Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2024 -25

Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	Second Year (Electronics Engineering), Sem. III
Course Code	7MA204
Course Name	Mathematics for Electronics Engineers
Desired Requisites:	Engineering Mathematics I and Engineering Mathematics II

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
		Credits: 3			

Course Objectives

1	To develop Mathematical skills and enhance thinking power of students.
2	To introduce fundamental concepts of Mathematics and their applications in engineering fields

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statements**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Descriptor**
CO1	**Understand** the solution of Nonlinear Partial differential equation	II	Understanding
CO2	**Understand** the Fourier transform and its properties	II	Understanding
CO3	**Construct** Fourier series for any periodic function by Euler's Formulae	III	Applying
CO4	**Apply** the Method of Laplace transforms to solve initial-value problems for linear differential equations with constant coefficients.	III	Applying
CO5	**Use** of basic knowledge of Z- transform to solve the problem in Signal system	III	Applying
CO6	**Apply** Various probability distribution to find the probabilities.	III	Applying

Module	**Module Contents**	**Hours**
I	**Laplace Transform and Its Applications** Definition, Transform of Standard functions, Properties, Transform of derivative and Integral, Inverse Laplace Transform, Convolution Theorem, Applications to solve linear differential equation	7
II	**Fourier Series** Periodic functions , Dirichlet's conditions, Definition , Determination of Fourier coefficients (Euler's formulae), Expansion of functions, Even and odd functions, Change of Interval and functions having arbitrary period, Half range	7

	Fourier sine and cosine series.	
III	**Partial differential equations and its Application** Introduction, Four Standard Forms: (i) $f(p,q)=0$ $(ii)\ f(z,p,q)=0, (iii) f_1(x,p)=f_2(y,q)$ (iv) Lagrange's equation application to one dimensional Heat equation.	6
IV	**Fourier Transform** Definition, Fourier Sine and Cosine Integral, Fourier sine and Cosine transform, Inverse Fourier sine and Cosine transform, Properties, Parseval's Identity.	6
V	**Z-Transform** Definition, Z- transform of standard functions, Properties of Z-transform, inverse Z transform, Application to difference equation	6
VI	**Probability Distribution** Random variable, discrete random variable, continuous random variable, probability mass function, probability density function, Poisson distribution, Normal Distribution, Exponential Distribution.	7

Textbooks	
1	Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley& Sons,Inc,10th Edition,2017.
2	A Text Book Of Applied Mathematics, Vol I and II , P.N. and J.N. Wartikar, Vidyarthi Griha Prakashan, Pune, 2010.
References	
1	Higher Engineering Mathematics, B.V.Ramanna., Tata McGraw Hill Education Pvt. Ltd, 1st Edition 2007.
2	Advanced Engineering Mathematics , H.K. Dass, S. Chand and company Ltd., 1st Edition 1988.
3	An Introduction to probability and Statistics, V.K Rohatgi, Wiley Publication, 2nd Edition 2008
4	Higher Engineering Maths, B.S.Grewal, Khanna Publication, 44th Edition, 2017.
Useful Links	
1	https://www.youtube.com/watch?v=lkAvgVUvYvY
2	https://www.youtube.com/watch?v=c9NibpoQjDk
3	
4	

CO-PO Mapping														
	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2													
CO2	2													
CO3	2													
CO4	2													
CO5	2													
CO6	2													
The strength of mapping is to be written as 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.														

Assessment
The assessment is based on MSE, ISE and ESE. MSE shall be typically on modules 1 to 3. ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO. ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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AY 2024-25

Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	Second Year B. Tech., Sem.-III
Course Code	7EN201
Course Name	Circuit Theory
Desired Requisites:	Engineering Mathematics, Basic Electrical Engineering

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
		Credits: 3			

Course Objectives

1.	On completion of the course, students should be sufficiently familiar with the theoretical structure, formal representation, computational methods, notation, and vocabulary of linear models to be able to apply them to the analysis and design of digital and analog communications and control systems. The students will be able to perform signal analysis with reference to spectrum analysis of deterministic signals.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO1	Work with basic fundamentals, theorems used in circuit's analysis	Understanding
CO2	Carry out transient and steady state analysis of different circuits	Analyzing
CO3	Do analysis and synthesis of circuit characteristics	Evaluating
CO4	Design a circuit and network	Creating

Module	**Module Contents**	**Hours**
I	**Network Analysis Diode Circuits:** Review of fundamentals of circuit components ,complex numbers and phasors in circuits, applications to networks, graphs and trees, node and mesh analysis, matrix representations dual and inverse networks, admittance and impedance, state variable analysis, T-II transformations, bridged-T and lattice networks, Network Theorems: Superposition, Millman, Norton, Thevenin, Maximum power transfer, AC and DC analysis	**8**
II	**Transient Response of Circuits:** RL and RC circuits, switching conditions, RLC circuits, Review of Laplace transform, important theorems and properties, application analysis of circuits in time domain, transfer function, Initial Conditions and Solutions to networks	**8**
III	**Sinusoidal Steady State Analysis:** The Sinusoidal Forcing Function, Phasor Concept, Average and Effective values of Voltage and Current, Instantaneous and Average Power, Complex Power, Steady State Analysis Using Mesh and Nodal Analysis, Application of Network Theorems to AC Circuits	**6**

V	**Resonance and Magnetically Coupled Circuits:** Series resonance, impedance and phase angle of series resonant circuit, voltage and current in series resonant circuit, effect of resistance on frequency response curve, bandwidth, selectivity and quality factor. Parallel resonance, resonant frequency for tank circuit, and variation of impedance with frequency factor of parallel resonant circuit, reactance curves. Magnetic coupled circuits: Mutual inductance, coefficient of coupling, single tuned and double tuned circuits	**6**
V	**Two Port Networks:** Open and short circuit parameters, transmission parameters, hybrid parameters, matrix form of input output relations, interaction of two four terminal networks, unsymmetrical networks, propagation functions, lattice networks, balanced and unbalanced networks, bisection theorem	**8**
VI	**Network Functions:** Concept of complex frequency network functions for one port and two port network, poles and zeros of network functions, restrictions on poles and zeros location for driving point function and transfer function. Time domain behavior from poles and zero plot, stability of active network, Characteristics of RLC and LC high pass, low pass, band pass and band stop filter.	**6**

Textbooks	
1	Van Valkenburg, "Network Analysis", PHI publication, 3rd Edition, 1983.
2	Leonard S. Bobrow, "Fundamentals of Electrical Engineering".
References	
1	L.P. Huelsman, "Basic Circuit Theory", PHI Publication, 3rd Edition, 2009.
2	C. K. Alexander, M. N. O. Sadiku, "Electrical Circuits", Tata McGraw-Hill, 2008.
3	Ravish R Singh, "Network Analysis and Synthesis", Tata McGraw-Hill, 2013
4	
Useful Links	
1	

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1	1												
CO2		1	2											
CO3		1		2									3	
CO4			1	2									3	

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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AY 2024-25

Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	Second Year B. Tech., Sem,-III
Course Code	7EN202
Course Name	Electronic Circuit Analysis and Design
Desired Requisites:	Analog Electronics

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
		Credits: 3			

Course Objectives

1	To **explain** the working of electronic circuits: small signal amplifiers using BJT and MOSFETs, feedback amplifiers and voltage regulators.
2	To **illustrate** the small signal models used for analysis of electronic circuits.
3	To **explain** the working of oscillators and multivibrators.
4	To **illustrate** the methods of designing the electronic circuits using discrete components.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO1	**Apply** the fundamentals of circuit theory to calculate AC/DC conditions of amplifiers.	Applying
CO2	**Analyze** the performance of electronic circuits (amplifiers) using small signal models such as hybrid-π, r_e and h-parameter model.	Analyzing
CO3	**Evaluate** the performance power amplifiers, feedback amplifiers, oscillators and multivibrators.	Evaluating
CO4	**Design** the electronic circuits (amplifiers) for given specifications using discrete components such as BJT, FET and MOSFET.	Creating

Module	**Module Contents**	**Hours**
I	**Small Signal Amplifiers:** Biasing Methods for BJT, JFET and MOSFET amplifiers, DC and AC load line analysis, small signal hybrid-π model, small signal equivalent circuit, analysis of common emitter (CE), common collector (emitter follower) amplifier and common base (CB) amplifier; analysis of common emitter (CS), common drain (source follower) amplifier and common gate (CG) amplifier.	**10**
II	**Power Amplifiers:** Classification of power amplifiers: class-A, class-B, class-AB, class-C power amplifiers; transformer-coupled amplifiers, class-AB push-pull complementary output stage.	**6**
III	**Frequency Response of Amplifiers:** Amplifier frequency response, square wave testing, effect of coupling, bypass, junction and stray capacitances, Low frequency and high frequency response of common emitter (CE) and common source (CS) amplifiers considering high frequency models of BJT and MOSFET.	**5**

IV	**Feedback Amplifiers:** Multistage amplifiers, Darlington pair, feedback concept, amplifiers with negative feedback, effects of negative feedback, four basic feedback topologies; Oscillators: basic principle of oscillation, Phase-Shift oscillator	**7**
V	**Oscillators and Multivibrators:** Principle of Positive feedback, Barkhausen criteria for oscillation, RC and LC oscillators; Multivibrators: Astable, Monostable and Bistable Multivibrator, Schmitt trigger circuit.	**8**
VI	**Voltage Regulators:** Series and shunt voltage regulators, design of Zener diode voltage regulator.	**4**

Textbooks	
1	D. A. Neamen, "Electronic Circuit Design and Analysis", 3rd Edition, McGraw Hill Education (India) Private Limited, New Delhi, 2007.
2	D. A. Neamen, "*Microelectronics: Circuit Analysis and Design*", 4th Edition, McGraw Hill Education (India) Private Limited, New Delhi, 2021.
3	A. S. Sedra and K. C. Smith, "Microelectronic Circuits", 5th Edition, Oxford University Press, 2004.
4	Allen Mottershead, "*Electronic Devices and Cir*cuits", 2nd Edition, PHI, 1979.
References	
1	R. Boylestad and L. Nashelsky, "*Electronic Devices and Circuit Theory*", 9th Edition, PHI, 2009.
2	Millman and Halkias, "*Electronic devices and Circuits: An Introduction*", 1st Edition, Tata McGraw Hill, 1991.
3	Jacob Millman, Herbert Taub, "Pulse, Digital and Switching Waveforms", 2nd Edition, Tata McGraw –Hill Publishing Company Ltd., New Delhi, 2007.
Useful Links	
1	https://nptel.ac.in/courses/108105158
2	https://nptel.ac.in/courses/117101106
3	https://nptel.ac.in/courses/108101091

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	3												2
CO2	2	3												2
CO3		3	3											2
CO4			3											2

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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AY 2022-23

Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	Second Year B. Tech., Sem. III
Course Code	7EN203
Course Name	Digital System and Microprocessor
Desired Requisites:	Digital Electronics

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial		30	20	50	100
		Credits: 3			

Course Objectives

1	To develop the fundamental concepts in digital design.
2	To make differences between combinational and sequential circuits evident to students.
3	To motivate students learn implementation of digital circuits using HDL and PLD.
4	To teach students to develop digital design using VHDL code

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO1	Differentiate between combinational and sequential circuits	Compare
CO2	Design medium scale combinational and sequential digital circuits	Construct
CO3	Utilize the architecture and organization of microprocessors with instruction set to design assembly language programs	Apply
CO4	Differentiate between PAL, PLA, PLD and their architecture.	Compare

Module	**Module Contents**	**Hours**
I	**Combinational Logic:** Review of Digital circuits, Code converter, Quine: Mc-cluskey method for logic minimization, Designs using MUX and Demux, Priority Encoder, Priority decoder, Parity Generator and Checker, Carry look ahead adder, ALU , tristate buffers, Hazards,. Hazard removal,	8
II	**Sequential Logic:** Characteristics equations of F/F,Conversion of any FF to any other FF, , Switch Denouncing, Counters.	6
III	**Shift register**: shift resistor, Bidirectional shift resistor, universal shift register, Johnson counter, universal shift resistor, Ring Counter. twisted ring counters, Timing parameters. Clock Skew, Clock jitter, Meta stability	8
IV	**Finite state machines:** State diagram, State assignment, Clocked Synchronous State Machines Design using J-K, D, T FF, State reduction	8
V	**a)Programmable Logic Devices**: Design Using PLA & PAL, CPLD architectures **b) Logic Families:** TTL,CMOS, and their characteristics	3
VI	**Microprocessors:** CPU organization, Introduction to 8-bit microprocessor architecture, internal architecture, assembly language programming, instructions.	6

Textbooks

1	"Digital Design", John F. Wakerly,Pearson Education Publication,
2	"Fundamentals of Digital Circuits", Anand Kumar, PHI, 2ndEdition, 2016.
3	"Digital Electronics" Mandal S.K , 1st Ediction. Mc-Graw-Hill
4	"VHDL-Programming by Example" Douglas Perry TMH, 4th Edition

5	"Microprocessor Architecture, Programming and Applications with the 8085 " Ramesh Gaonkar, Penram 6th Edition
References	
1	"Modern Digital Design", R..P.Jain, Mc-Graw-Hill
2	"Digital Logic and Computer Design", Morris Manno, PHI
3	
4	
Useful Links	
1	https://nptel.ac.in/courses/108/105/108105113
2	https://nptel.ac.in/courses/117/106/117106086
3	
4	

CO-PO Mapping														
	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1	1												
CO2		1	1	2										2
CO3			1	2										2
CO4	2	2												
The strength of mapping is to be written as 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.														

Assessment
The assessment is based on MSE, ISE and ESE. MSE shall be typically on modules 1 to 3. ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO. ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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AY 2024-25

Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	Second Year B. Tech., Sem. III
Course Code	7EN204
Course Name	Electronic Instrumentation
Desired Requisites:	-

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
		Credits: 2			

Course Objectives

1	Get an adequate knowledge about selecting particular sensing elements for the measurement of physical parameters.
2	Discuss the design, calibration and characteristics of various measuring systems/ instruments.
3	
4	

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO1	Identify various types of electronic instrument suitable for specific measurement.	Understand
CO2	Demonstrate different types of signal generators, oscilloscopes, analysers and their construction and operation.	Apply
CO3	Describe various errors present in measuring instruments.	Understand
CO4	Analyze the working principle, selection criteria and applications of various transducers used in measurement systems.	Analyze

Module	**Module Contents**	**Hours**
I	**Instrumentation of an Engineering System** Instrumentation of an Engineering System: Role of Sensors and Actuators, Human Sensory System, Mechatronic Engineering, Control System Architectures, Instrumentation Process. Component Interconnection and Signal Conditioning: Signal Modification and Conditioning, Impedance Matching Methods, Data Acquisition Hardware, Bridge Circuits, Linearizing Devices, Signal-Modification Hardware.	4
II	**Performance Specification and Instrument Rating Parameters** Performance Specification, Time-Domain Specifications, Frequency-Domain Specifications, Linearity, Instrument Ratings, Bandwidth Analysis, Aliasing Distortion Due to Signal Sampling, Instrument Error Considerations, Estimation from Measurements, Sensing and Estimation, Least-Squares Estimation.	4
III	**Analog Sensors and Transducers** Sensors and Transducers, Sensors for Electromechanical Applications, Potentiometer, Variable-Inductance Transducers, Permanent-Magnet and Eddy Current Transducers, Variable-Capacitance Transducers., Piezoelectric Sensors, Strain Gauges, Torque Sensors, Gyroscopic Sensors, Thermo-Fluid Sensors.	4

IV	**Digital and Innovative Sensing** Innovative Sensor Technologies, Shaft Encoders, Incremental Optical Encoder, Motion Sensing by Encoder, Encoder Data Acquisition and Processing, Absolute Optical Encoders, Encoder Error, Optical Sensors, Lasers, and Cameras, Miscellaneous Sensor Technologies, Tactile Sensing, MEMS Sensors, Sensor Fusion, Wireless Sensors	4
V	**Special Oscilloscopes** Delayed Time Base oscilloscopes, Analog storage oscilloscopes, Sampling oscilloscopes, Digital storage oscilloscopes, DSO Applications	4
VI	**Waveform Analyzing Instruments** Spectrum Analyzer , Digital Spectrum Analyzer	4
Textbooks		
1	B. P. Lathi and Jeff Kennedy, "Modern Digital and Analog Communication Systems", Third edition, Oxford University Press, 1998, ISBN: 12345678	
2	Straus, Joseph Nathan, "Elements of Communication", Third edition, Prentice Hall, 2011, ISBN: 12345678	
3		
4		
References		
1	Pawlak, Andrzej M.,Sensors and actuators in mechatronics : design and applications, CRC Press, Taylor & Francis Group, 2007.	
2	Ranganathan S.," Transducer Engineering", Allied Publishers (P) Ltd., 2003	
3		
4		
Useful Links		
1		

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1			2										2	
CO2		2	3											
CO3			2										2	
CO4			3										3	

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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AY 2024-25

Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	Second Year B. Tech., Sem.-III
Course Code	7EN251
Course Name	Electronic Circuit Analysis and Design Lab
Desired Requisites:	Analog Electronics Lab

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction	-	30	30	40	100
		Credits: 1			

Course Objectives

1	To **explain** the working of electronic circuits like rectifiers, amplifiers (voltage and current), power amplifiers and feedback amplifiers using BJT, FET and MOSFETs.
2	To **illustrate** the methods of designing the electronic circuits using discrete components.
3	To **explain** the practical ways of **measuring** AC and DC parameters of electronic circuits like amplifiers, feedback amplifiers for their performance analysis.
4	To **explain** the working of voltage regulators

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO1	**Demonstrate** the working of electronic circuits: small signal amplifiers built using BJT, JFET and MOSFET, feedback amplifiers and voltage regulators.	Applying
CO2	**Test** and **analyse** the performance of amplifiers built using BJT, JFET and MOSFET.	Analysing
CO3	**Evaluate** the performance of small signal, power and feedback amplifiers.	Evaluating
CO4	**Design** the electronic circuits (amplifiers) for given specifications using discrete components such as BJT, FET and MOSFET.	Creating

List of Experiments / Lab Activities/Topics

List of Topics(Applicable for Interaction mode):

List of Lab Activities: (Minimum 08 experiments)

1. Design and analysis of single stage common emitter BJT amplifier. Plot the frequency response of amplifier.
2. Design and analysis of common collector (emitter follower) amplifier.
3. Design and analysis of common source JFET amplifier.
4. Design and analysis of common source MOSFET amplifier.
5. Design and analysis of common drain (source follower) MOSFET amplifier.
6. Study of performance of Darlington pair.
7. Design and analysis of two stage BJT amplifier with negative feedback.
8. Design and analysis of class-A power amplifier using BJT/MOSFET.
9. Design and analysis of class-AB power amplifier.
10. Analyse the performance RC Phase-Shift Oscillator.
11. Analyse the performance astable multivibrator.
12. Design and analysis of Zener diode voltage regulator.
13. Design and analysis of series pass voltage regulator.

Textbooks

1	D. A. Neamen, "*Electronic Circuit Design and Analysis*", 3rd Edition, McGraw Hill Education (India) Private Limited, New Delhi, 2007.
2	A. S. Sedra and K. C. Smith, "*Microelectronic Circuits*", 5th Edition, Oxford University Press, 2004.
3	Allen Mottershed , "*Electronic Devices and Cir*cuits", 2nd Edition, PHI, 1979.
4	D. A. Neamen, "*Microelectronics: Circuit Analysis and Design*", 4th Edition, McGraw Hill Education (India) Private Limited, New Delhi, 2021.
References	
1	R. Boylestad and L. Nashelsky, "*Electronic Devices and Circuit Theory*", 9th Edition, PHI, 2009.
2	Millman and Halkias, "*Electronic devices and Circuits*", 1st Edition, Tata McGraw Hill, 1991.
3	Gerald E. Williams, "*Practical Transistor Circuit Design and Analysis*", 1st Edition, Tata McGraw Hill, New Delhi, 1973.
4	
Useful Links	
1	https://nptel.ac.in/courses/122106025
2	https://nptel.ac.in/courses/108105158
3	https://nptel.ac.in/courses/117101106
4	

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2									3				2
CO2				2										2
CO3					2									2
CO4				2										2

The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO, and preferably to only one PO.

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40

Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

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AY 2022-23

Course Information

Programme	B.Tech. (Electronics Engineering)
Class, Semester	Second Year B. Tech., Sem III
Course Code	7EN252
Course Name	Digital System and Microprocessor Lab
Desired Requisites:	Digital Electronics Lab

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction		30	30	40	100
		Credits: 1			

Course Objectives

1	To explain the importance of the HDL for Digital Design
2	To demonstrate the complete flow of EDA tool for implementing digital designs
3	To explain the concepts involved in simulation and synthesis of digital circuits using EDA tool

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO1	Able to write & debug the VHDL code / Assembly language program	Understand
CO2	Able to implement on kits or on simulator.	Apply

List of Experiments / Lab Activities/Topics

List of Topics(Applicable for Interaction mode):

List of Experiments:

1. Experiment 1: Introduction to Xilinx with sample experiment
2. Experiment 2: 1 bit full adder using 1 bit half adder as a component
3. Experiment 3: 4 bit full adder using 1 bit full adder as a component
4. Experiment 4: 1 bit full adder using 8:1 multiplexer as component
5. Experiment 5: 1 bit full adder using 1:8 demux as component
6. Experiment 6: Implementation of 4:1 mux using 2:1 mux as a component
7. Experiment 7: Implementation of demultiplexer IC 74138
8. Experiment 8: 4 bit comparator
9. Experiment 9: Implementation of flip flops
10. Experiment 10: UP counter and DOWN counter
11. Experiment 11: MODN counter
12. Experiment 12: UP-DOWN counter
13. Experiment 13: Shift registers
14. Experiment 14: Universal shift register
15. Experiment 15: Parallel loading shift register
16. Experiment 16: Sequence detector
17. Experiment 17: Creation of project in Quartus-II & download
18. Experiment 18 to 20: Assembly language program

Textbooks

1	John F. Wakerly, "Digital Design", Pearson Education Publication, 5th edition, 2018.
2	Anand Kumar, "Fundamentals of Digital Circuits", PHI, 2ndEdition, 2009

3	Mandal S.K , “Digital Electronics” Mc-Graw-Hill, 1stEdiction., 2009
4	Douglas Perry, “VHDL-Programming by Example” TMH, 4th Edition, 2012
5	“Microprocessor Architecture, Programming and Applications with the 8085 ” Ramesh Gaonkar, Penram 6th Edition
References	
1	R.P.Jain, “Modern Digital Design”, Mc-Graw-Hill, 4th edition, 2010
2	Morris Manno, “Digital Logic and Computer Design”, Prentice-Hall India, 1st edition 2011
3	
4	
Useful Links	
1	https://nptel.ac.in/courses/108/105/108105113
2	https://nptel.ac.in/courses/117/106/117106086
3	
4	

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	2		2	2									1
CO2		1	1											1

The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO, and preferably to only one PO.

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40

Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

Walchand College of Engineering, Sangli

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Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	Second Year B. Tech., Sem. III
Course Code	7EN253
Course Name	Data Structure and Algorithms Lab
Desired Requisites:	Programming basics, C programming

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Lecture	1 Hrs/ Week	30	30	40	100
		Credits: 1			

Course Objectives

1	To make the students understand different linear data structures and ADTs
2	To implement data structures by static and dynamic ways as per requirement
3	To apply different algorithms of searching and sorting techniques
4	To compare algorithms performance on basis of time complexities

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO1	**Demonstrate need of** different data structures and need of searching and sorting techniques.	Understand
CO2	**Implement** data structures stack and queue with different approaches	Apply
CO3	**Implement** searching and sorting algorithms.	Apply
CO4	**Examine** the complexity of data structures, searching and sorting algorithms	Analyze

List of Experiments / Lab Activities/Topics

List of Topics to be covered :

1. Data structures and its need
2. Different types of data structures
3. Static and dynamic approach for implementation of data structures
4. Algorithmic complexity and its significance
5. Need of searching techniques and its types
6. Need of sorting techniques and its types
7. Applications of data structures
8. Implementation of data structures
9. Implement searching algorithms with its complexity comparison
10. Implement sorting algorithms with its complexity comparison
11. Introduction to Graph theory and its applications

List of Lab Activities:
1. Programs to revise arrays, structures and pointers 2. Program to implement static stack 3. Program to implement static queue 4. Program to implement singly linked list 5. Different operations on singly linked list 6. Program to implement dynamic Stack 7. Program to implement dynamic queue 8. Programs to sort the data with algorithm complexity measure 9. Sequential search with algorithm complexity measure 10. Binary search with algorithm complexity measure

	Textbooks
1	Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures A pseudo code approach with C".
2	Horowitz, Sahni, "Fundamentals of Data structures in C", 2nd edition, 2008
3	S. Lipschutz, “Data Structures,Schaum's” Outlines Series, Tata McGraw-Hill, 2013
4	Ellis Horowitz, S. Sahni, D. Mehta, “Fundamentals of Data Structures in C++”, Galgotia Book Source, New Delhi, 2008

	References
1	N. B. Venkateshwarlu, E. V. Prasad, “C and Data Structures”, S. Chand and Company, 2010
2	Yashavant Kanetkar, “Understanding pointers in C”, BPB Publication, 4th Edition, 2009
3	Thomas H. Cormen, Charles E. Leiserson,,”Introduction to Algorithms”, PHI publications , 3rd Edition
4	

	Useful Links
1	http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html
2	https://www.coursera.org/learn/data-structures
3	http://vlabs.iitb.ac.in/vlabs-dev/labs/mit_bootcamp/dslab/index.php
4	https://nptel.ac.in/courses/106/106/106106130/

CO-PO Mapping														
	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3													
CO2		2												2
CO3		2												2
CO4			2						2					
The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO, and preferably to only one PO.														

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.				

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Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Second Year B. Tech., Sem III
Course Code	7IK201
Course Name	Introduction to Ancient Indian Technology
Desired Requisites:	General curiosity, maturity expected from adult student.

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	02 Hrs/week	MSE	ISE	ESE	Total
Tutorial	0 Hrs/week	30	20	50	100
		Credits: 2			

Course Objectives

1	The course is designed for undergraduate students, interested in learning about the ancient Indian technology which is the hallmark of glorious Indian civilization.
2	The objective is to emphasize on nature centric aspects of ancient Indian technologies that can be adopted in modern time.
3	The course is to expose the students to ancient science and technologies which can be adopted for modern technological development.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Descriptor**
CO1	Name the ancient Indian technological achivments	1	Remenbering
CO2	Comprehend the concept of Indian traditional knowledge and its relevance	2	Understanding
CO3	Explain the Indian contribution to the world at large	2	Understanding
CO4	Judge the ancient Indian technology.	5	Evaluating

Module	**Module Contents**	**Hours**
I	Introduction: Why are ancient Indian science and technology relevant today? What is science? How is it different from technology? .	4
II	Philosophy of ancient Indian technology, how is different from modern technology? Ancient Indian Scientific methods. Glimpses of ancient Indian science and technology?.	4
III	Material technology in ancient India : Mining, Metals and Metallurgy, Iron Making and craftsmanship, Wootz Steel Technology	5
IV	Extraction of Zinc in ancient India, Glass making, Bead making Techniques, Ceramic Technology.	4
V	Water Harvesting Technology, Irrigation Systems. Town planning, Building construction, Sanitation from ancient India period.	5
VI	Agriculture and Textile Technology in context of ancient India i.e Bharat.	4

Textbooks	
1	Transcript of the NPTEL course available at https://archive.nptel.ac.in/courses/101/104/101104065/. Title of the course "Introduction To Ancient Indian Technology" by Prof. D.P. Mishra Department of Aerospace Engineering, IIT Kanpur

References	
1	The NPTEL course available at https://archive.nptel.ac.in/courses/101/104/101104065/. Title of the course "Introduction To Ancient Indian Technology" by Prof. D.P. Mishra Department of Aerospace Engineering, IIT Kanpur

Useful Links	
1	https://archive.nptel.ac.in/courses/101/104/101104065/

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2					1								
CO2	1					2						1		
CO3	1					2			1					

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be Tests, assignments, oral, seminar etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 30 - 40% weightage on modules 1 to 3 and 60 - 70% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	7ESEN201
Course Name	Signals and Systems
Desired Requisites:	Applied Mathematics, Basic Electrical Engineering

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	---	30	20	50	100
		Credits: 3			

Course Objectives

1	On completion of the course, students should be sufficiently familiar with the theoretical structure, formal representation, computational methods, notation, and vocabulary of linear models to be able to apply them to the analysis and design of digital and analog communications and control systems. The students will be able to perform signal analysis with reference to spectrum analysis of deterministic signals.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO1	Classify signals and systems based on their characteristics and perform basic operations on signals.	Evaluate
CO2	Analyze time domain response of LTI systems	Analyze
CO3	Interpret the spectral properties of signals using Fourier analysis	Understand
CO4	Use Z- transform to study discrete time signals and systems	Apply

Module	**Module Contents**	**Hours**
I	**Signals – CT & DT** Introduction, standard signals, signal representation, Classification of signals- Analog, Discrete time, Digital signals, Classification of signals based on properties, Operations on signals	6
II	**Systems- CT & DT** Definition, representation, classification, Properties of CT and DT systems- Linearity, time invariant, causality ,stability, Invertibility,	7
III	**Time domain Analysis of CT & DT systems** CT systems: Zero state and zero input response, Impulse response, convolution integral, convolution integral - graphical representation of convolution DT systems: zero input, zero state and impulse response, convolution sum, DT LTI system ,Unit step response; properties of DT LTI systems- Memory, causality, stability	7
IV	**Fourier domain Analysis of Periodic Signals** Orthogonality property, Basis function, FS representation of periodic signal, Application of FS representation, Properties of Fourier series for CT signals, Recovery of CT signal from FS, FS representation of DT periodic signals	7

V	**Fourier domain Analysis of Aperiodic Signals** Representation of CT signals using samples, Nyquist sampling theorem,Fourier Transform representation of aperiodic CT signals, Evaluation of magnitude and phase response, DTFT, Properties of DTFT: Time reversal, Linear convolution-time and frequency domain, conjugate symmetry, Definition of DFT	7
VI	**Z Transform** Significance of Z transform, definition , Relation between LT and ZT, Relation between FT and ZT, Region of convergence (ROC), properties of ROC, Relation between pole locations and time domain behaviour of system, Applications	5

Textbooks	
1	A.V. Oppenheim, A.S. Willsky, S.H. Nawab, Signals and Systems, Prentice Hall,1997.
2	Ashok Ambardar, Analog and Digital Signal Processing, CL Engineering, 1999
3	
4	
References	
1	B. P. Lathi, Linear systems and signals ,Oxford University press, 2005
2	M. J. Roberts , Signals and Systems, Tata McGraw-Hill, 2005
3	Simon Haykin, Barry Van Veen, Signals and systems ,Wiley, 2003
4	Hwei P Hsu, Schaum's Outline Signals and Systems, Tata McGraw-Hill, 1995
Useful Links	
1	NPTEL lectures from Prof. S. C. Dutta Roy
2	
3	
4	

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1	1												1
CO2		1	1											1
CO3					2									1
CO4		2	2											1

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	Second Year B. Tech., Sem.-II
Course Code	7EN221
Course Name	Integrated Circuits and Applications
Desired Requisites:	Analog Electronics, Electronic Circuit Analysis and Design

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
		Credits: 3			

Course Objectives

1	To **explain** the working of differential amplifier and operational amplifier.
2	To **illustrate** the methods used for analysis of op-amp based circuits.
3	To **explain** the use of op-amp in linear and non-linear industrial circuits.
4	To **explain** the working of and design methods for voltage regulators.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO1	**Apply** the fundamentals of op-amp to calculate the circuit conditions, and illustrate functioning of various linear and nonlinear application circuits, such as amplifiers, waveform generators, digital to analog and analog to digital converters (DAC/ADC), , precision rectifiers, PLL, voltage regulators, etc.	Applying
CO2	**Analyz**e the op-amp based circuits considering ideal op-amp and also with effect of practical limitations of op-amp on the circuit output.	Analyzing
CO3	**Evaluate** the performance of op-amp based electronic circuits (Amplifiers, Waveform generators, active filters, DAC and ADC, voltage regulator)	Evaluating
CO4	**Design** op-amp based circuits considering practical limitations and as per given specifications.	Creating

Module	**Module Contents**	**Hours**
I	**Op-Amp Circuits:** Ideal Op-Amp circuit analysis, differential amplifier, instrumentation amplifier, voltage to current converters, current to voltage converters, transducer bridge amplifier, Op-Amp as Integrator and Differentiator, log/antilog amplifier.	8
II	**Op-Amp Practical Limitations:** Simplified Op-Amp circuit diagram, input bias and offset current, input offset voltage, input offset error compensation, low input bias Op-Amp, open loop response, closed loop response, transient response; sources of noise, stability in op-amp circuits, frequency compensation. Design of Op-Amp circuits (studied) considering practical limitations, including output swing and power supply. How to read the data sheet.	8
III	**Op-Amp based Filter Circuits:** Low pass, High pass, Band pass and Band reject filters, Advantage of active filter, First order active filter, standard second order active filters. Design of simple active filters.	4

IV	**Comparator and Waveform Generators:** Voltage Comparator, Schmitt triggers and applications, peak detector, sample and hold circuit, Sine wave generators, multvibrators, triangular wave generators, saw tooth wave generators, monolithic waveform generators, voltage to frequency and frequency to voltage converter, Design of comparator and waveform generator circuits.	8
V	**Digital-to-Analog and Analog-to-Digital Conversion:** Performance specifications, D to A conversion techniques, A to D conversion techniques, single chip DAC/ADC.	4
VI	**Voltage Regulator and PLL:** Precision rectifier, Linear regulators, Linear regulator applications, and design of Op-Amp based linear voltage regulator, three terminal voltage regulators: features, IC 78xx/79xx voltage regulators; Principle of Switching regulator: LM3524; Phase locked loop, Analog and digital phase detector, Monolithic PLLs: NE565, CD4046.	8

Textbooks	
1	Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", Tata McGraw Hill, New Delhi.
2	Robert F. Coughlin and Frederick F. Driscoll, "Operational Amplifiers and Linear Integrated Circuits", PHI.
3	G.B.Clayton, "Operational Amplifiers", International Edition, 2nd Edition.
4	

References	
1	Ramakant Gaikwad, "Op-amp and Linear Integrated Circuits", Pearson Education India.
2	Tobey and Graeme, "Operational Amplifiers", McGraw-Hill; First Edition, ISBN: 978-0070649170
3	D. Roy Choudhury and S. B. Jain, "Linear Integrated Circuits", New Age International Publishers, 4th Edition, 2017, ISBN: 9788122430981
4	David A. Bell, "Operational Amplifiers and Linear ICs", Oxford University Press, 2015.

Useful Links	
1	https://www.tutorialspoint.com/semiconductor_devices/semiconductor_devices_operational_amplifiers.htm
2	https://www.allaboutcircuits.com/video-tutorials/op-amp-basics-introduction-to-the-operational-amplifier/
3	https://web.mit.edu/6.101/www/reference/op_amps_everyone.pdf
4	https://www.ti.com/amplifier-circuit/op-amps/products.html

CO-PO Mapping

	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3													3
CO2		3												3
CO3		3												2
CO4			3							2				2

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment
The assessment is based on MSE, ISE and ESE. MSE shall be typically on modules 1 to 3. ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO. ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	7EN222
Course Name	Communication Engineering
Desired Requisites:	Basic Electronics Engineering, Engineering Mathematics

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
		Credits: 3			

Course Objectives

1	To introduce the techniques of transmitting and receiving information signals using analog and carrier modulation techniques and evaluate their performance levels (SNR) in the presence of channel noise.
2	To establish foundation for understanding the relationship among various technical factors useful for designing communication system.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO1	Define various fundamental aspects of the communication systems.	Remember
CO2	Understand various modulation & demodulation techniques used in communication systems.	Understand
CO3	Interpret various radio transmitter & receiver circuits and different types of noise in communication systems.	Apply
CO4	Analyse various parameters such as modulation index, channel capacity, transmission efficiency, S/N ratio etc. used in communication systems.	Analyse

Module	**Module Contents**	**Hours**
I	**Amplitude Modulation and Demodulation** DSB-FC, DSB-SC, SSB, VSB and ISB transmissions: mathematical Analysistime and frequency domain analysis, modulation index, generation and detection methods, power requirement of these systems, Comparison of AM modulation schemes, Quadrature Carrier Multiplexing(QAM), frequency division Multiplexing, AM detection : envelope detection, Demodulation of DSBSC : synchronous detection	9
II	**Frequency Modulation and Demodulation** Frequency Modulation (FM),: Single Tone Frequency Modulation, Spectrum Analysis, Narrowband FM, Wideband FM, Transmission Bandwidth of FM Waves, Generation of FM waves: Direct and Indirect Methods, Demodulation of FM, Phase Locked Loops, Limiting of FM waves, comparison between AM & FM, Phase Modulation, Relation between FM and PM	9
III	**Sampling theorem and Pulse Modulation Techniques** Sampling theorem, Types of sampling, Inter symbol interferences, Modulation & Demodulation of PAM, PWM, PPM, merits & demerits, Introduction to PCM system, quantization of signals, Differential PCM, Delta Modulation, Adaptive Delta Modulation.	4

IV	**Digital Data Transmission** Definition of Line Coding, various line codes, unipolar, bipolar RZ and NRZ techniques, split phase manchester formats	5
V	**Digital Modulation Techniques** Coherent Quadrature Modulation Techniques, Non Coherent Binary Modulation Techniques, Comparison of Binary and Quaternary Modulation Techniques; M array modulation Techniques, Power spectra, Bandwidth efficiency, M array Modulation formats Viewed in the light of channel Capacity theorem, Effect of inters symbol interference.	6
VI	**Noise** Classification and sources of noise, signal to noise ratio (SNR), noise analysis and measurements, equivalent noise bandwidth, noise figure, noise temperature, AWGN.	6

Textbooks	
1	T.L. Singal, "Analog and Digital Communication",6th Edition, Mc Graw Hill, 2012
2	Roy Blake , "Electronic Communication System", Thomson Publications, 2nd Edition,2002
3	Taub Schilling, "Principle of communication system", TMH publication, 4th Edition, 2013
4	

References	
1	Simon Hykin, "Communication System", 4th Edition, John Wiley & Sons, 2000
2	B. P. Lathi, "Modern Digital and Analog Communication Systems", Oxford Publications, 3rd Edition, 1998
3	George Kennedy, "Electronic Communication System", McGraw Hill, 4th Edition, 2009
4	

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1		3											2	
CO2		2	2										3	
CO3			2										2	
CO4			3										3	

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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Course Information	
Programme	B. Tech. (Electronics Engineering)
Class, Semester	Second Year B. Tech., Sem.- IV
Course Code	7EN223
Course Name	Microcontroller and Peripheral Interfacing
Desired Requisites:	Digital Electronics, C Programming

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
		Credits: 3			

Course Objectives	
1	To explain the difference between microprocessor and microcontroller.
2	To explain Intel 8051 microcontroller and its programming in assembly and 8051 C language.
3	To explain interfacing of external devices with Intel 8051 and 8051 C programming.
4	To explain design and development of microcontroller based applications / systems.

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	**Illustrate** the architecture of Microcontroller in comparison with Microprocessor.	Apply
CO2	**Demonstrate** situation-based interfacing of external devices with Intel 8051.	Apply
CO3	**Write** assembly and C language programs for Intel 8051 to meet given system requirements.	Analyze
CO4	**Design** 8051 microcontroller based applications / systems.	Create

Module	**Module Contents**	**Hours**
I	**Microprocessor vs. Microcontroller** Introduction of Microprocessor and Microcontroller; Block diagram, function of each pin of 8051; Architectural difference between microprocessor and microcontroller; features and applications of 8051.	4
II	**Microcontroller Programming** Microcontroller Programming basics; 8051 assembly language programming; Instruction set; Instruction types; Addressing modes; 8051 C programming; Features and advantages of 8051 C programming; Programming examples for both; Use of Development tools for Intel 8051.	8
III	**External Peripheral Interfacing** Port structure of 8051; Interfacing led and switch with 8051; Interfacing devices like relay, DC motor, Stepper motor, seven segment display, character LCD, DAC0808, digital sensors, analogue sensors through ADC0808; External memory interface; Writing algorithm and program for interfaces.	8
IV	**Internal Peripherals** 8051 Timer and its working, Timer modes, Programming timer as timer in C, Programming timer as counter in C; 8051 UART and its working, Serial communication modes, Programming UART in C; 8051 Interrupts sources, Interrupt flags, Vector addresses, Interrupt structure, Interrupt blocking conditions, Interrupt priorities, Interrupt latency, Interrupt configuration, Writing an Interrupt Service Routine in C.	8

V	**Microcontroller Based System Design** System requirements; Selection of components; Interface design; Flow chart design; Writing Algorithm; Writing C program for system; Creating libraries; Microcontroller based application / system design using internal and external peripherals.	7
VI	**Advanced Microcontrollers and Open Source Electronics Platforms** Introduction to Arduino, Setup computer to use Arduino, Arduino Libraries, Arduino Based Systems Design	4

Textbooks	
1	Kenneth J. Ayala, The 8051 Microcontroller Architecture, Programming and Applications, 2nd Edition, Penram International Publication, revised edition 2009
2	Mohammad Ali Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson Education, 2nd edition, 2010.
3	Ramesh Gaonkar, Fundamentals of Microcontrollers and Applications in Embedded Systems, Penram International Publication(India), 2010
4	Michael Margolis, Arduino Cookbook, O'Reilly Publications 2020

References	
1	Intel 8051 datasheet (www.intel.com)
2	Keil A51 and C51 manuals
3	Hi-Tech C Compiler manual
4	Massimo Banzi, Michael Shiloh, Getting Started with Arduino, Shroff/Maker Media 2014

Useful Links	
1	https://nptel.ac.in/
2	https://in.coursera.org/
3	https://www.tutorialspoint.com/
4	https://www.javatpoint.com/

CO-PO Mapping

	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3													
CO2	3													
CO3		3			3									
CO4			3											2

1: Low, 2: Medium, 3: High

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments, mini task, regular tests etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2024-25

Course Information	
Programme	B. Tech. (Electronics Engineering)
Class, Semester	Second Year B. Tech., Sem.-II
Course Code	7EN271
Course Name	Integrated Circuits and Applications Lab
Desired Requisites:	Analog Electronics Lab, Electronic Circuit Analysis and Design Lab

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction	-	30	30	40	100
		Credits: 1			

Course Objectives	
1	To **illustrate**, **demonstrate**, proper use of instruments and simulator software.
2	To **explain** the process of constructing a circuit and verifying working of circuits mentioned in the experiment list.
3	To **illustrate** the methods used for analysis and design of op-amp based circuits.
4	To **illustrate** how to perform the experiment and how to document the results.

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	**Use** the required instruments, with proper theoretical understanding of the instruments and modern tools such as circuit simulation software. (Skills of using Conventional as well as Modern Tools)	Applying
CO2	**Examine practically** the performance of a given op-amp based circuit, do correct calculations, draw correct inference and properly write the conclusions. (experiential learning)	Analyzing
CO3	**Design** simple op-amp based applications using the circuits studied in related theory course, and as per given problems. (independent thinking, experiential learning)	Creating
CO4	**Prepare the documentation** of proper observations, neat graphs, writing conclusion in grammatically and technically correct language, explain orally the circuit operation and process of performing the experiments in correct technical language. (Present and defend, measure, assess, interpret and conclude, communication skills)	Creating

List of Experiments / Lab Activities/Topics

List of Topics(Applicable for Interaction mode):

List of Lab Activities: (minimum 8 to 10 experiments)

1. Analysis and Design of Transistorized difference amplifier.
2. Analysis and Design of Adder Circuits.
3. Analysis and Design of Instrumentation Amplifier.
4. Designing with Practical Limitations of op-amp.
5. Analysis and Design of Active Filters.
6. Analysis and Design of Schmitt trigger circuit and Square wave-Triangular wave generator using op-amp.
7. Analysis and Design of RC Oscillators.
8. Analysis and Design of Precision rectifier.
9. Analysis and Design of Linear Regulated Power Supply.
10. Build and test multivibrator/ timer circuits using IC 555.
11. Design and Analysis of DAC and ADC.
12. Study of switching voltage regulator using LM3524.
13. Demonstration of Phase Locked Loop.

Textbooks

1	Sergio Franco, "Design with Op-Amp and Analog Integrated Circuits", Tata McGraw Hill, New Delhi.
2	Robert F. Coughlin and Frederick F. Driscoll, "Operational Amplifiers and Linear Integrated Circuits", PHI.
3	
4	

References

1	Ramakant Gaikwad,"Op-amp and Linear Integrated Circuits", Pearson Education India, ISBN: 9789332549913, Fourth Edition, 2015.
2	Tobey and Gramme, "Operational Amplifiers", McGraw-Hill; First Edition, ISBN: 978-0070649170, 1971 (Classic book)
3	D. Roy Choudhury and S. B. Jain, "Linear Integrated Circuits", New Age International Publishers, 4th Edition, 2017, ISBN: 9788122430981, 2017.
4	

Useful Links

1	https://www.allaboutcircuits.com/video-tutorials/op-amp-basics-introduction-to-the-operational-amplifier/
2	https://web.mit.edu/6.101/www/reference/op_amps_everyone.pdf
3	https://www.ti.com/amplifier-circuit/op-amps/products.html
4	

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1					3									3
CO2		3												3
CO3			3											3
CO4										3				3

The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO, and preferably to only one PO.

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.				

Walchand College of Engineering, Sangli

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AY 2024-25

Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	Second Year B. Tech., Sem. III
Course Code	7EN272
Course Name	Communication Engineering Lab
Desired Requisites:	Basic Electronics Engineering, Engineering Mathematics

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction	-	30	30	40	100
		Credits: 1			

Course Objectives

1	Demonstrate understanding of various digital modulation and demodulation techniques
2	Illustrate the performance of modulation and demodulation techniques in various transmission environments
3	
4	

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to -

CO1	Define the fundamentals and functions of various communication systems.	Remember
CO2	Understand the working operation of analog & digital modulation techniques used in communication systems.	Understand
CO3	Apply various methods used in communication systems for generation & reception of modulated & demodulated signals.	Apply
CO4	Analyse the waveforms of various modulation & demodulation techniques.	Analyse

List of Experiments / Lab Activities/Topics

List of Topics(Applicable for Interaction mode):

List of Lab Activities:

1. Spectrum analyser
2. AM Transmitter/ Receiver
   a. DSB-FC system
   b. DSB – SC system
3. FM Transmitter/ Receiver
   a. Reactance and varactor diode modulator
   b. PLL, quadrature, Foster- Seeley and detuned resonance detectors
4. Sampling theorem and reconstruction
5. Pulse Modulation and demodulation
   a. PAM, PWM,PPM techniques
6. PCM Modulation and Demodulation
7. Digital Data Transmission Techniques
8. Digital Modulation Techniques
9. Experiments on MATLAB
10. Experiments on National Instrument's Emona Datex Board

Textbooks

1	George Kennedy , "Electronic Communication System", McGraw Hill, 4th Edition, 2009

2	Roy Blake , “Electronic Communication System”, Thomson Publications, 2nd Edition,2002
3	Taub Schilling, “Principle of communication system”, TMH publication, 4th Edition, 2013
4	
References	
1	Wayne Tomasi ,“Adavnced Electronic Communications Systems”, Pearson education, 5th Edition,2014
2	Simon Hykin, “Communication System”, 4th Edition, John Wiley & Sons, 2000
3	B. P. Lathi, “Modern Digital and Analog Communication Systems”, Oxford Publications, 3rd Edition, 1998
4	
Useful Links	
1	
2	
3	
4	

CO-PO Mapping														
	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1					2								2	
CO2					3									2
CO3					3									2
CO4					3								2	
The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO, and preferably to only one PO.														

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.				

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Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	Second Year B. Tech., Semester-IV
Course Code	7EN273
Course Name	Microcontroller and Peripheral Interfacing Lab
Desired Requisites:	Digital Electronics, C Programming

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction	-	30	30	40	100
		Credits: 1			

Course Objectives

1	To explain debugging of an assembly and 8051 C program for 8051 microcontrollers in keil micro-vision C51 IDE
2	To show downloading and testing of 8051 C program for 8051 microcontroller using development board.
3	To explain development of 8051 C program for implementing given system requirements using 8051 microcontroller

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO1	**Use** keil micro-vision C51 IDE to debug an assembly and C programs for 8051 Microcontroller	Apply
CO2	**Write** a program for on chip peripheral configuration and external peripheral interfacings.	Apply
CO3	**Test** C programs written for 8051 microcontroller using development board as well as simulation software.	Analyze
CO4	**Design** of microcontroller based application	Create

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Introduction to software tool and hardware of 8051
2. Assembly language programs to perform different operations, implement if else, for loop, while loop, logic gates and to study block transfer
3. 8051 C program for LED blinking and operating LED using SWITCH
4. Interfacing Motor, BULB etc. with 8051 microcontroller
5. Interfacing 4 digits Multiplexed Display with 8051 microcontroller
6. Interfacing 16x2 characters LCD with 8051 microcontroller
7. Interfacing 4x4 Matrix Keyboard with 8051 microcontroller
8. Interfacing DAC0800 with 8051 microcontroller
9. Interfacing ADC0809 with 8051 microcontroller
10. Using Timer as Timer and Timer as Counter and hardware delay generation
11. Interrupts configuration and handling
12. Serial communication programming and Multiprocessor communication
13. Design, implementation and demonstration of microcontroller based applications using 8051 / Arduino Boards. (Mini-Project)

Textbooks	
1	Kenneth J. Ayala, The 8051 Microcontroller Architecture, Programming and Applications, 2nd Edition, Penram International Publication, revised edition 2009
2	Mohammad Ali Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson Education, 2nd edition, 2010.
3	Ramesh Gaonkar, Fundamentals of Microcontrollers and Applications in Embedded Systems, Penram International Publication(India), 2010
4	Michael Margolis, Arduino Cookbook, O'Reilly Publications 2020
References	
1	Intel 8051 datasheet (www.intel.com)
2	Keil A51 and C51 manuals
3	Hi-Tech C Compiler manual
4	Massimo Banzi, Michael Shiloh, Getting Started with Arduino, Shroff/Maker Media 2014
Useful Links	
1	https://www.alldatasheet.com/
2	https://www.keil.com/
3	https://www.tutorialspoint.com/
4	https://www.javatpoint.com/

CO-PO Mapping														
	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3													
CO2	3													
CO3		3			3									
CO4			3											2
1: Low, 2: Medium, 3: High														

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab Performance, Oral Exam	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.				

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Course Information	
Programme	B. Tech. (Electronics Engineering)
Class, Semester	Second Year B. Tech., Semester-IV
Course Code	7VSEN271
Course Name	Python Programming
Desired Requisites:	Computer Programming

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction	-	30	30	40	100
		Credits: 1			

Course Objectives	
1	To define the significance of Python in programming.
2	To demonstrate use of computer language constructs and principles such as: conditional branching loops, block structures, functions, and input/output for implementing programs to Solve problems.
3	To make use of the different libraries of Python

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	**Illustrate** the features of Python programming	**Apply**
CO2	**Implement** programs using Python language in a programming environment/using programming tool to solve problems.	**Apply**
CO3	**Examine** a given program to identify its output.	**Analyze**
CO4	**Demonstration** applications implemented using Embedded Systems and Python	**Create**

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1) **Introduction**: Python IDE installation and first python program and python comments
2) **Python Fundamentals**: Programs to study variables, contestants, literals and operators.
3) **Python Flow Control**: Programs to study if else statement, for loop, while loop, break, continue and pass statement.
4) **Python Data Types**: Programs to study Numbers, Type Conversion, Mathematics and List.
5) **Python Data Types**: Programs to study Tuple, Sets and Dictionary.
6) **Python Functions**: Programs to study Python Functions, Python Function Arguments, Python Variable Scope and Python Global Keyword.
7) **Python Functions:** Programs to study Python Recursion, Python Modules, Python Package and Python Main function
8) **Python Exception Handling**: Programs to study Python Exceptions, Python Exception Handling and Python Custom Exceptions.
9) **File Handling:** Programs to study open, create, read, write and delete operations on a file.
10) **Python Array:** Programs to study Arrays and built in methods of Arrays
11) **Data Structure**: Programs to demonstrate data structure example.
12) **Applications:** Programs to demonstrate web based application.
13) **Mini Project**

Textbooks	
1	R. Nageswara Rao, “Core Python Programming”, Dreamtech Press, 2nd Edition, 2017
2	Eric Matthes, “Python Crash Course – A Hands-on, Project-Based Introduction to Programming”, No Starch Press, 2nd Edition, 2019
3	Kenneth Lambert, “Fundamentals of Python: First Programs” Course Technology, Cengage Learning.2nd edition, 2017
References	
1	Barry, Paul, Head First Python, O Rielly,2nd Edition, 2010
2	2 Lutz, Mark, Learning Python, O Rielly, 4th Edition, 2009
Useful Links	
1	https://swayam.gov.in/
2	https://www.tutorialspoint.com/
3	https://www.javatpoint.com/
4	https://in.coursera.org/

CO-PO Mapping														
	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2				2									
CO2	2				2									
CO3		2			2									
CO4			2		2									
1: Low, 2: Medium, 3: High														

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.				

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Course Information

Programme	B. Tech. (All branches)
Class, Semester	Second Year B.Tech., Sem - IV
Course Code	7AE201
Course Name	Employability Skills Development (ESD)
Desired Requisites:	--

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	4Hrs/week	**ISE**	**MSE**	**ESE**	**Total**
Tutorial	-	20	30	50	100
Practical	-				
Interaction	-	**Credits: 2**			

Course Objectives

1	To improve the problem-solving skills of students
2	To understand the approach towards problem solving
3	Understanding the sectional cut-offs for different companies

Course Outcomes

CO1	Ability to improve the accuracy percentage	
CO2	Understand the current changing recruitment trends	
CO3	Understanding the differential marking scheme in papers	
CO4	Performance improvement in competitive exams like CAT, GATE	

Module	Module Contents	Hours
I	**Arithmetic I** Ratio, Proportion, Mark Up & Discount, Averages, Mixtures & Alligations, Simple & Compound Interest	6
II	**Arithmetic II** Percentages, Profit & Loss, Time & Work, Time, Speed & Distance, Boat & Streams, Linear Races	8
II	**Numbers** Cyclicity, Remainders, Cyclicity of Remainders, Indices, Factors, LCM, HCF	4
III	**Permutation, Combination, Probability** Fundamental principal of counting, Arrangements, Selection, Grouping, Distribution, Independent Events, Conditional Probability, Binomial Distribution	6
IV	**Logical Reasoning** Clocks, Calendars, Games & Tournaments, Analytical Puzzles, Binary Logic, Blood relations, Directions, Coding, Decoding, Seating Arrangement (Linear, Circular & Rectangular)	6
V	**Verbal Ability I** Vocabulary - Synonyms, Antonyms, Analogies Reading Comprehension, Para Jumbles	6
VI	**Verbal Ability II** Parts of Speech, Tenses, Subject Verb Agreement	4
Text Books		
1	Quantitative Aptitude - Abhijit Guha	
2	Quantitative Aptitude - Sarvesh Agarwal	
References		
1	Quicker Maths - M. Tyra	
2	Quantitative Aptitude - Chandresh Agarwal	
3	Puzzles to puzzle you - Shakuntala Devi	

Useful Links	
1	www.campusgate.co.in
2	www. Lofoya.com
3	www.brainbashers.com

CO-PO Mapping

	Programme Outcomes (PO)												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1											3				
CO2							2								
CO3									3						
CO4										3					

The strength of mapping is to be written as 1,2,3; Where, 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on the MCQ test which will be conducted online through the platform and it will be a proctored test. No negative marking will be there in the test. Test will be of 60 minutes with 20 questions each on Quantitative Aptitude, Logical Reasoning & Verbal Ability

Walchand College of Engineering, Sangli *(Government Aided Autonomous Institute)*					
AY 2024-25					
Course Information					
Programme	All WCE Programme				
Class, Semester	SY BTech 1st & 2nd Sem				
Course Code	7VE201				
Course Name	Value Education				
Desired Requisites:	Open mind and a willingness to learn				
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	01Hrs/week	LA1	LA2	ESE	Total
Tutorial	01 Hrs/week	30	30	40	100
		Credits: -			

Course Objectives	
1	Develop holistic personal and professional skills by enhancing communication, emotional intelligence, and resilience to foster positive relationships and sustainable living practices.
2	Promote ethical and sustainable leadership through the application of integrity, teamwork, and agrowth mindset to navigate success and failure while mastering effective presentation and communication skills.
3	Empower lifelong learning and contribution by reflecting on personal values, engaging in criticalthinking, and committing to continuous self-assessment and professional development for addressing global challenges.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Descriptor**
CO1	Learn effective communication, empathy, and relationship-building skills to foster positive interactions in personal andprofessional settings.	I	Remembering
CO2	Incorporate sustainable habits into daily life and build resiliencethrough mindfulness and stress management to handle challenges and support environmental stewardship.	II	Understanding
CO3	Develop goal-setting and achievement strategies, manage success and failure, and deliver impactful presentations foroverall personal and professional development.	III	Applying
CO4	Strengthen analytical skills and creative problem-solving techniques to make informed decisions and tackle complexissues in various contexts.	IV	Analyzing

Module	**Module Contents**	**Hours**
I	**Interpersonal skills** Introduction to Relationships, Communication Skills, Emotional Intelligence, Conflict Resolution, Maintaining Healthy Relationships	5

II	**Sustainable Living** Introduction to Sustainability, Environmental Impact, Sustainable Practices, Community Involvement, Personal Action Plan	5
III	**Inner Peace and Resilience** Understanding Inner Peace, Mindfulness and Meditation, Stress Management, Building Resilience, Positive Mindset	5
IV	**The Art of Winning** Winning Mindset, Goal Setting, Perseverance and Adaptability, Teamwork and Leadership, Case Studies and Real-life Examples	5
V	**Success and Failure Management** Understanding Success and Failure, Learning from Failure, Growth Mindset, Balancing Success and Failure, Personal Development Plan	5
VI	**The Art of Presentation** Introduction to Presentations, Content Organization, Verbal and Non-Verbal Communication, Practice and Delivery, Feedback and Improvement	5

Textbooks	
1	Stephen R. Covey, *The 7 Habits of Highly Effective People*, Free Press, 25thAnniversary Edition, 2013.
2	Daniel Goleman, *Emotional Intelligence: Why It Can Matter More Than IQ*, Bantam Books, 10th Anniversary Edition, 2005.
3	Carol S. Dweck, *Mindset: The New Psychology of Success*, Ballantine Books, Updated Edition, 2016.
4	William McDonough and Michael Braungart, *Cradle to Cradle: Remaking the WayWe Make Things*, North Point Press, 1st Edition, 2002.
5	Garr Reynolds, *Presentation Zen: Simple Ideas on Presentation Design and Delivery*, New Riders, 2nd Edition, 2011.
References	
1	Covey, S. R. (1989). *The 7 Habits of Highly Effective People*. Simon & Schuster.
2	Rosenberg, M. B. (2015). *Nonviolent Communication: A Language of Life*. PuddleDancer Press.
3	Carnegie, D. (1998). *How to Win Friends and Influence People*. Simon & Schuster.
4	Covey, S. R. (1989). *The 7 Habits of Highly Effective People*. Simon & Schuster.
5	Rosenberg, M. B. (2015). *Nonviolent Communication: A Language of Life*. PuddleDancer Press.
	Useful Links
1	https://ideas.ted.com/how-to-build-closer-relationships/
2	https://www.nationalgeographic.com/environment/article/sustainable-living
3	https://www.lexisnexis.in/blogs/family-law-in-india/
4	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8937019/
5	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8710473/

CO-PO Mapping														
	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	-	-	-	-	-	-	-	2	2	3	-	2		
CO2	-	-	-	-	-	2	3	2	2	-	-	2		
CO3	-	-	-	1	-	1	-	2	3	2	2	2		
CO4	-	-	-	3	2	2	2	2	2	2	3	2		
The strength of mapping is to be written as 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.														
Assessment														
The assessment is based on LA1, LA2 and ESE. LA1 shall be typically on modules 1 to 3. LA2 shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be Tests, assignments, oral, seminar etc. and is expected to map at least one higher order PO. ESE shall be on all modules with around 30 - 40% weightage on modules 1 to 3 and 60 - 70% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (LA1+LA2+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)													

Walchand College of Engineering, Sangli

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Course Information	
Programme	Multidisciplinary Minor (Electronics Engineering)
Class, Semester	Second Year B. Tech., Sem.-II
Course Code	7MDEN221
Course Name	Electronic Devices and Circuits
Desired Requisites:	Basic Electrical and Electronics Engineering

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
		Credits: 3			

Course Objectives

1	To **explain** the working of diode circuits and electronic circuits like small signal amplifiers, power amplifiers using BJT and MOSFETs. .
2	To **illustrate** the methods used for AC/DC analysis of transistorized and op-amp based circuits.
3	To **Explain** the working of power semiconductor devices and electrical power converter circuits.
4	To **explain** the working of oscillators, multivibrators, timing circuits and voltage regulators.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO1	**Explain** the working of diode circuits, transistorized and op-amp based circuits.	Understand
CO2	**Explain** the working of power semiconductor devices such as SCR, GTO, Power MOSFET and IGBT and power electronics circuits.	Understand
CO3	**Explain** the working of oscillators, multivibrators and applications of operational amplifier in analog computations.	Understand
CO4	**Solve** the examples on diode circuits, amplifiers, voltage regulators and op-amp based circuits considering ideal op-amp.	Applying

Module	**Module Contents**	**Hours**
I	**Diode Circuits:** Rectifier circuits, RC filter circuit, Zener diode voltage regulator, voltage multiplier circuits, diode logic circuits, photodiode and LED circuits.	**6**
II	**Transistorized Amplifiers:** Amplifier fundamentals, small signal amplifiers: common emitter amplifier, common collector amplifier; JFET/MOSFET common source/ common drain amplifier, frequency response of amplifiers.	**8**
III	**Power Amplifiers** Classification of power amplifiers: class-A, class-B, class-AB, class-C power amplifiers; transformer-coupled amplifiers, heat sink and its operation	**6**
IV	**Op-Amp Applications**: Differential amplifier, unity gain buffer (voltage follower), voltage comparator, zero crossing detector, effect of positive feedback, Schmitt trigger circuit, multivibrators, types of oscillator, RC oscillators, monolithic timers (IC555).	**7**
V	**Power Semiconductor Devices and Circuits:** SCR, TRIAC, DIAC, GTO, Power MOSFET and IGBT; controlled rectifiers, ac voltage controllers, inverter, chopper, UPS,	**6**

VI	**Regulated DC Power Supply:** Block diagram of regulated dc power supply, Zener diode voltage regulator, op-amp based voltage regulator, three terminal IC voltage regulator, switching regulators.	**6**

Textbooks	
1	R. Boylestad and L. Nashelsky, "*Electronic Devices and Circuit Theory*", 9th Edition, PHI, 2009.
2	D. A. Neamen, "*Microelectronics: Circuit Analysis and Design*", 4th Edition, McGraw Hill Education (India) Private Limited, New Delhi, 2021.
3	Ramakant Gaikwad, "Op-amp and Linear Integrated Circuits", 4th edition, Pearson, 2015.
4	M.H. Rashid, "*Power Electronics: Circuits, Devices & Applications*", Third Edition, PHI, New Delhi, 2008.
References	
1	Albert Malvino, David J. Bates, "Electronic Principles", 7th Edition, McGraw Hill Education, 2017.
2	Robert F. Coughlin and Frederick F. Driscoll, "Operational Amplifiers and Linear Integrated Circuits," Pearson Education, 2009.
3	M. D. Singh & K. B. Khanchandani, "*Power Electronics*", Second Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2007.
4	
Useful Links	
1	https://nptel.ac.in/courses/108101091
2	https://nptel.ac.in/courses/108105158
3	https://www.tutorialspoint.com/semiconductor_devices/semiconductor_devices_operational_amplifiers.htm
4	https://nptel.ac.in/courses/108/105/108105066/#

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	3												2
CO2	2	3												2
CO3		3	3											2
CO4			3											2

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)