STATE BOARD OF TECHNICAL EDUCATION, BIHAR
Scheme of Teaching and Examinations for
IVth SEMESTER DIPLOMA IN ELECTRONICS & COMMUNICATION ENGINEERING
(Effective from Session 2020-21 Batch)

THEORY

S.No	SUBJECTS	SUBJECT CODE	TEACHING SCHEME Periods per week	Hours of Exam	Teacher's Assessment (TA) Marks (A)	Class Test (CT) Marks (B)	End Semester Exam. (ESE) Marks (C)	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	Credits
1.	Microcontroller and its Applications	2021401	03	03	10	20	70	100	28	40	03
2.	Communication Components and Materials	2038402	03	03	10	20	70	100	28	40	03
3.	Digital Communication Systems	2021403	03	03	10	20	70	100	28	40	03
4.	Electronic Equipment Maintenance	2021404	03	03	10	20	70	100	28	40	03
5.	Linear Integrated Circuits	2021405	03	03	10	20	70	100	28	40	03
	Total: 15						350	500			15

PRACTICAL

S.No	SUBJECTS	SUBJECT CODE	TEACHING SCHEME Periods per week	Hours of Exam	Practical (ESE) Internal (A)	Practical (ESE) External (B)	Total Marks (A+B)	Pass Marks in the Subject	Credits
6.	Microcontroller and its Applications Lab	2021406	02 50% Physical 50% Virtual	03	15	35	50	20	01
7.	Digital Communication Systems Lab	2021407	02 50% Physical 50% Virtual	03	07	18	25	10	01
8.	Linear Integrated Circuits Lab	2021408	02 50% Physical 50% Virtual	03	07	18	25	10	01
9.	MATLAB	2020409	02 50% physical 50% Virtual	03	07	18	25	10	01
	Total: 08						125		04

TERM WORK

S.No	SUBJECTS	SUBJECT CODE	TEACHING SCHEME Periods per week	Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject	Credits
10.	Essence of Indian Knowledge and Tradition (TW)	2021410	02	07	18	25	10	01
11.	Microprocessor & its Application Lab (TW)	2021411	02	07	18	25	10	01
12.	Minor Project (TW)	2021412	04	15	35	50	20	02
13.	Block Chain through Moocs / Swaym / Others (TW)	2021413	02	07	18	25	10	01
	Total- 10					125		05
Total Periods per week of each duration One Hour = 33						Total Marks:750		24

MICROCONTROLLER AND APPLICATION
(ELECTRONICS ENGINEERING GROUP)

Subject Code 2021401	Theory						Credits
	No. of Periods Per Week			**Full Marks**	**:**	**100**	**03**
	L	**T**	**P/S**	**ESE**	**:**	**70**	
	03	**-**	**-**	**TA**	**:**	**10**	
	-	**-**	**-**	**CT**	**:**	**20**	

Course Objectives:

The aim of this course is to help the students to attain the following industry identified competency through various teaching learning experiences:

  ☐ **Maintain micro controller based systems.**

CONTENTS: THEORY

Chapter	Name of the Topic	Hours
Unit I	**Introduction** Introduction to Microprocessors and Microcontrollers, Architectures (8085, 8086) Intel MCS51 family features – 8051 – organization and architecture.	**10**
Unit II	**8051 instructions set and programming** 8051 instructions set, addressing modes, conditional instructions, I/O Programming, Arithmetic logic instructions, single bit instructions, interrupt handling, programming counters, timers and Stack	**12**
Unit III	**MCS51 and external Interfaces 8 User interface** – keyboard, LCD, LED, Real world interface – ADC, DAC, SENSORS Communication interface	**12**
Unit IV	**C programming with 8051** I/O Programming, Timers/counters, Serial Communication, Interrupt, User Interfaces- LCD, Keypad, LED and communication interfaces (RS232).	**12**
Unit V	ARM processor core-based microcontrollers 14 Need for RISC Processor-ARM processor fundamentals, ARM core-based controller (LPC214X), IO ports, ADC/DAC, Timers	**14**
	TOTAL	**60**

References:

S. No.	Title of Book	Author	Publication
1.	The 8051 Micro Controller and Embedded Systems	Muhammad Ali Mazidi & Janice Gilli Mazidi, R.D.Kinely	PHI Pearson Education, 5th In- dian reprint
2.	Microprocessor and Microcontrollers	Krishna Kant	Eastern Company Edition, Prentice Hall of India, New Delhi
3.	Microprocessor & Microcontroller Architecture: Programming & Interfacing using 8085,8086,8051	Soumitra Kumar Mandal	McGraw Hill Edu,
4.	Microcontrollers: Architecture implementation and Programming	Tabak Daniel, Hintz Kenneth j	Tata McGraw Hill, 2007
5.	ARM Developer's Guide.UM10139 LPC214X User manual – Rev.4	Andrew N.Sloss, Dominic Symes, Chris Wright	User manual – Rev.4
6.	Microprocessors and interfacing: programming and hardware	Douglas V. Hall	Tata McGraw Hill, 2editon, 2007
7.	"Microcontroller – Fundamentals and Applications with Pic	Valder – Perez	Yeesdee Publishers, Tayler & Francis

Course outcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned objective:

- ☐ Analyse architecture of microcontroller ICs.
- ☐ Interpret the program of 8051 in assembly language for the given operations
- ☐ Interpret the program by using timer interrupt and serial ports parallel ports
- ☐ Interface the memory and IO devices to 8051 microcontroller
- ☐ Maintain microcontroller used in different application

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COMMUNCATION COMPONENTS AND MATERIALS

Subject Code 2038402	Theory			No of Period in one session : 50			Credits
	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

Rationale:

Electronics is a major part of our day-to-day life. In each and all field electronic systems are used. Basic electronics is one of the subjects which are the base of all advance electronics. It starts with PN junction which makes the student to follow the functioning of all semiconductor-based electronics. This is a core group subject and it develops cognitive and psychomotor skills.

	Contents: Theory	Hrs.	Marks
Unit -1	**Passive Components** Resistor: definition, symbol, unit. Thermistor (symbol and list of application only) Resistor colour code, wattage (w.r to size) Capacitor: definition, symbol, unit Types of capacitors (to be shown in practical, no theory) Inductor: definition, symbol, unit Transformer: symbol, types (step up and step down), application.	[12]	
Unit -2	**Rectifiers & Filters** Need of rectifier, definition Types of rectifiers – Half wave rectifier, Full wave rectifier, (Bridge & centre tapped) Circuit operation Input/output waveforms for voltage & current Average (dc) value of current & voltage (no derivation) Ripple, ripple factor, ripple frequency, PIV of diode used, transformer utilization factor, efficiency of rectifier.	[11]	
Unit -3	**Optical Diodes** LED, photo diode, Tunnel diode, Varacter diode, symbol, operating principle and application of each. Symbol, operating principle & applications of each.	[07]	
Unit -4	**Integrated Circuits** Integrated Circuits, Advantage and disadvantage of Integrated Circuits IC Package, IC Classifications Making Monolithic IC Fabrication of Components on Monolithic IC Simple Monolithic ICs, IC Symbols Scale of Integration	[14]	
Unit -5	Gun diode, PIN diode Characteristics and their uses.	[06]	
	Total	**50**	

DIGITAL COMMUNICATION SYSTEMS
(ELECTRONICS ENGINEERING GROUP)

Subject Code 2021403	Theory						Credits
	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	-	-	TA	:	10	
	-	-	-	CT	:	20	

Course Objectives:

The aim of this course is to help the students to attain the following industry identified competency through various teaching learning experiences:

- ☐ **Maintain basic digital communication systems**

CONTENTS: THEORY

Chapter	Name of the Topic	Hours
Unit I	Block diagram and sub-system description of a digital communication system. Sampling of low-pass and band-pass signals, PAM, PCM, signal to quantization noise ratio analysis of linear and nonlinear quantizers, Line codes and bandwidth considerations; PCM TDM hierarchies, frame structures, frame synchronization and bit stuffing.	14
Unit II	Quantization noise analysis of DM and ADM; DPCM and ADPCM; Low bit rate coding of speech and video signals. Baseband transmission, matched filter, performance in additive Gaussian noise; Inter symbol interference (ISI), Nyquist criterion for zero ISI, sinusoidal roll-off filtering, correlative coding, equalizers and adaptive equalizers; Digital subscriber lines.	15
Unit III	Geometric representation of signals, maximum likelihood decoding; Correlation receiver, equivalence with matched filter. Generation, detection and probability of error analysis of OOK, BPSK, coherent and non-coherent FSK, QPSK and DPSK; QAM, MSK and multicarrier modulation; Comparison of bandwidth and bit rate of digital modulation schemes.	15
Unit IV	Introduction to Information and Coding Theories: Information Theory: information measures, Shannon entropy, differential entropy, mutual information, capacity theorem for point-to point channels with discrete and continuous alphabets. Coding Theory: linear block codes – definitions, properties, bounds on minimum distance (singleton, Hamming, GV, MRRW), soft versus hard decision decoding, some specific codes (Hamming, RS, Concatenated); Convolutional codes – structure, decoding (the Viterbi and BCJR algorithms); Turbo codes, LDPC codes.	16
	TOTAL	**64**

References:

S. No.	Title of Book	Author	Publication
1.	Communication Systems	Haykin, S	4th Ed., John Wiley & Sons
2.	Modern Digital and Analog Communication Systems	Lathi, B.P. and Ding, Z	Intl. 4th Ed., Oxford University Press.
3.	Digital Communications	Proakis, J.G. and Saheli, M	5th Ed., McGraw-Hill
4.	Digital Communication: Fundamentals and Applica-tions	Sklar, B., and Ray, P.K	2nd Ed., Dorling Kindersley
5.	Elements of Information Theory	T. Cover and J. Thomas	2/e, Wiley.
6.	Principles of Digital Commu- nication	R. G. Gallager	Cambridge Univ. Press
7.	A Foundation in Digital Com-munication	A. Lapidoth	Cambridge Univ. Press
8.	Error Control Coding	S. Lin and D. Costello	2/e, Prentice Hall.

Course Outcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry-oriented COs associated with the above-mentioned objective:

- ☐ Analyse various error detection and correction codes in digital communication systems
- ☐ Use various pulse code modulation techniques
- ☐ Maintain systems based on digital modulation techniques

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ELECTRONICS EQUIPMENT MAINTENANCE
(ELECTRONICS ENGINEERING GROUP)

Subject Code 2021404	Theory						Credits
	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	-	-	TA	:	10	
	-	-	-	CT	:	20	

Course Objectives:

The aim of this course is to help the students to attain the following industry identified competency through various teaching learning experiences:

 Maintain the electronic Equipment's / Gadgets/Appliance

CONTENTS: THEORY

Chapter	Name of the Topic	Hours
Unit I	Fundamental Troubleshooting Procedures Inside An Electronic Equipment: Reading Drawings And Diagrams – Block Diagram, Circuit Diagram, Wiring Diagram; Disassembly and reassembly of equipment, Equipment Failures and causes such as poor design, production deficiencies, careless storage and transport, inappropriate operating conditions, Nature of faults, Fault location procedure, Fault finding aids – Service and maintenance manuals and instruction manuals, Test and Measuring instruments, special tools Troubleshooting techniques, Approaching components for tests, Grounding systems in Electronic Equipment, Temperature sensitive Intermittent problems Corrective actions, Situations where repairs should not be attempted.	**10**
Unit II	Passive Components and Their Testing Passive Components- Resistors, Capacitors, Inductors Failures in fixed resistors, testing of resistors, variable resistors, variable resistors as potentiometers, failures in potentiometers, testing of potentiometers, servicing potentiometers, LDRs and Thermistors Types of capacitors and their performance, Failures in capacitors, testing of capacitors and precautions therein, variable capacitor types, Testing of inductors and inductance measurement	**09**

Unit III	Testing of Semiconductor Devices Types of semiconductor devices, Causes of failure in Semiconductor Devices, Types of failure Test procedures for Diodes, special types of Diodes, Bipolar Junction Transistors, Field Effect Transistors, Thyristors Operational Amplifiers, Fault diagnosis in op-amp circuits	09
Unit IV	Logic IC families, Packages in Digital ICs, IC identification, IC pin-outs, Handling ICs, Digital troubleshooting methods – typical faults, testing digital ICs with pulse generators Logic clip, Logic Probe, Logic Pulser, Logic Current Tracer, Logic Comparator Special consideration for fault diagnosis in digital circuits Handling precautions for ICs sensitive to static electricity Testing flip-flops, counters, registers, multiplexers and de-multiplexers, encoders and decoders; Tri-state logic.	10
Unit V	Rework and Repair of Surface Mount Assemblies Surface Mount Technology and surface mount devices Surface Mount Semiconductor packages – SOIC, SOT, LCCC, LGA, BGA, COB, Flatpacks and Quad Packs, Cylindrical Diode Packages, Packaging of Passive Components as SMDs Repairing Surface Mount PCBs, Rework Stations.	7
	TOTAL	**45**

References:

S. No.	Title of Book	Author	Publication
1.	Modern Electronic Equipment: Trouble-shooting, Repair and Maintenance	Khandpur	TMH 2006
2.	Electronic Instruments and Systems: Principles, Maintenance and Troubleshooting	R. G. Gupta	Tata McGraw Hill Edition 2001
3.	Student Reference Manual for Electronic Instrumentation Laboratories	David L Terrell	Butterworth-Heinemann
4.	Electronic Testing and Fault Diagnosis	G. C. Loveday, A. H	Wheeler Publishing

Course Outcomes:
The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry-oriented COs associated with the above mentioned objective:
- ☐ Select maintenance policy for equipment/appliances/gadgets.
- ☐ Select troubleshooting tools for a specified work
- ☐ Maintain the electronic home appliances consumer electronics products
- ☐ Select digital troubleshooting method
- ☐ Rework and Repair of Surface Mount Assemblies

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LINEAR INTEGRATED CIRCUITS
(ELECTRONICS ENGINEERING GROUP)

Subject Code 2021405	Theory						Credits
	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	-	-	TA	:	10	
	-	-	-	CT	:	20	

Course Objectives:

The aim of this course is to help the students to attain the following industry identified competency through various teaching learning experiences:

☐ **Maintain electronics circuits consisting of Linear Integrated Circuits.**

CONTENTS: THEORY

Chapter	Name of the Topic	Hours
Unit I	**IC Fabrication and Circuit Configuration for Linear IC** Advantages of ICs over discrete components – Manufacturing process of monolithic Ics Construction of monolithic bipolar transistor – Monolithic diodes – Integrated Resistors Monolithic Capacitors – Inductors. Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage References, BJT Differential amplifier with active loads, General operational amplifier stages -and internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate, Open and closed loop configurations.	14
Unit II	**Applications Of Operational Amplifiers** Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band pass Butterworth filters.	12
Unit III	**Analog Multiplier and PLL** Analog Multiplier using Emitter Coupled Transistor Pair -Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing.	12

Unit IV	**Analog to digital and digital to analog converters** Analog and Digital Data Conversions, D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode R2R Ladder types switches for D/A converters, high speed sample-and-hold circuits, A/D Converters specifications - Flash type – Successive Approximation type - Single Slope type – Dual Slope type - A/D Converter using Voltage- to-Time Conversion – Over sampling A/D Converters.	**10**
Unit V	**Waveform generators and special function ICs** Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator Monolithic switching regulator, Switched capacitor filter IC MF10, Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Opto- couplers and fibre optic IC.	**12**
	TOTAL	**64**

References:

S.No.	Title of Book	Author	Publication
1.	Design with operational amplifiers and analoginte- grated circuits, 3rd Edition	Sergio Franco	Tata McGraw-Hill, 2007
2.	Linear Integrated Circuits,	D.Roy Choudhry, Shail Jain	New Age International Pvt. Ltd
3.	System design using Inte- grated Circuits	B.S.Sonde	New Age Pub, 2nd Edition, 2001
4.	Analysisand DesignofAna- log Integrated Circuits	Gray and Meyer	Wiley International, 2005.
5.	OP-AMP and Linear ICs	Ramakant A.Gayakwad	Prentice Hall / Pearson Educa-tion, 4th Edition, 2001
6.	Operational Amplifier and Linear Integrated Circuits	K Lal Kishore	Pearson Education, 2006

Course Outcomes:
The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned objective:
- ☐ Use Op-Amp in linear electronic circuits
- ☐ Use various configurations of open for different applications troubleshoot various linear applications of Om-Amp for the given specification.
- ☐ Maintain filters and oscillators used in various electronic circuits
- ☐ Troubleshoot specified applications using various linear ICS

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MICROCONTROLLER AND ITS APPLICATION LAB
(ELECTRONICS ENGINEERING GROUP)

Subject Code 2021406	Practical						Credits
	No. of Periods Per Week			Full Marks	:	50	01
	L	T	P/S	Internal	:	15	
	-	-	02	External	:	35	

Course Objectives:
The aim of this course is to help the students to attain the following industry identified competency through various teaching learning experiences:

☐ **Maintain micro controller-based systems.**

CONTENTS: PRACTICAL

S. No.	Name of the Topic
1	Programming 8051 Microcontroller using ASM and C, and implementation in flash 8051 microcontroller.
2	Programming with Arithmetic logic instructions [Assembly]
3	Program using constructs (Sorting an array) [Assembly]
4	Programming using Ports [Assembly and C]
5	Delay generation using Timer [Assembly and C]
6	Programming Interrupts [Assembly and C]
7	Implementation of standard UART communication (using hyper terminal) [Assembly and C].
8	Interfacing LCD Display [Assembly and C]
9	Interfacing with Keypad [Assembly and C]
10	Programming ADC/DAC [Assembly and C]
11	Interfacing with stepper motor [Assembly and C]
12	Pulse Width Modulation [Assembly and C]
13	Programming ARM Micro controller using ASM and C using simulator.
14	Programming with Arithmetic logic instructions [Assembly]
15	GPIO programming in ARM microcontroller. [C Programming].
16	Timer's programing in ARM Microcontroller. [C Programming].

References:

S.No.	Title of Book	Author	Publication
1.	The 8051 Micro Controller and Embedded Systems	Muhammad Ali Mazidi& Janice Gilli Mazidi, R.D.Kinely	PHIPearson Education, 5th Indian reprint
2.	Microprocessor and Micro-controllers	Krishna Kant	Eastern Company Edition, Prentice Hall of India, New Delhi

3.	Microprocessor & Microcontroller Architecture: Pro- gramming & Interfacing using 8085,8086,8051	Soumitra Kumar Mandal	McGraw Hill Edu,
4.	Microcontrollers: Architec- ture implementation and Pro- gramming	Tabak Daniel, Hintz Kenneth j	Tata McGraw Hill, 2007
5.	ARM Developer's Guide. UM10139 LPC214X User manual – Rev.4	Andrew N.Sloss, Dominic Symes, Chris Wright	User manual – Rev.4
6.	Microprocessors and inter- facing: programming and hardware	Douglas V. Hall	Tata McGraw Hill, 2editon, 2007
7.	"Microcontroller Funda- mentals and Applications with Pic	Valder – Perez	Yeesdee Publishers, Tayler & Francis

Course outcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry-oriented COs associated with the above-mentioned objective:

- ☐ Analyze architecture of microcontroller ICs.
- ☐ Interpret the program of 8051 in assembly language for the given operations
- ☐ Interpret the program by using timer interrupt and serial ports parallel ports
- ☐ Interface the memory and IO devices to 8051 microcontrollers
- ☐ Maintain microcontroller used in different application

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DIGITAL COMMUNICATION SYSTEM LAB
(ELECTRONICS ENGINEERING GROUP)

Subject Code 2021407	Practical						Credits
	No. of Periods Per Week			**Full Marks**	:	25	
	L	**T**	**P/S**	**Internal**	:	07	**01**
	-	-	02	**External**	:	18	

Course Objectives:

The aim of this course is to help the students to attain the following industry identified competency through various teaching learning experiences:

   ☐ **Maintain basic digital communication systems**

CONTENTS: PRACTICAL

S.No.	Name of Topic
1	Pulse Code Modulation and Differential Pulse Code Modulation.
2	Delta Modulation and Adaptive Delta modulation.

3	Simulation of Band Pass Signal Transmission and Reception
	    • Amplitude Shift Keying
	    • Frequency Shift Keying
	    • Phase Shift Keying.

4	Performance Analysis of Band Pass Signal Transmission and Reception
	    • Amplitude Shift Keying
	    • Frequency Shift Keying
	    • Phase Shift Keying.

5	Implementation of Amplitude Shift Keying
6	Implementation of Frequency Shift Keying
7	Implementation of Phase Shift Keying.
8	Time Division Multiplexing: PLL (CD 4046) based synch, clock and data extraction

References:

S.No.	Title of Book	Author	Publication
1.	Communication Systems	Haykin, S	4th Ed., John Wiley& Sons
2.	Modern Digital and Analog Com- munication Systems	Lathi, B.P. and Ding, Z	Intl. 4th Ed., Oxford University Press.
3.	Digital Communications	Proakis, J.G.and Saheli, M	5th Ed., McGraw-Hill

4.	Digital Communication: Funda-mentals and Applications	Sklar, B., and Ray, P.K	2nd Ed., Dorling Kinders-ley
5.	Elements of Information Theory	T. Cover and J. Thomas	2/e, Wiley.
6.	Principles of Digital Communica- tion	R. G. Gallager	Cambridge Univ. Press
7.	A Foundation in Digital Communi- cation	A. Lapidoth	Cambridge Univ. Press
8.	Error Control Coding	S. Lin and D. Costello	2/e, Prentice Hall.

Course Outcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned objective:

- ☐ Analyse various error detection and correction codes in digital communication systems
- ☐ Use various pulse code modulation techniques
- ☐ Maintain systems based on digital modulation techniques

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LINEAR INTEGRATED CIRCUIT LAB
(ELECTRONICS ENGINEERING GROUP)

Subject Code 2021408	Practical						Credits
	No. of Periods Per Week			Full Marks	:	25	01
	L	T	P/S	Internal	:	07	
	-	-	02	External	:	18	

Course Objectives:

The aim of this course is to help the students to attain the following industry identified competency through various teaching learning experiences:

☐ **Maintain electronics circuits consisting of Linear Integrated Circuits.**

CONTENTS: PRACTICAL

S.No.	Name of the Topic
1.	Operational Amplifiers (IC741)-Characteristics and Application.
2.	Waveform Generation using Op-Amp (IC741).
3.	Applications of Timer IC555.
4.	Design of Active filters.
5.	Study and application of PLL IC's
6.	Design of binary adder and subtractor.
7.	Design of counters.
8.	Study of multiplexer and demultiplexer /decoders.
9.	Implementation of combinational logic circuits.
10.	Study of DAC and ADC
11.	Op-Amp voltage Regulator- IC 723

References:

S. No.	Title of Book	Author	Publication
1.	Design with operational amplifiers and analog inte- grated circuits, 3rd Edition	Sergio Franco	Tata McGraw-Hill, 2007
2.	Linear Integrated Circuits,	D.Roy Choudhry, Shail Jain	New Age International Pvt. Ltd
3.	System design using Inte- grated Circuits	B.S.Sonde	New Age Pub, 2nd Edition, 2001
4.	Analysisand DesignofAna- log Integrated Circuits	Gray and Meyer	Wiley International, 2005.
5.	OP-AMP and Linear ICs	Ramakant A.Gayakwad	Prentice Hall / Pearson Educa- tion, 4th Edition, 2001

6.	Operational Amplifier and Linear Integrated Circuits	K Lal Kishore	Pearson Education, 2006

Course Outcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry-oriented COs associated with the above-mentioned objective:

- ☐ Use Op-Amp in linear electronic circuits
- ☐ Use various configurations of open for different applications troubleshoot various linear applications of Om-Amp for the given specification.
- ☐ Maintain filters and oscillators used in various electronic circuits
- ☐ Troubleshoot specified applications using various linear ICS

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MATLAB

Subject Code	Term Work						Credits
2020409	**No. of Periods Per Week**			**Full Marks**	**:**	**25**	**01**
	L	**T**	**P**	**Internal**	**:**	**07**	
	—	—	**02**	**External**	**:**	**18**	

Unit-1	MATLAB Environment – Introduction, MATLAB environment, MATLAB as a calculator, MATLAB Online, Syntax and Semantics, Help, Plotting. Matrices and Operators : Introduction, the Colon Operator, Accessing Parts of a Matrix, Combining and Transforming Matrices, Arithmetic Part 1, Arithmetic Part 2, Operator Precedence.
Unit-II	Functions : Introduction, Function I/O, Formal Definition of Functions, Sub Functions, Scope, Advantages of Functions, Scripts, an Problem Solving.
Unit-III	Programmer's Toolbox : Introduction, Matrix Building, Input-Output, Plotting, Debugging, Selection : Selection, If – Statements, Relational and Logical Operators, Nested if – Statements, Variable Number of Function Arguments, Robustness, Persistent Variables.
Unit-IV	Loops : For -Loops While – Loops, Break Statements, Logical Indexing. Data Types : Introduction, Strings, Structs, Cells.
Unit-V	File Input / Output : I/O, Excel Files, Text Files, Binary Files. Applications of MATLAB in Electrical Machine, Power system, Control System and Power Electronics.
Unit-VI	Simulink : Getting Started, Simulink Library Browser, Connections, Block Specification, Toolboxes, Building Systems, Applications.

List of Practical's :

1.	Basic Operations on Matrices.
2.	Generation of Various Signals such as Unit impulse, unit step, square, saw tooth, triangular, sinusoidal, ramp etc.
3.	Operations on signals and sequences such as addition, multiplication, scaling, shifting, folding, computation of energy and average power.
4.	Mesh and Nodal analysis of electrical circuits.
5.	Application of network theorems such as Thevenin's, Norton's, Superposition etc. to electrical networks.
6.	Locating Zeroes and poles and plotting the pole-zero maps in S plane and for the given TF
7.	Simulation of DC circuits.
8.	Measurement of Active power of three phase circuit for balanced oads.
9.	Simulation of single-phase diode bridge rectifiers with filter for R and RL loads.

References / Text Books :

1. Books
    (i)   Computer Programming with MATLAB by J. Michael Fitzpatrick and Akos Ledeczi
    (ii) Getting Started with MATLAB : A Quick Introduction for Scientists and Engineers by Rudra Pratap
2. Video Lectures (Web Links) :
    (1) https://ocw.mit.edu/courses/mathematics/18-s997-introduction-to-matlab-programming.fall2011/index.html
    (2) https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-094-introduction-tomatlab-january-jjap-2010/index.html.
    (3) https://in.mathworks.com/vidoes/getting-started-with-matlab-68985.html.
    (4) https://www.mathworks.com/examples/
https://www.coursera.org/learn/matlab

ESSENCE OF INDIAN KNOWLEDGE AND TRADITION (TW)
(ELECTRONICS ENGINEERING GROUP)

Subject Code 2021410	Term Work						Credits
	No. of Periods Per Week			Full Marks	:	25	01
	L	T	P/S	Internal	:	07	
	02	-	02	External	:	18	
	-	-	-	-	:	-	

Course Content:

- ☐ Modern Science and Indian Knowledge System
- ☐ Yoga and Holistic Health care
- ☐ Case Studies.

References:

S. No.	Title of Book	Author	Publication
1.	Cultural Heritage of India- Course Material	V. Sivaramakrishna	Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2.	Modern Physics and Vedant	Swami Jitatmanand	Bharatiya Vidya Bhavan
3.	The web of Life	Fritzof Capra	
4.	Tao of Physics	Fritzof Capra	
5.	Tarkasangraha of Annam Bhatta, Inernational	V N Jha	Chinmay International Foundation, Velliarnad, Amakuam
6.	Science of Consciousness Psychotherapy and Yoga Practices	R N Jha	Vidyanidhi Prakasham, Delhi, 2016

MICROPROCESSORS AND ITS APPLICATIONLAB (TW)

Subject Code 2021411	Term Work						Credits
	No. of Periods Per Week			Full Marks	:	25	01
	L	T	P/S	Internal	:	07	
	-	-	02	External	:	18	
	-	-	-	-	:	-	

CONTENTS: PRACTICAL

Intellectual Skills:
    1. Logical development
    2. Programming skills
Motor Skills:
    1. Data entry, Error Correction and Execution of assembly language programms
    2. Connection Skills
List of Practical's:

Using microprocessor 8085 kit:

1. Demonstration and study of microprocessor kit
2. Program for addition of and subtraction of two hexadecimal numbers
3. Program for finding largest / smallest number
4. Program for arranging numbers in ascending / descending order
5. Program for 16-bit addition
6. Program for data masking
7. Program for multiplication of two eight-bit numbers
8. Program using JMP Instruction
9. Two programs using Loop.

MINOR PROJECT (TW)

Subject Code (2021412)	Term Work						Credits
	No. of Periods Per Week			**Full Marks**	**:**	**50**	**02**
	L	**T**	**P/S**	**Internal**	**:**	**15**	
	-	-	**04**	**External**	**:**	**35**	
	-	-	-	-	**:**	-	

BLOCK CHAIN THROUGH MOOCS / SWAYM / OTHERS (T.W)

Subject Code 2021413	Term Work						Credits
	No. of Periods Per Week			Full Marks	:	25	01
	L	T	P/S	Internal	:	07	
	-	-	02	External	:	18	
	-	-	-	-	:	-	