TULSIRAMJI GAIKWAD-PATIL College of Engineering & Technology

Mohgaon, Wardha Road, Nagpur - 441 108

An Autonomous Institute

DEPARTMENT OFELECTRONICS & COMMUNICATION ENGINEERING

B.Tech. Electronics & Communication Engineering

Syllabus

From

Academic Year 2022-23

Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

(An Autonomous Institution Affiliated to RTM Nagpur University, Nagpur)

Programme: Electronics & Communication Engineering

Scheme of Instructions: Second Year B.Tech. in Electronics & Communication Engineering

Semester – IV

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME				
									CT-1	CT-2	TA/CA	ESE	TOTAL
1	PCC	BEC2401	Signals & Systems	3	-	-	3	3	15	15	10	60	100
2	PCC	BEC2402	Electromagnetic Theory	3	-	-	3	3	15	15	10	60	100
3	PCC	BEC2403	Analog Circuit Design	3	-	-	3	3	15	15	10	60	100
4	PCC	BEC2404	Microprocessor & Microcontroller	3	-	-	3	3	15	15	10	60	100
5	HSMC	BSH2301	Human Values for Professional Ethics	3	-	-	3	3	15	15	10	60	100
6	PCC	BEC2406	Signals & Systems Lab	-	-	2	2	1	-	-	25	25	50
7	PCC	BEC2407	Microprocessor & Microcontroller Lab	-	-	2	2	1	-	-	25	25	50
8	PCC	BEC2408	Analog Circuit Design Lab	-	-	2	2	1	-	-	25	25	50
9	PROJ	BEC2409	Micro Project	-	-	2	2	1	-	-	25	25	50
10	MCC	BAU2410	Group Reading of Classics	2	-	-	2	Audit	-	-	-	-	-
			Total	**17**	**-**	**08**	**25**	**19**	**75**	**75**	**150**	**400**	**700**

L- Lecture T-Tutorial P-Practical

CT1- Class Test 1 TA/CA- Teacher Assessment/Continuous Assessment

CT2- Class Test 2 ESE- End Semester Examination (For Laboratory End Semester performance)

Course Category	HSMC (Hum., Soc. Sc, Mgmt.)	BSC (Basic Sc.)	ESC (Engg. Sc.)	PCC (Programme Core Courses)	PEC (Programme Elective Courses)	OEC (Open Elective courses from other discipline)	Project / Seminar /Industrial Training	MCC (Mandatory Courses)
Credits	3	-	--	15	--	--	01	Yes
Cumulative Sum	5	21	24	12	--	--	-	--

PROGRESSIVE TOTAL CREDITS : 59+19 =78

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Second Year (Semester-IV) B.Tech. Electronics & Communication Engineering

BEC2401 : SIGNALS AND SYSTEMS

Teaching Scheme	
Lectures	3 Hrs/week
Tutorial	0 Hrs/week
Total Credit	3

Examination Scheme	
CT-1	15 Marks
CT-2	15 Marks
TA	10 Marks
ESE	60 Marks
Total	100 Marks
Duration of ESE: 03 Hrs 00 Min.	

Course Outcomes (CO)

Students will be able to

Determine the responses and Classification of Signals and systems.
Explain LTI system based on impulse response Using Convolution theorem
Analyze spectral characteristics of continuous-time Periodic and Aperiodic signals using Fourier Series and Transform.
Examine sampling and interpolation to sample and reconstruct signals.
Illustrate the Laplace and Z transform to evaluate the continuous-time and discrete-time signals and systems.

Course Contents

Unit I	**CONTINUOUS-TIME, AND DISCRETE-TIME SIGNALS AND SYSTEMS:** Signals, Signal Energy and Power, Transformations of the Independent Variable, Periodic Signals, Even and Odd Signals, Exponential and Sinusoidal Signals, Complex Exponential and Sinusoidal Signals, Unit Impulse and Unit Step Functions, Systems and Properties
Unit II	**LINEAR TIME-INVARIANT SYSTEMS:** LTI Systems: The Convolution Integral/ Sum, The Unit Impulse, The Representation of Signals in Terms of Impulses, The Unit Impulse Response, Representation of LTI Systems, Properties of LTI Systems.
Unit III	**CONTINUOUS AND DISCRETE-TIME FOURIER SERIES AND FOURIER TRANSFORM:** The Response of LTI Systems to Complex Exponentials, Fourier Series Representation, Linear Combinations of Harmonically Related Complex Exponentials, Determination of the Fourier Series Representation, Convergence of the Fourier Series, Properties, Parseval's Relation. Representation of Aperiodic Signals: Fourier Transform, Convergence of Fourier Transforms, Properties.
Unit IV	**TIME AND FREQUENCY CHARACTERIZATION OF SIGNALS AND SYSTEMS:** The Magnitude-Phase Representation of the Fourier Transform, Frequency Response of LTI Systems, Linear and Nonlinear Phase, Group Delay, Time-Domain Properties of Ideal Frequency Selective Filters. Representation of a Continuous-Time Signal by Its Samples: The Sampling Theorem and Reconstruction of a Signal from its Samples Using Interpolation.
Unit V	**THE LAPLACE AND Z-TRANSFORM** Region of Convergence, Inverse Laplace Transform, Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot, Properties, Analysis, Characterization of

	LTI Systems, Interconnections and realization of Discrete systems.

Text Books	
1	A.V. Oppenheim, A.S. Wilsky and H. Nawab S, “Signals & Systems”, Prentice-Hall, 2005
2	Lathi, B. P., and R. A. Green. Linear Systems and Signals. 2018.
3	Signals & Systems Analysis Using Transformation - 1st edition 2003. Robert McGraw-Hill
Reference Books	
1	Rodger E Zaimer and William H Tranter, “Signals & Systems – Continuous and Discrete”, McMillan Publishing Company, Bangalore, 2005.
2	John .G.Proakis , “Digital Signal Processing Principles, Algorithms and Applications , Prentice Hall, New Delhi 2006,.
3	Sanjit .K. Mitra “Digital Signal Processing A Computer based approach” ‘Tata McGrawHill Edition, New Delhi, 2001,
Useful Links	
1	https://onlinecourses.nptel.ac.in/noc21_ee28/preview
2	https://archive.nptel.ac.in/courses/108/104/108104100/

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Second Year (Semester-IV) B.Tech. Electronics & Communication Engineering

EC2402: Electromagnetic Theory

Teaching Scheme	
Lectures	3 Hrs/week
Tutorial	0 Hrs/week
Total Credit	**3**

Examination Scheme	
CT-1	15 Marks
CT-2	15 Marks
TA	10 Marks
ESE	60 Marks
Total	100 Marks
Duration of ESE: 03 Hrs 00 Min.	

Course Outcomes (CO)

Students will be able to

1	**Describe** the orthogonal coordinate system for mathematical analysis of the gradient, curl, divergence of a quantity and application of Gauss's Law, Divergence theorem in electromagnetic field.
2	**Explain** the Coulomb's law, Gauss's law and its application in Electric Static Field Intensity for point line, surface, and volume charge distributions.
3	**Interpret** the Divergence Theorem, Conductor Properties and Boundaries conditions. Poisson's Equations, Laplace Equations for the electric field Intensity
4	**Analyze** Biot –Savart law, Ampere's Circuital law, Stoke's Theorem and Boundary wall conditions for Magnetic field Intensity.
5	**Apply** the Maxwell's equations for Static and Time varying fields and the concepts of Faraday's law's of electromagnetic induced

Course Contents

Unit I	Orthogonal coordinate systems: Cartesian, cylindrical, spherical and transformations, Gradient of a Scalar Field. Divergence of a Vector Field, Curl of a Vector Field, Laplacian Operator, Irrotational and solenoidal field.
Unit II	Coulomb's law, Electric field intensity for different charge distribution: point, line surface, volume, Concept of electric flux, Gauss's law and its application to field computation in symmetric structures and non-symmetric structures
Unit III	Divergence Theorem, Definition of Potential Field of System of Charge, Potential Gradient, Energy Density in Electrostatic Field. Current And Current Density, Conductor Properties And Boundaries Condition, Nature Of Dielectric Materials Capacitance, Capacitance Of Parallel Plate Capacitance, Capacitance Of Two Wire Line, Poisson's And Laplace Equations
Unit IV	Biot –Savart law and applications to infinite and finite current filament, Ampere's Circuital law and applications to line charge, coaxial transmission cables, uniform current sheet charge, solenoid, Stroke's Theorem Magnetic flux and magnetic flux density , Scalar and vector magnetic potential, Nature of magnetic materials, boundary conditions at interface of two magnetic fields, Potential energy.
Unit V	Time varying fields and Maxwell's equations: Faradays law, Displacement current, Maxwell's equation in point form, Maxwell's equations in integral form.

Text Books

T.1	Engineering Electromagnetics Seventh Edition William H. Hayt Tata McGraw – Hill
T.2	Field and Wave Electromagnetics Second Edition 21 Jan 2010 David K. Cheng Addison Wesley

Reference Books

R.1	Electromagnetism Theory and application 2ndEdition2009 Ashutosh Pramanik Prentice Hall.
R.2	Elements of Electromagnetics M. N. O. Sadku Oxford Press.
Useful Links	
1	https://archive.nptel.ac.in/courses/108/104/108104087/
2	https://archive.nptel.ac.in/courses/115/104/115104088/

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Second Year (Semester-IV) B.Tech. Electronics & Communication Engineering

BEC2403: Analog Circuit Design

Teaching Scheme	
Lectures	3 Hrs/week
Tutorial	0 Hrs/week
Total Credit	3

Examination Scheme	
CT-1	15 Marks
CT-2	15 Marks
TA	10 Marks
ESE	60 Marks
Total	100 Marks
Duration of ESE: 03 Hrs 00Min.	

Course Outcomes (CO)

Students will be able to

Determine the basic principle of operational amplifier, parameters, and its configurations
Examine the need and use of linear op-amp circuits and their applications.
Examine non-linear applications of op-amp circuits and their application
Analyze the working and component of dc power supply.
Analyze the designing of oscillators and filters

Course Contents

UnitI	Op-Amp Fundamentals: Block diagram of operational amplifier, Differential amplifiers using transistors & its configurations, Op-Amp parameters, virtual ground concept, Ideal OP-Amp, Equivalent circuit, Voltage Transfer curve, Inverting & non inverting configurations.
UnitII	Linear Op Amp Circuits:Voltage follower, Summing amplifier, scaling and averaging amplifier, Subtractor, Instrumentation amplifier and applications, Integrator and differentiators, current to voltage converters, voltage to current converters, Clippers & Clampers.Peak detector, Log and antilog amplifiers and analog multipliers.
Unit III	Nonlinear Op Amp Circuits: Comparators, Schmitt trigger, Precision Rectifier. Multivibrators: Bistable, Monostable, Astable using Op-Amp, Sample/Hold circuits, 555 Timer and its applications, Phase lock loops. D/A (R/R) & A/D conversion circuits (Successive Approximation Method), design of ADC using 0804 ICs.
UnitIV	Unregulated D.C. power supply system with rectifiers and filters, Design of series voltage regulators, design of fixed voltage regulators (IC 78xx and 79xx), adjustable regulators (LM 317, 337), protection circuits for regulators, Design of SMPS (Buck & Boost)
UnitV	OPAMP based Wein Bridge and Phase Shift oscillators, Transistorized Hartley &Colpitts oscillator, Crystal oscillators, Evaluation of figure of merit for all above oscillator circuits. Design of Butterworth Active Filters LPF, HPF, BPF, BRF etc,

Text Books

1	Ramakant Gaikwad, OPAMPS and Linear Integrated Circuits, PHI/Pearson Education.
2	Franco: Designing with Op-Amps (McGraw Hill).
3	K.R. Botkar, Integrated Circuits, Khanna Publishers, Delhi

Reference Books

1	Linear Integrated Circuits Mannal I, II, and III: National Semiconductor
2	Regulated Power supply Handbook. Texas Instruments.
3	Operational Amplifier Design and Applications Tobey, Graham, Huelsman McGraw Hill.
Useful Links	
1	https://nptel.ac.in/courses/117/105/117105147/
2	https://nptel.ac.in/courses/117/107/117107094/
3	http://nptel.ac.in/courses/117103064

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Second Year (Semester-IV) B.Tech. Electronics & Communication Engineering

BEC2404: Microprocessor & Micro-controller

Teaching Scheme	
Lectures	3Hrs/week
Tutorial	0Hrs/week
Total Credit	3

Examination Scheme	
CT-1	15 Marks
CT-2	15 Marks
TA	10 Marks
ESE	60 Marks
Total	100 Marks
Duration of ESE:03Hrs00Min.	

Course Outcomes (CO)

Students will be able to

1. **Explain** the structure, organization, and instruction set of 8086 microprocessor.
2. **Implement** interfacing of 8086 microprocessor with input output devices by using program peripheral devices.
3. **Analyze** the organizational structure & instruction set of microcontroller 8051.
4. **Apply** programming knowledge for controlling displays and motors using 8051 microcontroller.
5. **Evaluate** the working behavior of advance peripheral interface controller and Arduino.

Course Contents

Unit I	8086 microprocessor, Pin diagram, Architecture, features and operating modes, Flag Register, memory organization & interfacing, Addressing modes, complete instruction set, Interrupt structure.
Unit II	I/O interfacing, Interfacing of peripherals like 8255 PPI, multiplexed 7-seg display & matrix keyboard interface using 8255. Programmable Keyboard/Display controller 8279, Serial communication, Classification & transmission formats. USART 8251, Pins & block diagram, interfacing with 8086 & programming.
Unit III	Comparison of microprocessor & micro-controller, Introduction to 8051 micro controller; Pin diagram, architecture, features & operation, Ports, memory organization, SFR's, Flags, Counters/Timers, Serial ports. Interfacing of external RAM & ROM with 8051. 8051 ,Interrupt structure, Instruction set of 8051; data transfer, logical, arithmetic & branching instructions, Addressing modes.
Unit IV	Interfacing of Switches, keyboard, LED & LCD display, ADC & DAC interface, stepper motor interface.
Unit V	PIC Micro-controllers – overview: Features, PIC 16c6x/7x architecture, Introduction to Arduino boards, basic types, history & IDE, Compatible shields with their libraries.

Text Books

1	M.A. Mazidi & J.G. Mazidi, the 8051 Micro-controller and Embedded system, 3rd Indian reprint, Pearson Education
2	Microprocessor 8086/8088 Family Programme Interfacing: Liu & Gibson.
3	**Programming PIC Micro-controllers with XC8 by Authors: Subero, Armstrong.**

Reference Books

1	Micro-controllers – Peatman, Mc Graw Hill.
2	Microprocessors & Microcomputers based system design by Md. Rafiquzzaman.
3	Introduction to Microprocessors for Engineers and Scientists, P. K. Ghosh, P. R. Sridhar, PHI

	Publication.
Useful Links	
1	https://nptel.ac.in/courses/108/105/108105159/
2	https://nptel.ac.in/courses/108/104/108104139/
3	https://nptel.ac.in/courses/117/106/117106108/

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Second Year (Semester-IV) B.Tech. Electronics & Communication Engineering

BSH2301: Human Values for Professional Ethics

Teaching Scheme	
Lectures	3 Hrs/week
Tutorial	0 Hrs/week
Total Credit	3

Examination Scheme	
CT-1	15 Marks
CT-2	15 Marks
TA	10 Marks
ESE	60 Marks
Total	100 Marks
Duration of ESE: 03 Hrs 00 Min.	

Course Outcomes (CO)

Students will be able to

Describe Value Education and its role for Self-exploration.
Illustrate the Harmony in the Human Being and Society
Examine the Ethical Human Conduct along with Universal Order.
Explain Use of theories of Basic Ethical principles.
Predict Global Issues in Professional Ethics and Sustainable Development

Course Contents

Unit I	**Introduction to Value Education** Value Education, Definition, Concept and Need for Value Education, The Content and Process of Value Education, Basic Guidelines for Value Education, Self-exploration as a means of Value Education.
Unit II	**Harmony in the Human Being, Family, Society and Nature** Human Being is more than just the Body, Understanding Myself as Co-existence of the Self and the Body, Understanding the activities in the Self and the activities in the Body, Family as a basic unit of Human Interaction and Values in Relationships, The Basics for Respect and today's Crisis: Affection, Guidance, Reverence, Glory.
Unit III	**Social Ethics** The Basics for Ethical Human Conduct, Defects in Ethical Human Conduct, Holistic Alternative and Universal Order, Universal Human Order and Ethical Conduct.
Unit IV	**Basic Theories** Basic Ethical principles, Moral Developments, Deontology, Utilitarianism, Virtue theory, Rights Theory, Casuist Theory, Moral Absolution, Moral Rationalism, Moral Pluralism, Ethical Egoism, Feminist Consequentialism, Moral Issues, Moral Dilemmas, Moral Autonomy.
Unit V	**Global Issues in Professional Ethics:** Introduction- Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Deflection, Pollution, Ethics in Manufacturing and Marketing, Media Ethics; War Ethics; Bio Ethics, Intellectual Property Rights.

Text Books

1	A.N Tripathy, New Age International Publishers, 2003.
2	Bajpai. B. L, New Royal Book Co, Lucknow, Reprinted, 2004.

3	Bertrand Russell Human Society in Ethics & Politics.
4	Professional Ethics: R. Subramanian, Oxford University Press, 2015.
Reference Books	
1	Corliss Lamont, Philosophy of Humanism.
2	Gaur. R.R, Sangal. R, Bagaria. G.P, A Foundation Course in Value Education, Excel Books, 2009.
3	Gaur. R.R, Sangal. R, Bagaria. G.P, Teachers Manual Excel Books, 2009.
4	I.C. Sharma. Ethical Philosophy of India Nagin& co Julundhar.
5	Mortimer. J. Adler, – Whatman has made of man.
6	Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, Cengage Learning, 2015.

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Second Year (Semester-IV) B.Tech. Electronics & Communication Engineering

BEC2406: Signals and Systems Lab

Teaching Scheme		Examination Scheme	
Practical	2 Hrs/week	**CA**	25 Marks
Total Credit	1	**ESE**	25 Marks
		Total	50 Marks
		Duration of ESE: 02 Hrs 00 Min.	

Course Outcomes (CO)

Students will be able to

1	**Determine** the responses and Classification of Signals and systems.
2	**Explain** LTI system based on impulse response Using Convolution theorem
3	**Analyze** spectral characteristics of continuous-time Periodic and Aperiodic signals using Fourier Series and Transform.
4	**Examine** sampling and interpolation to sample and reconstruct signals.
5	**Illustrate** the Laplace and Z transform to evaluate the continuous-time and discrete-time signals and systems.

Sr. No.	List of Experiment	CO
1	**Demonstrate** generation of some simple signals such as the complex exponential signal and real sinusoids.	**CO1**
2	**Explore** the commutation of even and odd symmetries in a signal with algebraic operations	**CO1**
3	**Explore** the effect of transformation of signal parameters (amplitude-scaling, and time shifting).	**CO2**
4	**Explore** the various properties of the impulse signals.	**CO2**
5	**Identify** given system as linear or non-linear, causal or non-causal, stable or unstable etc.	**CO3**
6	**Compute** discrete Fourier transform of a signal.	**CO3**
7	**Demonstrate** Perceval's theorem associated with Fourier series analysis for a periodic square wave sampled using appropriate sampling frequency.	**CO4**
8	**Verify** Multiplication property associated with Fourier series analysis for a periodic triangular wave sampled using appropriate sampling frequency	**CO4**
9	**Verify** shifting property associated with Fourier series analysis for a periodic square wave sampled using appropriate sampling frequency	**CO4**
10	**Compute** Z transform of a sequence.	**CO5**

Text Books

1	A.V. Oppenheim, A.S. Wilsky and H. Nawab S, "Signals & Systems", Prentice-Hall, 2005
2	Lathi, B. P., and R. A. Green. Linear Systems and Signals. 2018.
3	Signals & Systems Analysis Using Transformation - 1st edition 2003. Robert McGraw-Hill

Reference Books

1	Digital signal processing- A practical approach 2nd Edition, 2002.E. C. Ifeachar, B. W. Jarvis Pearson
2	Digital Signal Processing - A. Nagoor Kani 2nd Edition McGraw Hill.

Useful Links	
1	https://nptel.ac.in/courses/108/104/108104139/
2	http://nptel.ac.in/courses/117107095

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Second Year (Semester-IV) B.Tech. Electronics & Communication Engineering

BEC2407: Microprocessor & Micro-controller Lab

Teaching Scheme	
Practical	2 Hrs/week
Total Credit	1

Examination Scheme	
CA	25 Marks
ESE	25 Marks
Total	50 Marks
Duration of ESE: 02 Hrs 00 Min.	

Course Outcomes (CO)

Students will be able to

1	**Execute** an Assembly Language Program of 16-bit addition & Multiplication using DMS in 8086.
2	**Create** division of 32/16-bit numbers stored in DMS & Copy elements from one array to another in 8086.
3	**Create** a program in 8086 to separate even and odd numbers from an array and to find the largest number within the array.
4	**Implement** of digital clock design using 8086 and LED blinking on the 8051 microcontrollers.
5	**Create** a program of 8051 microcontroller to control a 7 Segment LED display and provide delays for stepper motor control.

Sr. No.	List of Experiment	CO
1	**Execute** an ALP to perform a 16 bit addition in DMS.	**CO1**
2	**Execute** an ALP to perform Multiplication of two 16 bit numbers assume two are stored in DMS also store the result in consecutive location.	**CO1**
3	**Write** an ALP to perform Division of two 32/16 bit numbers assume two are stored in DMS.	**CO2**
4	**Write** a Program to copy all the elements of one array into another array in 8086.	**CO2**
5	**Write** a Program to separate even and odd numbers from array in 8086.	**CO3**
6	**Prepare** a program to find largest number from array in 8086 microprocessors.	**CO3**
7	**Prepare** a Program for digital clock design using 8086.	**CO4**
8	**Prepare** an ALP of LED blinking in 8051.	**CO4**
9	**Write** a program of 8051 with 7 Segment LED display.	**CO5**
10	**Create** a 8051 program to delay a Stepper Motor.	**CO5**

Text Books

1	M.A. Mazidi & J.G. Mazidi, the 8051 Micro-controller and Embedded system, 3rd Indian reprint, Pearson Education
2	Microprocessor 8086/8088 Family Programme Interfacing: Liu & Gibson.
3	Programming PIC Micro-controllers with XC8 by Authors: Subero, Armstrong.

Reference Books

1	Micro-controllers – Peatman, Mc Graw Hill.
2	Microprocessors & Microcomputers based system design by Md. Rafiquzzaman.

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1	https://nptel.ac.in/courses/108/105/108105159/
2	https://nptel.ac.in/courses/108/104/108104139/

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Second Year (Semester-IV) B.Tech. Electronics & Communication Engineering

BEC2408: Analog Circuit Design Lab

Teaching Scheme		Examination Scheme	
Practical	2 Hrs/week	**CA**	25 Marks
Total Credit	1	**ESE**	25 Marks
		Total	50 Marks
		Duration of ESE: 02 Hrs 00 Min.	

Course Outcomes (CO)

Students will be able to

1	**Determine** the basic principle of operational amplifier, parameters, and its configurations.
2	**Examine** the need and use of linear op-amp circuits and their applications.
3	**Analyze** non-linear applications of op-amp circuits and their applications
4	**Examine** and design DC Power Supply.
5	**Examine** and design various types of oscillators and filters.

Sr. No.	List of Experiment	CO
1	Analyze Frequency response of Inverting & Non inverting Op Amp Using IC 741	CO1
2	Implement Adder & Subtractor Circuit using Op Amp	CO2
3	Analyze input & output waveform of Integrator & Differentiator Circuit using Op Amp	CO2
4	Observe waveform of clipper & clamper circuit using Op Amp	CO2
5	Observe waveform of Schmitt trigger circuit as square wave generator.	CO3
6	Observe waveform of function generator using Op Amp (Sine, Square, Triangular)	CO3
7	Design Astable Multivibrator using Op amp IC 741.	CO3
8	Design Astable Multivibrator using IC 555 timer	CO3
9	Implement series & shunt voltage regulators.	CO4
10	Analyze active filters circuit LPF, HPF, BPF, BRF	CO5

Text Books

1	Ramakant Gaikwad, OPAMPS and Linear Integrated Circuits, PHI/Pearson Education.
2	Franco: Designing with Op-Amps (McGraw Hill).
3	K.R. Botkar, Integrated Circuits, Khanna Publishers, Delhi

Reference Books

1	Linear Integrated Circuits Mannal I, II, and III: National Semiconductor
2	Regulated Power supply Handbook. Texas Instruments.
3	Operational Amplifier Design and Applications Tobey, Graham, Huelsman McGraw Hill.

Useful Links

1	https://nptel.ac.in/courses/117/105/117105147/
2	https://nptel.ac.in/courses/117/107/117107094/
3	http://nptel.ac.in/courses/117103064

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