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: 2019-20

FOR THE PROGRAMME

T. 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 Electronics and Telecommunication Engineering and Technology

MISSION

To impart quality education in Electronics and Telecommunication engineering (IM4, IM5) (DPEO1)

To facilitate techno-social and economic growth (IM5, IM6) (DPEO3) (DPEO1)

To develop active learners and competitive engineers for sustainable technical growth through lifelong learning and ICT based education (IM3, IM6) (DPEO1)

To provide skill and value-based education to address societal issues (IM1, IM2) (DPEO2, DPEO3)

PROGRAM EDUCATIONAL OBJECTIVES

PEO1 To provide engineering solutions by applying domain knowledge

PEO2 To instill professionalism and ethical values among engineers towards cultured and developed society

PEO3 To develop interpersonal skills to meet the aspirations of the stakeholders

PROGRAMME SPECIFIC OUTCOMES

PSO1 Demonstrate reasonable amount of proficiency to understand the engineering problems to design and develop the electronic and communication systems through collaborative efforts

PSO2 Utilize modern simulation and hardware tools to analyze the performance of electronic and communication systems.

DEPARTMENT OF ELECTRONICS & TELECOMMUNICATION ENGINEERING

PROGRAMME OUTCOMES

The Program 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

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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
204191	Employability Skill Development	2	-	2			50			50	2	1
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	Classify systems based on their properties and determine the response of LTI systems using convolution
CO4	Represent CT and DT systems in the Frequency domain using Fourier Analysis tools like CTFS, CTFT, DTFS and DTFT.
CO5	Conceptualize the effects of Probability and Random Variable.
CO6	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 Fourier 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	NPTEL Course on Signals and Systems by Dr. V. M. Gadre		
	https://nptel.ac.in/courses/108104100/		
	MIT Open Courseware		
	https://ieeexplore.ieee.org/abstract/document/1161523/		
Contents beyond Syllabus	Correlation between Mathematics and Signals and systems Case studies of applications where Signals and systems are applicable.		
Additional Experiments	Experiments based on audio and video signal processing using MATLAB		
Bridging Courses	Course on Basic Probability Theory		
Tutorials	**As Listed above**		
Presentations	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 Y. S. Lin	Performance Dependance on Width to Length Ratio of Si Cap/SiGe Channel MOSFETs	IEEE Transactions on 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	Proceedings of the IRE, vol. 40, pp. 1644–1650,

		Kilomegacycle Range	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**	**University Course Code:**	204184
Designation of Course	Professional Core	**Course Number:**	C204
Teaching Scheme	**Theory :** 4 Hrs /Week	**Laboratories:** 2 Hrs / Week	
Course Outcome Assessment Tools	**External Assessment (University Level)**	**Direct Tools**	Online Examination: 50 Marks End-Semester Theory Examination: 50 Marks
	Internal Assessment (Department Level)	**Direct Tools**	Term-work : Nil Oral : 50 Marks Assignments, Q&A session, Group Discussion, Test, Mini Project
		Indirect Tools	Course Exit Survey
Prerequisites	Basic knowledge of C language is required.		

Introduction of the Course	
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	
CO1	Understand and apply 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 as per the University Syllabus	
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)
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
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		
	To measure and verify port characteristics of microwave tee junctions (E, H, E-H Planes).		
	To measure and verify port characteristics of Directional Coupler and calculate coupling factor, insertion loss and directivity.		
	To measure and verify port characteristics of Isolator and Circulator and calculate insertion loss and isolation in dB.		
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		
	Graph using adjacency Matrix with BFS & DFS traversals.		
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:
T3	Yashwant Kanetkar	Data Structure through C	BPB Publication 2nd Edition
T4	Prof. P.S.Deshpande , Prof. O.G. Kakde	C & Data Structures	Dreamtech Press
T5	E Balgurusamy	C and Data Structures	Tata McGraw-Hill, Second Revised Edition
Reference Books	**Author**	**Title of Book**	**Publication**
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			
	Doing mini project on topic given by faculty in group of two students.		
	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		
Web Resources			
1	Spoken Tutorial on C and C++ Programming		
2	Online NPTEL course on C Programming		
3	MIT notes on C Programming and Data Structure		
Research papers for reference	**Author**	**Title of Paper**	**Journal/Transaction**
1			
2			
Contents beyond Syllabus			
	Brief discussion on quick sort ,merge sort, heap sort and file handling		
Additional Experiments	Read & write operations in a text file using File Handling concepts.		
Bridging Courses			
	No bridging course is required since all the prerequisite courses have been learnt by the students at FE classe.		
Assignments			
For students will do mini project on any one of following topic			
1.	Polynomial addition using array of structure.		
2.	Evaluation of postfix expression (input will be postfix expression)		
3.	Implement following Matrix operations: addition with pointers to arrays multiplication without pointers to arrays transpose with pointers to arrays		
4.	Implement set operations using arrays and perform union, intersection, difference, symmetric difference		
5.	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: a) Insert b) delete, c) Display forward, d) Display backward		
6.	Represent graph using adjacency list or matrix and generate minimum spanning tree using Prism's algorithm		
7.	Manipulations of polynomials using linked lists.		

8.	Binary search tree: Create, search, non recursive traversals
9.	Library Data base Management system
10.	Bank records management system
11.	Write a program to print all combinations of a string. String and function
12.	Display calendar of Month after user enters year and month.
Tutorials	Not Applicable
Presentations	Self prepared presentations for students

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 : Study of IC-74LS153 as a Multiplexer. (Refer Data-Sheet). Design and Implement 8:1 MUX using IC-74LS153 & Verify its Truth Table. Design & Implement the given 4 variable function using IC74LS153. Verify its Truth-Table. Study of IC-74LS138 as a Demultiplexer / Decoder (Refer Data-Sheet). Practical) (Test Benches and FSM excluded). Design and Implement full adder and subtractor function using IC- 74LS138. Design & Implement 3-bit code converter using IC-74LS138.(Gray to Binary/Binary to Gray) Study of IC-74LS83 as a BCD adder,(Refer Data-Sheet). Design and Implement 1 digit BCD adder using IC-74LS83 Design and Implement 4-bit Binary sub tractor using IC-74LS83. Study of IC-74LS85 as a magnitude comparator,(Refer Data-Sheet) Design and Implement 4-bit Comparator. 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). Design and Implement MOD-N and MOD-NN using IC-74LS90 and draw Timing Diagram. 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: Write a assembly/C language program to perform arithmetic operations. Write a assembly/C language program to perform internal and external memory transfer operations 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	Introduction to applications of Digital Electronics. Study of 8051 programming language.		
Additional Experiments	Measurement of power dissipation of TTL		
	Measurement of propagation delay of TTL.		
Bridging Courses	NIL		
Assignments	Assignment based on prerequisites of Digital Electronics.		
	Assignments based on each unit.		
	Multiple Choice Questions Assignments		
Tutorials	NIL		
Presentations	Self-prepared presentations on different units.		

SE (E&TC)

Semester II

Mathematics III

Course Title: Mathematics III		**Course Number: 207005**	**Course Name:C207**
Year: SE		**Semester: II**	
Type of Course		Basic	
Teaching Scheme: 4 Hrs/Week		**Laboratories:** 1 Hrs/Week	
Course Assessment Method Examples	**Direct methods**	On-line Examination: 50 Marks	Theory Examination: 50Marks
		Term-work 25 Marks	Practical/Oral
	Indirect Methods	Assignments, Presentations, MCQs	Seminars, Quiz, Q&A session, Group Discussion
Course Prerequisites	Engg. Mathematics I and II		
Course Objectives	**Assessment Method Used**		
1	Provide students with a broad knowledge of the principles of engineering mathematics & its application..		
2	Provide students with the skills necessary to perform in the multidisciplinary environment of the 21st century		
3	Graduates will have a fundamental knowledge needed for the practice or advanced study in various fields		
4	Graduates will have a broad education necessary for productive careers.		
5	Prepare students to exhibit professional growth throughout their careers.		
Course Outcomes			
CO1	Demonstrate wide knowledge in topics like LDE, Transform, Vector Differentiation & Integration & numerical methods.		
CO2	Demonstrate the ability for understanding the concepts of applications into LDE of higher order.		
CO3	Demonstrating the physical interpretation of vector differentiation, green`s lemma theorem, Line integral		
CO4	Demonstrating the ability to apply the studied knowledge to solve real life engineering problems.		
Course Contents			
Unit-I	**Linear Differential Equation**		
	Introduction to differential equation of 1st order , 1st degree ,explanation about Order and degree of differential equation.Introduction to the concepts of complimentary function and particular integral.Various methods of finding particular integral namely General Method, Variation Parameter, Short Cut Method.Introduction to LDE with constant coefficients, Homogeneous equations,Cauchy`s & Legendre`s DE, Simultaneous & Symmetric Simultaneous DE.		
Unit-II	**Fourier And Z- Transform**		

	Introduction to Fourier Transform ,understanding of exponential form of Fourier series. Fourier integral theorem, meaning of sine and cosine integrals and their inverses. Introductory to Z-transform ,its meaning standard properties ,standard sequences and their inverses.Uses of Z-Transform in solving difference equations.
Unit-III	**Numerical Methods**
	Physical Interpretation of interpolation, numerical differentiation and integration. Introduction to the method of calculating polynomial approximations also interpolating Polynomial which is used both for interpolation & extrapolation.Understanding the concepts of finite differences & difference operator.Understanding of numerical integration ,by trapezoidal rule, simpson`s rule .
Unit-IV	**Vector Differential Calculus**
	Physical Interpretation of vector differentiation, Radial ,transverse & Normal components of velocity & acceleration, vector differential operator, Gradient, Divergence & Curl. Directional derivatives Solenoidal, Irrotational & Conservative fields Scalar Potential Vector Identities.
Unit- V	**Vector Integral Calculus**
	Introduction to line, surface ,volume integral & its application to find work done ,Green`s Lemma, Gauss`s Divergence Theorem, Stoke`s Theorem. Application to problem in electromagnetic fields.
Unit-VI	**Complex Variables**
	Introduction to functions of complex variable ,analytic functions, Cauchy-riemann equations, Conformal mapping ,Cauchy`s integral formula & residue theorem.

Text Books	**Author**	**Title of Book**	**Publication & Edition**
T1	Erwin Kreyszig	Advanced Engineering Mathematics	Wiley Eastern Ltd
T2	Peter V .O`Neil	Advanced Engineering Mathematics	Thompson Learning
Reference Books			
R1	B.V.Ramana	Higher Engineering Mathematics	Tata McGraw-Hill
R2	Thomas L.Harman James Dabney & Norman Richert	Advanced Engineering Mathematics with MATLAB	2e Cole, Thomson Learning
R3	M.D.Greenberg	Advanced Engineering Mathematics	Pearson Education2e
R4	B.S.Grewal	Higher Engineering Mathematics	Khanna Publication, Delhi

R5	P.N.Wartikar	Applied Mathematics (Volumes I& II)	Pune Vidyarthi Griha Prakashan ,Pune
Self-Learning Material (OCW, Handouts, Web Recourses, Research papers etc.)	Nil		
Contents beyond Syllabus	Methods of variation of parameter of 3rd order		
Additional Experiments (If any)	Not applicable		
Bridging Courses	Before the commencement of regular classes ,respective teachers conducts 20 minutes session on everyday basis for the first 15 days which focuses on class 12 level basic maths,also revision of certain important topics related to Engineering Mathematics- I and Engineering Mathematics-II are covered to understand the concepts of Engineering Mathematics-III		
Assignments	1. Linear differential equations with constant coefficients and transform. 2. Numerical methods and vector differential calculus.		
Tutorials	1. LDE→ C.F AND P.I, short cut method 2. FT→ Fourier transform, inverse Fourier transform 3. Z transform 4. Miscellaneous 5. Vector algebra 6. Vector Identities 7. Numerical Methods		
Presentations	Nil		

Integrated Circuits

Course Title: Integrated Circuits		**Course Number:** 204187	**Course Name: C208**
Year: SE		**Semester: II**	
Type of Course		Professional Core	
Teaching Scheme: 3 Hrs/Week		**Laboratories:** 2 Hrs/Week	
Course Assessment Method Examples	**Direct methods**	On-line/ Examination: 50Marks	Theory Examination: 50 Marks
		Term-work	Practical 50 Marks
	Indirect Methods	Assignments, Presentations, MCQs	Seminars, Quiz, Q&A session, Group Discussion
Course Prerequisites	Basics of BJT.		
Course Objectives			
1	To introduce the basic building blocks of linear integrated circuits.		
2	To teach the linear and non-linear applications of operational amplifiers.		
3	To introduce the theory and applications of analog multipliers and PLL.		
4	To teach the theory of ADC and DAC.		
5	To introduce a few special functions integrated circuits		
Course Outcomes			
CO1	On completion of this course, the students will have a thorough understanding of operational amplifiers with linear integrated circuits		
CO2	Students will be able to design circuits using operational amplifiers for various applications		
Course Contents			
Unit-I	**OP-AMP Basics**		
	Block diagram of OP-AMP, Differential Amplifier configurations, Differential amplifier analysis for dual-input balanced-output configurations using 'r' parameters, Need and types of level shifter, current mirror circuits. Voltage series and voltage shunt feedback amplifier and its effect on Ri, Ro, bandwidth and voltage gain.		
	Practical		
	Measure Op-Amp parameters and compare with the specifications. Input bias current, input offset current and input offset voltage. slew rate , CMRR Compare the result with datasheet of corresponding Op-Amp.		
Unit-II	**Linear Applications of OP-AMP**		
	Inverting and Non-inverting amplifier, voltage follower, voltage scaling, difference amplifier, Ideal integrator, errors in ideal integrator, practical integrator, frequency response of practical integrator, applications of integrator, Ideal differentiator, errors in ideal differentiator, practical differentiator, frequency response of practical differentiator, applications of differentiator, Requirements of Instrumentation amplifier, 3 OP-AMP Instrumentation amplifier, Instrumentation amplifier applications.		
	Practical		
	1. Design, Built and Test Integrator.		
	2. Design, Built and Test Differentiator.		

	3. Design, Built and Test three Op-amp instrumentation amplifiers for typical application.
Unit-III	**Non-linear Applications of OP-AMP**
	Comparator, characteristics of comparator, applications of comparator, Schmitt trigger (symmetrical/asymmetrical), Square wave generator, triangular wave generator, Problems in basic rectifier, Need of precision rectifier, Half wave , Full wave precision rectifiers, peak detectors, sample and hold circuits
	Practical
	1. Design, Built and Test half and full wave rectifier.
	2. Design, Built and Test Comparator and Schmitt Trigger.
	3. Design, Built and Test Sample and Hold Circuit.
	4. Design, Built and Test Square and Triangular wave generator
Unit- IV	**Converters using OP-AMP**
	V-F and F-V converter, I-V and V-I converter, Current amplifier, DAC, types of DAC, characteristics, specifications, advantages and disadvantages of each type of DAC, ADC, types of ADC, characteristics, specifications, advantages and disadvantages of each type of ADC
	Practical
	Design and implement 2 bit R- 2R ladder DAC.
	Design and implement 2 bit flash type ADC
Unit-V	**Phase Locked Loop &Oscillators**
	Block diagram of PLL and its function, PLL types, characteristics/parameters of PLL, and different applications of PLL. Oscillators principle, types and frequency stability, design of phase shift, wein bridge, Quadrature, voltage controlled oscillators.
	Practical
	Design, build and test square & triangular wave generator.
Unit-VI	**Active filters**
	Design and frequency scaling of First order and second order Active LP, HP, BP and wide and narrow band BR Butterworth filters and notch filter. All pass filters.

Text Books	**Author**	**Title of Book**	**Publication & Edition**
T1	Ramakant A. Gaikwad	Op Amps and Linear Integrated Circuits	Pearson Education
T2	Salivahanan and Kanchanabhaskaran	Linear Integrated Circuits	TMH
Reference Books			
R1	George Clayton and Steve Winder	Operational Amplifiers	Newnes
R2	Sergio Franco	Design with Operational Amplifiers and Analog Integrated Circuits	TMH
R3	Bali	Linear Integrated Circuits	Mc Graw Hill
R4	Gray, Hurst, Lewise, Meyer	Analysis & Design of Analog Integrated Circuits	Wiley Publications

Self-Learning Material (OCW, Handouts, Web Recourses, Research papers etc.)	Application Notes on Integrated Circuits
Additional Experiments (If any)	Plot DC Characteristic of Op- Amp.
Bridging Courses	Expert Lecture on Integrated Circuits.
Assignments	Nil
Tutorials	Nil
Presentations	In addition to regular experiments finally one session was conducted on practical discussion only .circuit Diagram, working of circuit, applications, all the points were discussed again in detail

Control Systems

Course Title: Control Systems		**Course Number:** 204188	**Course Name:C209**
Year: SE		**Semester: II**	
Type of Course	Professional Core		
Teaching Scheme: 3 Hrs/Week		**Laboratories:**	
Course Assessment Method Examples	**Direct methods**	On-line Examination: 50 Marks	End Semester Examination: 50 Marks
		Term-work :--	Practical/Oral:--
	Indirect Methods	Class Test, MCQ test, Assignments, Presentations	Q&A session, Group Discussion
Course Prerequisites	Basic Circuits, Laplace Transform		
Course Objectives	**Assessment Method Used**		
1	To make students aware of basics of control systems, its classification		
2	To make the students aware of transfer function and mathematical modelling of system		
3	To make the students aware of basics concepts of time domain and frequency domain analysis and design of system using Root locus, Bode plot and Nyquist plot.		
4	To make the students to understand PID controller.		
5	To make the students to analyse state variable and guide the students for analyzing controllability and observability of system		
Course Outcomes			
CO209.1	Formulate transfer function of given control system.		
CO209.2	Find time response of given control system.		
CO209.3	Evaluate stability of control system using Routh Array Criteria.		
CO209.4	Apply Root locus & Bode plot technique to analyze control system.		
CO209.5	Express and solve system equations in state variable form.		
CO209.6	Construct ladder Diagram program for given system problem		
Course Contents			
Unit-I	**Control System Modelling**		
	Basic Elements of Control system, Open loop and closed loop systems, Differential equations and transfer function, Modelling of Electrical systems, Translational and Rotational systems, Block diagram reduction techniques, Signal flow graph.		
	Tutorial		
Unit-II	**Time Response analysis**		
	Standard input signals, Time response analysis of first order systems, Time response analysis of second order systems, steady state errors and error constants, design specifications for second order systems.		
	Tutorial		

Unit-III	**Stability**
	Concept of stability, Routh-Hurwitz criterian, Relative stability,Root locus techniques, construction of Root locus, dominant poles, applications of Root locus Diagram.
	Tutorial
Unit-IV	**Frequency Response Analysis**
	Frequency domain versus Time domain analysis and its correlation, Bode plot, Polar plots and Development of Nyquist plots. Frequency domain specifications from the plots, stability analysis from plots.
	Tutorial
Unit- V	**State Space Analysis**
	State space advantages and representation, Transfer function from state space,physical variable form, phase variable forms, Controllable canonical form, observable canonical forms, solution of homogeneous state equations, state transition matrix and its properties, computation of state transition matrix by Laplace transform method only, concept of controllability and observability
	Tutorial
Unit-VI	**Digital Control Systems**
	Introduction to PLC: Block schematic, PLC addressing, any one application of PLC using Ladder diagram, Introduction to PID controller, P,PI,PD,PID characteristics and concept of Zeigler- Nicholas method. Digital control systems: Special features of digital control systems, Necessity of Sample and hold operations for computer control, z transform and pulse transfer function, stability and response of sampled data systems.
	Tutorial

Text Books	**Author**	**Title of Book**	**Publication & Edition**
T1	Katsuhiko Ogata	Modern Control Engineering,	fifth Edition, PHI learning Private Limited, New Delhi 2010
T2	I. J Nagrath , M Gopal	control Systems Engineering	fifth edition, New Age International Publishers, New Delhi 2007
Reference Books			
R1	Curtis D Johnson	Process control Instrumentation Technology	eighth edition, PHI private Limited, New Delhi 2011
R2	Richard C Drof, Robert N Bishop	Modern control Systems,	Addison Wesley Publishing company 2001
R3	B C Kuo	Digital control systems	Second Edition , Oxford University press, New York 1992
R4			
R5			

Self-Learning	Control system components: Servomotors, Stepper Motor
	Nptel.ac.in/courses/108101037 [nptel –Electrical Engineering/Control systems]

Material (OCW, Handouts, Web Recourses, Research papers etc.)	
Contents beyond Syllabus	Force to Voltage Analogy and Force to current Analogy.
Additional Experiments (If any)	
Bridging Courses	--
Assignments	
1	Transfer function.
2	Stability Analysis
3	Root Locus & Bode Plot
4	State Space Analysis
5	Programmable Logic Controller
Tutorials	
Presentations	Introduction to control system with examples, Bode Plot
	PLC

Analog Communication

Course Title: Analog Communication		**Course Number:** 204189	**Course Name:C210**
Year: SE		**Semester: II**	
Designation of Course		Professional Core	
Teaching Scheme: 4 Hrs/Week		**Laboratories:** 2 Hrs/Week	
Course Assessment Methods	**Direct methods**	online: 50 Marks	End Sem: 50 Marks
			Practical: 50 Marks
	Indirect Methods	Assignments, Presentations	Q&A session, Group Discussion
Prerequisites	Signals and systems		

Course Objectives	
1	To address block wise study of Analog Communication System
2	To illustrate the need for modulation and study of AM, FM modulation techniques, their analysis in time domain and frequency domain.
3	To expose students to Bandwidth calculations for various analog modulation techniques
4	To analyze TRF Receivers and AM, FM Superheterodyne receivers. To study characteristics of receivers.
5	To understand performance analysis of various analog communications systems under the presence of noise
6	To expose students to the process of sampling. To analyze and compare Pulse and digital modulation techniques.
Course Outcomes	
CO1	After successfully completing the course students will be able to Understand and identify the fundamental concepts and various components of analog communication systems.
CO2	Understand, analyze ,explain and compare various analog modulation schemes
CO3	Understand and apply concepts and techniques from Fourier analysis and circuit analysis to communication systems.
CO4	Understand the various sources of noise and its effect on analog modulation schemes.
CO5	Describe various pulse and digital modulation techniques
Course Contents	
Unit-I	**AM Transmission**
	Base band & Carrier communication, Generation of AM (DSBFC) and its spectrum, Power relations applied to sinusoidal signals, DSBSC – multiplier modulator, Nonlinear generation, switching modulator, Ring modulator & its spectrum, Modulation Index. SSBSC, ISB & VSB, their generation methods & Comparison, Block Diagram of AM Transmitter and Broadcast technical standards.
	Practical : 1. Study of Class C Single Tuned amplifier to demonstrate AM Generation 2. A) AM Generation (DSB -FC): Calculation of modulation index by graphical method, Power of AM Wave for different modulating signal. B) Envelope Detector - Practical diode detector, Observe effect of change in RC

	time constant which leads to diagonal and negative clipping 3. Generation of DSB-SC with the help of Balanced Modulator IC1496/1596 & its detection 4. SSB modulator using Filter method, phase shift method & its detection 5.AM transmitter: Measure Total power of transmitter with the help of Spectrum Analyzer or Wattmeter, Observe variation in total power by varying modulating signal level Assignments using suitable Software 1. Generate AM waveform for given modulation index, signal frequency and carrier frequency.
Unit-II	**AM Reception**
	Block diagram of TRF AM Receivers, Super Heterodyne Receiver, Dual Conversion Super heterodyne Receiver, Concept of Series & Parallel resonant circuits for Bandwidth & Selectivity. Performance Characteristics: Sensitivity, Selectivity, Fidelity, Image Frequency Rejection and IFRR. Tracking, Mixers. AM Detection: Rectifier detection, Envelope detection; Demodulation of DSBSC: Synchronous detection; Demodulation of SSBSC: Envelope detection
	Practical: 6.A)Frequency modulator using varactor diode and NE 566 VCO, calculation of modulation index B)FM demodulator using such as IC 565 (PLL based) 7.Study of FM Transmitter; observe output waveform using Spectrum Analyzer and see the effect of Eigen values on carrier power Assignments using suitable Software 2. Generate FM waveform for given signal amplitude and carrier frequency.
Unit-III	**FM Transmission**
	Instantaneous frequency, Concept of Angle modulation, frequency spectrum& Eigen Values, Narrow band & wide band FM, Modulation index, Bandwidth, Phase Modulation, Bessel's Function and its mathematical analysis, Generation of FM (Direct & Indirect Method), FM stereo Transmitter, Two way FM Radio Transmitter, Comparison of FM and PM.
	Practical: 8.Measurement of Performance Characteristics of Receiver: Sensitivity, Selectivity, Fidelity
Unit-IV	**FM Reception**
	Block diagram of FM Receiver, FM Stereo Receiver , Two way FM Radio Receiver, FM detection using Phase lock loop(PLL) ,Slope detector, Balanced Slope detector etc.
Unit- V	**Noise**

	Sources of Noise, Types of Noise, White Noise, Thermal noise, shot noise, partition noise, Low frequency or flicker noise, burst noise, avalanche noise, Signal to Noise Ratio, SNR of tandem connection, Noise Figure, Noise Temperature, Friss formula for Noise Figure, Noise Bandwidth, Behavior of Baseband systems and Amplitude modulated systems i.e.DSBSC and SSBSC in presence of noise		
Unit-VI	**Pulse Analog modulation**		
	Band limited & time limited signals, Narrowband signals and systems, Sampling theorem in timedomain, Nyquist criteria, Types of sampling- ideal, natural, flat top, Aliasing & Aperture effect. PAM PWM & PPM. Pulse Code Modulation – Generation & reconstruction		
	Practical: 9.Verification of Sampling Theorem, PAM Techniques, (Flat top & Natural sampling), Effect of variable sampling rate, filter cutoff, reconstruction of original signal using Interpolation Filter. Aliasing Effect in frequency domain. Assignments using suitable Software 3.Prove sampling Theorem. Reconstruct the analog signal from its samples. Observe aliasing effect by varying sampling frequency		
Text Books	**Author**	**Title of Book**	**Publication**
T1	B. P. Lathi	Modern Digital and Analog. Communication Systems, 3rd Edition	Oxford University Press
T2	Dennis Roddy & Coolen	Electronic Communication, 4th Edition	Prentice Hall
Reference Books			
R1	Simon Haykin	Communication Systems", 4th Edition	John Wiley & Sons
R2	Taub& Schilling	Principles of Communication Systems	Tata McGraw-Hill
R3	George Kennedy	Electronic Communication Systems" 5th Edition	McGraw-Hill
R4	Frenzel	Principles of Electronic Communication Systems"3rd Edition	Tata McGraw-Hill
R5	Leon W.Couch, II	Digital and Analog Communication Systems,7TH Eition	Pearson Education
Self-Learning Facilities, Web Resources, Research papers for reference	Modern Digital and Analog. Communication Systems, 3rd Edition by B.P.Lathi		
	Video lectures from NPTEL: http://nptel.iitm.ac.in Lecture Series on Communication Engineering by Prof.Surendra Prasad, Department of Electrical Engineering ,IIT Delhi		
Contents beyond Syllabus	Details of electromagnetic spectrum, ISM band.		

Additional Experiments	Conducted an experiment to study spectral contents of sine , square and triangular signal using spectrum analyzer
Bridging Courses	Not Applicable
Assignments	
1	AM modulation demodulation
2	Carrier null in FM
3	PAM,PWM,PPM
4	PCM
5	Superhetrodyne Receivers
Tutorials	Not Applicable
Presentations	Self prepared presentations on different units.

Object Oriented Programming

Course Title:	**Object Oriented Programming**	**Course Number: 204190**	**Course Code : C211**
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/End Semester Examination: 50Marks
		Term-work	Practical/Oral
	Indirect Methods	Assignments, Presentations	Seminars, Quiz, Q&A session, Group Discussion
Prerequisites	Basics of C language and Data structure &Algorithm		

Introduction of Course

Computer hardware can understand instructions only in the form of machine codes i.e. 0's and 1's. A programming language used to communicate with the hardware of a computer is known as low-level language or machine language. It is very difficult for humans to understand machine language programs because the instructions contain a sequence of 0's and 1's only. Also, it is diff cult to identify errors in machine language programs. Moreover, low-level languages are machine-dependent. To overcome the difficulties of machine languages, high-level languages such as Basic, Fortran, Pascal, COBOL, and C were developed. High-level languages allow some English-like words and mathematical expressions that facilitate better understanding of the logic involved in a program. While solving problems using high-level languages, importance was given to develop an algorithm (step-by-step instructions to solve a problem). While solving complex problems, a lot of difficulties were faced in the algorithmic approach. Hence, object oriented programming languages such as C++ and Java were evolved with a different approach to solve the problems. Object-oriented languages are also high-level languages with concepts of classes and objects

Course Objectives

1	Define object oriented concepts used in C++ and JAVA.
2	Describe fundamentals of programming such as variables, expressions, conditional and iterative execution and methods in C++ and JAVA.
3	Apply basic concepts of object oriented programming in C++ and JAVA such as classes, invoking methods and using class libraries.
4	Illustrate Interface, multithreading ,exception handling in JAVA
5	Develop computer program to solve specified problems with C++ and JAVA languages

Course Outcomes

CO1	Describe the concept of object oriented paradigm such as encapsulation, abstraction, inheritance and polymorphism.
CO2	Design a class in C++ and JAVA and develop codes using basic constructs as constructors and destructors.
CO3	Execute codes in C++ and JAVA to demonstrate overloading and inheritance concepts.
CO4	Develop simple JAVA programs using interface, multi threading.
CO5	Implement basic programs in JAVA for in JAVA for exception handling and creating Applet

Course Contents

Unit-I	**Introduction to Object Oriented Programming**
	Principles of OOP: Software crisis, Software evolution, OOP paradigm, Basic Concepts of OOP, Benefits & applications of OOP. Beginning with C++: What is C++, Applications of C++, A Simple C++ Program, More C++ statements. Moving from C to C++: Declaration of variable, Reference variables, Scope resolution operator, Member dereferencing operator, memory management operators. Functions in C++: Function prototyping, Call by reference
	Practical
	1. Write a program in C++ to sort the numbers in an array using separate functions for read,display, sort and swap. The objective of this assignment is to learn the concepts of input,output, functions, call by reference in C++.
Unit-II	**Concepts of Object Oriented Programming with C++**
	Classes & Objects: Specifying a class, Defining member functions, A C++ program with class, Making an outside function inline, Nesting of member function, Private member function, Arrays within class, Member allocation for objects, Arrays of objects, Objects as function arguments. Constructors & Destructors: Constructors, Parameterized constructors, Multiple constructors in a class, Constructors with default arguments. Operator overloading concept: Use of operator overloading, defining operator overloading, Binary operator overloading. Introduction to Inheritance: Concept and types of Inheritance, Defining derived classes, Single inheritance, Making a private member inheritable, multilevel inheritance.
	Practical
	2. Write a program in C++ to perform following operations on complex numbers Add, Subtract, Multiply, Divide, Complex conjugate. Design the class for complex number representation and the operations to be performed 3. Write a program in C++ to implement Stack. Design the class for stack and the operations to be performed on stack. Use Constructors and destructors 4. Write a program in C++ to perform following operations on complex numbers Add, Subtract, Multiply, Divide. Use operator overloading for these operations 5. Write a program in C++ to implement database of persons having different profession e,g. engineer, doctor, student, laborer etc. using the concept of multiple inheritance
Unit-III	**Java Fundamentals**
	Evolution of Java, Comparison of Java with other programming languages, Java features, Java Environment, Simple Java Program, Java Tokens, Java Statements, Constants, variables, data types. Declaration of variables, Giving values to variables, Scope of variables, arrays, Symbolic constants, Typecasting, Getting values of variables, Standard default values, Operators, Expressions, Type conversion in expressions, Operator precedence and associativity, Mathematical functions, Control statements- Decision making & branching, Decision making & looping.

	Practical
	1. Write some simple programs in Java such as i) To find factorial of number. ii) To display first 50 prime numbers. iii) To find sum and average of N numbers. 2. Write a program in Java to implement a Calculator with simple arithmetic operations such as add, subtract, multiply, divide, factorial etc. using switch case and other simple java statements.
Unit-IV	**Classes, Methods & Objects in Java**
	Class Fundamentals, Declaring Objects, Assigning Object reference variables, Methods, Constructors, The This keyword, Garbage collection, finalize method, Overloading methods, using objects as parameters, Argument passing, returning objects, Recursion, access control, static, final, arrays, strings class, Command line arguments.
	Practical
	3. Write a program to implement addition, subtraction and multiplication of two complex numbers in Java 4. Write a program in Java with class Rectangle with the data fields width, length, area and colour. The length, width and area are of double type and colour is of string type. The methods are get_length(), get_width(), get_colour() and find_area(). Create two objects of Rectangle and compare their area and colour. If the area and colour both are the same for the objects then display " Matching Rectangles", otherwise display " Non-matching Rectangle". 5. Write Programs in Java to sort i) List of integers ii) List of names. 6. Write a Program in Java to add two matrices. 7. Write a program to implement stack or any other data structure in Java
Unit- V	**Inheritance, Packages and Interfaces**
	Inheritance basics, Using Super, Creating Multilevel hierarchy, Constructors in derived class, Method overriding, Dynamic method dispatch, Using Abstract classes, Using final with inheritance, Object class, Packages, Access protection, Importing packages, Interfaces: Define, implement and extend. Default interface methods, Use static method in interface.
	Practical
	8. Write a program in Java to create a player class. Inherit the classes Cricket_player, Football_player and Hockey_player from player class. 9. Write a Java program which imports user defined package and uses members of the classes contained in the package. 10. Write a Java program which implements interface.
Unit-VI	**Multithreading, Exception handling & Applets**
	Introduction to multithreading: Introduction, Creating thread and extending thread class. Concept of Exception handling: Introduction, Types of errors, Exception handling syntax, Multiple catch statements. I/O basics, Reading console inputs, Writing Console output. Applets: Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating a simple applet.
	Practical
	11. Create an applet with three text Fields and four buttons add, subtract,

<table>
<tr><td></td><td colspan="3">multiply and divide. User will enter two values in the Text Fields. When any button is pressed, the corresponding operation is performed and the result is displayed in the third Text Fields.
12. Write a java program which use try and catch for exception handling
13. Write a program to create multiple threads and demonstrate how two threads communicate with each other.</td></tr>
<tr><td>Text Books</td><td>Author</td><td>Title of Book</td><td>Publication</td></tr>
<tr><td>T1</td><td>E Balagurusamy</td><td>“Object Oriented Programming Using C++ and JAVA”</td><td>Tata McGraw-Hill</td></tr>
<tr><td>T2</td><td>Herbert Schildt</td><td>Java: The complete reference</td><td>Tata McGraw Hill, 7th Editon.</td></tr>
<tr><td>Reference Books</td><td></td><td></td><td></td></tr>
<tr><td>R1</td><td>Bjarne Stroustrup,</td><td>C++ Programming Language</td><td>Pearson Education</td></tr>
<tr><td>R2</td><td>H.M.Dietel and P.J.Dietel</td><td>Java How to Program</td><td>Pearson Education/PHI, Sixth Edition</td></tr>
<tr><td>R3</td><td>Robert Lafore</td><td>Object-Oriented Programming in C++</td><td>Pearson Education India , (4th Edition)</td></tr>
<tr><td>R4</td><td></td><td></td><td></td></tr>
<tr><td>R5</td><td>Yeshwant Kanetkar</td><td>“Let us C++”</td><td>BPB Publications</td></tr>
<tr><td>Self-Learning Facilities</td><td colspan="3">NPTEL Lecture Series</td></tr>
<tr><td>Web Resources</td><td colspan="3"></td></tr>
<tr><td>Research papers for reference</td><td>Author</td><td>Title of Paper</td><td>Journal/Transaction</td></tr>
<tr><td>1</td><td></td><td></td><td></td></tr>
<tr><td>Contents beyond Syllabus</td><td colspan="3"></td></tr>
<tr><td>Additional Experiments</td><td colspan="3">1. Write some simple programs in C++ such as
i) To find factorial of number.
ii) To display first 50 prime numbers.
iii) To find sum and average of N numbers.
iv)Display pyramid of digits
1
2 3 4
5 6 7 8 9
v)Check given number is perfect number or not.
2. Write c++ program to define time class and accept the time from user,add and display it. (write functions like getdata, display, calculate)
3. Write C++ program to define date class and accept the date from user , add and display it.
4. Write a program in C++ using function overloading to calculate volume of different shapes.
5. Write base class shape and four derived classes circle, square, rectangle</td></tr>
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	and triangle. Implement getarea method in all classes and find the area of given all types of shapes and display it 6. Write a Java Program to implement array of objects Write class employee having Employee name and salary as data members. Also function to accept this data from user and display it.Write class EmployeeTest which will have array of object of class Employee and main method for execution. 7. A. Create class Test. In main method of Test class declare one integer, long, float variables. Accept integer variable value from user. Assign integer variable value to long and float variable and display three variable value separately. B. Create class Test. In main method of Test class declare one integer, long, double variables. Accept double variable value from user. Assign double variable value to long and integer variable and display three variable value separately.
Bridging Courses	
Assignments	
1	Inline function
2	Function
3	Constructor and destructor
4	Function overloading
5	String and scanner class
Tutorials	
Presentations	Presentations on topic class , constructor , destructor, inheritance in C++
	Presentations on topic class , array, inheritance in Java

Employability Skill Development

Course Title: Employability Skill Development		**Course Number:** 204191	**Course Name: C212**
Year: SE		**Semester: II**	
Type of Course	Professional Core		
Teaching Scheme: 2 Hrs/week		**Laboratories:** 02 Hrs/week	
Course Assessment Method Examples	**Direct methods**	On-line Examination: 00 Marks	End Semester Examination: 00 Marks
		Term-work :--50 Marks	Practical/Oral:-- 00 Marks
	Indirect Methods	Resume writing, Letter writing, Comprehension , Prepare PPTs, Solve mathematics, group discussion	
Course Prerequisites	Basic Knowledge of English Reading & Writing		
Course Objectives			
1	To develop analytical abilities.		
2	To develop communication skills.		
3	To introduce the students to skills necessary for getting , keeping and being successful in profession.		
4	To expose the students to leadership and team building skills.		
Course Outcomes: After completing this course students will be able to:			
CO1	Solve the arithmetic and mathematical reasoning tests.		
CO2	Communicate their ideas to their peers using ppt tools.		
CO3	Formulate resume.		
CO4	Discuss in a group on a given topic.		
CO5	Formulate feasible solutions for defined problem.		
CO6	State their responses for the questions asked in the interview.		
Course Contents			
Unit-I	**Soft Skills & Communication Basics**		
	Soft Skills Vs Hard skills, Skills to master, Interdisciplinary relevance, global & national perspectives on soft skills, Resume, Curriculum Vitae, How to develop an impressive resume, Different formats of resume-Chronological, Functional, Hybrid, Job application or cover letter, Professional presentation-planning, preparing & delivering presentation, Technical writing.		
	Practical		
Unit-II	**Arithmetic & Mathematical Reasoning**		
	Aspects of intelligence, Blooms Taxonomy, multiple intelligence theory, Number sequence test, mental arithmetic(square & square root, LCM, HCF, speed calculation, reminder theorem)		
	Practical No.1		

	Every student should collect five questions of each type: a. Number Sequence b. Mental Arithmetic c. Square , Square roots d. LCM , HCF e. Speed calculations
	Practical No 2.
	Write up on : a. Blooms Taxonomy b. Multiple Intelligence theory c. Every student should identify his / her strengths and weaknesses. d. Action plan to improve the weaknesses
Unit-III	Analytical Reasoning & Quantitative Ability
	Matching selection, Arrangements, verifications (Exercises on each of these types).Verbal aptitude(synonym, Antonym, Analogy).
	Practical No 3
	Every student should collect five questions of each type: a. Matching b. Selection c. Arrangements d. Verifications
	Practical No 4.
	Every student should collect five questions of each type: a. Verbal Aptitude b. Synonym c. Antonym d. Analogy
Unit-IV	**Grammar & comprehension**
	English sentences & phrases, Analysis of complex sentences, Transformation of sentences, Paragraph writing, story writing, Reproduction of story, Letter writing, précis writing, paraphrasing & Email Writing
	Experiment No 5
	Solve the exercises from book (wren & Martin, English Grammar & Composition) based on : a. English sentences & phrases b. Paragraph writing c. Story writing d. Letter Writing
	Experiment No 9
	Technical report writing and seminar Presentation.
Unit- V	Skills For Interviews

	Interviews-Types of Interviews, preparatory steps for job interviews, interview skill tips, Group Discussion- Importance of group discussion, types of group discussion, difference between group discussion, panel discussion & debate, personality traits evaluated in group discussion, tips for successful partitioning in group discussion, Listening skills-virtue of listening, fundamentals of good listening, Nonverbal communication-body movements, physical appearance, verbal sounds, closeness, time.		
	Experiment No 7		
	Practice test(aptitude ,analytical abilities, logical reasoning)		
	Experiment No 8		
	Extempore , group discussion & debate		
	Experiment No 10		
	Mock Interviews.		
Unit-VI	Problem solving Techniques		
	Problem solving model: 1. Define the problem 2. Gather information, Identify various solutions, 4. Evaluate alternatives 5. Take actions 6.Evaluate the actions. Problem solving Skills: 1. Communicate 2. Brain storming 3. Learn from mistakes.		
	Experiment No 6		
	Formulate suitable assignment to solve a real problem using problem solving techniques.		
Text Books	**Author**	**Title of Book**	**Publication & Edition**
T1	R. gajendra Singh Chauhan, sangeeta Sharma,	Soft Skills – An integral approach to maximize personality	ISBN:987-81-265-5639-7 First edition 2016 Wiley
T2	Wren & Martin	English Grammer & Comprehension	S. Chand Publication
T3	R.S. Aggarwal	A modern approach to verbal Reasoning	S. Chand Publication
Reference Books			
R1	Philip Carter	The complete book of Intelligence	John Wiley & sons Ltd.
R2	Philip carter , ken Russel	Succeed at IQ test	Kigan Page
R3	Eugene Ehrlich , Daniel Murphy	Schaum's outline of English Grammer	McGraw Hills
R4	David F Beer, David A Mc Murrey	A guide to writing as an Engineer	ISBN-978-1-118-30027-5 4th Edition ,2014, Wiley
Self-Learning Material (OCW, Handouts, Web Recourses,	Name of the course: Better Spoken English Course url: https://onlinecourses.nptel.ac.in/noc19_hs19/		
	Name of the course: Employment Communication A Lab based course Course url: https://onlinecourses.nptel.ac.in/noc19_hs20/ Course duration :8 weeks		

Research papers etc.)	
Additional Experiments (If any)	Resume Writing
Presentations	Presentation by students on different topics to develop their skills to prepare Power point presentation & present it.