicultural environment.

PO5. Ability to communicate effectively with engineers and community at large.

PO6. Ability to identify, formulate and solve Electronic Engineering problems.

PO7. Ability to recognize the need and engage life-long learning.

PO8. Ability to comprehend management and entrepreneurship skills.

PO9. Ability to design process, components and system to meet specified needs in Electronic Engineering.

PO10. Understanding the principle of sustainable development for Electronic Engineering Design.

PO11. Ability to use the techniques, skills and modern engineering tools necessary for Electronics Engineering practice.

PO12. Ability to work in multi-disciplinary teams within Electronic Engineering discipline.

PROGRAMME SPECIFIC OUTCOMES

PSO1. Demonstrate reasonable amount of proficiency in the areas of digital communication, embedded systems and project development.

PSO2. Utilize modern tools to analyze the performance of communication systems.

INDEX

Second Year

Curriculum Book

Syllabus Structure of Savitribai Phule Pune University, Pune

Course Structure S. E. (Electronics & Telecommunication Engineering)

2015Course

Course Code	Course	Teaching Scheme Hrs/Week			Examination Scheme					Marks Total	Credit	
					Theory		TW	P	O			
		L	T	P	On-Line	Theory					TH/ TUT	PR+ OR
Legends:												
L: Lectures T: Tutorial P: Practical TW: Term Work O: Oral												
Semester –III												
204181	Signals & Systems	3	1	-	50	50	25	-	-	125	4	-
204182	Electronic Devices & Circuits	4	-	2	50	50	-	50	-	150	4	1
204183	Electrical Circuits and Machines	3	-	2	50	50	25	-	-	125	3	1
204184	Data Structures and Algorithms	4	-	2	50	50	-	-	50	150	4	1
204185	Digital Electronics	4	-	2	50	50	-	50	-	150	4	1
204186	Electronic Measuring Instruments & Tools	1	-	2	-	-	50	-	-	50	1	1
204192	**Audit Course 1**	--	--	--	--	--	--	--	--	--	--	--
	Total of Semester-I	**19**	**1**	**10**	**250**	**250**	**100**	**100**	**50**	**750**	**20**	**05**
									Total Credits		**25**	
Semester-IV												
207005	Engineering Mathematics III	4	1	-	50	50	25	-	-	125	5	-
204187	Integrated Circuits	4	-	2	50	50	25	50	-	175	4	1
204188	Control Systems	3	-	-	50	50	-	-	-	100	3	-
204189	Analog Communication	3	-	2	50	50	-	50	-	150	3	1
204190	Object Oriented Programming	3	-	4	50	50	-	-	50	150	3	2
204193	**Audit Course 2**	--	--	--	--	--	--	--	--	--		
	Total of Semester-II	**19**	**1**	**10**	**250**	**250**	**100**	**100**	**50**	**750**	**20**	**05**
									Total Credits		**25**	

SE (E&TC)

Semester I

Signals and Systems

Course Title: Signals and Systems		**Course Number: 204181**	**Course Name:C201**
Year: SE		**Semester: I**	
Designation of Course		Professional Core	
Teaching Scheme: 3 Hrs/Week		**Tutorial:** 1 Hrs/Week	
Course Assessment Methods	**Direct methods**	On-line Examination: 50 Marks	End Semester Examination: 50Marks
			Practical/Oral
	Indirect Methods	Assignments, Presentations	Seminars, Quiz, Q&A session, Group Discussion
Prerequisites	Basic Algebra, Trigonometry, Differential Equation		

Course Objectives	
1	To explain and model the signals in time and frequency domain mathematically
2	To classify signals into different categories.
3	To analyze Linear Time Invariant system in Time and Transform domains.
4	To built basics for understanding of the courses like Signal processing, Control and communication.
5	To develop basics of probability and random variables.

Course Outcomes	
CO1	Characterize and analyze the properties of CT and DT signals and systems
CO2	Analyze CT and DT systems in Time domain using convolution
CO3	Represent CT and DT systems in the Frequency domain using Fourier Analysis tools like CTFS, CTFT, DTFS and DTFT.
CO4	Conceptualize the effects of Probability and Random Variable.
CO5	Analyze CT and DT systems using Laplace transforms.

Course Contents	
Unit-I	**Introduction to Signals and Systems**
	Definition of signals and systems, communication and control systems as examples, Sampling of analog signals, Sampling Theorem, Continuous time and discrete time signals, Classification of signals as even, odd, periodic and non periodic, deterministic and non deterministic, energy and power. Elementary signals used for testing: reasons for using slandered test signals,exponential, sine, impulse step and its properties, ramp, rectangular, triangular, signum, sinc. Operations on signals: Amplitude scaling, addition, multiplication, differentiation, integration(Accumulator for DT), time scaling, time shifting and folding. Systems: Definition, Classification: linear and non linear, time variant and invariant, causal and non-causal, static and dynamic, stable and unstable,

	invertible.
	Practical/Tutorial
	1 A) Sketch and write defining mathematical expression for the following signals in CT and DT a) Unit Step. b) Rectangular c) Exponential d) Signum e) Sine f) Sinc g) Triangular h) Unit Impulse. i) Unit Ramp B) Classify and find the respective value for the above signals a) Periodic / Non Periodic b) Energy / Power /Neither 2. Take any two CT and DT signals and perform the following operation Amplitude scaling, addition, multiplication, differentiation, integration (accumulator for DT), time scaling, time shifting and folding 3. Express any two system mathematical expressions in input output relation form and determine whether each one of them is, Memory less, Causal, Linear, Stable, Time invariant, Invertible
Unit-II	**Time domain representation of LTI System**
	System modeling: Input-output relation, Definition of impulse response, convolution sum, convolution integral, computation of convolution integral using graphical method for unit step to unit step, unit step to exponential, exponential to exponential, unit step to rectangular and rectangular to rectangular only. Computation of convolution sum. Properties of convolution. system interconnection, system properties in terms of impulse response, step response in terms of impulse response.
	Practical/Tutorial
	4. Express any two system mathematical expressions in impulse response form and determine whether each one of them is, Memory less, Causal, Linear, Stable, Time in variant, Invertible 5. Perform convolution Integral of Two continuous signals.
Unit-III	**Fourier Series**
	Fourier series (FS) representation of periodic CT signals, Dirichlet condition for existence of fourier series, orthogonality, basis functions, amplitude and phase response, FS representation of CT signals using trigonometric and exponential fourier series. Applications of fouriesr series, properties of fourier

	series and their physical significance, Gibbs phenomenon, Discrete Time Fourier Series, properties, convergence of DTFS.
	Practical/Tutorial
	6. To find the Fourier series for the signals and plot its magnitude and phase response.
Unit-IV	**Fourier Transform**
	Fourier Transform (FT) representation of aperiodic CT signals, Dirichlet condition for existence of fourier transform, evaluation of magnitude and phase response, FT of standard CT signals, FT of standard periodic CT signals, Properties and their significance, Interplay between time and frequency domain using sinc and rectangular signals, Fourier Transform for periodic signals, introduction to Discrete Time Fourier Transform
	Practical/Tutorial
	7.State and prove the properties of CT Fourier Transform. Take rectangular and Sinc signal as example and demonstrate the application of CTFT properties and also demonstrate the interplay between time and frequency domain.
Unit- V	**Laplace Transform and its application**
	Definition of Laplace Transform (LT), Limitations of fourier transform and need of Laplace transform, Laplace transform of standard periodic and aperiodic functions, properties of Laplace transform and their significance, Laplace transform evaluation using properties, Inverse Laplace transform based on partial fraction expansion, stability considerations in S domain, Application of Laplace transforms to the LTI system analysis.
	Practical/Tutorial
	8. State and prove the properties CT Laplace Transform. Take any example of system in time domain and demonstrate the application of LT in system analysis
Unit-VI	**Probability and Random Signals**
	Probability: Experiment, sample space, event, probability, conditional probability and statistical independence, Bayes theorem, Uniform and Gaussian probability models. **Random variables:** Continuous and Discrete random variables, cumulative distributive function, Probability density function, properties of CDF and PDF. Statistical averages, mean, moments and expectations, standard deviation and variance. **Introduction to Correlation:** Autocorrelation, Cross correlation, Properties.
	Practical/Tutorial
	9. To perform auto and cross correlation for DT and CT signals. Also explain the relation between convolution and correlation. 10. A) List and Explain the properties of CDF & PDF, Suppose a certain random variable has the CDF

	$F_X(x)=\begin{cases} 0 & x \le 0 \\ kx^2 & 0 < x \le 10 \\ 100k & x > 10 \end{cases}$ Evaluate k, Write the corresponding PDF and find the values of P(X<=5) and P(5 <X <= 7) B) Find mean ,mean square , standard deviation , variance of X when $f_X(x)=ae^{-ax}u(x)$ with a>0

Text Books	Author	Title of Book	Publication
T1	Simon Haykins and Barry Van Veen,	Signals and Systems	2nd Edition, Wiley India.
T2	Charles Phillips	Signals , Systems and Transforms	3rd Edition, Pearson Education.
Reference Books			
R1	M.J.Roberts	Signals and Systems	2nd Edition,Mc Graw Hill,2007
R2	Shaila Apte	Signals and Systems – Principles and Applications	Cambridge University Press, 2016
R3	Mrinal Mandal and Amir Asif, ,	Continuous and Discrete Time Signals and Systems	Cambridge University Press, 2007
R4	Peyton Peebles	Probability, Random Variable, Random Processes	4 th Edition, Tata Mc Graw Hill.
R5	M.J.Roberts and Govind Sharma	Fundamentals of Signals and Systems	2nd Edition,Mc Graw Hill,2010

Self-Learning Facilities, Web Resources, Research papers for reference	**NOT APPLICABLE**
Contents beyond	Correlation between Mathematics and Signals and systems

Syllabus	
Additional Experiments	**NOT APPLICABLE**
Bridging Courses	
Tutorials	**As Listed above**
Presentations	Prepared presentations on UNIT No I, III, VI

Electronic Devices and Circuits

Course Title: Electronic Devices and Circuits		**Course Number: 204182**	**Course Name**:- C202
Designation of Course		Professional Core	
Teaching Scheme: 4 Hrs/Week		**Laboratories:** 2 Hrs/Week	
Course Assessment Methods	**Direct methods**	In-Semester Examination: 30 Marks	Theory/End Semester Examination: 70 Marks
		Term-work 50 Mark	Oral 50 Marks
	Indirect Methods	Assignments, Presentations	Seminars, Quiz, Q&A session,Group Discussion
Prerequisites	Basic Electronics		

Introduction of Course

This course is the base for all electronic circuits involving transistors. The course is focused to operation, use and application of field effect transistors (such as junction field effect transistor and metal oxide semiconductor transistors) due to inherent advantages of field effect transistors over bipolar junction transistor necessary for integration (viz. VLSI or ULSI) of electronic circuits. The course also introduces use and application of adjustable regulator integrated circuits to design variable regulated d.c. power supply as well as switch mode power supply

Course Objectives	
1	To understand state of the art in transistor technology and advantages and disadvantages of using bipolar and unipolar transistors,
2	To understand construction and characteristic features of FETs (viz. JFET, MOSFETs, CMOS and Bi-CMOs),
3	To understand d.c. and a.c. biasing and analysis of FET circuits,
4	To understand various applications of MOSFETs such as diode, resistor, amplifier, switch, oscillator etc,
5	To understand regulators such as IC adjustable regulator (LM317) and switch mode power supply (SMPS).

Course Outcomes	
CO1	Know state of art in transistor technology
CO2	Understand construction and operation of JFET and E-MOSFET semiconductor devices and its applications
CO3	Understand how dc and ac analysis of JFET and E-MOSFET based electronic circuits
CO4	Understand importance of feedback concept in transistorized circuits and its use in amplifier and oscillator circuit
CO5	Understand behavior of transistors and transistorized circuits at low and high frequency
CO6	Apply their knowledge about JFET and MOSFET to design electronic switch, amplifier and oscillator

Course Contents	
Unit-I	**JFET**

	Introduction to JFET, Types, Construction, Operation, Static Characteristics, Pinch off voltage, FET Volt-Ampere characteristics, FET Configurations (CS/CD/CG) and their Comparison. Biasing of FET (Self). FET as an amplifier and its analysis (CS) and its frequency response. Small signal model, FET as High Impedance circuits.
	Practical
	1. To verify VI characteristics of JFET and determine various static and dynamic parameters 2. To design a common source self-bias circuit for given specifications to be used as amplifier. 3. To test the designed self-bias amplifier circuit and find input impedance, output impedance, voltage gain and bandwidth.
Unit-II	**MOSFET & its DC Analysis**
	Basics of MOS Transistor operation, Construction of n-channel E-MOSFET, E-MOSFET characteristics & parameters, non-ideal voltage current characteristics viz. Finite output resistance, body effect, sub-threshold conduction, breakdown effects and temperature effects. Common source circuit, Load Line & Modes of operation, common MOSFET configurations: DC Analysis, constant current source biasing.
	Practical
	1. To test and design n-channel MOSFET as switch or inverter
Unit-III	**MOSFET AC Circuit Analysis**
	The MOSFET CS small signal amplifier, Small signal parameters, small signal equivalent circuit, Modelling, Body effect, Analysis of CS amplifier. Introduction to BiCMOS technology. The MOSFET internal capacitances and high frequency model. Introduction to MOSFET as basic element in VLSI, V-I characteristic equation in terms of W/L ratio, MOSFET scaling and small geometry effects, MOSFET capacitances.
	Practical
	1. To test and design n-channel common source MOSFET amplifier and find its input impedance, output impedance and voltage gain.
Unit-IV	**MOSFET Circuits**
	MOSFET as switch, diode/active resistor, Current sink and source, current mirror, Voltage references, Basic principle of band gap reference, CMOS Inverter as amplifier: Active load, Current source and Push pull configurations.
	Practical
	1. To test and design n-channel MOSFET as switch or inverter
	2. To test and design n-channel common source MOSFET amplifier and find its input impedance, output impedance and voltage gain.
Unit- V	**Feedback Amplifiers and Oscillators**
	Four types of amplifiers. Feedback topologies. Effect of feedback on terminal characteristics of amplifiers. Examples of voltage series and Current series FET feedback amplifiers and their analysis. Barkhausen criterion, stability with feedback. General form of LC oscillator. FET RC Phase Shift oscillator, Wein bridge oscillator, Hartley and Colpitts oscillators
	Practical
	1. To test/simulate and understand the effect of current series feedback using n-

	channel common source self- bias JFET amplifier 2. To test/simulate and understand the effect of voltage series feedback using n-channel common source self- bias JFET amplifier 3. To design and test Hartley /Colpitts oscillator using C.S. JFET amplifier 4. To design and test RC phase shift / Weinbridge oscillator using C.S. JFET amplifier 5. To design and test Hartley /Colpitts oscillator using C.S. E-MOSFET amplifier		
Unit-VI	**Voltage Regulator**		
	Block diagram of an adjustable three terminal positive and negative regulators (317,337).Typical connection diagram, current boosting. Low drop out voltage regulators. Introduction to Switch Mode Power supply (SMPS), Block diagram of SMPS, Types of SMPS. Comparison of Linear Power supply and SMPS.		
	Practical		
	1. To design and implement adjustable voltage regulated power supply using LM317.		
Text Books	**Author**	**Title of Book**	**Publication**
T1	Millman, Halkias	Integrated Electronics- Analog and Digital Circuits and Systems	TMH, 2nd Edition
T2	Donald Neamen	Electronic Circuit Analysis and Design	TMH, 3rd Edition
Reference Books	**Author**	**Title of Book**	**Publication**
R1	David A. Bell	Electronic Devices and Circuits	Oxford press, 5th Edition
R2	Boylstad, Nashlesky	Electronic Devices and Circuits Theory	PHI, 2006. 9th Edition
R3	Sedra Smith	Microelectronics Circuits	5th Edition, Oxford, 1999
Self-Learning Facilities			
	NPTEL Lecture Series / Virtual Laboratory-IIT, Powai http://www.radio-electronics.com/info/data/smt/what-is-surface-mount-technology-tutorial.php http://www.sciencedaily.com/releases/2016/02/160203134504.htm http://physics.usask.ca/~chang/homepage/Organic/Organic.html http://www.organicsemiconductors.com		
Web Resources			
1	http://www.electronics-tutorials.ws/transistor/tran_1.html		
2	http://www.allaboutcircuits.com/textbook/semiconductors/chpt-1/active-versus-passive-devices/		
Research papers for reference	**Author**	**Title of Paper**	**Journal/Transaction**
1	R. H. Dennard, F. H. Gaensslen, H-N. Yu, V. L. Rideout, E. Bassous and A. R. Leblanc	Design of Ion-Implanted MOSFET's with Very Small Physical Dimensions	IEEE Journal of Solid-state Circuits, Vol. Ssc-9 No. 5 October 1974.
2	W. T. Chang and	Performance Dependance on	IEEE Transactions on

	Y. S. Lin	Width to Length Ratio of Si Cap/SiGe Channel MOSFETs	Electronic Devices, vol.60 No. 11, pp. 3663–3668, November 2013.
3	K. S. Packard	The Origin of Waveguides: A Case of Multiple Rediscovery	IEEE Transactions on Microwave Theory and Techniques, vol. MTT-32, pp. 961–969, September 1984.
4	D. D. Grieg and H. F. Englemann	Microstrip—A New Transmission Technique for the Kilomegacycle Range	Proceedings of the IRE, vol. 40, pp. 1644–1650, December 1952.
5	I. J. Bahl and R. Garg	A Designer's Guide to Stripline Circuits	Microwaves, January 1978, pp. 90–96.

Contents beyond Syllabus	
	Assignments to collect literature on recent advances in microwave theory and their applications
Additional Experiments	Syllabus suggest any 09 experiments, but we will conduct more than 09 experiments 1. To study VI characteristics of JFET 2. To simulate self-bias C.S. JFET dc circuit to evaluate d.c. operating parameters 3. To test and understand effect of voltage series feedback on C.S. self biased JFET amplifier 4. To simulate and understand effect of current series feedback on C.S. self biased JFET amplifier 5. To design and test Colpitts oscillator using C.S. self biased JFET amplifier
Bridging Courses	
	No bridging course is required since all the prerequisite courses have been learnt by the students at First Year Engineering.
Assignments	
	1. Assignments on Theory will be given on every topic on regular basis. 2. To simulate and understand effect of current series feedback on C.S. self biased JFET amplifier 3. To design and simulate Colpitts oscillator using C.S. self biased JFET amplifier
Tutorials	
	1. To design a C.S. self bias amplifier using JFET for given specification
Presentations	
	1. Preparation of presentation on advancements in semiconductor electronics

Electrical circuits and Machines

Course Title:	Electrical circuits and Machines	**Course Number:** 204183	Course Name:C203
Designation of Course	Understanding of Electrical Machines and Network Analysis		
Teaching Scheme: 3Hrs/Week		**Laboratories:** 2 Hrs/Week	
Course Assessment Methods	**Direct methods**	On-line Examination: 50 Marks	Theory Paper Examination: 50 Marks
		Term-work - 25Marks	Oral - N/A
	Indirect Methods	Assignments, Presentations	Seminars, Quiz, Q&A session, Group Discussion
Prerequisites	Basic Electrical Engg, Basic Electronics Engg.		
Introduction of Course			
Course Objectives			
1	Analyze AC and DC networks with network simplification techniques		
2	Have a basic knowledge of transformers and their types		
3	Conduct experimental procedures on different types of electrical machines		
4	Understand the constructional details, characteristics, features and application areas of various types of electric motors.		
Course Outcomes			
CO1	Understand fundamental underlying principles of Network Analysis Techniques		
CO2	Analyse and understand the principle of Transformer action and basic principles of transformer selection, working		
CO3	Have a basic knowledge of the use DC machines i.e. DC series motor and DC shunt motor		
CO4	Have a basic knowledge of AC Machines , specifically AC motors		
CO5	Have a basic knowledge and overview of BLDC motors and stepper motors		
Course Contents			
Unit-I	**Basic Circuit Analysis and Simplification Techniques**		
	Kirchhoff's Current and Voltage Laws, Independent and dependent sources and their interconnection, power calculations. Network Analysis: Mesh, Super mesh, Node and Super Node analysis. Source transformation and source shifting. Network Theorems: Superposition, Thevenin's, Norton's and Maximum Power Transfer Theorems, Millers Theorem and its dual. (AC circuit analysis for all the topics of this unit)		
	Experiments		
	Network Theorems : 1. To verify Thevenin's and Norton's theorem (DC or AC)		
Unit-II	**Transformers**		
	Types, Construction, Transformer on No-load (Transformation ratio, emf		

	equation), impedance transformation, losses in transformer, regulation and efficiency, rating. Auto transformer, coupling transformer, Isolation transformer, C.T. and P.T., Design of single phase transformer for instrument power supply, High frequency transformers.
	Experiments
	1. O.C. And S.C. Test on single phase transformer
	2. Polarity test on single phase transformer
Unit-III	**DC Machines**
	Construction of DC Machine, Motoring and generation action, types, EMF equation, Torque equation (Torque-armature current characteristics, Torque-speed characteristics, speed-armature current characteristics), Power flow diagram. Problems on speed, torque & losses. Different methods of speed control, different types of starters for DC shunt motor. Permanent Magnet DC motors, Applications of DC Motors
	Experiments
	1. Load characteristics of D.C. series motor
	2. Brake test on D.C. Shunt motor
	3. Speed control of DC motor using armature voltage and field current control method. Measure RPM and plot graph of speed versus armature voltage and field current.
Unit-IV	**AC Motors**
	Three phase Induction motors, principle of operation, types, slip and torque equation, Torque-slip characteristics, condition for maximum torque & ratios, types of starters, speed control, V/f control, Applications. Synchronous motors: Construction, principle of operation, characteristics, speed control and applications.
	Experiments
	1. Load test on 3-phase induction motor
	2. No load & blocked-rotor test on 3-phase induction motor: a. Determination of parameters of equivalent circuit b. Plotting of circle diagram.
	3.To plot speed- torque characteristic of three phase induction motor.
Unit- V	**Special Motors 1**
	BLDC Motor, Construction, principle, characteristics, control circuit, sensors, applications. Construction, principle & applications of Reluctance Motor, Universal Motor.
	Experiments
Unit-VI	**Special Motors 2**
	Construction, types, principle, Characteristics, control circuit & applications of Stepper Motor and Servo motor. Construction, principle, characteristics, Types and applications of single phase and two phase Induction Motor.

	Experiments		
	1. To study various operating modes of stepper motor.		
Text Books	**Author**	**Title of Book**	**Publication**
T1	Abhijit Chakrabarti & Sudipta Debnath,	Electrical Machines	Tata McGraw-Hill
T2	William H Hayt, Jack E Kimmerly and Steven M. Durbin,	Engineering Circuit Analysis	Tata McGraw-Hill
Reference Books			
R1	A.E. Fitzgerald, Charles Kingsley & Jr. Stephen D. Umans	Electrical Machinery	Tata McGraw-hill Publication 6th Edition
R2	I.J Nagarath & D.P Kothari	Electrical Machines	Kothari Tata McGraw-hill Publication 4th Edition
R3	T. J. E. Miller,	Brushless permanent-magnet and reluctance motor drives	Oxford University Press
Self-Learning Facilities	NIL		
Web Resources	NIL		
Research papers for reference	**Author**	**Title of Paper**	**Journal/Transaction**
1	NIL		
2			
Contents beyond Syllabus	NIL		
Additional Experiments	NIL		
Bridging Courses	NIL		
Assignments	NIL		
Tutorials	NIL		
Presentations	NIL		

Data Structures and Algorithms

Course Title: Data Structures and Algorithms		**Course Number:**204184	**Course Name:C204**
Year: SE		**Semester: I**	
Designation of Course	Professional Core		
Teaching Scheme: 4 Hrs/Week		**Laboratories:** 2 Hrs/Week	
Course Assessment Methods	**Direct methods**	On-line Examination: 50 Marks	Theory Examination: 50 Marks
		Term-work: Nil	Oral 50 Marks
	Indirect Methods	Assignments, Presentations	Seminars, Quiz, Q&A session, Group Discussion
Prerequisites	Basic knowledge of C language is required.		

Course Objectives	
1	To assess how the choice of data structures and algorithm design methods impacts the performance of programs.
2	To choose the appropriate data structure and algorithm design method for a specified application.
3	To study the systematic way of solving problems, various methods of organizing large amounts of data.
4	To solve problems using data structures such as linear lists, stacks, queues, binary trees, binary search trees, and graphs and writing programs for these solutions.
5	To employ the different data structures to find the solutions for specific problems
Course Outcomes	**Having successfully completed this course, the student are now able to**
CO1	Write and understand the programs that use arrays & pointers in C
CO2	Discuss the computational efficiency of the principal algorithms such as sorting &searching.
CO3	Describe how arrays, records, linked structures are represented in memory and use them in algorithms.
CO4	Implement stacks & queues for various applications
CO5	Understand various terminologies and traversals of trees and use them for various applications.
CO6	Understand various terminologies and traversals of graphs and use them for various applications.
Course Contents	
Unit-I	**Introduction to C and Algorithm**
	Constants, variables and keywords in C, operators and control structure in c(decision, loop and case), functions, macros, arrays and string manipulation, structure, union, enumeration, bitwise operations Functions: Parameter passing call by value and call by reference, scope rules, functions and pointers,

	function returning pointer, pointer to function, String manipulations using Arrays, pointer to pointer, Dynamic memory management. **Analysis of algorithm**: frequency count and its importance in analysis of an algorithm, Time complexity & Space complexity of an algorithm, Big 'O' notation
	Practical
	1. Implement set operations using arrays and perform union, intersection, difference, symmetric difference 2. Perform following String operations with and without pointers to arrays (without using the library functions) : a. substring, b. palindrome, c. compare, d. copy, e. reverse. 3. Data base Management using array of structure with operations Create, display, Modify, Append, Search and Sort.(For any database like Employee or Bank database with and without pointers to structures) 4. Polynomial addition using array of structure. 5. Implement following Matrix operations: a. addition with pointers to arrays b. multiplication without pointers to arrays c. transpose with pointers to arrays
Unit-II	**Searching and Sorting**
	Need of searching and sorting, why various methods of searching and sorting, Sorting methods: Linear, binary search and fibonnaci Search. **Sorting methods**: Bubble, insertion, selection, merge, Time complexity of each searching and sorting algorithm, Hashing Techniques.
	Practical
	1. Write C program to store student information (e.g. RollNo, Name, Percentage etc.). a. Display the data in descending order of Percentage (Bubble Sort). b. Display data for Roll No specified by user (Linear Search). c. Display the number of passes and comparisons for different test cases (Worst,Average, Best case).
Unit-III	**Stack and Queues**
	Stacks: Concept, Basic Stack operations, Array representation of stacks, Stack as ADT, Stack Applications: Reversing data, Arithmetic expressions conversion and evaluation. **Queues:** Concept, Queue operations, Array representation of queues, Queue as ADT, Circular queues, Application of queues: Categorizing data, Simulation of queues.
	Practical
	1. Implement Stack using arrays. Write a menu driven program to perform following operations on stack a) Push b) Pop c) Display 2. Implement Queue using arrays. Write a menu driven program to perform following operations on Queue a) Insert b) Delete c) Display

	3. Evaluation of postfix expression (input will be postfix expression)		
Unit-IV	**Linked List**		
	Concept of linked organization, singly linked list, stack using linked list, queue using linked list, doubly linked list, circular linked list, Linked list as ADT. Representation and manipulations of polynomials using linked lists, ,comparison of sequential linked organization with linked organization		
	Practical		
	1. Create a singly linked list with options: a. Insert (at front, at end, in the middle), b. Delete (at front, at end, in the middle), c. Display, d. Display Reverse, e. Revert the SLL. 2. Implement Stack using Linked Lists. Write a menu driven program to perform following operations on stack a) Push b) Pop c) Display 3. Implement Queue using Linked Lists. Write a menu driven program to perform following operations on Queue a) Insert b) Delete c) Display 4. Accept input as a string and construct a Doubly Linked List for the input string with each node contains, as a data one character from the string and perform: Insert b) delete, c) Display forward, d) Display backward		
Unit- V	**Trees**		
	Introduction to trees: Basic Tree Concepts, Binary Trees: Concept & Terminologies, Representation of Binary Tree in memory, Traversing a binary tree, Binary Search Trees (BST): Basic Concepts, BST operations		
	Practical		
	Binary search tree: Create, search, recursive traversals.		
Unit-VI	**Graphs**		
	Basic Concepts & terminology, Sequential representation of graphs; Adjacency matrix, Path matrix, Linked representation of a graph, Operations on graph, Traversing a graph, Spanning trees; Minimum Spanning tree, Kruskal's Algorithm, Prim's Algorithm. Dijkstra's Shortest Path Algorithm		
	Practical		
	1 Graph using adjacency Matrix with BFS & DFS traversals. 2 Represent graph using adjacency list or matrix and generate minimum spanning tree using Prism's algorithm		
Text Books	**Author**	**Title of Book**	**Publication**
T1	Ellis Horowitz, SartajSahni	Fundamentals of Data Structures	Galgotia Books Source. ISBN:10: 0716782928
T2	Richard F. Gilberg& Behrouz A. Forouzan	Data Structures A Pseudocode Approach with C	Cengage Learning, second edition. ISBN-10:

Reference Books			
R1	Seymour Lipschutz	Data Structure with C	Schaum's Outlines, Tata McGrawHill.ISBN-10: 1259029964
R2	E Balgurusamy	Programming in ANSI C	Tata McGraw-Hill, Third Edition.ISBN-10: 1259004619
R3	YedidyahLangsam, Moshe J Augenstein, Aaron M Tenenbaum	Data structures using C and C++	PHI Publications, Second Edition). ISBN 10: 8120311779
Self-Learning Facilities, Web Resources, Research papers for reference	**NPTEL Lecture Series on** Data Structures And Algorithms By Prof. Naveen Garg **,**I IT Delhi C Programming and Data Structures ,IIT Kharagpur Course , Prof. P.P.Chakraborty		
	Virtual Laboratory: Computer Science & Engineering : Programming & Data Structures http://cse.iitkgp.ac.in/~rkumar/pds-vlab/ Computer Science & Engineering: Computer Programming Lab: http://cse02-iiith.vlabs.ac.in/index.php Computer Science & Engineering: Data structure : http://cse01-iiith.vlabs.ac.in/		
	https://sites.google.com/site/atulkg/courses/data-structures-and-algorithms-2014		
Contents beyond Syllabus	Brief discussion on quick sort ,merge sort, heap sort and file handling		
Additional Experiments	**Students perform extra simple assignments such as :**		
	1. Write a program that reads an integer between 0 – 999 and adds all the digits in the integer, print separate digits and display the reverse number		
	2. Write a program that can read five integers from the user and then determines the smallest and largest value among the five integers.		
Bridging Courses	Nil		
Assignments	**For students on following topic**		
1	String and function		
2	pointers		
3	Sorting methods and searching methods		
4	Structure concept		
5	Structure, union and array		
6	Link list		
7	Stack		
8	Queue		
9	Tree		

10	Graph
11	File handling
Tutorials	Not Applicable
Presentations	On topics Searching method , Sorting methods, Stack, Queue, tree Traversal methods, Graph traversal methods

Digital Electronics

Course Title:	**Digital Electronics**	**Course Number:** 204185	**Course Name:C205**
Designation of Course: Professional Core			
Teaching Scheme: 4 Hrs/Week		**Laboratories:** 2 Hrs/Week	
Course Assessment Methods	**Direct methods**	On-line: 50 Marks	Theory: 50 Marks
			Practical: 50 Marks
	Indirect Methods	Assignments, Presentations	Q&A session, Group Discussion, Multiple Choice Questions
Prerequisites	One should know difference between digital and analog signals. One should have introductory knowledge about Modern Electronics and Basic Algebra as applied to it.		

Introduction of Course: The concept and theory of digital Electronics are needed in almost all electronics and telecommunication engineering fields and in many other engineering and scientific disciplines as well. The main objective of this course is to lay the foundation for further studies in areas such as communication, VLSI, computer, microprocessor etc. One of the most important reasons for the unprecedented growth of digital electronics is the advent of integrated circuit. This course will explore the basic concepts of digital electronics. Having successfully completed this course the student will be able to understand the basic logic gates and various variable reduction techniques of digital logic circuit in detail. Understand, identify and design combinational and sequential circuits. Students will also be able to design and implement hardware circuit to test performance and application for what it is being designed. They will be able to Simulate and verify using computer simulation software to obtain desired result, understand and verify simulated circuit model with hardware implementation.

Course Objectives

1	To learn the basic concepts of digital electronics starting from the number systems and their conversions to the designing of combinational and sequential circuits and the state of the art programmable logic devices.
2	To get insight into different digital logic families and their performance parameters and interpret the datasheets of digital ICs.
3	To learn the design and optimization techniques for combinational and sequential digital logic circuits, state machines and determine their performance when implemented with SSI/MSI.
4	To understand the architectures of programmable logic devices and semiconductor memories
5	To give overview about the features and basic architecture of microcontroller.
6	With the understanding of above mentioned topic, to lay foundation for further studies in area of microprocessor and microcontroller, VLSI etc.

Course Outcomes

CO1	Able to design and implement combinational and sequential digital circuits.

CO2	Able to design hardware of sequential circuit for various practical applications like sequence generator, detector and counter using state diagrams and state table.
CO3	Understand and measure the performance parameters of TTL & CMOS ICs.
CO4	Understand and design logic functions using programmable logic devices like PAL, PLA and semiconductor memory architecture.
CO5	Understand the architecture of 8051microcontroller and write simple assembly language programs for basic operations.

Course Contents

Unit-I	**Combinational Logic Design** Standard representations for logic functions, k map representation of logic functions (SOP and POS forms), minimization of logical functions for min-terms and max-terms (upto 4 variables), don't care conditions, Design Examples: Arithmetic Circuits, BCD - to – 7 segment decoder, Code converters. Adders and their use as subtractor, look ahead carry, ALU, Digital Comparator, Parity generators/checkers, Multiplexers and their use in combinational logic designs, multiplexer trees, De-multiplexers and their use in combinational logic designs, Decoders, demultiplexer trees. Introduction to Quine-McCluskey method.
	Practical : 1. Study of IC-74LS153 as a Multiplexer. (Refer Data-Sheet). A. Design and Implement 8:1 MUX using IC-74LS153 & Verify its Truth Table. B. Design & Implement the given 4 variable function using IC74LS153. Verify its Truth- Table. 2. Study of IC-74LS138 as a Demultiplexer / Decoder (Refer Data-Sheet). Practical) (Test Benches and FSM excluded). A. Design and Implement full adder and subtractor function using IC- 74LS138. B. Design & Implement 3-bit code converter using IC-74LS138.(Gray to Binary/Binary to Gray) 3. Study of IC-74LS83 as a BCD adder,(Refer Data-Sheet). A. Design and Implement 1 digit BCD adder using IC-74LS83 B. Design and Implement 4-bit Binary sub tractor using IC-74LS83. 4. Study of IC-74LS85 as a magnitude comparator,(Refer Data-Sheet) A. Design and Implement 4-bit Comparator. B. Design and Implement 8-bit Comparator
Unit-II	**Sequential Logic Design** 1 Bit Memory Cell, Clocked SR, JK, MS J-K flip flop, D and T flip-flops. Use of preset and clear terminals, Excitation Table for flip flops. Conversion of flip flops. Application of Flip flops: Registers, Shift registers, Counters (ring counters, twisted ring counters), Sequence Generators, ripple counters, up/down counters, synchronous counters, lock out, Clock Skew, Clock jitter. Effect on synchronous designs.

	Practical: 1. Study of Counter ICs (74LS90/74LS93). A. Design and Implement MOD-N and MOD-NN using IC-74LS90 and draw Timing Diagram. B. Design and Implement MOD-N and MOD-NN using IC-74LS93 and draw Timing Diagram. 2. Study of synchronous counter (IC74HC191/ IC74HC193) Design & Implement 4-bit Up/down Counter and MOD-N Up/down Counter using IC74HC191/ IC74HC193. Draw Timing Diagram 3. Study of Shift Register (74HC194/74LS95), (Refer data-Sheet) Design and Implement Pulse train generator using IC-74HC194/IC74LS95 (Use right shift/left shift). Design and Implement 4-bit Ring Counter/ Twisted ring Counter using shift registers IC 74HC194/IC74LS95.
Unit-III	**State Machines** Basic design steps- State diagram, State table, State reduction, State assignment, Mealy and Moore machines representation, Implementation, finite state machine implementation, Sequence detector. Introduction to Algorithmic state machines- construction of ASM chart and realization for sequential circuits
Unit-IV	**Digital Logic Families** Classification of logic families, Characteristics of digital ICs-Speed of operation, power dissipation, figure of merit, fan in, fan out, current and voltage parameters, noise immunity, operating temperatures and power supply requirements.TTL logic. Operation of TTL NAND gate, active pull up, wired AND, open collector output, unconnected inputs. Tri-State logic. CMOS logic – CMOS inverter, NAND, NOR gates, unconnected inputs, wired logic , open drain output. Interfacing CMOS and TTL. Comparison table of Characteristics of TTL, CMOS, ECL, RTL, I2L, DCTL.
	Practical: Verify four voltage and current parameters for TTL and CMOS (IC 74LSXX, 74HCXX),
Unit- V	**Programmable Logic Devices and Semiconductor Memories** Programmable logic devices: Detail architecture, Study of PROM, PAL, PLA, Designing combinational circuits using PLDs. General Architecture of FPGA and CPLD Semiconductor memories: memory organization and operation, expanding memory size, Classification and characteristics of memories, RAM, ROM, EPROM, EEPROM, NVRAM, SRAM,DRAM.
Unit-VI	**Introduction to Microcontroller 8051** Microprocessors and Microcontrollers comparison, 8051 architecture, Pin description, addressing modes, instruction set of 8051, concepts of Counters

	and Timers with the help of status registers, Port Structure and Interrupts. Simple programming examples – for addition, subtraction, multiplication and delay.		
	Practical: 1. Write a assembly/C language program to perform arithmetic operations. 2. Write a assembly/C language program to perform internal and external memory transfer operations 3. Write a assembly/C language program to use port pin for simple application		
Text Books	**Author**	**Title of Book**	**Publication**
T1	R.P. Jain	Modern digital electronics, 3rd edition	TMH Publication
T2	M. Morris Mano	Digital Logic and Computer Design	Prentice Hall of India, 2013
Reference Books			
R1	A. Anand Kumar	Fundamentals of digital circuits, 4thedition	PHI publication
R2	Wakerly Pearson	Digital Design: Principles and Practices	Pearson Education,
R3	Mark Bach	Complete Digital Design	Tata MCGraw Hill
R4	MykePredko	Programming and customizing the 8051 microcontroller	Tata McGraw Hill 2003
R5	Muhammad Mazidi	The 8051 Microcontroller and Embedded Systems using Assembly and C	Pearson Education, 2nd edition
Self-Learning Facilities **Web Resources** **Research papers for reference**	NPTEL Lecture Series : Web Link:http://nptel.ac.in/video.php?subjectId=117106086 Name of the speaker: Prof. S. Srinivasan. Topic: 1. State Machines 2.Mealy and Moore Circuits VLAB Website link : http://he-oep.vlabs.ac.in/List%20of%20experiments.html?domain=ElectronicsandCommunications www.alldatasheet.com: Data sheets of various ICs used in practical. Digital Systems: NPTEL Notes		
Contents beyond Syllabus	1. Introduction to applications of Digital Electronics. 2. Study of 8051 programming language.		

Additional Experiments	1. Measurement of power dissipation of TTL
	2. Measurement of propagation delay of TTL.
Bridging Courses	NIL
Assignments	1. Assignment based on prerequisites of Digital Electronics.
	2. Assignments based on each unit.
	3. Multiple Choice Questions Assignments
Tutorials	NIL
Presentations	Self prepared presentations on different units.