Vision of Institute

"To emerge as a learning Center of Excellence in the National Ethos in domains of Science, Technology and Management"

Mission of Institute

[M1] To strive for rearing standard and stature of the students by practicing high standards of Professional ethics, transparency and accountability
[M2] To provide facilities and services to meet the challenges of Industry and Society
[M3] To facilitate socially responsive research, innovation and entrepreneurship
[M4] To ascertain holistic development of student and staff members by inculcating knowledge and profession as work practices

Vision of the Department

To impart state of art education for enabling youth to offer solution for the challenges faced in the field of Electronics & Communication Engineering.

Mission of the Department

- To stimulate and develop the students through quality education to face the challenges.
- To empower youth for developing them as a leader through lifelong learning.
- To infuse scientific temper towards research activities.
- To provide a framework for promoting training in collaboration with industry institute interaction.
- To foster a broad spectrum of knowledge in order to prepare them for ethical and social concern.

Program Education Objectives (PEO)

- Students will apply basic fundamentals in mathematics, physics and electronic engineering discipline to build sound foundations.
- Students will design, analyze and solve engineering problems to develop them as the professional leaders in the field of Electronics & communication Engineering.
- Students will get exposure by providing technical training to execute the multidisciplinary projects as a team.
- Students will channelize their knowledge through lifelong learning to assist in the development of the society.
- Students will acquire work ethics and concern for society.

Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

SCHEME OF INSTRUCTION

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	CT-1	CT-2	TA/CA	ESE	TOTAL
1	PCC	EC2401	Signals & Systems	3	-	-	3	3	15	15	10	60	100
2	PCC	EC2402	Electromagnetic Theory	3	-	-	3	3	15	15	10	60	100
3	PCC	EC2403	Analog Circuit Design	3	-	-	3	3	15	15	10	60	100
4	PCC	EC2404	Microprocessor & Microcontroller	3	-	-	3	3	15	15	10	60	100
5	HSMC	BSH 2405	Human Values for Professional Ethics	3	-	-	3	3	15	15	10	60	100
6	PCC	EC2406	Signals & Systems Lab	-	-	2	2	1	-	-	25	25	50
7	PCC	EC2407	Microprocessor & Microcontroller Lab	-	-	2	2	1	-	-	25	25	50
8	PCC	EC2408	Analog Circuit Design Lab	-	-	2	2	1	-	-	25	25	50
9	PROJ	EC2409	Micro Project	-	-	2	2	1	-	-	25	25	50
10	MCC	AU2410	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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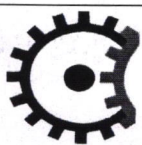
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College Of Engineering &
Technology, Nagpur

Program: B. Tech Electronics & Communication Engineering

Semester	Course Code	Name of Course	L	T	P	Credits
IV	EC2401	Signals and Systems	3	-	-	3

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

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

Reference Books

R.1	Ashok Ambardar, "Introduction to Analog and Digital Signal Processing", PWS Publishing Company, Newyork, 2002.
R.2	Rodger E Zaimer and William H Tranter, "Signals & Systems – Continuous and Discrete",

	McMillan Publishing Company, Bangalore, 2005.
R.3	John .G.Proakis , "Digital Signal Processing Principles, Algorithms and Applications , Prentice Hall, New Delhi 2006,.
R.4	Sanjit .K. Mitra "Digital Signal Processing A Computer based approach" 'Tata McGrawHill Edition, New Delhi, 2001,
R.5	S. Haykin and Barry Van Veen, "Signals & Systems", John Wiley and Sons Inc., New Delhi, 2008.

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc21_ee28/preview
2	https://archive.nptel.ac.in/courses/108/104/108104100/
3	https://www.digimat.in/nptel/courses/video/108104100/L52.html

	Course Outcomes	CL	Class Sessions	Lab Sessions
EC2401.1	**Determine** the responses and Classification of Continuous-time, discrete -time signals & systems	3	9	-
EC2401.2	**Analyze** LTI system based on impulse response Using Convolution theorem	4	9	-
EC2401.3	**Analyze** and synthesize spectral characteristics of continuous-time Periodic and Aperiodic signals using Fourier Series and Transform.	4	9	-
EC2401.4	**Apply** sampling and interpolation to time & frequency characterization of signals & systems.	3	9	-
EC2401.5	**Apply** the Laplace and Z transform to evaluate the continuous-time and discrete-time signals and systems.	5	9	-

Program: B. Tech Electronics & Communication Engineering

Semester	Course Code	Name of Course	L	T	P	Credits
IV	EC2403	Electromagnetic Theory	3	1	-	4

Pre-Requisites: Applied Mathematics III, Applied Mathematics IV, Fundamentals of Physics

Course Objectives:

1.	To provide the students of Engineering with a clear and logical presentation of basic concepts and principles of electromagnetic.
2.	To study the concept of electric field intensity for different charge distribution.
3.	To study the concept of current and conductor and poisson's and laplace equations.
4.	To aware the students about different types of theorem & laws for electric, magnetic flux density.

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

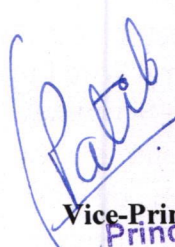| Reference Books	
R.1	Electromagetism Theory and application 2ndEdition2009 Ashutosh Pramanik Prentice Hall.
R.2	Elements of Electromagnetis M. N. O. Sadku Oxford Press.

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/

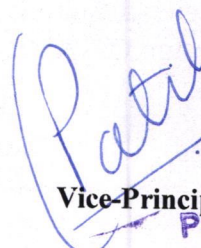|	Course Outcomes	CL	Class Sessions	Lab Sessions
EC2403.1	**Summarize** Orthogonal coordinate systems and its fields.	2	9	-
EC2403.2	**Examine** Coulomb's law, Gauss's law and its application in Electric Field Intensity.	4	9	-
EC2403.3	**Analyze** Divergence Theorem, Conductor Properties using Poisson's And Laplace Equations.	3	9	-
EC2403.4	**Apply** Biot –Savart law, Ampere's Circuital law, Boundary wall conditions in Magnetic field Intensity.	1	9	-
EC2403.5	**Apply** Maxwell's equations for Static and Time varying fields.	2	9	-

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Program: B. Tech Electronics & Communication Engineering

Semester	Course Code	Name of Course	L	T	P	Credits
IV	EC2408	Analog Circuit Design Lab	-	-	2	1

Sr. No.	List of Experiment	CO
1	Design/Plot the Frequency response of Inverting and Non-inverting amplifiers.	CO1
2	Implementation of Op-Amp as adder & subtractor.	CO1
3	To design OP-AMP as Integrator and Differentiator and plot its input/output waveforms.	CO1
4	To study OP-AMP as Clippers & Clampers.	CO3
5	Function generator using operational amplifier (sine, triangular & square wave)	CO3
6	Design and verify Multivibrator circuits using IC 741(Astable, Monostable)	CO3
7	Design and verify Multivibrator circuits using IC 555 (Bistable) / Astable and monostable multivibrator using IC 555	CO3
8	To design OP-AMP as Schmitt trigger for generating a waveform of specific pulse width	CO2
9	To study Sample/Hold circuits	CO4
10	Design series voltage regulators.	CO4

Text Books

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

Reference Books

R.1	Linear Integrated Circuits Mannal I, II, and III: National Semiconductor
R.2	Regulated Power supply Handbook. Texas Instruments.
R.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

	Course Outcomes	CL	Class Sessions	Lab Sessions
EC2408.1	Determine the basic principle of operational amplifier, parameters, and its configurations.	2	-	2

EC2408.2	**Examine** the need and use of linear op-amp circuits and their applications.	3	-	4
EC2408.3	**Analyze** non-linear applications of op-amp circuits and their applications	3	-	2
EC2408.4	**Examine** and design DC Power Supply.	2	-	4
EC2408.5	**Examine** and design various types of oscillators and filters.	3	-	4

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Program: B. Tech Electronics & Communication Engineering

Semester	Course Code	Name of Course	L	T	P	Credits
IV	EC2405	Microprocessor & Micro-controller	3	-	-	3

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/

	Course Outcomes	CL	Class Sessions	Lab Sessions
EC2405.1	**Analyze** the structure and organization of the instruction set in the 8086 microprocessor.	3	9	2
EC2405.2	**Implement** the ability to configure the microprocessor's I/O ports and communication protocols for specific peripherals.	3	9	8
EC2405.3	**Analyze** the execution of 8051 microcontroller programs and identify potential errors or inefficiencies.	3	9	2
EC2405.4	**Implement** the interfacing 8051 micro-controller with display & stepper motor.	3	9	2
EC2405.5	**Analyze** the performance and behavior of advanced controllers implemented with Arduino.	4	9	4

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Program: B. Tech. IV Semester

Semester IV	BSH2405: Human Values for Professional Ethics

Teaching Scheme			Examination Scheme	
Theory	3 Hrs/week		CT-I	15 Marks
Tutorial	-		CT-II	15 Marks
Total Credits	3		CA	10Marks
Duration of ESE: 3Hrs			ESE	60 Marks
Pre- Requisite: Ethical Science & Business Ethics			Total Marks	100 Marks

Course Contents

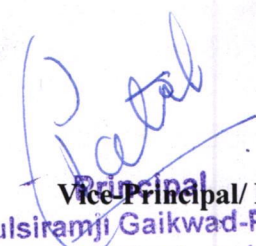|	
Unit I	**Introduction to Value Education** Value Education, Definition, Concept and Need for Value Education, The Content and Process of Value Education, Basic Guidelines for Value Education, Self-exploration as a means of Value Education.
Unit II	**Harmony in the Human Being, Family, Society and 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	
T.1	A.N Tripathy, New Age International Publishers, 2003.
T.2	Bajpai. B. L, New Royal Book Co, Lucknow, Reprinted, 2004.
T.3	Bertrand Russell Human Society in Ethics & Politics.
T.4	Professional Ethics: R. Subramanian, Oxford University Press, 2015.
Reference Books	
R.1	Corliss Lamont, Philosophy of Humanism.
R.2	Gaur. R.R, Sangal. R, Bagaria. G.P, A Foundation Course in Value Education, Excel Books, 2009.
R.3	Gaur. R.R, Sangal. R, Bagaria. G.P, Teachers Manual Excel Books, 2009.
R.4	I.C. Sharma. Ethical Philosophy of India Nagin& co Julundhar.
R.5	Mortimer. J. Adler, – Whatman has made of man.
R.6	Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, Cengage Learning, 2015.

COs	Course Outcomes	CL	Class Sessions
CO1	**Describe** Value Education and its role for Self-exploration.	2	9
CO2	**Illustrate** the Harmony in the Human Being and Society.	3	9
CO3	**Examine** the Ethical Human Conduct along with Universal Order.	3	9
CO4	**Use** of various theories of Basic Ethical principles.	3	9
CO5	**Predict** Global Issues in Professional Ethics and Sustainable Development.	3	10

Program: B. Tech Electronics & Communication Engineering

Semester	Course Code	Name of Course	L	T	P	Credits
IV	EC2406	Signals and Systems Lab	-	-	2	1

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

Text Books

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

Reference Books

R.1	Ashok Ambardar, "Introduction to Analog and Digital Signal Processing", PWS Publishing Company, Newyork, 2002.
R.2	Rodger E Zaimer and William H Tranter, "Signals & Systems – Continuous and Discrete", McMillan Publishing Company, Bangalore, 2005.
R.3	John .G.Proakis , "Digital Signal Processing Principles, Algorithms and Applications , Prentice Hall, New Delhi 2006,.
4	Sanjit .K. Mitra "Digital Signal Processing A Computer based approach" 'Tata McGraw Hill Edition, New Delhi, 2001,
5	S. Haykin and Barry Van Veen, "Signals & Systems", John Wiley and Sons Inc., New Delhi, 2008.

Useful Links

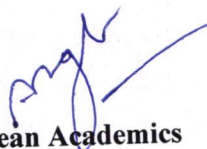|	
1	https://onlinecourses.nptel.ac.in/noc21_ee28/preview
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3	https://www.digimat.in/nptel/courses/video/108104100/L52.html

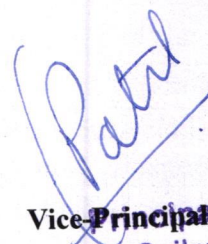|	Course Outcomes	CL	Class Sessions	Lab Sessions
EC2406.1	**Determine** the responses and Classification of Continuous-time, discrete-time signals & systems	3	-	2
EC2406.2	**Analyze** LTI system based on impulse response Using Convolution theorem	4	-	4
EC2406.3	**Analyze** and synthesize spectral characteristics of continuous-time Periodic and Aperiodic signals using Fourier Series and Transform.	4	-	2
EC2406.4	**Apply** sampling and interpolation to time & frequency characterization of signals & systems.	3	-	4
EC2406.5	**Apply** the Laplace and Z transform to evaluate the continuous-time and discrete-time signals and systems.	5	-	4

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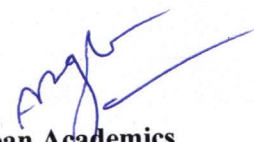## Program: B. Tech Electronics & Communication Engineering

Semester	Course Code	Name of Course	L	T	P	Credits
IV	EC2407	Microprocessor & Microcontroller Lab	-	-	2	1

Sr. No.	List of Experiment	CO
1	Write an ALP to perform a 16 bit addition in DMS.	CO1
2	Write an ALP to perform multiplication of two 16 bit numbers assumes 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 assumes two are stored in DMS	CO1
4	Write an ALP to move content of array from one memory block to another memory block.	CO2
5	Write an ALP to separate odd and even number.	CO2
6	Write ALP to delete character from given string for 8086.	CO1
7	Write program to find smallest number from array.	CO3
8	Write ALP to exchange two strings for 8051.	CO3
9	To study stepper motor interface with 8051.	CO4
10	Write an ALP to generate square wave of 1KHz on one pin of port.	CO5

Text Books

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

Reference Books

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

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3	https://nptel.ac.in/courses/117/106/117106108/

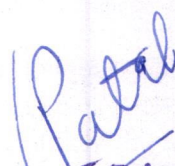|	Course Outcomes	CL	Class Sessions	Lab Sessions
EC2407.1	**Analyze** the structure and organization of the instruction set in the 8086 microprocessor.	2	-	2

EC2407.2	**Implement** the ability to configure the microprocessor's I/O ports and communication protocols for specific peripherals.	4	-	4
EC2407.3	**Analyze** the execution of 8051 microcontroller programs and identify potential errors or inefficiencies.	3	-	2
EC2407.4	**Implement** the interfacing 8051 micro-controller with display & stepper motor.	3	-	2
EC2407.5	**Analyze** the performance and behavior of advanced controllers implemented with Arduino.	4	-	4

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Program: B. Tech Electronics & Communication Engineering

Semester	Course Code	Name of Course	L	T	P	Credits
IV	EC2403	Analog Circuit Design	3	-	-	3

Course Contents

Unit I	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.
Unit II	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.
Unit IV	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)
Unit V	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

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

Reference Books

R.1	Linear Integrated Circuits Mannal I, II, and III: National Semiconductor
R.2	Regulated Power supply Handbook. Texas Instruments.
R.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

	Course Outcomes	CL	Class Sessions	Lab Sessions
EC2403.1	**Determine** the basic principle of operational amplifier, parameters, and its configurations.	2	9	-

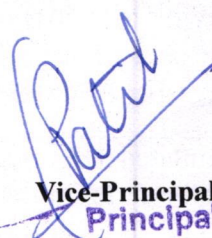|				
EC2403.2	**Examine** the need and use of linear op-amp circuits and their applications.	3	9	-
EC2403.3	**Analyze** non-linear applications of op-amp circuits and their applications	4	9	-
EC2403.4	**Examine** and design DC Power Supply.	5	9	-
EC2403.5	**Examine** and design various types of oscillators and filters.	3	9	-