Department of Electronics and Telecommunication Engineering

Fourth Semester Syllabus NEP 2020

Course Code	Name of Course	Course Category	Teaching Scheme				Credits	Evaluation Scheme					
								Theory			Practical		Total Marks
			L	T	P	Total Hours		TAE	CAE	ESE	INT	EXT	
SEMESTER-IV													
23BTECL204 23BTECP204	Analog Integrated Circuits	PCC 4	3	-	2	5	4	10	15	50	25	25	125
23BTECL205 23BTECP205	Microcontroller & Applications	PCC 5	3	-	2	5	4	10	15	50	25	-	100
23BTMBL202 EC	Entrepreneurship Development Practices	EEMC 2	2	-	-	2	2	10	15	50	-	-	75
23BTSHL233 EC	Universal Human Values 2: Understanding Harmony	VEC 2	2	-	-	2	2	10	15	50	-	-	75
23BTECL208 23BTECP208	Vocational and Skill Enhancement Elective –III	VSEC 3	1	-	2	3	2	10	15	-	25	-	50
23BTXXXXX	Open Elective II	OE 2	2	-	-	2	2	10	15	50	-	-	75
23BTECL207	Multidisciplinary Minor	MDM 2	2	-	-	2	2	10	15	50	-	-	75
23BTSHL231 EC 23BTSHP231 EC	Aptitude and Employability Skill	AEC 2	1	-	2	3	2	10	15	-	25	-	50
		TOTAL	**16**		**08**	**24**	**20**	**80**	**120**	**300**	**100**	**25**	**625**

Department of Electronics and Telecommunication Engineering

Course	Offered to Department	Name of Subject	Course Code
Multidisciplinary Minor (MDM2)	IT	Introduction to Signals and System	23BTECL207IT
Multidisciplinary Minor (MDM2)	ETC	Cyber Crimes and Investigation	23BTCYL205EC
Vocational and Skill Enhancement Elective - III	ETC	Introduction to Robotics	23BTECL208 23BTECP208
Open Elective-II	Other than ETC	Principles of Electronic Communication	23BTECL209
Open Elective-II	ETC	Basics of GAME Programming	23BTITL221
		Foundation of Electric Vehicle	23BTEEL215
		Introduction to Neural Networks and Deep Learning	23BTAIL206
		Machine Learning Concepts	23BTDSL212
		Web Security	23BTCYL206

Department of Electronics and Telecommunication Engineering

Course Title: Analog Integrated Circuits										
Semester	IV	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	EVEN	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	PCC4	3	-	2	4	10	15	50	25	25
Course Code	23BTECL204 23BTECL204									
Teaching Mode	Offline	5 Hrs			Total	75			50	
Duration of ESE	3 Hrs					125				

Course Objectives	1. To understand analog circuits and systems.
	2. To know linear and nonlinear applications of operational amplifier ICs.
	3. To study and use different ICs such as timers, regulators etc. for real time applications.
Course Outcomes	**Upon successful completion of this course, student will be able to:**
	CO1 Understand basic parameters, feedback techniques & applications of opamp.
	CO2 Apply op-amp based circuits design in real time applications.
	CO3 Design real time applications using filters & oscillators.
	CO4 Design nonlinear op-amp based circuits required in communications & embedded systems.
	CO5 Design & develop analog applications using different ICs.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3							2	3		
CO2	3	3	3	2	3							2	3		
CO3	3	3	3	2	3							2	3		
CO4	3	3	3	3	3							2	3		
CO5	3	3	3	3	3							2	3		

Course Contents:

Department of Electronics and Telecommunication Engineering

Unit	Contents	Hours
I	**Basics of operational amplifier:** Introduction to Differential Amplifier, Block diagram of OPAMP, Inverting and Non-inverting amplifier configurations, negative feedback, voltage gain, input & output impedance, Bandwidth. Input offset voltage, input bias and offset current, Slew rate, CMRR, PSRR, Frequency response.	**8 Hrs.**
II	**OPAMP based Linear applications:** Arithmetic operations: Summer, Subtractor, Scaling and Averaging, Differential amplifier using OPAMP, Instrumentation amplifier, Integrator, Differentiator.	**8 Hrs.**
III	**Filters & Oscillators:** Classification of Filters, Active Filters, First to Sixth –Order Butterworth filter, IGMF configuration, All Pass Filter, Cascade Design of Filters, Classification of Oscillators, Design of Op-amp based Phase Shift and Wein Bridge Oscillators, Square, Triangular and Saw Tooth Wave Generators	**8 Hrs.**
IV	**OPAMP based Non-linear applications:** Schmitt Trigger, Voltage Comparator, Voltage Limiters and Window Detector, Clippers and Clampers, Peak Detector, Precision Rectifiers, Sample & Hold, ADC, DAC	**8 Hrs.**
V	**Special ICs applications:** LM358 OPAMP, 555 Timer, Phase Locked Loops IC565, Voltage Controlled Oscillator Basic Operation, IC based Voltage Regulator Circuits, AGC. Analog Multiplier, Advance topics based on course	**8 Hrs.**

Text Books	1.	Operational amplifiers, Design and applications, Tobey, Graeme, Huelsman, McGraw Hill,1990,2
	2	Operational Amplifiers and Linear Integrated Circuits, Gaikwad R. A, PHI, 2
	3	Electronics devices and Circuits and Theory, Robert L. Boylestad, Louis Nashelsky, Pearson India, 2009, Tenth Edition
E Book	1.	Linear Ic Applications, A.P.Godse U.A.Bakshi, Technical Publications, 2009
	2.	Operational Amplifiers & Linear Integrated Circuits: Theory and Application / 3E E-Book
Reference Books	1.	Design with OPAMPS and Analog ICS Francis S McGraw Hills
	2.	OPAMPS and Linear ICs Fiore J.M Delmer-Thomson, USA, 2001.
	3.	https://nptel.ac.in/courses/108/101/108101091/

Department of Electronics and Telecommunication Engineering

List of Experiments

Sr. No.	Name of Experiments
1	To implement & verify IC741 as inverting & non-inverting amplifier
2	To implement Summing Amplifier using IC741
3	To implement & verify input & output waveforms of Differentiator using IC741
4	To implement & verify input & output waveforms of Integrator using IC741
5	To implement & verify frequency response of 1st order Low Pass Filter using IC741
6	To implement & verify frequency response of 1st order High Pass Filter using IC741
7	To design Full Wave Rectifier using IC 741
8	To implement & verify IC555 as A stable Multivibrator
9	To design RC phase shift Oscillator using IC 741 and verify its frequency of oscillation.
10	To design and verify zero crossing detector using IC741.
11	To design and verify Positive clipper Circuit using IC 741
Open Ended Experiments	
1	To Design LED Flasher using IV LM324
2	To design Diode Tester Circuit using IC741

Department of Electronics and Telecommunication Engineering

Course Title: Microcontroller and Applications										
Semester	IV	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	EVEN	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	PCC5	3	-	2	4	10	15	50	25	-
Course Code	23BTECL205 23BTECL205									
Teaching Mode	Offline				Total	75			25	
Duration of ESE	3 Hrs					100				

Course Objectives	1. To study and understand various microcontrollers and embedded systems
	2. To understand the design parameters of embedded systems applications.
	3. To study and impart different tools for embedded system and IoT application design.
Course Outcomes	CO1 Demonstrate the principle of embedded systems and Microcontroller
	CO2 Design the interfacing of devices and peripherals
	CO3 Develop programming for applications develop real time applications
	CO4 Make Use of Arduino Controller for Designing of Embedded Applications.
	CO5 Design and Develop different embedded system and IoT applications.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	2	3						2	1	3	2	3
CO2	2	2	3	2	3						2	1	3	2	3
CO3	3	2	3	2	3						2	1	3	2	3
CO4	3	2	3	2	3						2	1	3	2	3
CO5	3	2	3	3	3						2	1	3	2	3

Department of Electronics and Telecommunication Engineering

Course Contents:

Unit	Contents	Hours
I	**Embedded Systems:** Introduction to embedded Systems, Requirements /Componentsof Embedded Systems, Design process of Embedded System, Design metrics of Embedded System. Introduction to RTOS, Introduction of Microprocessor. **Microcontrollers:** Introduction to microcontrollers, Difference between Microprocessor and Microcontroller, different types of Microcontrollers, 8051 architecture, data types and directives, flag bits and PSW register, register bank and stack.	9
II	**Assembly Language Programming:** Jump, Loop and Call Instructions, I/O Port Programming, Addressing modes, Arithmetic, Logic instructions and programs, data types and time delay. Interfacing to External Memory.	9
III	**Programming:** Timer/counter, Interrupts and serial communications, Serial I/O, Programming Tools **Interfacing with 8051:** ADC and DAC interfaces for microcontrollers, Real time interfacing with LED, Keypad, LCD display, Sensors interfacing.	9
IV	**Arduino Application:** Introduction to Arduino, serial communication and timer, control design using arduino. Real time interfacing with LED, LCD & Sensors.	9
V	**Embedded IoT Applications:** Introduction to IoT, Design and perform different embedded system and IoT Applications: Robotic, Industrial Automations & Health care.	9

Text Books	1.	Muhammad Ali Mazidi, the 8051 Micro-controller & Embedded System using assembly & C, Pearson Education,2008, Second
	2	Muhammad Ali Mazidi, ARM Assembly language programming and Architecture, Second
	3	Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, Pearson Education India, 2009, Second
Reference Books	1.	Shibu K. V. Introduction to Embedded System, The McGraw Hill, 2011
	2.	Ajay V. Deshmukh, Micro-controllers - Theory and Applications, Tata McGraw Hill,
	3.	Kenneth J. Ayala, The 8051 Micro-controller – Architecture, Programming & Applications, Penram International & Thomson Asia, 1996, Second
	4.	Embedded System Design- Frank Vahid, Wiley India Pvt. Limited 2006.

Department of Electronics and Telecommunication Engineering

List of Experiments

Sr. No.	Name of Experiments	Mapped Course Outcomes
1	Write a program to perform Arithmetic operations using 8051 microcontroller	CO1
2	Write a program to perform data transfer between two memory blocks using 8051 microcontroller	CO2
3	Write a program to find smallest number from memory blocks using 8051 microcontroller	CO2
4	Write a program to blink led connected to Pin P2.0 using 8051 microcontroller. (Proteous based)	CO3
5	Write a program to interface 7Segment display with 8051 Microcontroller. (Proteous based)	CO3
6	Write a program to generate squire wave using 8051 microcontroller.	CO4
7	Interface LCD display with Arduino (Hands on)	CO4
8	Design and perform IoT based ultrasonic range Finder.	CO5
9	Interface blue tooth Module HC-05 with Arduino for wireless communication System.	CO4
10	Interface different sensor like LDR, IR with 8051 Microcontroller (Proteous based)	CO4
11	Design and perform different embedded system and IoT Applications	CO5
12	Project Module-1	CO3, CO5

Department of Electronics and Telecommunication Engineering

Course Title: Introduction to Robotics – Skill Enhancement Elective - III										
Semester	**IV**	Teaching Scheme				Evaluation Scheme				
Term	EVEN					Theory			Practical	
Course Category	VSEC3	Th	Tu	Pr	Credits	TAE	CAE	ESE	Int	Ext
Course Code	23BTECL208 23BTECP208	1 Hr	--	2 Hrs	2	10	15	--	25	--
Teaching Mode	Offline					**25**			**25**	
Duration of ESE	--	3 Hrs.			Total	**50**				

Course Objectives	To get comfortable with the Electronics embedded system & robotics programing
	To enlighten the students about the fundamentals of robotic systems.
Course Outcomes	CO1: Apply the basic concepts of robot
	CO2: To Analyze End effectors and robot controls.
	CO3: To formulate Robot Transformations. and Sensors
	CO4: To study and analyze sensors and drivers
	CO5: To develop Robot cell design and applications

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	3	2	3								3	1	1
CO2	1	1	3	2	2								3	1	1
CO3	1	1	3	2	2								3	1	1
CO4	1	1	3	2	2								2	1	1
CO5	1	1	3	2	2								2	1	1

Department of Electronics and Telecommunication Engineering

Course Contents:

Unit	Contents	Hours
I	**INTRODUCTION** Robot anatomy-Definition, law of robotics, Terminology of Robotics-Accuracy and repeatability of Robotics, Robot classifications- Architecture of robotic systems-Robot degree of freedom	3
II	**END EFFECTORS AND ROBOT CONTROLS** Mechanical grippers-Slider crank mechanism, Screw type, Rotary actuators, cam type-Magnetic grippers-Vacuum grippers. Robot controls-Point to point control, Continuous path control.	3
III	**ROBOT TRANSFORMATIONS** Robot kinematics- Types- 2D, 3D Transformation Scaling, Rotation, and Translation-Homogeneous coordinates, Problems on transformation.	3
IV	**ROBOTIC SENSORS AND DRIVERS** Sensors in robot – Touch sensors-Tactile sensor – Proximity and range sensors – Robotic vision sensor-Force sensor-Light sensors, Pressure sensors. Types and selection of drives, Actuators, Robot Drive systems- Hydraulic, Pneumatic and Electric system.	3
V	**ROBOT CELL DESIGN AND APPLICATIONS** Robot work cell design and control-Sequence control, Operator interface, Safety monitoring devices in Robot-Mobile robot working principle. Robot applications.	3

Text Books	1.	S.R. Deb, Robotics Technology and flexible automation, ISBN: 9780070077911 Publisher- Tata McGraw-Hill Education., 2010
	2.	Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, Technology programming and Applications ISBN-10 : 1259006212 Publisher : McGraw Hill Education; 2nd edition (1 July 2017)
Reference Books	1.	Craig. J. J Introduction to Robotics mechanics and control ISBN: 0-13-1236329-6 Addison- Wesley, 1999 3rd Addition.
	2.	Bharat Bhushan, Springer Handbook of Nanotechnology, ISBN: 978-3-642-02525-9 Springer, 2006.
on line TL Material	1	Introduction to Robots & Robotics https://nptel.ac.in/courses/112/105/112105249/
	2.	Robotics Engineering Books & Study Material https://www.ncertbooks.guru/robotics-engineering/

Department of Electronics and Telecommunication Engineering

Sr. No.	Name of Experiments
1	Introduction to Robotics field and Hardware components.
2	Introduction types of robots and applications.
3	Design basic embedded system timer counter for robot motor run for 20 sec.
4	Design & interface embedded board with Analog sensor with serial monitor.
5	Design & interface embedded board with Digital sensor with serial monitor.
6	Design & Interface embedded system with display system to view results.
7	Design & interface DC gear motor for 10 sec run time for wheel base robot.
8	Design RF control mechanism for Robotics wireless Communication system
9	Case Study on embedded system project for X-Y axis control mega CNC robot.
10	Design Robotics Biped application.
11	Open ended project: Design Multi sensor self-path finding robots.

Department of Electronics and Telecommunication Engineering

Course Title: Open Elective II-Principles of Electronic Communication										
Semester	IV	Teaching Scheme				Evaluation Scheme				
Term	Even					Theory			Practical	
Course Category	OE2	Th	Tu	Pr	Credits	TAE	CAE	ESE	Int	Ext
Course Code	23BTECL209	2 Hrs.	-	-	2	10	15	50	-	-
Teaching Mode	Offline									
Duration of ESE	3 Hrs.	2 Hrs.			Total	75			-	
						75				

Course Objectives	1. Introduce the students to modulation and various analog and digital modulation schemes.
	2. They can have a broad understanding of satellite, optical, cellular, mobile, wireless and telecom concepts.
Course Outcomes	**Upon successful completion of this course, student will be able to:**
	CO1: Understand various types of modulations.
	CO2: Analyze different types of LAN Networks
	CO3: Understand Basics of Satellite Communication
	CO4: Understand Basics of Optical Communication
	CO5: Understand Basics of Wireless Technology

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3		3	2				1		1		3		3
CO2	3	3		3	2				1		1		3		3
CO3	3	3		3	2				1		1		3		3
CO4	3	3		3	2				1		1		3		3
CO5	3	3		3	2				1		1		3		3

Department of Electronics and Telecommunication Engineering

Course Content

Unit	Contents	Hours
I	**Introduction:** Need for Modulation, Frequency translation, Electromagnetic spectrum, Gain, Attenuation and decibels. Digital Modulation techniques ASK, FSK, PSK, DPSK	06
II	**Networking and Local Area Networks:** Network fundamentals, LAN hardware, Ethernet LANs, Token Ring LAN	06
III	**Satellite Communication Overview:** Satellite Orbits, satellite communication systems, satellite Subsystems, Ground Stations, Satellite Applications, Global Positioning systems.	06
IV	**Optical Communication Overview:** Optical Principles, Optical Communication Systems, Fiber –Optic Cables, Optical Transmitters & Receivers	06
V	**Wireless Technologies Overview:** Wireless LAN, PANs and Bluetooth, Zig Bee and Mesh Wireless networks, Wimax and MANs, Infrared wireless, RFID communication, UWB.	06

Text Book/Reference Books/Online Material

Text Books	1.	Principles of Electronic Communication Systems, Louis E. Frenzel, 3e, McGraw Hill publications, 2008.
	2.	Electronic Communications systems, Kennedy, Davis 4e, McGraw Hill publications, 1999
EBooks	1.	Telecommunication switching and Networks By P.Gnanasivam
	2	Telecommunication switching and Networks by Thigarajan Vishwanathan
Reference Books	1.	Theodore Rapp port, Wireless Communications - Principles and practice, Prentice Hall, 2002.
	2.	Roger L. Freeman, Fundamentals of Telecommunications, 2e, Wiley publications.
	3.	Introduction to data communications and networking, Wayne Tomasi, Pearson Education, 2005
on line TL Material	1.	NPTEL Lecture

Department of Electronics and Telecommunication Engineering

Course Title: Introduction to Signals and System - Multidisciplinary Minor										
Semester	IV	Teaching Scheme				Evaluation Scheme				
Term	Even					Theory			Practical	
Course Category	MDM2	Th	Tu	Pr	Credits	TAE	CAE	ESE	Int	Ext
Course Code	23BTECL207	2 Hrs.	-	-	2	10	15	50	-	-
Teaching Mode	Offline									
Duration of ESE	3 Hrs.	2 Hrs.			Total	75			-	
						75				

Course Objectives	1. To introduce the fundamentals, characteristics, concept techniques of signals &
	2. Understanding signals and system is in terms of both the time and transform domains, takingadvantage of the complementary insights and tools that these different perspective provide.
	3. To characterize LTI systems in the Time domain and various Transform domains
Course Outcomes	**Upon successful completion of this course, student will be able to:**
	CO1: To represent & classify signals, Systems & identify LTI systems.
	CO2: To understand LTI systems and its analysis.
	CO3: To analyze the Continuous Time systems by performing Convolution
	CO4: To understand Discrete Time Fourier Transform.
	CO5: To understand sampling of signals and quantization process

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2					1		1	1	3		3
CO2	3	3	3	2					1		1	1	3		3
CO3	3	3	3	2					1		1	1	3		3
CO4	3	3	3	2					1		1	1	3		3
CO5	3	3	3	2					1		1	1	3		3

Department of Electronics and Telecommunication Engineering

Course Content

Unit	Contents	Hours
I	**Introduction to Signals and Systems:** Signals and systems as seen in everyday life. Basic definitions, Classification of signals and systems. Signal operations and properties. Basic continuous time signals, discretization of continuous time signals, discrete time signals. Basic system properties, Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, Representation of digital signals. Case study of different signals form communication and biomedical field	06
II	**Continuous time and discrete time Linear shift invariant (LSI) systems:** Impulse response and step response, convolution, input-output behavior with Aperiodic convergent inputs, cascade interconnections. Characterization of causality and stability of linear shift-invariant systems.	06
III	**Continuous Time Fourier Transform:** Representation of Aperiodic Signal, Fourier Transform for Periodic Signals, Properties of CTFT, Convolution and multiplication property of continuous FT, Systems characterized by Linear Constant Coefficient Differential equations.	06
IV	**Discrete Time Fourier Transform (DTFT)** Properties of DTFT , convolution property, multiplication property, Duality, Systems characterized by Linear Constant Coefficient Difference Equations	06
V	**Sampling:** Sampling theorem – Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling	06

Text Books	1.	Signals and Systems: Alan V Oppenheim, Alan S Willsky, S Hamid Nawab, Prentice Hall India 2009
	2.	Signals & Systems - Simon Haykin and Van Veen, Wiley, 2nd Edition.
	3.	Signals, Systems & Communications - B.P. Lathi, BS Publications, 2003.
EBooks	1.	https://drive.google.com/file/d/0B7SUGT-4AMaJZGFvTi0tMHpmRjQ/view
Reference Books	1.	Signals & Systems - Simon Haykin and Van Veen,Wiley, 2nd Edition.
	2.	Signals, Systems and Transforms - C. L. Philips, J.M.Parr and Eve A.Riskin, Pearson education.3rd Edition, 2004.
	3	Fundamentals of Signals and Systems Michel J. Robert, MGH International Edition. 2008.
on line TL Material	1.	IIT's NPTEL lectures

Department of Electronics and Telecommunication Engineering