Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

(Accredited 'A' Grade by NAAC with a score of 3.25)

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Engineering

Minors in DSP and Embedded System

Offered by Electronics & Telecommunication Engineering

SoE & Syllabus 2020

28 June 2020

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B.E. SCHEME OF EXAMINATION 2020-21

Electronics & Telecommunication Engineering

Minors in DSP and Embedded System

SN	Sem	Type	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
						L	T	P	Hrs		MSEs*	TA**	ESE	
1	5	PC	ET2601	Analog Electronics	T	3	0	0	3	3	30	30	40	3
2	5	PC	ET2602	Digital Circuts and Fundamentals of Microprocessors	T	3	0	0	3	3	30	30	40	3
3	5	PC	ET2603	Analog and Digital Electronics Lab	p	0	0	1	2	1		60	40	3
4	6	PC	ET2611	Embedded System	T	3	0	0	3	3	30	30	40	3
5	6	PC	ET2612	Digital Signal Processing	T	3	0	0	3	3	30	30	40	3
6	6	PC	ET2613	Simulation Lab	P	0	0	1	2	1		60	40	3
7	7	PC	ET2621	Analog and Digital Communication	T	3	0	0	3	3	30	30	40	3
8	7	PC	ET2622	Analog and Digital Communication Lab	P	0	0	1	2	1		60	40	3
					TOTAL	**15**	**0**	**3**	**21**	**18**				

MSEs* = Three MSEs of 15 Marks each will conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment

TA ** = for Theory : 20 marks on lecture quizzes, 8 marks on assignments, 2 marks on class performance

TA = for Practical : MSPA will be 15 marks each**

		June 2020	**1.00**	**Applicable for AY 2020-21 Onwards**
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**	

V Semester
ET2601: Analog Electronics

Course Objective	Course Outcome
ts should be able to 1) Understand modern analog circuits using integrated bipolar and field effect transistor technologies. 2) Understand basic principles of analog integrated circuit for analog IC design. 3) Learn operational amplifier basics, its parameters and its applications. 4) Understand Data converters and waveform generators	Students will be able to 1) Understand fundamentals of OP-AMP. 2) Design and parametric analysis of error compensation network. 3) Design and analyze linear and non- linear OP-AMP applications. 4) Explore special function ICs and its applications.

UNIT-1: OPERATIONAL AMPLIFIER FUNDAMENTALS
Basic Op Amp Configurations, Open loop, Ideal Op Amp, Feedback in OPAMP circuit: Inverting, Non inverting, voltage follower. **(06 Hours)**

UNIT-2: OP AMP LIMITATIONS- STATIC and DYNAMIC
OPAMP parameters, Input Bias and Offset Current, Input Bias and Offset voltages, input offset error Compensation, open loop and closed loop Frequency response, Transient response. **(06 Hours)**

UNIT-3: LINEAR APPLICATIONS
Summer, difference amplifier, integrator, differentiator, Current-to-Voltage Converter, Voltage-to-Current Converter, Voltage-to-Frequency Converter, Frequency -to-Voltage Converter, Transducer and Instrumentation Amplifier circuits, Industrial applications. **(06 Hours)**

UNIT 4: NONLINEAR CIRCUITS
Precision Rectifiers, clipper, clamper, Voltage Comparators, Schmitt Triggers, Sample-and-Hold Circuits, Load Controlling circuits.
WAVEFORM GENERATORS
Sinusoidal Oscillators based on Wein bridge and RC Phase shift and Square wave generation, Triangular wave generator **(06 Hours)**

UNIT-5: ACTIVE FILTERS
Transfer function, first order filter, standard frequency response, KRC Filters with variable gain and Unity Gain, Second order LPF & HPF Butterworth filter design, BPF and BRF **(06 Hours)**

UNIT 6: SPECIAL FUNCTION IC'S
Monolithic timers IC 555, Application circuits based on IC555, D-A Converters (DACs), A- D Converters (ADCs), Linear IC LM324. **(06 Hours)**

Text books:				
1	Design with Operational Amplifiers and Analog Integrated Circuits	2002	By Sergio Franco	McGraw-Hill
2	Linear Integrated Circuits	2015	By D. Roy Chaudhuri, Shail Jain	New Age International

3	Op-Amps and Linear Integrated Circuits	2015	ByRamakant A. Gayakwad	Pearson
Reference books:				
1.	Linear Integrated Circuits	2010	By S. Salivahanan, V. S. Bhaaskaran	McGraw-Hill

V Semester
ET2602: Digital Circuits and Fundamentals of Microprocessor

Course Learning Objective Students will be able to	Course Outcomes Students will be able to
1. To learn digital logic families and minimization method. 2. Understand the concept of Combinational circuits using MSI and LSI chips 3. To Learn arithmetic circuits 4. To Know Synchronous, and Asynchronous counters and flip flops 5. To Study 8085 Microprocessor. 6. To Study assembly language programming.	1. Simplify Boolean expressions using k-map & tabulations method. 2. Identify, formulate, and solve combinational logic design problems. 3. Understand the concepts of flip-flops, and it's conversion from one flip-flop to another. 4. Design sequential logic circuits. 5. Develop programs for 8085 microprocessor.

Unit - I **[6 Hrs]**
Introduction to Logic families & their characteristics. Fan-In, Fan-out, Propagation delay, Power dissipation, Noise Margin, CMOS inverter. BCD arithmetic, simplification of Boolean expressions, Implementations of Boolean expressions using logic gates, Karnaugh map, Quine McCaskey methods, Formation of switching functions from word statements.

Unit - II **[5 Hrs]**
Functions & implementation using Multiplexer, Demultiplexer, Encoder, Decoder. Combinational circuit analysis, Combinational circuits design using MSI and LSI chips, Code Converters.

Unit - III **[5 Hrs]**
Design of Arithmetic circuits: Half & Full adders, Half & Full subtractors , Multibit parallel adders, Carry Propagate adder & Carry Look ahead adder, BCD Adder, Comparators, Multi bit Application designs, ALU

Unit - IV **[6 Hrs]**
Edge & Level triggers. Need for sequential circuits, Binary cell, Latches and flip-flops. RS-FF, D-FF, JK-FF, Master-Slave JK-FF & T-FF, Excitation & Truth Table, Flip-flop conversions, Shift registers, Synchronous and Asynchronous sequential Circuits. Counters Design, Ring counter.

Unit - V **[7 Hrs]**
Introduction to 8085 Microprocessor-Architecture, Addressing Modes, Instruction set, PIN configuration

Unit - VI **[7 Hrs]**
8085 advanced instructions, Assembly language programming, Interrupts)

Text books:	
1	Digital Design 3rd edition 2007-06-15 M. Morris Mano, Pearson PH
2	Microprocessor Architecture, Programming and Applications with the 8085, Ramesh Gaonkar ,Penram International Publications.
Reference books:	
1	Digital Circuits & Microprocessors 5th edition, 2004 Hebert Taub Mc Graw Hill2
2	Fundamentals of Digital Logic with VHDL Design 2nd Edition, 2007 Stephen Brown & Zvonko Vranesic TMH
3	Engg Approach to Digital Design 1st edition(February 19, 1997)W. Fletcher PHI

V Semester
ET2603: Lab : Analog and Digital Electronics

Course Learning Objective Students will be able to	Course Outcomes Students will be able to
1) Understand basic principles of analog integrated circuit for analog IC design. 2) Learn operational amplifier basics, its parameters and its applications. 3) Understand the concept of Combinational and Sequential circuits. 4) To Study assembly language programming.	1) Design and analyze linear and non- linear OP-AMP applications. 2) Explore special function ICs and its applications 3) Identify, formulate, and solve combinational logic design problems. 4) Design sequential logic circuits. 5) Develop programs for 8085 microprocessor.

Expt. No.	Name of Experiment
1	OP-AMP as a inverting amplifier / non-inverting amplifier with frequency response
2	Study different OPAMP parameters: CMRR, Slew rate of OP-AMP
3	OP-AMP as an Integrator
4	OP-AMP as a Low pass filter
5	Bistable Multivibrator using IC 555
6	Design and Realization of Basic logic gates using Universal gates
7	Design of Adder and Subtractor
8	Design of Flip Flop
9	Design of Shift Resister
10	Design of Counter
11	Write a program to add two 8 bit numbers

VI Semester
ET2611: Embedded System

Course Learning Objective Students will be able to	Course Outcomes Students will be able to
1) To study & understand the detailed architectural features of Arduino IDE Overview 2) To study the Elements of Arduino Board 3) To explore the Arduino programming and types of Arduino Board 4) To understand interfacing of various peripherals with Arduino Board	1) Explore the architectural features of Arduino IDE Overview. 2) Explore various elements of Arduino Board. 3) Develop programs in interfacing of different peripherals with ATMEGA328 P PU. 4) Acquire knowledge about memory management in ATMEGA328 P PU.

UNIT-1 **(06 Hours)**
Introduction To Arduino: Arduino Installation, Arduino IDE Overview, Elements of Arduino Board, Types of Arduino Board, Block diagram of ATMEGA 328 P PU, On-chip flash program memory.

UNIT-2 **(06 Hours)**
Introduction To Arduino Programming: Comments, Variables, Setup Function, Loop Function, Conditional Statements, Arrays, Important Header Files.

UNIT-3 **(06 Hours)**
Introduction to NodeMCU, Insight Into ESP8266 NodeMCU Features & Using It With Arduino IDE, Installing the ESP8266 Core on Windows OS, ESP8266 NodeMCU Pinout, Power requirement, Serial Communication, Peripherals and I/O, Serial Communication.

UNIT-4 **(06 Hours)**
Introduction to ESP 32, Differentiate between NodeMcu with ESP 32, ESP 32 Features & Using It With Arduino IDE, ESP 32 Pinout, Power requirement, Serial Communication, Peripherals and I/O, Serial Communication.

UNIT-5 **(06 Hours)**
Memory Hierarchy, memory size and speed, on-chip memory, caches, cache design, memory management.

UNIT-6: **(06 Hours)**
Arduino Interfacing with peripherals Pin Mode Functions Input and Output In Arduino –LED With Arduino, LCD with Arduino, DC motor – forward and reverse, Ultrasonic Sensor With Arduino, Blinking and Fading an LED Using Arduino. Buzzer With Arduino, PIR Sensor With Arduino, Temperature Sensor With Arduino, Smoke and Gas Sensor in Arduino, Humidity sensor, LDR using Arduino, GPS With Arduino

Text Books:

Exploring Arduino: Tools and Techniques for Engineering Wizardry 2nd Edition	2nd Edition October 24, 2019	by Jeremy Blum	Wiley; 2 edition (October 24, 2019)
Adventures in Arduino 1st Edition	1st Edition May 4, 2015	by Becky Stewart	Wiley; 1st Edition May 4, 2015

Reference Books:

Arduino: A Technical Reference	Publish Date: May 2016	J. M. Hughes	O'Reilly Media, Inc.

VI Semester
ET2612: Digital Signal Processing

Course Learning Objective Students will be able to	Course Outcomes Students will be able to
1) Learn Signals and System. 2) Understand discrete time signal and system 3) Understand z transform and discrete Fourier transform and verify the properties 4) Study the design of IIR and FIR digital filters	1) Differentiate Signals and System and perform sampling of signal. 2) Analyse discrete time signal and system. 3) Apply z transform and discrete Fourier transform and verify the properties. 4) Design and implement digital IIR and FIR filters

Unit I : Signals, Systems and Signal Processing **(6 Hrs)**

Basic Elements of Digital Signal Processing, Advantages, Classification of Signals, Concept of Frequency in Continuous time and Discrete time Signals, Sampling of Analog Signals

Unit II: Discrete Time Signals and Systems **(6 Hrs)**

Elementary Discrete time signals, Classification of Discrete time signals, Input-output Description of System, Block diagram representation of discrete time system, Classification of discrete time system, Response of LTI system: Convolution.

Unit III: Z-transform **(6 Hrs)**

Z-transform, Properties of Z-transform, Rational Z-transform, Inverse z-transform by Power series expansion and partial fraction expansion, one sided z-transform, Transient and steady state response, Causality and stability

Unit IV: Discrete Fourier Transform (DFT) **(6 Hrs)**

Frequency Domain Sampling, DFT as Linear Transformation, Properties of DFT: Periodicity, Linearity, Symmetry, Circular Convolution, Time reversal, circular time shift and frequency shift, Parseval theorem

Unit V: IIR and FIR Filter Design **(6 Hrs)**

Impulse invariant transformation, Bilinear transformation, IIR Butterworth and Chebyshev filter design, FIR filter design using windowing techniques

Unit VI: Digital Filter Structures **(6 Hrs)**

Structure for the realization of Discrete time system, Structures for FIR System: Direct Form structures, Cascade Form structures, Linear Phase structures, Lattice structures, Structures for IIR System: Direct Form, Cascade, Parallel and transpose Form structures, Signal flow graph.

Text books:				
1	"Digital Signal Processing - Principles, algorithms and applications"	4th edition, 2013	John G. Proakis	McGraw-Hill

2	"Discrete time Signal Processing"	3rd edition 2010	Alan Oppenheim, Ronald Schafer and Buch	Pearson
3	"Digital Signal Processing - A computer based approach," Publication	4th edition, 2013	Sanjit K. Mitra,	McGraw-Hill
Reference books:				
1	Digital Signal Processing	3rd Edition 2017	S Salivahanan A Vallavraj C Gnanapriya	McGraw-Hill

VI Semester
ET2613: Simulation Lab

Course Learning Objective Students will be able to	Course Outcomes Students will be able to
1) Learn Signals and System. 2) Understand discrete time signal and system 3) Understand interfacing of different peripherals with ATMEGA328 P PU	1) Differentiate Signals and System and perform sampling of signal. 2) Analyse discrete time signal and system. 3) Develop programs in interfacing of different peripherals with ATMEGA328 P PU.

Expt. No.	Name of Experiment
1	Sampling of Continuous time signal
2	Illustration of Aliasing
3	Generation of Discrete time signals
4	Operation on Discrete time signals
5	To find circular convolution of two discrete time signals
6	Toggle LED connected to port pin of ATMEGA 328 P PU and Node MCU.
7	Display message on LCD using ATMEGA 328 P PU and Node MCU.
8	Interfacing Ultrasonic Sensor with ATMEGA 328 P PU and Node MCU.
9	Interfacing Temperature Sensor with ATMEGA 328 P PU and Node MCU
10	Interfacing Smoke and Gas Sensor with ATMEGA 328 P PU and Node MCU

VII Semester
ET2621: Analog and Digital Communication

Course Learning Objective Students will be able to	Course Outcomes Students will be able to
1) Understand the fundamentals of amplitude & angle modulation schemes. 2) Study different types of noise &discrete modulation schemes 3) Study different Analog Pulse Modulation and digital modulation schemes 4) Learn various Digital carrier systems 5) Study different Multiple access Techniques and spread spectrum communication techniques	1) Analyze different analog modulation techniques. 2) Analyze different types of noise. 3) Analyze various Digital carrier systems 4) Describe and compare various Multiple access techniques 5) Analyze and apply spread spectrum communication techniques for wireless applications

UNIT-I: **Noise**
External noise, internal noise, Noise calculations, Noise figure, Noise temperature **(4 Hrs)**

UNIT-II:: Amplitude Modulation
Baseband signals; Modulation (Tone & message); Generation of AM and Demodulation, Double-sideband AM; Double-sideband suppressed carrier AM; AM bandwidth and AM modulation/demodulation, Single-sideband AM; Quadrature carrier multiplexing, Frequency division multiplexing (FDM);Super heterodyne receivers **(7 Hrs)**

Unit 3: Angle (phase & frequency) modulation: introduction; Waveform and bandwidth requirements compared to AM; Spectra of angle modulation, Narrowband angle-modulation case; Wideband angle- modulation, Generation of FM (and PM) signals; Armstrong's direct method of generation; Direct method of generation, Demodulation of angle-modulated signals: Time delay modulator, Slope detector and Balanced discriminator; Feedback demodulators, Interference in angle modulation; Pre-emphasis and de-emphasis; FM broadcasting; Super heterodyne FM receivers **(7 Hrs)**

Unit 4: Analog pulse modulation; Sampling theorem and introduction to sampling, quantization and encoding, Pulse code modulation; Differential pulse code modulation; Delta modulation; Power spectral density; Eye diagrams and bit error rates, Introduction to Digital source coding **(6 Hrs)**

Unit 5: Digital carrier systems – ASK, PSK, binary PSK, FSK, QPSK, digital I/Q modulation, M-ary signaling and bandwidth efficiency, Introduction to channel coding **(6 Hrs)**

Unit 6: Multiple access techniques – Multiplexing (Frequency division multiplexing and Time division multiplexing); frequency domain multiple access,time division multiple access, code division multiple access and spatial division multiple access .
Introduction to spread spectrum communication (DSSS and FHSS); Examples of spread spectrum with Wi-Fi and Bluetooth, Orthogonal frequency division multiple access (OFDMA) applied to wireless communications **(6 Hrs)**

Text books:

1	Introduction to Analog and Digital communications	2nd Edition	Simon Hykin and Michael Moher	Wlley Publishing, 2006
2	Analog and Digital Communications Theory and Lab Work	1st edition	Abhay Gandhi	Cengage Learning Publishing, 2015.

3	Modern Analog and Digital Communication Systems.	3rd Edition	B. P.Lathi	Oxford University Press, 2007

Reference books:

1	Electronic Communication Systems	-	Blake	Thomson Delmar Publications, 2002
2	Analog and Digital Communication System	3rd Edition	Martin S. Roden	Prentice Hall of India, 2002.
3	Wireless Communications: Principles and Practice	2nd Edition	Rappaport T.S	Pearson Education, 2007
4	Principles of Communication	3rd Edition	H.Taub, D L Schilling and G Saha	Pearson Education, 2007
5	Digital Communication Fundamentals and Applications	2nd Edition	B.Sklar	Pearson Education 2007.
6	Advanced Electronic Communication Systems	6th Edition	Wayne Tomasi	Pearson Education, 2009

VII Semester
ET2622: Lab : Analog and Digital Communication

Course Learning Objective Students will be able to	Course Outcomes Students will be able to
1) Understand the fundamentals of amplitude & angle modulation schemes. 2) Study different types of noise &discrete modulation schemes 3) Study different Analog Pulse Modulation and digital modulation schemes 4) Learn various Digital carrier systems 5) Study different Multiple access Techniques and spread spectrum communication techniques	1) Analyze different analog modulation techniques. 2) Analyze different types of noise. 3) Analyze various Digital carrier systems 4) Describe and compare various Multiple access techniques 5) Analyze and apply spread spectrum communication techniques for wireless applications

Expt. No.	Name of Experiment
1	Study of Amplitude Modulation and De-modulation
2	Study of Frequency Modulation and De-modulation
3	Generation of SSB-SC using balanced modulator
4	Generation of DSB-SC
5	Generation of Pulse Width modulation
6	Study of Sampling & reconstruction
7	Generation of Pulse code modulation
8	Generation of frequency shift keying
9	Study of Time Division Multiplexing
10	Generation of Delta Modulation