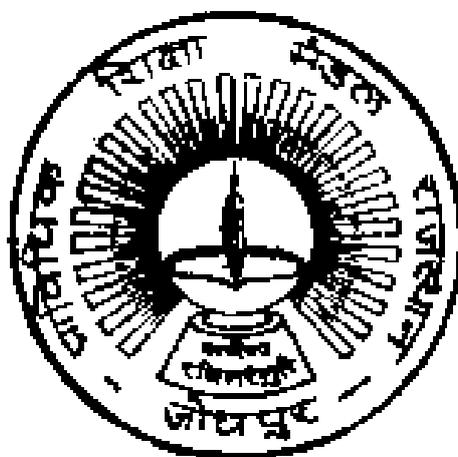


GOVERNMENT OF RAJASTHAN
BOARD OF TECHNICAL EDUCATION RAJASTHAN
JODHPUR

SEMESTER SCHEME-2020-21

(SESSION 2021-2022 & ONWARDS)



TEACHING AND EXAMINATION SCHEME
AND SYLLABUS

ELECTRONICS ENGINEERING

(EL)

.....
Curriculum Development Cell
Board of Technical Education, Rajasthan
W-6 Residency Road,
Jodhpur

GOVERNMENT OF RAJASTHAN
BOARD OF TECHNICAL EDUCATION RAJASTHAN, JODHPUR
TEACHING AND EXAMINATION SCHEME
(SEMESTER SCHEME-2020-21)
FOR DIPLOMA III SEMESTER (ELECTRONICS ENGINEERING) (EL)
SESSION 2021-2022 & ONWARDS

Subject Category	Subject Code	Subjects	Distribution of Time				Distribution of Max. Marks/ Duration						Total Marks	Credits	
			Hours per week				End Semester Exam			Internal Assessment					
			L	T	P	Tot	TH	Hrs.	PR	Hrs.	CT	TU/As sign			PR(S)
PC	**EL 3001	Principles of Electronic Communication	4	0	0	4	60	3	-	-	20	20	-	100	4
PC	*EL 3002	Electronic Devices and Circuits	3	0	0	3	60	3	-	-	20	20	-	100	3
PC	§EL 3003	Digital Electronics	3	0	0	3	60	3	-	-	20	20	-	100	3
PC	EL 3004	Electronic Measurements and Instrumentation	3	0	0	3	60	3	-	-	20	20	-	100	3
PC	***EL 3005	Electric Circuits and Network	2	1	0	3	60	3	-	-	20	20	-	100	3
PC	**EL 3006	Principles of Electronic Communication Lab	0	0	2	2	-	-	40	-	-	-	60	100	1
PC	*EL 3007	Electronic Devices and Circuits Lab	0	0	2	2	-	-	40	-	-	-	60	100	1
PC	*EL 3008	Digital Electronics Lab	0	0	2	2	-	-	40	-	-	-	60	100	1
PC	EL 3009	Electronic Measurements and Instrumentation Lab	0	0	2	2	-	-	40	-	-	-	60	100	1
SI	EL 3010	Summer Internship-I(4 weeks after II Sem)	-	-	-	-	-	-	100	-	-	-	-	100	2
VS	+EL 3333	Anandam (Joy of Giving)	-	-	1	1	-	-	-	-	-	-	100	100	2
		Students Centered Activities	0	0	3	3	-	-	-	-	-	-	-	-	-
		Total	15	1	12	28	300		260		100	100	340	1100	24
		Grand Total :												1100	24

- | | |
|--|---|
| 1. L : Lecture | 5. PR : Marks for End Semester Exam for Practical |
| 2. T : Tutorial | 6. CT : Marks for class tests (Internal Assessment) |
| 3. P : Practical | 7. TU/Assi : Marks for tutorials/Assignment (Internal Assessment) |
| 4. TH : Marks for End Semester Exam for Theory | 8. PR(S) : Marks for practical and viva (Internal Assessment) |

1. +EL 3333 is same in all branches of Engineering

2. *EL 3002, *EL 3007 and *EL 3008 are same as EF/ER/RA 3002, EF/ER/RA 3007 and EF/ER/RA 3008

3. §EL 3003 is same as EF/ER/RA/MT 3003

4. **EL 3001 and **EL 3006 are same as EF 3001 and EF 3006 respectively

5. ***EL 3005 is same as EF/ER 3005

GOVERNMENT OF RAJASTHAN
BOARD OF TECHNICAL EDUCATION RAJASTHAN, JODHPUR
TEACHING AND EXAMINATION SCHEME
(SEMESTER SCHEME-2020-21)
FOR DIPLOMA IV SEMESTER (ELECTRONICS ENGINEERING) (EL)
SESSION 2021-2022 & ONWARDS

Subject Category	Subject Code	Subjects	Distribution of Time				Distribution of Max. Marks/ Duration							Total Marks	Credits
			Hours per week				End Semester Exam				Internal Assessment				
			L	T	P	Tot	TH	Hrs	PR	Hrs	CT	TU/Assi	PR(S)		
PC	***EL 4001	Microcontroller and Applications	3	0	0	3	60	3	-	-	20	20	-	100	3
PC	EL 4002	Consumer Electronics	3	0	0	3	60	3	-	-	20	20	-	100	3
PC	EL 4003	Digital Communication Systems	3	0	0	3	60	3	-	-	20	20	-	100	3
PE	EL 4004	Programme Elective- I **EL40041- Electronic Equipment Maintenance ***EL40042- Simulation Software	3	0	0	3	60	3	-	-	20	20	-	100	3
PE	EL 4005	Programme Elective II ***EL40051- Linear Integrated Circuits *EL40052- Power Electronics	3	0	0	3	60	3	-	-	20	20	-	100	3
PC	***EL 4006	Microcontroller and Applications Lab	0	0	2	2	-	-	40	3	-	-	60	100	1
PC	EL 4007	Digital Communication Systems Lab	0	0	2	2	-	-	40	3	-	-	60	100	1
PE	EL 4008	Programme Elective- I Lab **EL40081- Electronic Equipment Maintenance Lab ***EL40082- Simulation Software Lab	0	0	2	2	-	-	40	3	-	-	60	100	1
PE	EL4 009	Programme Elective II Lab ***EL40091- Linear Integrated Circuits Lab *EL40092- Power Electronics Lab	0	0	2	2	-	-	40	3	-	-	60	100	1
PR	EL 4010	Minor Project	0	0	4	4	--	--	40	--	--	--	60	100	2
AU	+EL 4222	Essence of Indian Knowledge and Tradition	2	0	0	2	--	--	--	--	--	--	--	--	0
VS	+EL 4444	Anandam (Joy of Giving)	--	--	1	1	--	--	--	--	--	--	100	100	2
		Students Centered Activities	0	0	3	3	--	--	--	--	--	--	--	--	--
		Total	17	0	16	33	300		200		100	100	400	1100	23
Grand Total :													1100	23	

- | | |
|--|---|
| 1. L : Lecture | 5. PR : Marks for End Semester Exam for Practical |
| 2. T : Tutorial | 6. CT : Marks for class tests (Internal Assessment) |
| 3. P : Practical | 7. TU/Assi : Marks for tutorials/Assignment (Internal Assessment) |
| 4. TH : Marks for End Semester Exam for Theory | 8. PR(S) : Marks for practical and viva (Internal Assessment) |

1. +EL 4222 and +EL 4444 are same in all branches of Engg.

2. *EL40052 and *EL40092 are same as EF/ER/RA 40052 and EF/ER/RA 40092 respectively

3. **EL 4041 and **EL 4081 are same as EF 40041 and EF 40081 respectively

4. ***EL 4001, ***EL 40042, ***EL 40051, **EL 4006, **EL 40082 and ***EL 40091 are same as are same as EF/ER 4001, EF/ER 4042, EF/ER 4051, EF/ER 4006, EF/ER 40082 and EF/ER 40091 respectively

Student Centered Activities will be graded as A, B, C & D on the basis of attendance and interest of the student in learning

Note: Students will go for 6 Weeks Summer Internship in the Summer Vacations after Fourth Semester. The assessment of the Summer Internship will be done in Fifth Semester

GOVERNMENT OF RAJASTHAN
BOARD OF TECHNICAL EDUCATION RAJASTHAN, JODHPUR
TEACHING AND EXAMINATION SCHEME
(SEMESTER SCHEME-2020-21)
FOR DIPLOMA V SEMESTER (ELECTRONICS ENGINEERING)
SESSION 2022-2023 & ONWARDS

Subject Category	Subject Code	Subjects	Distribution of Time				Distribution of Max. Marks/ Duration							Total Marks	Credits
			Hours per week				End Semester Exam				Internal Assessment				
			L	T	P	Tot	TH	Hrs.	PR	Hrs.	CT	TU/Assi	PR(S)		
PC	***EL 5001	Embedded Systems	4	0	0	4	60	3	-	-	20	20	-	100	4
PC	**EL 5002	Mobile and Wireless Communication	3	0	0	3	60	3	-	-	20	20	-	100	3
OE	+EL 5100	Open Elective-I +EL 51001- Economic Policies in India +EL 51002- Engineering Economics & Accountancy	3	0	0	3	60	3	-	-	20	20	-	100	3
PE	EL 5003	Programme Elective III *EL50031- Industrial Automation *EL50032- Control System And PLC	3	0	0	3	60	3	-	-	20	20	-	100	3
PE	EL 5004	Programme Elective IV **EL50041- Microwave and RADAR EL50042- Optical Communication and networking	3	0	0	3	60	3	-	-	20	20	-	100	3
PC	***EL 5005	Embedded Systems Lab	0	0	2	2	-	-	40	3	-	-	60	100	1
PC	**EL 5006	Mobile and Wireless Communication Lab	0	0	2	2	-	-	40	3	-	-	60	100	1
PE	EL 5007	Programme Elective III Lab *EL50071- Industrial AutomationLab *EL50072- Control System And PLC Lab	0	0	2	2	-	-	40	3	-	-	60	100	1
PE	EL 5008	Programme Elective IV Lab **EL50081- Microwave and RADAR Lab EL50082- Optical Communication and networking Lab	0	0	2	2	-	-	40	3	-	-	60	100	1
SI	EL 5009	Summer Internship-II(6 weeks after IV S Labern)	0	0	0	0	-	-	100	-	-	-	-	100	3
PR	EL 5010	Major Project	0	0	2	2	-	-	-	-	-	-	-	-	--
VS	+EL 5555	Anandam (Joy of Giving)	--	--	1	1	--	--	--	--	--	--	100	100	2
		Students Centered Activities	0	0	3	3	--	--	--	--	--	--	--	--	--
		Total	16	0	14	30	300		260		100	100	340	1100	25
Grand Total :													1100	25	

1. L : Lecture

2. T : Tutorial

3. P : Practical

4. TH : Marks for End Semester Exam for Theory

5. PR : Marks for End Semester Exam for Practical

6. CT : Marks for class tests (Internal Assessment)

7. TU/Assi : Marks for tutorials/Assignment (Internal Assessment)

8. PR(S) : Marks for practical and viva (Internal Assessment)

1. +EL 51001, +EL 51002 and +EL5555 are same in all branches of Engineering

2. *EL 50031, *EL50032, *EL 50071, *EL 50072, and are same as EF/ ER/RA 50031, EF/ ER/RA 50032, , EF/ ER/RA 50071, and EF/ ER/RA 50072, respectively

3. **EL 5002, **EL 50041, **EL 5006 and **EL 5081 are same as EF 5002, EF 50041, EF 5006 and EF 50081 respectively

4.***EL 5001 and ***EL 5005 are same as EF/ER 5001 and EF/ER 5005 respectively

Student Centered Activities will be graded as A, B, C & D on the basis of attendance and interest of the student in learning.

Note:Major Project will be continued and Assesed in VI Semester

GOVERNMENT OF RAJASTHAN
BOARD OF TECHNICAL EDUCATION RAJASTHAN, JODHPUR
TEACHING AND EXAMINATION SCHEME
(SEMESTER SCHEME-2020-21)
FOR DIPLOMA VI SEMESTER (ELECTRONICS ENGINEERING)
SESSION 2022-2023 & ONWARDS

Subject Category	Subject Code	Subjects	Distribution of Time				Distribution of Max. Marks/ Duration							Total Marks	Credits
			Hours per week				End Semester Exam				Internal Assessment				
			L	T	P	Tot	TH	Hrs	PR	Hrs	CT	TU/Assi	PR(S)		
HS	+EL 6111	Entrepreneurship and Startups	3	1	0	4	60	3	-	-	20	20	-	100	4
OE	+EL 6200	Open Elective-II +EL 62001- Project Management +EL 62002- Renewable Energy Technologies	3	0	0	3	60	3	-	-	20	20	-	100	3
OE	+EL 6300	Open Elective-III +EL 63001- Product Design +EL 63002- Disaster Management	3	0	0	3	60	3	-	-	20	20	-	100	3
AU	+EL 6333	Indian Constitution	2	0	0	2	-	-	-	-	-	-	-	-	0
PC	EL 6001	Computer Networking and Data Communication	4	0	0	4	60	3	-	-	20	20	-	100	4
PC	EL 6002	Computer Networking and Data Communication Lab	0	0	2	2	-	-	40	3	-	-	60	100	1
PR	EL 6003	Major Project	0	0	6	6	--	--	40	--	--	--	60	100	4
SE	EL 6004	Seminar	1	0	0	1	-	-	-	-	-	-	100	100	1
VS	+EL 6666	Anandam (Joy of Giving)	--	--	1	1	--	--	--	--	--	--	100	100	2
		Students Centered Activities	0	0	3	3	--	--	--	--	--	--	--	--	--
		Total	16	1	12	29	240		80		80	80	320	800	22
Grand Total :													800	22	

- | | |
|--|---|
| 1. L : Lecture | 5. PR : Marks for End Semester Exam for Practical |
| 2. T : Tutorial | 6. CT : Marks for class tests (Internal Assessment) |
| 3. P : Practical | 7. TU/Assi : Marks for tutorials/Assignment (Internal Assessment) |
| 4. TH : Marks for End Semester Exam for Theory | 8. PR(S) : Marks for practical and viva (Internal Assessment) |

1. + EL 6111, +EL 62001, +EL 62002, +EL 63001, +EL 63002, +EL 6333 and +EL 6666 are same in all branches of Engineering

Student Centered Activities will be graded as A, B, C & D on the basis of attendance and interest of the student in learning.

GOVERNMENT OF RAJASTHAN
BOARD OF TECHNICAL EDUCATION RAJASTHAN JODHPUR
SEMESTER SCHEME-2020-21



III SEMESTER
(SESSION 2021-2022 & ONWARDS)

PRINCIPLES OF ELECTRONIC COMMUNICATION

Course Code	EL-3001 (Same as EF 3001)
Course Title	Principles of Electronic Communication
Number of Credits	4 (L-4,T-0, P-0)
Prerequisites	NIL
Course Category	PC

COURSE OUTCOMES:

- Use of different modulation and demodulation techniques
- used in analog communication.
- Identify and solve basic communication problems.
- Analyse transmitter and receiver circuits.
- Compare and contrast design issues, advantages, disadvantages and limitations of analog communication systems.

COURSE CONTENTS:**UNIT-1 ANALOG MODULATION:**

- 1.1 Concept of frequency translation.
- 1.2 Amplitude Modulation:
- 1.3 Description of full AM, DSBSC, SSB and VSB in time and frequency domains
- 1.4 Methods of generation & demodulation
- 1.5 Descriptions of FM signal in time and frequency domains

UNIT-2 PULSE ANALOG MODULATION:

- 2.1 Ideal sampling,
- 2.2 Sampling theorem, aliasing, interpolation
- 2.3 Natural and flat top sampling in time and frequency domains

UNIT-3 PCM & DELTA MODULATION SYSTEMS:

- 3.1 Uniform and Non-uniform quantization
- 3.2 PCM and delta modulation
- 3.3 Signal to quantization noise ratio in PCM and delta modulation

UNIT-4 DIGITAL MODULATION:

- 4.1 Baseband transmission: Line coding (RZ, NRZ), inter symbol interference (ISI), pulse shaping
- 4.2 Nyquist criterion for distortion free base band transmission, raised cosine spectrum.
- 4.3 Pass band transmission: Geometric interpretation of signals, orthogonalization

UNIT-5 SPREAD-SPECTRUM MODULATION:

- 5.1 Introduction
- 5.2 Pseudo-Noise sequences
- 5.3 Direct sequence spread spectrum (DSSS) with coherent BPSK, processing gain, probability of error,
- 5.4 Frequency-hop spread spectrum (FHSS)
- 5.5 Application of spread spectrum:
- 5.6 CDMA

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Principles of communication systems By Taub Schilling, T.M.H.
2. Fundamentals of communication systems By Proakis & Salehi, Pearson education
3. Communication Systems by Simon Haykin, John Wiley
4. Communication Systems (Analog and Digital) By R.P. Singh, S.D. Sapre, T.M.H.
5. Modern Digital & Analog Communication By B.P. Lathi, Oxford Publications
6. Digital & Analog Communication Systems By K.S. Shanmugam, John Wiley

ELECTRONICS DEVICES AND CIRCUITS

Course Code	EL 3002(Same as EF/ER/RA 3002)
Course Title	Electronic Devices And Circuits
Number of Credits	3 (L-3,T-0, P-0)
Prerequisites	NIL
Course Category	PC

COURSE CONTENTS:**UNIT 1 – SEMICONDUCTOR AND DIODES**

- 1.1 Definition, Extrinsic/Intrinsic, N-type & p-type
- 1.2 PN Junction Diode – Forward and Reverse Bias Characteristics
- 1.3 Zener Diode – Principle, characteristics, construction, working
- 1.4 Diode Rectifiers – Half Wave and Full Wave
- 1.5 Filters – C, LC and PI Filters

UNIT 2 – BIPOLAR JUNCTION TRANSISTOR (BJT)

- 2.1 NPN and PNP Transistor – Operation and characteristics
- 2.2 Common Base Configuration – characteristics and working
- 2.3 Common Emitter Configuration – characteristics and working
- 2.4 Common Collector Configuration – characteristics and working
- 2.5 High frequency model of BJT
- 2.6 Classification of amplifiers
- 2.7 negative feedback

UNIT 3 – FIELD EFFECT TRANSISTORS

- 3.1 FET – Working Principle, Classification
- 3.2 MOSFET Small Signal model
- 3.3 N-Channel/ P-Channel MOSFETs – characteristics
- 3.4 Enhancement and depletion mode
- 3.5 MOS- FET as a Switch
- 3.6 Common Source Amplifiers
- 3.7 Uni-Junction Transistor – equivalent circuit and operation

UNIT 4 – SCR DIAC & TRIAC

- 4.1 SCR – Construction, operation, working, characteristics
- 4.2 DIAC - Construction, operation, working, characteristics
- 4.3 TRIAC - Construction, operation, working
- 4.4 characteristics SCR and MOSFET as a Switch
- 4.5 DIAC as bidirectional switch
- 4.6 Comparison of SCR, DIAC, TRIAC, MOSFET

UNIT 5 – AMPLIFIERS AND OSCILLATORS

- 5.1 Feedback Amplifiers – Properties of negative Feedback, impact of feedback on different parameters
- 5.2 Basic Feedback Amplifier Topologies: Voltage Series, Voltage Shunt Current Series, Current Shunt
- 5.3 Oscillator – Basic Principles, Crystal Oscillator, Non-linear/ Pulse Oscillator

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Analog Circuits By AK Maini Khanna Publishing House Ed. 2018 (ISBN: 978-93-86173-584)
1. Electronic Devices and Circuits S. Salivahanan and N. Suresh Kumar McGraw Hill Education; Fourth edition (1 July 2017) ISBN: 978-9339219505
2. Electronics Devices and circuit theory Boyestad & Nashelsky Pearson Education India; 11 edition (2015) ISBN: 978-9332542600
3. Electronic Principles Albert Malvino & David Bates Tata McGraw Hill Publication 2010 ISBN: 978-0070634244
4. Electronics Devices & Circuits Jacob Millman McGraw Hill Education; 4 edition (2015)ISBN: 978-9339219543

SUGGESTED SOFTWARE/LEARNING WEBSITES:

1. <https://www.electronics-tutorials.ws/>
2. <https://www.youtube.com/watch?v=Rx43l-QpeWQ>
3. <https://electronicsforu.com/resources/electronic-devices-and-circuit-theory>

DIGITAL ELECTRONICS

Course Code	EL 3003(Same as EF/ER/RA/MT 3003)
Course Title	Digital Electronics
Number of Credits	3 (L-3,T-0, P-0)
Prerequisites	NIL
Course Category	PC

COURSE CONTENTS:**UNIT 1 – NUMBER SYSTEMS & BOOLEAN ALGEBRA**

- 1.1 Introduction to different number systems – Binary, Octal, Decimal, Hexadecimal
- 1.2 Conversion from one number system to another.
- 1.3 Boolean variables – Rules and laws of Boolean algebra
- 1.4 De-Morgan's Theorem
- 1.5 Karnaugh Maps and their use for simplification of Boolean expressions

UNIT 2 – LOGIC GATES

- 2.1 Logic Gates – AND, OR, NOT, NAND, NOR, XOR, XNOR: Symbolic representation and truth table
- 2.2 Implementation of Boolean expressions and Logic Functions using gates
- 2.3 Simplification of expressions

UNIT 3 – COMBINATIONAL LOGIC CIRCUITS

- 3.1 Arithmetic Circuits – Addition, Subtraction, 1's 2's Complement, Half Adder, Full Adder, Half Subtractor, Full Subtractor, Parallel and Series Adders
- 3.2 Encoder, Decoder
- 3.3 Multiplexer – 2 to 1 MUX, 4 to 1 MUX, 8 to 1 MUX. Applications
- 3.4 Demultiplexer – 1 to 2 DEMUX, 1- 4 DEMUX, 1- 8 DEMUX

UNIT 4 – SEQUENTIAL LOGIC CIRCUITS

- 4.1 Flip Flops – SR, JK, T, D, FF, JK-MS, Triggering
- 4.2 Counters – 4 bit Up – Down Counters, Asynchronous/ Ripple Counter, Decade Counter- Mod 3, Mod 7 Counter, Johnson Counter, Ring Counter
- 4.3 Registers – 4bit Shift Register: Serial in Serial Out, Serial in Parallel Out, Parallel in Serial Out, and Parallel inParallel Out

UNIT 5 – MEMORY DEVICES

- 5.1 Classification of Memories – RAM Organization, Address Lines and Memory Size,
- 5.2 Static RAM, Bipolar RAM, cell Dynamic RAM, D RAM, DDR RAM
- 5.3 Read only memory – ROM organization, Expanding memory, PROM, EPROM, EEPROM, Flash memory
- 5.4 Data Converters – Digital to Analog converters, Analog to Digital Converters

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Digital principles & Applications Albert Paul Malvino & Donald P. Leach McGraw Hill Education; Eighth edition ISBN: 978-9339203405
2. Digital Electronics Roger L. Tokheim Macmillan McGraw-Hill Education (ISE Editions); International 2 Revised edition ISBN: 978-0071167963
3. Digital Electronics – an introduction to theory and practice William H. Gothmann Prentice Hall India Learning Private Limited; 2 edition ISBN: 978-8120303485
4. Fundamentals of Logic Design Charles H. Roth Jr. Jaico Publishing House; First edition ISBN: 978-8172247744
5. Digital Electronics R. Anand Khanna Publications, New Delhi (Edition 2018) ISBN: 978-93-82609445

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Course Code	EL 3004
Course Title	Electronic Measurements and Instrumentation
Number of Credits	3 (L-3,T-0, P-0)
Prerequisites	NIL
Course Category	PC

COURSE CONTENTS:**UNIT – I BASICS OF MEASUREMENTS AND BRIDGES**

- 1.1 Accuracy & precision, Resolution
- 1.2 Types of Errors
- 1.3 DC Bridges – Wheatstone and Kelvin Double Bridge
- 1.4 AC Bridges - Maxwell's Bridge, Hay's Bridge, Anderson Bridge, De-Sauty's Bridge

UNIT- II POTENTIOMETER

- 2.1 Basic DC slide wire Potentiometer
- 2.2 Crompton's DC Potentiometer
- 2.3 Applications of DC Potentiometer
- 2.4 AC Potentiometers
- 2.5 Applications of AC Potentiometers

UNIT– III MEASURING INSTRUMENTS

- 3.1 Permanent Magnet Moving Coil Instruments (PMMC)
- 3.2 Moving Iron type Instruments (MI)
- 3.3 Electro Dynamo Type
- 3.4 Instruments Single Phase Energy Meter

UNIT– IV ELECTRONIC INSTRUMENTS

- 4.1 Electronic Voltmeter and Digital Voltmeter
- 4.2 Electronic Multimeters
- 4.3 Q – Meter
- 4.4 Vector Impedance Meter

UNIT– V OSCILLOSCOPES

- 5.1 Cathode ray tube: construction, operation, screens, graticules
- 5.2 Vertical deflection system, Horizontal deflection system, Delay line,
- 5.3 Measurement of frequency, time delay, phase angle and modulation index (trapezoidal method)
- 5.4 Oscilloscope probe: Structure of 1:1 and 10:1 probe
- 5.5 MultipleTraceCRO

UNIT- VI TRANSDUCERS

Classification, Selection Criteria, Characteristics, Construction, Working Principles and Application of following Transducers:

- 6.1 RTD, Thermocouple, Thermistor
- 6.2 LVDT, Strain Gauge
- 6.3 Load Cell
- 6.4 Piezoelectric Transducers

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Electrical & Electronic Measurement & Instruments A.K. Sawhney Dhanpat Rai & Sons, India
2. Electronic Instrument and Measurement Technique W.D. Cooper Prentice Hall International, India.
3. Electronic Measurement & Instrumentation J.G. Joshi Khanna Publishing House, Delhi
4. Measurement systems application and design E.O. Doebelin and D. N. Manik the Mcgraw-Hill
5. Electronic Measurements and Instrumentation Oliver and Cage the Mcgraw-Hill
6. Basic Electrical Measurement M.B. Stout Prentice hall of India, India
7. Electronic Instrumentation H. S. Kalsi the Mcgraw-Hill
8. Electrical and Electronics Measurement and Instrumentation Prithwiraj Pukrait, Budhaditya Biswas, Santanu Das, Chiranjib Koley The Mcgraw-Hill

ELECTRIC CIRCUITS & NETWORK

Course Code	EL 3005(Same as EF/ER 3005)
Course Title	Electric Circuits & Network
Number of Credits	3 (L-2,T-1, P-0)
Prerequisites	NIL
Course Category	PC

COURSE CONTENTS:**UNIT – 1 BASIC OF NETWORK AND NETWORK THEOREM**

- 1.1 Node and Mesh
- 1.2 Analysis Superposition Theorem
- 1.3 Thevenin Theorem
- 1.4 Norton Theorem
- 1.5 Maximum Power transfer theorem
- 1.6 Reciprocity Theorem

UNIT– 2 GRAPH THEORY

- 2.1 Graph of network, tree, and incidence matrix
- 2.2 F- Tie Set Analysis
- 2.3 F-Cut Set Analysis
- 2.4 Analysis of resistive network using cut-set and tie-set Duality

UNIT– 3 TIME DOMAIN AND FREQUENCY DOMAIN ANALYSIS

- 3.1 Solution of first and second order differential equations for Series and parallel R-L, R-C, R-L-Ccircuits
- 3.2 Initial and Final conditions in network elements
- 3.3 Forced and Free response, time constants Steady State and Transient State Response
- 3.4 Analysis of electrical circuits using Laplace Transform for standard inputs (unit, Ramp, Step)

UNIT– 4 TRIGONOMETRIC AND EXPONENTIAL FOURIER SERIES

- 4.1 Discrete spectra and symmetry of waveform
- 4.2 Steady state response of a network to non-sinusoidal periodic inputs
- 4.3 power factor, effective values
- 4.4 Fourier transform and continuous spectra

UNIT- 5 TWO PORT NETWORK

- 5.1 Two Port Network
- 5.2 Open Circuit Impedance Parameters
- 5.3 Short Circuit Admittance Parameters
- 5.4 Transmission Parameters
- 5.5 Hybrid Parameters
- 5.6 Interrelationship of Two Port Network
- 5.7 Inter Connection of Two Port Network

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Networks and Systems Ashfaq Husain Khanna Publishing House
2. Network Analysis M. E. Van Valkenburg Prentice Hall of India
3. Engineering Circuit Analysis W. H. Hayt, J. E. Kemmerly and S. M. Durbin McGraw Hill
4. Electrical Circuits Joseph Edminister Schaum's Outline, Tata McGraw Hill
5. Basic Circuit Theory Lawrence P. Huelsma Prentice Hall of India
6. Network & Systems D. Roy Choudhury Wiley Eastern Ltd
7. Linear Circuit Analysis De Carlo and Lin Oxford Press

PRINCIPLES OF ELECTRONIC COMMUNICATIONS LAB

Course Code	EL 3006(Same as EF 3006)
Course Title	Principles of Electronic Communications Lab
Number of Credits	1 (L-0,T-0, P-2)
Prerequisites	NIL
Course Category	PC

PRACTICAL OUTCOMES (PROs)

1. Understanding the different techniques of signal modulation and demodulation.
2. Understanding the variation in amplitude of controllers.

PRACTICALS:

1. Harmonic analysis of a square wave of modulated waveform: measures modulation index.
2. To modulate a high frequency carrier with sinusoidal signal to obtain FM signal.
3. To study and observe the operation of a super heterodyne receiver
4. To modulate a pulse carrier with sinusoidal signal to obtain PWM signal and demodulate it.
5. To modulate a pulse carrier with sinusoidal signal to obtain PPM signal and demodulate it.
6. To observe pulse amplitude modulated waveform and its demodulation.
7. To observe the operation of a PCM encoder and decoder. To consider reason for using digital signal x-missions of analog signals.
8. To study & observe the amplitude response of automatic gain controller (AGC).

(SEMESTER SCHEME-2020-21)

ELECTRONIC DEVICES AND CIRCUITS LAB

Course Code	EL 3007(Same as EF/ER/RA 3007)
Course Title	Electronic Devices and Circuits Lab
Number of Credits	1 (L-0,T-0, P-2)
Prerequisites	NIL
Course Category	PC

PRACTICAL OUTCOMES (PROs)

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

PRACTICALS:

1. Construct the circuit and plot the VI characteristics of the PN Junction Diode ,find the cut in voltage
2. Construct the circuit and plot the characteristics of a Zener Diode. Find thebreakdown voltage
3. Construct a Half Wave Rectifier and obtain regulation characteristics –WithoutFilters and with Filters Compare the results
4. Construct a Full Wave Rectifier and obtain regulation characteristics –WithoutFilters and with Filters Compare the results
5. Construct a Bridge Rectifier and obtain regulation characteristics – Without Filters and with Filters
6. Obtain the characteristics of DIAC and TRIAC
7. Simulate half wave, full wave and bridge rectifier using simulation tool likePSpice/ Orcad/ Multisim.
8. Develop a simulation model for Voltage Series and Voltage Shunt Feedback Amplifiers
9. Develop circuits for Voltage Series and Voltage Shunt Feedback Amplifiers andObtain output plots. Compare the results with the simulation model.
10. Develop a simulation model for Current Series and Current Shunt Feedback Amplifiers
11. Develop circuits for Current Series and Current Shunt Feedback Amplifiers andObtain output plots. Compare the results with the simulation model

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Analog Circuits By AK Maini Khanna Publishing House Ed. 2018 (ISBN: 978-93-86173-584)
2. Electronic Devices and Circuits S. Salivahanan and N. Suresh Kumar McGraw Hill Education; Fourth edition (1 July 2017) ISBN: 978-9339219505
3. Electronics Devices and circuit theory Boyestad & Nashelsky Pearson Education India; 11 edition (2015)ISBN: 978-9332542600
4. Electronic Principles Albert Malvino & David Bates Tata McGraw Hill Publication 2010 ISBN: 978-0070634244
5. Electronics Devices & Circuits Jacob Millman McGraw Hill Education; 4 edition (2015)ISBN: 978-9339219543

DIGITAL ELECTRONICS LAB

Course Code	EL 3008(Same as EF/ER/RA 3008)
Course Title	Digital Electronics Lab
Number of Credits	1 (L-0,T-0, P-2)
Prerequisites	NIL
Course Category	PC

PRACTICAL OUTCOMES (PROs)

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

PRACTICALS:

1. To verify the truth tables for all logic gates – NOT OR AND NAND NORXOR XNOR using CMOS Logic gates and TTL Logic Gates
2. Implement and realize Boolean Expressions with Logic Gates
3. Implement Half Adder, Full Adder, Half Subtractor, Full subtractor using ICs
4. Implement parallel and serial full-adder using ICs
5. Design and development of Multiplexer and De-multiplexer using multiplexer ICs
6. Verification of the function of SR,D, JK and T Flip Flops
7. Design controlled shift registers
8. Construct a Single digit Decade Counter (0-9) with 7 segment display
9. To design a programmable Up-Down Counter with a 7 segment display
10. Study of different memory ICs
11. Study Digital- to – Analog and Analog to Digital Converters
12. Simulate in Software (such as PSpice) an Analog to Digital Converter
13. Simulate in Software (such as PSpice) an Analog to Digital Converter

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Digital principles & Applications Albert Paul Malvino & Donald P. Leach McGraw Hill Education; Eighth edition ISBN: 978-9339203405
2. Digital Electronics Roger L. Tokheim Macmillian McGraw-Hill Education (ISE Editions); International 2 Revised edition ISBN: 978-0071167963
3. Digital Electronics – an introduction to theory and practice William H. Gothmann Prentice Hall India Learning Private Limited; 2 edition ISBN: 978-8120303485
4. Fundamentals of Logic Design Charles H. Roth Jr. Jaico Publishing House; First edition ISBN: 978-8172247744
5. Digital Electronics R. Anand Khanna Publications, New Delhi (Edition 2018) ISBN: 978-93-82609445

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION LAB

Course Code	EL 3009
Course Title	Digital Electronics Lab
Number of Credits	1 (L-0,T-0, P-2)
Prerequisites	NIL
Course Category	PC

PRACTICAL OUTCOMES (PROs)

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

PRACTICALS:

1. Measure unknown inductance using following bridges (a) Anderson Bridge (b) Maxwell Bridge
2. Measure Low resistance by Kelvin's Double Bridge
3. Calibrate an ammeter using DC slide wire potentiometer
4. Calibrate a voltmeter using Crompton potentiometer
5. Measure low resistance by Crompton potentiometer
6. Calibrate a single-phase energy meter by phantom loading
7. Study the working of Q-meter and measure Q of coils
8. Study working and applications of (i) C.R.O. (ii) Digital Storage C.R.O. & (iii) C.R.O. Probes
9. Measurement of displacement with the help of LVDT
10. Draw the characteristics of the following temperature transducers (a) RTD (Pt-100) (b) Thermistor
11. Measurement of strain/force with the help of strain gauge load cell

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Electrical & Electronic Measurement & Instruments A.K. Sawhney Dhanpat Rai & Sons, India
2. Electronic Instrument and Measurement Technique W.D. Cooper Prentice Hall International, India.
3. Electronic Measurement & Instrumentation J.G. Joshi Khanna Publishing House, Delhi
4. Measurement systems application and design E.O. Doebelin and D. N. Manik the Mcgraw-Hill
5. Electronic Measurements and Instrumentation Oliver and Coge the Mcgraw-Hill
6. Basic Electrical Measurement M.B. Stout Prentice hall of India, India
7. Electronic Instrumentation H. S. Kalsi the Mcgraw-Hill
8. Electrical and Electronics Measurement and Instrumentation Prithwiraj Pukrait, Budhaditya Biswas, Santanu Das, Chiranjib Koley The Mcgraw-Hill

GOVERNMENT OF RAJASTHAN
BOARD OF TECHNICAL EDUCATION RAJASTHAN JODHPUR
SEMESTER SCHEME-2020-21



IV SEMESTER
(SESSION 2021-2022 & ONWARDS)

MICROCONTROLLER AND APPLICATIONS

Course Code	EL 4001(Same as EF/ER 4001)
Course Title	Microcontroller and Applications
Number of Credits	3(L-3,T-0, P-0)
Prerequisites	NIL
Course Category	PC

COURSE CONTENTS:**UNIT I INTRODUCTION**

- 1.1 Introduction to Microprocessors and Microcontrollers
- 1.2 Architectures [8085,8086]
- 1.3 Intel MCS- 51 family features
- 1.4 8051 -organization and architecture

UNIT II PROGRAMMING WITH 8051

- 2.1 8051 instruction set
- 2.2 addressing modes
- 2.3 conditional instructions
- 2.4 I/O Programming
- 2.5 Arithmetic logic instructions
- 2.6 single bit instructions
- 2.7 interrupt handling
- 2.8 programming counters, timers and Stack

UNIT III

- 3.1 MCS51 and external Interfaces
- 3.2 User interface – keyboard, LCD, LED
- 3.3 Real world interface -ADC, DAC
- 3.4 SENSORS Communication interface

UNIT IV C PROGRAMMING WITH 8051

- 4.1 I/O Programming
- 4.2 Timers/counters
- 4.3 Serial Communication
- 4.4 Interrupt
- 4.5 User Interfaces- LCD, Keypad, LED and communication interfaces [RS232]

UNIT V ARM PROCESSOR CORE BASED MICROCONTROLLERS

- 5.1 Need for RISC Processor-ARM processor fundamentals
- 5.2 ARM core based controller [LPC214X]
- 5.3 IO ports, ADC/DAC, Timers

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. The 8051 Micro Controller and Embedded Systems Muhammad Ali Mazidi& Janice Gilli Mazidi, R.D.Kinely PHI Pearson Education, 5th Indian 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, 2000
7. "Microcontroller – Fundamentals and Applications with Pic Valder – Perez Yeesdee Publishers, Tayler & Francis

CONSUMER ELECTRONICS

Course Code	EL 4002
Course Title	Consumer Electronics
Number of Credits	3 (L-3,T-0, P-0)
Prerequisites	NIL
Course Category	PC

COURSE CONTENTS:**UNIT-I AUDIO FUNDAMENTALS AND DEVICES**

- 1.1 Basic characteristics of sound signal
- 1.2 Audio level metering, decibel level in acoustic measurement
- 1.3 Microphone & Types
- 1.4 speaker types & working principle
- 1.5 Sound recording principle & types

UNIT-II AUDIO SYSTEMS

- 2.1 CD player
- 2.2 home theatre sound system, surround sound
- 2.3 Digital console block diagram, working principle, applications
- 2.4 FM tuner, ICs used in FM tuner TDA 7021T
- 2.5 PA address system

UNIT-III TELEVISION SYSTEMS-

- 3.1 Monochrome TV standards,
- 3.2 scanning process, aspect ratio, persistence of vision and flicker, interlace scanning, picture resolution, Composite video signal
- 3.3 Colour TV standards
- 3.4 colour theory, hue, brightness, saturation, luminance and chrominance,
- 3.5 Different types of TV camera
- 3.6 Transmission standards

UNIT-IV TELEVISION RECEIVERS AND VIDEO SYSTEMS-

- 4.1 PAL-D colour TV receiver
- 4.2 Digital TVs: - LCD, LED, PLASMA, HDTV, 3-D TV, projection TV
- 4.3 DTH receiver
- 4.4 Video interface, Digital Video, SDI, HDMI Multimedia Interface
- 4.5 Digital Video Interface, 4.6 CD and DVD player

UNIT-V HOME / OFFICE APPLIANCES

Diagrams, operating principles and controller for

- 5.1 FAX
- 5.2 Photocopier
- 5.3 Microwave Oven
- 5.4 Washing Machine
- 5.5 Air conditioner
- 5.6 Refrigerators
- 5.7 Digital camera
- 5.8 cam coder

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Consumer Electronics Bali S.P Pearson Education India, 2010, latest edition
2. Audio video systems: principle practices & troubleshooting Bali R and Bali S.P Khanna Book Publishing Co. (P) Ltd., 2010 Delhi, India, latest edition
3. Modern Television practices Gulati R.R. New Age International Publication (P) Ltd. New Delhi Year 2011, latest edition
4. Audio video systems Gupta R.G. Tata Mcgraw Hill, New Delhi, India 2010, latest edition
5. Mastering Digital Television Whitaker Jerry & Benson Blair McGraw-Hill Professional, 2010, latest edition
6. Standard handbook of Audio engineering Whitaker Jerry & Benson Blair McGraw-Hill Professional, 2010, latest edition

DIGITAL COMMUNICATION SYSTEMS

Course Code	EL 4003
Course Title	Digital Communication Systems
Number of Credits	3 (L-3,T-0, P-0)
Prerequisites	NIL
Course Category	PC

COURSE CONTENTS:**UNIT 1**

- 1.1 Block diagram and sub-system description of a digital communication system
- 1.2 Sampling of low-pass and band-pass signals
- 1.3 PAM, PCM,
- 1.4 Signal to quantization noise ratio analysis of linear and nonlinear quantizers
- 1.5 Line codes and bandwidth considerations
- 1.6 PCM TDM hierarchies
- 1.7 frame structures, frame synchronization and bit stuffing

UNIT 2

- 2.1 Quantization noise analysis of DM and ADM; DPCM and ADPCM
- 2.2 Low bit rate coding of speech and video signals
- 2.3 Baseband transmission
- 2.4 matched filter, performance in additive Gaussian noise
- 2.5 Inter-symbol interference (ISI), Nyquist criterion for zero ISI
- 2.6 sinusoidal roll-off filtering
- 2.7 correlative coding
- 2.8 equalizers and adaptive equalizers; Digital subscriber lines

UNIT 3

- 3.1 Geometric representation of signals,
- 3.2 maximum likelihood decoding
- 3.3 Correlation receiver, equivalence with matched filter
- 3.4 Generation, detection and probability of error analysis of OOK, BPSK, coherent and non-coherent FSK, QPSK and DPSK
- 3.5 QAM, MSK and multicarrier modulation
- 3.6 Comparison of bandwidth and bit rate of digital modulation schemes

UNIT 4

- 4.1 Introduction to Information and Coding Theories
- 4.2 Information Theory: information measures, Shannon entropy, differential entropy, mutual information
- 4.3 capacity theorem for point-to-point channels with discrete and continuous alphabets
- 4.4 Coding Theory: linear block codes – definitions, properties, bounds on minimum distance (singleton, Hamming, GV, MRRW)
- 4.5 Soft versus hard decision decoding, some specific codes (Hamming, RS, and Concatenated)
- 4.6 Convolutional codes – structure, decoding (the Viterbi and BCJR algorithms)
- 4.7 Turbo codes
- 4.8 LDPC codes

REFERENCES /SUGGESTED LEARNING RESOURCES:

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 Applications 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 Communication R. G. Gallager Cambridge Univ. Press
7. A Foundation in Digital Communication A. Lapidoth Cambridge Univ. Press
8. Error Control Coding S. Lin and D. Costello 2/e, Prentice Hall.

ELECTRONIC EQUIPMENT MAINTENANCE

Course Code	EL 40041 (Same as EF 40041)
Course Title	Electronic Equipment Maintenance
Number of Credits	3 (L-3,T-0, P-0)
Prerequisites	NIL
Course Category	PE

COURSE CONTENTS:**UNIT 1:**

- 1.1 Fundamental Troubleshooting Procedures inside Electronic Equipment:
- 1.2 Reading Drawings And Diagrams – Block Diagram, Circuit Diagram, Wiring Diagram;
- 1.3 Dis-assembly and re-assembly of equipment,
- 1.4 Equipment Failures and causes such as poor design, production deficiencies, careless storage and transport, inappropriate operating conditions
- 1.5 Nature of faults, Fault location procedure, Fault finding aids – Service and maintenance manuals and instruction manuals
- 1.6 Test and Measuring instruments, special tools Troubleshooting techniques
- 1.7 Approaching components for tests, Grounding systems in Electronic Equipment,
- 1.8 Temperature sensitive Intermittent problems Corrective actions, Situations where repairs should not be attempted

UNIT 2:

- 2.1 Passive Components and Their Testing Passive Components- Resistors, Capacitors, Inductors
- 2.2 Failures in fixed resistors, testing of resistors, variable resistors, variable resistors as potentiometers, failures in potentiometers, testing of potentiometers, servicing potentiometers, LDRs and Thermistors
- 2.3 Types of capacitors and their performance, Failures in capacitors, testing of capacitors and precautions Therein, variable capacitor types,
- 2.4 Testing of inductors and inductance measurement

UNIT 3:

- 3.1 Testing of Semiconductor Devices Types of semiconductor devices,
- 3.2 Causes of failure in Semiconductor Devices
- 3.3 Types of failure Test procedures for
 - 3.3.1 Diodes
 - 3.3.2 Special types of Diodes
 - 3.3.3 Bipolar Junction Transistors
 - 3.3.4 Field Effect Transistors
 - 3.3.5 Thyristors
 - 3.3.6 Operational Amplifiers, Fault diagnosis in op-amp circuits

UNIT 4:

- 4.1 Logic IC families, Packages in Digital ICs,
- 4.2 IC identification, IC pin-outs, Handling ICs,
- 4.3 Digital troubleshooting methods – typical faults, testing digital ICs with pulse generators Logic clip, Logic Probe, Logic Pulser, Logic Current Tracer, Logic Comparator
- 4.4 Special consideration for fault diagnosis in digital circuits
- 4.5 Handling precautions for ICs sensitive to static electricity
- 4.6 Testing flip-flops, counters, registers, multiplexers and demultiplexers, encoders and decoders; Tri-state logic

UNIT 5:

- 5.1 Rework and Repair of Surface Mount Assemblies
- 5.2 Surface Mount Technology and surface mount devices Surface Mount Semiconductor packages – SOIC, SOT, LCCC, LGA, BGA, COB, Flat packs and Quad Packs,
- 5.3 Cylindrical Diode Packages, Packaging of Passive Components as SMDs
- 5.4 Repairing Surface Mount PCBs, Rework Stations.

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Modern Electronic Equipment: Trouble- shooting, Repair and Maintenance Khandpur TMH 2006
2. Electronic Instruments and Systems: Principles, Maintenance and Troubleshooting R. G. Gupta TMH 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

SIMULATION SOFTWARE

Course Code	EL 40042(Same as EF/ER 40042)
Course Title	Simulation Software
Number of Credits	3 (L-3,T-0, P-0)
Prerequisites	NIL
Course Category	PE

Course Contents:**UNIT I**

- 1.1 Introduction to PSpice software
- 1.2 General purpose circuit simulation using Schematic Editor,
- 1.3 Introduction to netlist command based SPICE simulation,
- 1.4 Basic netlist commands. Basic circuit analyses: DC, AC Transient

UNIT II

- 2.1 Introduction to PCB Design software Schematic Entry, Netlist Creation, Working with component libraries,
- 2.2 Design of Boards, Layout of Parts, Optimizing Parts Placements, Pads and Via, Manual and Auto Routing,
- 2.3 Handling Multiple Layers

UNIT III

- 3.1 Introduction to SCILAB,
- 3.2 use SCILAB functions.
- 3.3 Writing simple programs using SCILAB, handling arrays, files, plotting of functions etc.
- 3.4 Writing SCI files for Creation of analog & discrete signals, plotting of signals etc.
- 3.5 Simulation of electronic circuits using SCILAB

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. NGspice, LTSpice, MULTISIM, Orcad, Proteus or other open source PCB design tools, SCILAB
2. Website: <http://www.scilab.org/> (To download SCILAB open source software)
3. <http://www.linear.com/>,
4. <http://www.expresspcb.com/>
5. <http://ngspice.sourceforge.net/>

LINEAR INTEGRATED CIRCUITS

Course Code	EL 40051(Same as EF/ER 40051)
Course Title	Linear Integrated Circuits
Number of Credits	3 (L-3,T-0, P-0)
Prerequisites	NIL
Course Category	PE

COURSE CONTENTS:**UNIT I - IC FABRICATION AND CIRCUIT CONFIGURATION FOR LINEAR IC**

- 1.1 Advantages of ICs over discrete components –
- 1.2 Manufacturing process of monolithic Ics
- 1.3 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.

UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS

- 2.1 Sign Changer
- 2.2 Scale Changer
- 2.3 Phase Shift Circuits
- 2.4 Voltage Follower,
- 2.5 V-to-I and I-to-V converters
- 2.6 Adder, subtractor
- 2.7 Instrumentation amplifier
- 2.8 Integrator, Differentiator
- 2.9 Logarithmic amplifier, Antilogarithmic amplifier
- 2.10 Comparators, Schmitt trigger
- 2.11 Precision rectifier, peak detector
- 2.12 Clipper and clamper
- 2.13 Low-pass, high-pass and band-pass Butterworth filters

UNIT III ANALOG MULTIPLIER AND PLL

- 3.1 Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell – Variable transconductance technique.
- 3.2 analog multiplier ICs and their applications,
- 3.3 Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator,
- 3.4 Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing.

UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS

- 4.1 Analog and Digital Data Conversions,
- 4.2 D/A converter – specifications –
- 4.3 weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode R2R Ladder types switches for
- 4.4 D/A converters, high speed sample-and-hold circuits
- 4.4 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.

UNIT V WAVEFORM GENERATORS AND SPECIAL FUNCTION ICs

- 5.1 Sine-wave generators, Multi-vibrators and Triangular wave generator, Saw-tooth wave generator,
- 5.2 ICL8038 function generator,
- 5.3 Timer IC 555,
- 5.4 IC Voltage regulators – Three terminals fixed and adjust- able voltage regulators - IC 723 general purpose regulator Monolithic switching regulator,
- 5.5 Switched capacitor filter IC MF10,
- 5.6 Frequency to Voltage and Voltage to Frequency converters,

- 5.7 Audio Power amplifier, Video Amplifier, Isolation Amplifier,
5.8 Opto-couplers and fibre optic IC.

REFERENCES /SUGGESTED LEARNING RESOURCES

1. Design with operational amplifiers and analog integrated 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 Integrated Circuits B.S.Sonde New Age Pub, 2nd Edition, 2001
4. Analysis and Design of Ana- log Integrated Circuits Gray and Meyer Wiley International, 2005.
5. OP-AMP and Linear Ics Ramakant A.Gayakwad Prentice Hall / Pearson Education, 4th Edition, 2001
6. Operational Amplifier and Linear Integrated Circuits K Lal Kishore Pearson Education, 2006

(SEMESTER SCHEME-2020-21)

POWER ELECTRONICS

Course Code	EL 40052(Same as EF/ER/RA 40052)
Course Title	POWER ELECTRONICS
Number of Credits	3 (L-3T-0, P-0)
Prerequisites	NIL
Course Category	PE

COURSE CONTENTS:**UNIT I POWER SEMI CONDUCTOR DEVICES AND CONTROLLED RECTIFIER**

- 1.1 Classification of Thyristor family
- 1.2 Working, of SCR, IGBT, GTO, DIAC and TRIAC

UNIT II SCR PROTECTION AND COMMUTATING CIRCUITS

- 2.1 Need of SCR protections: Over voltage and over current protection
- 2.2 Snubber circuit, freewheeling diode, Thermistor, heat sink
- 2.3 Turn off (commutation) method and types-Natural commutation, Forced commutation, Series resonance/ current commutation, Voltage commutation

UNIT III CHOPPERS

- 3.1 Function and working of choppers
- 3.2 Types of chopper circuits: A type to E-type
- 3.3 Jone's chopper circuit

UNIT IV INVERTERS AND CYCLOCONVERTER

- 4.1 Working principle of inverter
- 4.2 Classification of inverter-
Phase and 3-phase inverters
Line commutated and forced commutated inverters
Series, Parallel and bridge inverter
- 4.3 Operating principle of cyclo converter.
- 4.4 Types of cyclo-converters:
Single phase to single phase cyclo converter
Single phase to bridge cyclo converter

UNIT V OTHER INDUSTRIAL APPLICATIONS OF POWER ELECTRONIC DEVICES

- 5.1 Speed control of D.C. Motor using armature voltage control.
- 5.2 Speed control of D.C. Motor using SCR chopper circuit.
- 5.3 Speed control of D.C. drive using PLL method.

REFERENCES /SUGGESTED LEARNING RESOURCES

1. Power Electronics Rashid, Muhammad H. PHI Learning, and New Delhi latest edition
2. Power Electronics Gupta, B. R., Singhal V. S.K. Kataria and sons, New Delhi

MICROCONTROLLER AND APPLICATIONS LAB

Course Code	EL 4006(Same as EF/ER 4006)
Course Title	Microcontroller and Applications Lab
Number of Credits	1 (L-0,T-0, P-2)
Prerequisites	NIL
Course Category	PC

PRACTICALS:

1. Programming 8051 Micro controller 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] Programming ARM Micro controller using ASM and C using simulator.
13. Programming with Arithmetic logic instructions [Assembly]
14. GPIO programming in ARM microcontroller. [C Programming].
15. Timers programming in ARM Microcontroller. [C Programming].

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. The 8051 Micro Controller and Embedded Systems Muhammad Ali Mazidi& Janice Gilli Mazidi, R.D.Kinely PHI Pearson Education, 5th Indian 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, 2000
7. "Microcontroller – Fundamentals and Applications with Pic Valder – Perez Yeesdee Publishers, Tayler & Francis

DIGITAL COMMUNICATION SYSTEMS LAB

Course Code	EL 4007
Course Title	Digital Communication SystemsLab
Number of Credits	1 (L-0,T-0, P-2)
Prerequisites	NIL
Course Category	PC

PRACTICALS:

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 /SUGGESTED LEARNING RESOURCES:

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 Applications 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 Communication R. G. Gallager Cambridge Univ. Press
7. A Foundation in Digital Communication A. Lapidoth Cambridge Univ. Press
8. Error Control Coding S. Lin and D. Costello 2/e, Prentice Hall

SEMESTER SCHEME-2020-21

ELECTRONIC EQUIPMENT MAINTENANCE LAB

Course Code	EL 40081(Same as EF 40081)
Course Title	Electronic Equipment MaintenanceLab
Number of Credits	1 (L-0,T-0, P-2)
Prerequisites	NIL
Course Category	PE

PRACTICALS:

1. Demonstrate use of various hand held tools.
2. Test the performance of different passive electronic components (fixed/variable)
3. Test the performance of active electronic components like general purpose transistor/FET
4. Verify the functionality of TTL and CMOS Digital IC's using IC tester
5. Explore datasheet of minimum any five electronics components and analog/ Digital IC's

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Modern Electronic Equipment: Trouble- shooting, Repair and Maintenance Khandpur TMH 2006
2. Electronic Instruments and Systems: Principles, Maintenance and Troubleshooting R. G. Gupta TMH 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

(SEMESTER SCHEME 2020-21)

SIMULATION SOFTWARE LAB

Course Code	EL 40082(Same as EF/ER 40082)
Course Title	Simulation Software Lab
Number of Credits	1 (L-0,T-0, P-2)
Prerequisites	NIL
Course Category	PE

Course Outcomes:After successful completion of the course students should be able to:

1. Design the electronics circuits using software tools like NGspice/LTSpice/Multisim.
2. Simulate various analog and digital circuits using NGspice/LTSpice/Multisim
3. Able to design PCB for given circuit using PCB Software like EAGLE, ExpressPCB, and OrCAD.
4. Use open source SCILAB tool and write simple programs
5. Plot various waveforms using SCILAB.
6. Simulate basic electronic system blocks using SCILAB

PRACTICALS:-

1. Simulation of one rectifier circuit and one clipper/clamper circuit.
2. Simulation of any one transistor biasing circuit.
3. Simulation of CE single/double stage amplifier circuit.
4. Simulation of any one power amplifier circuit.
5. Simulation of any one JFET/MOSFET amplifier circuit.
6. Simulation of any one negative feedback circuit.
7. Simulation of encoder/multiplexer circuit.
8. Simulation of decoder/de multiplexer circuit.
9. Simulation of any one flip-flop circuit using gates.
10. Simulation of any one register/counter circuit.
11. Design of PCB for any one circuit from experiment 1 to 6.
12. Design of PCB for any one circuit from experiment 7 to 10.
13. Plot the sine, cosine, triangle and exponential waveform using SCILAB.
14. Plot sampled sine, cosine, triangle and exponential waveform using SCILAB.
15. Study of Simulink. (Only source and sink available in Simulink library).

REFERENCES /SUGGESTED LEARNING RESOURCES:

NGspice, LTSpice,MULTISIM, Orcad, Proteus or other open source PCB design tools, SCILAB
 Website: <http://www.scilab.org/> (To download SCILAB open source software)
<http://www.linear.com/>,
<http://www.expresspcb.com/>
<http://ngspice.sourceforge.net/>

LINEAR INTEGRATED CIRCUITS LAB

Course Code	EL 40091(Same as EF/ER 40091)
Course Title	Linear Integrated Circuits Lab
Number of Credits	1 (L-0,T-0, P-2)
Prerequisites	NIL
Course Category	PE

PRACTICAL OUTCOMES (PROs)**PRACTICALS:**

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 /SUGGESTED LEARNING RESOURCES

1. Design with operational amplifiers and analog integrated 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 Integrated Circuits B.S.Sonde New Age Pub, 2nd Edition, 2001
4. Analysis and Design of Ana- log Integrated Circuits Gray and Meyer Wiley International, 2005.
5. OP-AMP and Linear Ics Ramakant A.Gayakwad Prentice Hall / Pearson Education, 4th Edition, 2001
6. Operational Amplifier and Linear Integrated Circuits K.Lal Kishore Pearson Education, 2006

SEMESTER SCHEME-2020-21

POWER ELECTRONICS LAB

Course Code	EL 40092(Same as EF/ER/RA 40092)
Course Title	Power Electronics Lab
Number of Credits	1 (L-0,T-0, P-2)
Prerequisites	NIL
Course Category	PE

PRACTICAL OUTCOMES (PROs)**PRACTICALS:**

1. Test the performance of IGBT
2. Test the performance of GTO
3. Test the performance of TRIAC for AC load control
4. Troubleshoot Snubber circuits
5. Troubleshoot SCR commutating circuits.
6. Simulate chopper circuit, observe and print the various wave forms.
7. Test the Speed control of DC motor using chopper circuits
8. Test the Speed control of motor using PLL method.

REFERENCES /SUGGESTED LEARNING RESOURCES

1. Power Electronics Rashid, Muhammad H. PHI Learning, and New Delhi latest edition
2. Power Electronics Gupta, B. R., Singhal V. S.K. Kataria and sons, New Delhi

(SEMESTER SCHEME-2020-21)

ESSENCE OF INDIAN KNOWLEDGE AND TRADITION

Course Code	EL 4222(Common in all branches of Engg.)
Course Title	Essence of Indian Knowledge and Tradition
Number of Credits	0(L-2,T-0, P-0)
Prerequisites	None
Course Category	AU

COURSE CONTENTS:

Basic Structure of Indian Knowledge System:

- (i) वेद,
- (ii) उन्नवेद (आयुर्वेद, धनुर्वेद, गन्धर्ववेद, स्थानत्यआदद)
- (iii) वेदशाखांग (शिक्षा, कलन, ननस्त, व्याकरण, ज्योनतषछथांद),
- (iv) उन्नथाइग (धर्मशास्र, र्ीरथांसाथा, नुरथाण, तकशरथास्र)
 - Modern Science and Indian Knowledge System
 - Yoga and Holistic Health care
 - Case Studies.

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. V. Sivarama Krishna, " Cultural Heritage of India- Course Material", Bhartiya Vidya Bhavan, Mumbai, fifth Edition, 2014.
2. Swami Jitatanand, " Modern Physics and Vedant", Bhartiya Vidya Bhavan.
3. Fritz of Capra, " The wave of Life".
4. Fritz of Capra, " Tao of Physics".
5. V N Jha, " Tarka sangraha of Annam Bhatta, International" Cinmay Foundation, Velliarnad, Amakum.
6. R N Jha, " Science of Consciousness Psychotherapy and Yoga Practices" Vidya nidhi Prakasham, Delhi, 2016.

GOVERNMENT OF RAJASTHAN
BOARD OF TECHNICAL EDUCATION RAJASTHAN JODHPUR
SEMESTER SCHEME-2020-21



V SEMESTER
(SESSION 2021-2022 & ONWARDS)

EMBEDDED SYSTEMS

Course Code	EL 5001(Same as EF/ER 5001)
Course Title	Embedded Systems
Number of Credits	4 (L-4, T-0, P-0)
Prerequisites	NIL
Course Category	PC

COURSE CONTENTS:**UNIT I –**

- 1.1 Embedded C basics operators for Arduino
- 1.2 Familiarizing with the Arduino IDE
- 1.3 Sketch designing for Arduino Communication interfaces using serial port
- 1.4 Basic understanding of the code with Boolean operations, pointer access operations, bitwise operations, compounded operations.

UNIT II –

- 2.1 Embedded C control structure blocks
- 2.2 looping mechanism – for, do and while
- 2.3 The branching operations based on conditions expression

UNIT III

- 3.1 Introduction to Arduino Mega
- 3.2 Arduino Mega specifications including power ratings, digital and analog peripherals.
- 3.3 Difference between the C language and Embedded C language
- 3.4 Arduino Mega Ports, Pins, Digital and Analog Peripherals

UNIT IV

- 4.1 Communication with Arduino
- 4.2 Different communication modules available with their real-life application Communication interface

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Arduino Projects For Dummies (For Dummies Series) Kennedy George; Davis Bernard; Prasanna SRM Wiley (5 July 2013) ISBN: 978-1118551479
2. Make: Getting Started With Arduino – The Open Source Electronics Prototyping Platform Massimo Banzi and Michael Shiloh Shroff/Maker Media; Third edition (27 December 2014) ISBN : 978-9351109075

SUGGESTED SOFTWARE/LEARNING WEBSITES:

<https://www.arduino.cc/reference/en/>
<https://learn.adafruit.com/category/learn-arduino>

MOBILE AND WIRELESS COMMUNICATION

Course Code	EL 5002(Same as EF 5002)
Course Title	Mobile and Wireless Communication
Number of Credits	3 (L-3, T-0, P-0)
Prerequisites	NIL
Course Category	PC

COURSE CONTENTS:**UNIT I –**

- 1.1 Overview of Cellular Systems
- 1.2 Evolution 2g/3G/4G/5G
- 1.3 Cellular Concepts – Frequency reuse, Co channel and Adjacent channel Interference

UNIT II –

- 2.1 Wireless propagation
- 2.2 Link budget, Free-space path loss, Noise figure of receiver
- 2.3 Multipath fading, Shadowing, Fading margin, shadowing margin

UNIT III

- 3.1 Antenna diversity,
- 3.2 wireless channel capacity
- 3.3 MIMO

UNIT IV

- Overview of
- 4.1 CDMA
- 4.2 OFDM
- 4.3 LTE

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Wireless Communications – Principles and Practice T. S. Rappaport, (2nd edition) Pearson ISBN 9788131731864
2. Modern Wireless Communications Haykin & Moher Pearson 2011 (Indian Edition) ISBN: 978-8131704431

ECONOMIC POLICIES IN INDIA

Course Code	EL 51001(Common in all branches of Engg.)
Course Title	Economic Policies in India
Number of Credits	3 (L:3,T:0,P:0)
Prerequisites	NIL
CourseCategory	OE

COURSE LEARNING OBJECTIVES:

The objective of this course is to familiarize the students of different streams with the basic concepts, structure, problems and issues concerning Indian economy.

CO1	Understand Indian economics policy, planning strategies
CO2	It will enable to students to comprehend theoretical and empirical development across countries and region for policy purposes
CO3	Development Economics as a discipline encompasses different approach estotheproblemsofunemployment,poveity,incomegeneration,industrializationfromdifferentperspec-tives
CO4	Abletoidentifytheproblemsandcapabletodecidetheapplicationforfuturedevelopment
CO5	Analyzeeconomicissuesandfindsolutionstocomplexeconomicproblemsandtakecor-recteconomicjudgment

COURSE CONTENTS:**1. BASIC FEATURES AND PROBLEMS OF INDIAN ECONOMY:**

- 1.1. Economic History of India;
- 1.2. Nature of Indian Economy
- 1.3. Demographic features and Human Development Index,
- 1.4. Problems of Poverty, Unemployment, Inflation, income inequality, Blackmoney in India.

2. SECTORAL COMPOSITION OF INDIAN ECONOMY:

- 2.1. Issues in Agriculture sector in India,
- 2.2. land reforms
- 2.3. Green Revolution
- 2.4. agriculture policies of India,
- 2.5.

3. INDUSTRIAL DEVELOPMENT,

- 3.1. Small scale and cottage industries,
- 3.2. Industrial Policy,
- 3.3. Public sector in India,
- 3.4. Service sector in India.

4. ECONOMIC POLICIES:

- 4.1. Economic Planning in India,
- 4.2. Planning commission v/s NITI Aayog,
- 4.3. Five Year Plans,
- 4.4. Monetary policy in India,
- 4.5. Fiscal Policy in India,
- 4.6. Centre state Finance Relations,
- 4.7. Finance commission in India
- 4.8. LPG policy in India

5. EXTERNAL SECTOR IN INDIA

- 5.1. India's foreign trade value composition and direction,
- 5.2. India Balance of payment since 1991,
- 5.3. FDI in India,
- 5.4. Impact of Globalization on Indian Economy,
- 5.5. WTO and India.

REFERENCE BOOKS:

1. Dutt Rudder and K.P.M Sunderam (2017). Indian Economy .S Chand & Co.Ltd. New Delhi.
2. Mishra S. K & V. K Puri (2017). Indian Economy and Its Development Experience. Himalaya Publishing House.
3. Singh, Ramesh, (2016): Indian Economy, Tata-McGraw Hill Publications, New Delhi.
4. Dhingra, I.C., (2017): March of the Indian Economy, Heed Publications Pvt. Ltd.
5. Karam Singh Gill, (1978): Evolution of the Indian Economy, NCERT, NewDelhi
6. Kaushik Basu (2007): The Oxford Companion to Economics of India ,Oxford University Press.

(SEMESTER SCHEME-2020-21)

ENGINEERING ECONOMICS & ACCOUNTANCY

Course Code	EL 51002(Common in all branches of Engg.)
Course Title	Engineering Economics & Accountancy
Number of Credits	3 (L:3,T:0,P:0)
Prerequisites	NIL
Course Category	OE

COURSE OBJECTIVES

- To acquire knowledge of basic economic of a ciliate the process of economic decision making.
- To acquire knowledge on basic financial management aspects.
- To develop the basic skills to analyze financial statements.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

CO1	Understand the macro-economic environment of the business and its impact on enterprise
CO2	Understand cost elements of the product and its effect on decision making
CO3	Prepare accounting records and summarize and interpret the accounting data for managerial decisions
CO4	Understand accounting systems and analyze financial statements using ratio analysis
CO5	Understand the concepts of financial management and investment

COURSE CONTENTS**1. INTRODUCTION:**

- 1.1. Managerial Economics;
- 1.2. Relationship with other disciplines;
- 1.3. Firms: Types, objectives and goals;
- 1.4. Managerial decisions;
- 1.5. Decision analysis.

2. DEMAND & SUPPLY ANALYSIS:

- 2.1. Demand;
 - 2.1.1. Types of demand;
 - 2.1.2. Determinants of demand;
 - 2.1.3. Demand function;
 - 2.1.4. Demand elasticity;
 - 2.1.5. Demand forecasting;
- 2.2. Supply;
 - 2.2.1. Determinants of supply;
 - 2.2.2. Supply function;
 - 2.2.3. Supply elasticity.

3. PRODUCTION AND COST ANALYSIS:

- 3.1. Production function;
- 3.2. Returns to scale;
- 3.3. Production optimization;
- 3.4. Least cost input; Iso quants;
- 3.5. Managerial uses of production function;
- 3.6. Cost Concepts;
 - 3.6.1. Cost function;

- 3.6.2. Types of Cost;
- 3.6.3. Determinants of cost;
- 3.6.4. Short run and Long run cost curves;
- 3.6.5. Cost Output Decision;
- 3.6.6. Estimation of Cost.

4. PRICING:

- 4.1. Determinants of Price;
- 4.2. Pricing under different objectives and different market structures;
- 4.3. Price discrimination;
- 4.4. Pricing methods in practice;
- 4.5. Role of Government in pricing control.

5. FINANCIAL ACCOUNTING (ELEMENTARY TREATMENT):

- 5.1. Balance sheet and related concepts;
- 5.2. Profit & Loss Statement and related concepts;
- 5.3. Financial Ratio Analysis;
- 5.4. Cash flow analysis;
- 5.5. Funds flow analysis;
- 5.6. Comparative financial statements;
- 5.7. Analysis & Interpretation of financial statements;
- 5.8. Investments;
- 5.9. Risks and return evaluation of investment decision;
- 5.10. Average rate of return;
- 5.11. Payback Period;
- 5.12. Net Present Value;
- 5.13. Internal rate of return,

REFERENCE BOOKS:

- 1. Mc Guigan, Moyer and Harris, 'Managerial Economics; Applications, Strategy and Tactics', Thomson South Western, 10th Edition, 2005.
- 2. Prasanna Chandra. 'Fundamentals of Financial Management', Tata Mcgraw Hill Publishing Ltd., 4th edition, 2005.
- 3. Samuelson. Paul A and Nordhaus W. D., 'Economics', Tata Mcgraw Hill Publishing Company Limited, New Delhi, 2004.
- 4. Paresh Shah, 'Basic Financial Accounting for Management', Oxford University Press, New Delhi, 2007.
- 5. Salvatore Dominick, 'Managerial Economics in a global economy'. Thomson SouthWestern, 4th Edition, 2001.

INDUSTRIAL AUTOMATION

Course Code	EL 50031(Same as EF/ER/RA 50031)
Course Title	Industrial Automation
Number of Credits	3 (L-3, T-0, P-0)
Prerequisites	NIL
Course Category	PE

COURSE CONTENTS:**UNIT I -**

- 1.1 Industrial automation overview and data acquisition
- 1.2 Architecture of Industrial Automation Systems.
- 1.3 Measurement Systems Characteristics
- 1.4 Data Acquisition Systems

UNIT II -

- 2.1 Control Generation
- 2.2 Introduction to Automatic Control
- 2.3 P-I-D Control
- 2.4 Feed-forward Control Ratio Control
- 2.5 The branching operations based on conditions expression

UNIT III

- 3.1 Sequential control and PLC
- 3.2 Introduction to Sequence Control, PLC, RLL
- 3.3 PLC Hardware Environment

UNIT IV

- 4.1 Industrial control application
- 4.2 Hydraulic Control Systems
- 4.3 Pneumatic Control Systems
- 4.4 Energy Savings with Variable Speed Drives
- 4.5 Introduction to CNC Machines

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Industrial Instrumentation, Control and Automation S.Mukhopadhyay, S. Sen and A. K. Deb Jaico Publishing House, 2013 ISBN: 978-8184954098
2. Electric Motor Drives, Modeling, Analysis and Control R. Krishnan Prentice Hall India, 2002 ISBN: 978-0130910141

CONTROL SYSTEM AND PLC

Course Code	EL 50032(Same as EF/ER/RA 50032)
Course Title	Control System And PLC
Number of Credits	3 (L-3, T-0, P-0)
Prerequisites	NIL
Course Category	PE

COURSE CONTENTS:**UNIT I BASICS OF CONTROL SYSTEM**

- 1.1 Basics of control system diagram and practical examples
- 1.2 Classification of control systems:-
Open loop and closed loop systems
Linear and non-linear systems
- 1.3 transfer function

UNIT II TIME DOMAIN STABILITY ANALYSIS

- 2.1 Transient and steady state response
- 2.2 standard test inputs: Step, Ramp, Parabolic, Impulse and their corresponding Laplace transform
- 2.3 analysis of second order control system: analysis for unit step input, concept, definition, effect of damping.
- 2.4 steady state analysis: type 0, 1, 2 systems, steady state error and error constants, numerical problems

UNIT III PROCESS CONTROLLERS

- 3.1 Process control system: block diagram, functions of each block
- 3.2 control actions: discontinuous mode, continuous mode
- 3.3 composite controllers: PI, PD, PID controllers, output equation, response

UNIT IV FUNDAMENTALS OF PLC

- 4.1 PLC: block diagram, classification, needs and benefits of PLCs in automation
- 4.2 descriptions of different parts of PLC: CPU function, scanning cycle, speed of execution, memory, i/o modules
- 4.3 PLC installation

UNIT V PLC HARDWARE AND PROGRAMMING

- 5.1 Discrete input modules: block diagram, specifications of AC input modules and DC input module. Sinking and Sourcing concept in DC input modules
- 5.2 discrete output modules: block diagram, description, specifications of AC output module and DC output modules
- 5.3 analog input and output modules: block diagram and specifications
- 5.4 I/O addressing of PLC: addressing data files, format of logical address, different addressing types
- 5.5 PLC programs using Ladder programming language.

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Modern control engineering Ogata K. PHI 5th edition New Delhi
2. Programmable Logic Controllers Petruzella F.D. TMH 3rd edition New Delhi

MICROWAVE AND RADAR

Course Code	EL 50041(Same as EF 50041)
Course Title	Microwave And Radar
Number of Credits	3 (L-3, T-0, P-0)
Prerequisites	NIL
Course Category	PE

COURSE CONTENTS:**UNIT I –**

- 1.1 Introduction to Microwaves, History and applications of Microwaves
- 1.2 Mathematical Model of Microwave Transmission-Microwave transmission modes, wave- guides and transmission lines, Impedance Matching
- 1.3 Microwave Network Analysis

UNIT II –

- 2.1 Passive and Active Microwave Devices
- 2.2 Directional Coupler, Power Divider, Attenuator, Resonator.
- 2.3 Microwave active components: Diodes, Transistors, Microwave Tubes

UNIT III –

- 3.1 Microwave Design Principles
- 3.2 Microwave Filter Design
- 3.3 Microwave Amplifier Design
- 3.4 Microwave Mixer Design
- 3.5 Microwave Oscillator Design
- 3.6 Microwave Antennas

UNIT IV –

- 4.1 Microwave Measurements,
- 4.2 Microwave Systems,
- 4.3 Effect of Microwaves on human body

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Microwave Engineering D.M. Pozar Wiley; Fourth edition (2013) ISBN 978-8126541904
2. Foundation for Microwave Engineering R.E. Collins Wiley; Second edition (2007) ISBN : 978-8126515288

OPTICAL COMMUNICATION AND NETWORKING

Course Code	EL 50042
Course Title	Optical Communication And Networking
Number of Credits	3 (L-3, T-0, P-0)
Prerequisites	NIL
Course Category	PE

UNIT I INTRODUCTION TO OPTICAL FIBERS

- 1.1 Element of an Optical Fiber Transmission link—
- 1.2 Total internal reflection-Acceptance angle –Numerical aperture
- 1.3 Optical Fiber Modes and Configurations
- 1.4 Single Mode Fibers-Graded Index fiber structure.

UNIT II SIGNAL DEGRADATION OPTICAL FIBERS

- 2.1 Attenuation - Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses,
- 2.2 Signal Distortion in Optical Wave guides-Information Capacity determination -Group Delay-Material Dispersion, Wave guide Dispersion,
- 2.3 Signal distortion in SM fibers-Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in GI fibers- Mode Coupling -Design Optimization of SM fibers-RI profile and cut-off wavelength.

UNIT III FIBER OPTICAL SOURCES AND COUPLING

- 3.1 LED structures -Light source materials -Quantum efficiency and LED power, Modulation of a LED,
- 3.2 lasers Diodes-Modes and Threshold condition -Rate equations -External Quantum efficiency -Resonant frequencies -Laser Diodes, Temperature effects,
- 3.3 Fiber -to- Fiber joints, Fiber splicing-Signal to Noise ratio , Detector response time.

UNIT IV FIBER OPTIC RECEIVER AND MEASUREMENTS

- 4.1 Fundamental receiver operation, Pre amplifiers, Error sources – Receiver Configuration– Probability of Error– Quantum limit
- 4.2 Fiber Attenuation measurements- Dispersion measurements – Fiber Refractive index profile measurements

UNIT V OPTICAL NETWORKS AND SYSTEM TRANSMISSION

- 5.1 Basic Networks – SONET / SDH – Broadcast – and –select WDM Networks –Wavelength Routed . Networks
- 5.2 Non linear effects on Network performance --
- 5.3 Link Power budget -Rise time budget- Noise Effects on System Performance-Operational Principles of WDM Performance of WDM + EDFA system – Solutions – Optical CDMA – Ultra High Capacity . . . Networks

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Govind P. Agrawal, "Fiber Optic Communication Systems", John Wiley, 3rd Edition, 2004
2. Joseph C. Palais, "Fiber Optic Communication", Pearson Education, 4th Ed, 2004.

EMBEDDED SYSTEMS LAB

Course Code	EL 5005(Same as EF/ER 5005)
Course Title	Embedded Systems Lab
Number of Credits	1 (L-0, T-0, P-2)
Prerequisites	NIL
Course Category	PC

PRACTICALS:-

1. Built-in LED state control by push button sketch implementation
2. Built-in LED blinking sketch implementation
3. Built-in LED blinking by toggling states based on binary operation
4. Built-in LED state control by user interface through serial port
5. User interface for Boolean operation and bit wise operation through serial port
6. User interface for compounded operation through serial port
7. Looping mechanism to check the state of pin and if change print its status on serial port
8. Controlling multiple LEDs with a loop and an array
9. Use a potentiometer to control the blinking of an LED
10. Uses an analog output (PWM pin) to fade an LED.
11. Servo Motor Control using PWM
12. Temperature sensor interfacing and sending its reading over serial port
13. I2C light sensor interfacing and sending its reading over serial port

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Arduino Projects for Dummies (For Dummies Series) Kennedy, George, Davis Bernard; Prasanna SRM Wiley (5 July 2013) ISBN: 978-1118551479
2. Make: Getting Started With Arduino - The Open Source Electronics Prototyping Platform Massimo Banzi and Michael Shiloh Shroff/Maker Media; Third edition (27 December 2014) ISBN : 978-9351109075

SUGGESTED SOFTWARE/LEARNING WEBSITES:

<https://www.arduino.cc/reference/en/>
<https://learn.adafruit.com/category/learn-arduino>

MOBILE AND WIRELESS COMMUNICATION LAB

Course Code	EL 5006(Same as EF 5006)
Course Title	Mobile And Wireless Communication Lab
Number of Credits	1 (L-0, T-0, P-2)
Prerequisites	NIL
Course Category	PC

SUGGESTED PRACTICALS/ EXERCISES

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

PRACTICALS:-

1. To understand the cellular frequency reuse concept to find the co-channel cells for a particular cell.
2. To understand the path loss
3. Understand the path loss with shadowing
4. Understanding the Flat fading
5. Understanding the Frequency selective fading
6. Understanding the Multipath channel for the following objectives
No Fading
Flat Fading
Dispersive Fading
7. To simulate a dipole antenna (λ , $\lambda/4$, $\lambda/2$, $3\lambda/2$) for a particular frequency using 4NEC2
8. Perform following experiments using CDMA trainer kit
PSK modulation and demodulation experiment
Bit synchronization extraction experiment
Error correction encoding experiment

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Wireless Communications – Principles and Practice T. S. Rappaport, (2nd edition) Pearson ISBN 9788131731864
2. Modern Wireless Communications Haykin & Moher Pearson 2011 (Indian Edition) ISBN: 978-8131704431

(SEMESTER SCHEME-2020-21)

INDUSTRIAL AUTOMATION LAB

Course Code	EL 50071(Same as EF/ER/RA 50071)
Course Title	Industrial Automation Lab
Number of Credits	1 (L-0, T-0, P-2)
Prerequisites	NIL
Course Category	PE

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

PRACTICALS:-

1. Develop a data acquisition system using Arduino
2. Temperature control system using PID
3. Level control system based on error feedback
4. PLC programming using Relay ladder Logic for AND , OR XOR and NOR gate
5. PLC, RLL programming using CASCADE method
6. PLC timer, counter, registers and analog input/output functions
7. Variable Speed drive of an induction motor
8. PLC/ microcontroller based computer numerical control machine job completion

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Industrial Instrumentation, Control and Automation S.Mukhopadhyay, S. S. Sen and A. K. Deb Jaico Publishing House, 2013 ISBN: 978-8184954098
2. Electric Motor Drives, Modelling, Analysis and Control R. Krishnan Prentice Hall India, 2002 ISBN: 978-0130910141

(SEMESTER SCHEME-2020-21)

CONTROL SYSTEM AND PLC LAB

Course Code	EL 50072(Same as EF/ER/RA 50072)
Course Title	Control System And PLC Lab
Number of Credits	1 (L-0, T-0, P-2)
Prerequisites	NIL
Course Category	PE

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

PRACTICALS:-

1. Different Toolboxes in MATLAB, Introduction to Control Systems Toolbox or its equivalent open source freeware Software like Scilab using Spoken Tutorial MOOCs.
2. Determine the transfer function for given closed loop system in block diagram representation.
3. Plot unit step response of given transfer function and find delay time, rise time, peak time and peak overshoot
4. Using MATLAB/SCILAB
 - a) Simulation of a typical second order system and determination of step response and evaluation of time domain specifications
 - b) Evaluation of the effect of additional poles and zeroes on time response of second order system
 - c) Evaluation of effect of pole location on stability d) Effect of loop gain of a negative feedback . system on stability
5. To study the effect of P, PI, PD and PID controller on step response of a feedback control system (Using control engineering trainer/process control simulator). Verify the same by simulation
6. Components/sub-components of a PLC, Learning functions of different modules of a PLC system
7. Practical steps in programming a PLC (a) using a Hand held programmer (b) using computer interface
8. Introduction to step 5 programming language, ladder diagram concepts, instruction list syntax
9. Basic logic operations, AND, OR, NOT functions.
10. Logic control systems with time response as applied to clamping operation

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Modern control engineering Ogata K. PHI 5th edition New Delhi
2. Programmable Logic Controllers Petruzella F.D. TMH 3rd edition New Delhi

MICROWAVE AND RADAR LAB

Course Code	EL 50081(Same as EF 50081)
Course Title	Microwave And Radar Lab
Number of Credits	1 (L-0, T-0, P-2)
Prerequisites	NIL
Course Category	PE

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

PRACTICALS:-

1. To study wave guide components.
2. To study the characteristics of Gunn oscillator Gun diode as modulated source.
3. Introduction to Smith chart and its application for the unknown impedance measurement.
4. Study the behaviour of impedance matching for passive networks using Smith chart.
5. To study loss and attenuation measurement of attenuator
6. Construct a cavity resonator in waveguide and study its characteristics using the network analyzer and a frequency Counter.
7. To determine the frequency and wavelength in a rectangular wave- guide working in TE₁₀ mode

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Microwave Engineering D.M. Pozar Wiley; Fourth edition (2013) ISBN 978-8126541904
2. Foundation for Microwave Engineering R.E. Collins Wiley; Second edition (2007) ISBN : 978-8126515288

SEMESTER SCHEME-2020-21

OPTICAL COMMUNICATION AND NETWORKING LAB

Course Code	EL 50082
Course Title	Optical Communication And Networking Lab
Number of Credits	1 (L-0, T-0, P-2)
Prerequisites	NIL
Course Category	PE

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

PRACTICALS:-

1. To study the different types of optical fibres.
2. Study of optical sources: LED & LASER
3. measurement of the numerical aperture
4. dc characteristics of led and laser diodes
5. propagation loss and bending loss in single mode optical glass fiber
6. data communication system usinga fiber- optic system
7. mode characteristics of single mode fiber

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Govind P. Agrawal, "Fiber Optic Communication Systems", John Wiley, 3rd Edition, 2004
2. Joseph C. Plais, "Fiber Optic Communication", Pearson Education, 4th Ed, 2004.

(SEMESTER SCHEME-2020-21)

GOVERNMENT OF RAJASTHAN
BOARD OF TECHNICAL EDUCATION RAJASTHAN JODHPUR
SEMESTER SCHEME-2020-21



VI SEMESTER
(SESSION 2021-2022 & ONWARDS)

ENTREPRENEURSHIP AND START-UPS

Course Code	EL 6111(Common in all branches of Engg.)
Course Title	Entrepreneurship and Start-ups
Number of Credits	4 (L-3,T-1, P-0)
Prerequisites (Course code)	None
Course Category	HS

COURSE LEARNING OBJECTIVES:

1. Acquiring Entrepreneurial spirit and resourcefulness.
2. Familiarization with various uses of human resource for earning dignified means of living.
3. Understanding the concept and process of entrepreneurship-its contribution and role in the growth and development of individual and the nation.
4. Acquiring entrepreneurial quality, competency, and motivation.
5. Learning the process and skills of creation and management of entrepreneurial venture.

LEARNING OUTCOME:

Upon completion of the course, these student will be able to demonstrate knowledge of the following topics:

1. Understanding the dynamic role of entrepreneurship and small businesses
2. Organizing and Managing a Small Business
3. Financial Planning and Control
4. Forms of Ownership for Small Business
5. Strategic Marketing Planning
6. New Product or Service Development
7. Business Plan Creation

COURSE CONTENTS:**1. INTRODUCTION TO ENTREPRENEURSHIP AND START-UPS**

- 1.1. Definitions, Traits of an entrepreneur, Intrapreneurship, Motivation
- 1.2. Types of Business Structures,
- 1.3. Similarities / differences between entrepreneurs and managers.

2. BUSINESS IDEAS AND THEIR IMPLEMENTATION

- 2.1. Discovering ideas and visualizing the business
- 2.2. Activity map
- 2.3. Business Plan

3. IDEA TO START-UP

- 3.1. Market Analysis– Identifying the target market,
- 3.2. Competition evaluation and Strategy Development,
- 3.3. Marketing and accounting,
- 3.4. Risk analysis

4. MANAGEMENT

- 4.1. Company's Organization Structure,
- 4.2. Recruitment and management of talent.
- 4.3. Financial organization and management

5. FINANCING AND PROTECTION OF IDEAS

- 5.1. Financing methods available for start-ups in India
- 5.2. Communication of Ideas to potential investors– Investor Pitch

5.3. Patenting and Licenses

6. EXIT STRATEGIES FOR ENTREPRENEURS ,BANKRUPTCY, AND SUCCESSION AND HARVESTING STRATEGY**SUGGESTED LEARNING RESOURCES:**

S.No.	Title of Book	Author	Publication
1.	The Startup Owner's Manual: The Step by-Step Guide for Building a Great Company	Steve Blank and Bob Dorf	K & S Ranch ISBN-978-0984999392
2.	The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses	Eric Ries	Penguin UK ISBN-978-0670921607
3.	Demand: Creating What People Love Before They Know They Want It	Adrian J. Slywotzky with Karl Weber	Headline Book Publishing ISBN-978-0755388974
4.	The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business	Clayton M. Chris Tensen	Harvard business ISBN:978-142219602

SUGGESTED SOFTWARE/LEARNING WEBSITES:

- a. <https://www.fundable.com/learn/resources/guides/startup>
- b. <https://corporatefinanceinstitute.com/resources/knowledge/finance/corporatehstructure/>
- c. <https://www.finder.com/small-business-finance-tips>
- d. <https://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your-business/>

SEMESTER SCHEME 2020-21

PROJECT MANAGEMENT

CourseCode	EL 62001(Common in all branches of Engg.)
CourseTitle	Project Management
NumberofCredits	3(L:3,T:0,P:0)
Prerequisites	NIL
CourseCategory	OE

COURSE LEARNING OBJECTIVES

- To develop the idea of project plan, from defining and confirming the project goals and objectives, identifying tasks and how goals will be achieved.
- To develop an understanding of key project management skills and strategies.

COURSE OUTCOMES

At the end of the course, the student will be able to:

CO1	Understand the importance of projects and its phases.
CO2	Analyze projects from marketing, operational and financial perspectives.
CO3	Evaluate projects based on discount and non-discount methods.
CO4	Develop network diagrams for planning and execution of a given project.
CO5	Apply crashing procedures for time and cost optimization.

COURSE CONTENTS**1. CONCEPT OF A PROJECT:**

- 1.1. Classification of projects
- 1.2. Importance of project management
- 1.3. The project Life cycle
- 1.4. Establishing project priorities (scope-cost-time)
- 1.5. Project priority matrix
- 1.6. Work break down structure.

2. CAPITAL BUDGETING PROCESS:

- 2.1. Planning -Analysis-Selection-Financing-Implementation-Review.
- 2.2. Generation and screening of project ideas
- 2.3. Market and demand analysis
- 2.4. Demand forecasting techniques.
- 2.5. Market planning and marketing research process
- 2.6. Technical analysis

3. FINANCIAL ESTIMATES AND PROJECTIONS:

- 3.1. Cost of projects
- 3.2. Means of financing
- 3.3. Estimates of sales and production-cost of production
- 3.4. Working capital requirement and its financing
- 3.5. Profitability project , cash flow statement and balance sheet.

3.6. Breakeven analysis.

4. BASIC TECHNIQUES IN CAPITAL BUDGETING:

- 4.1. Non discounting and discounting methods
- 4.2. pay-back period
- 4.3. Accounting rate of return
- 4.4. Net present value
- 4.5. Benefit cost ratio
- 4.6. Internal rate of return.
- 4.7. Project risk.
- 4.8. Social cost benefit analysis and economic rate of return.
- 4.9. Non-financial justification of projects.

5. PROJECT ADMINISTRATION:

- 5.1. Progress payments,
- 5.2. Expenditure planning,
- 5.3. Project scheduling and network planning,
- 5.4. Use of Critical Path Method(CPM),
- 5.5. Schedule of payments and physical progress,
- 5.6. time-cost trade off.
- 5.7. Concepts and uses of PERT
- 5.8. Cost as a function of time,
- 5.9. Project Evaluation and Review Techniques
- 5.10. Cost mechanisms.
- 5.11. Determination of least cost duration.
- 5.12. Post project evaluation.
- 5.13. Introduction to various Project management softwares.

REFERENCE BOOKS

1. Project planning, analysis, selection, implementation and review –Prasannachandra–Tata McGraw Hill
2. Project Management – the Managerial Process– Clifford F. Gray & Erik W. Larson-McGrawHill
3. Project management- David I Cleland- McGraw Hill International Edition, 1999
4. Project Management– Gopala krishnan– Memillan India Ltd.
5. Project Management- Harry – Maylor – Pearson Publication

RENEWABLE ENERGY TECHNOLOGIES

CourseCode	EL 62002(Common in all branches of Engg.)
CourseTitle	Renewable Energy Technologies
NumberofCredits	3 (L:3,T:0,P:0)
Prerequisites	NIL
CourseCategory	OE

COURSE LEARNING OBJECTIVES

- To understand present and future scenario of world energy use.
- To understand fundamentals of solar energy systems.
- To understand basics of wind energy.
- To understand bio energy and its usage in different ways.
- To identify different available non-conventional energy sources.

COURSE OUTCOMES

At the end of the course, the student will be able to:

CO1	Understand present and future energy scenario of the world.
CO2	Understand various methods of solar energy harvesting.
CO3	Identify various wind energy systems.
CO4	Evaluate appropriate methods for Bio energy generations from various Bio wastes.
CO5	Identify suitable energy sources for a location.

COURSE CONTENTS**1. INTRODUCTION:**

- 1.1. World Energy Use;
- 1.2. Reserves of Energy Resources;
- 1.3. Environmental Aspects OF Energy Utilisation;
- 1.4. Renewable Energy Scenario in India and around the World;
- 1.5. Potentials, Achievements/ Applications;
- 1.6. Economics of renewable energy systems.

2. SOLAR ENERGY:

- 2.1. Solar Radiation;
- 2.2. Measurements of Solar Radiation;
- 2.3. Flat Plate and Concentrating Collectors;
- 2.4. Solar direct Thermal Applications;
- 2.5. Solar thermal Power Generation
- 2.6. Fundamentals of Solar Photo Voltaic Conversion;
- 2.7. Solar Cells;
- 2.8. Solar PV Power Generation;
- 2.9. Solar PV Applications.

3. WIND ENERGY:

- 3.1. Wind Data and Energy Estimation;

- 3.2. Types of Wind Energy Systems;
- 3.3. Performance; Site Selection;
- 3.4. Details of Wind Turbine Generator;
- 3.5. Safety and Environmental Aspects.

4. BIO-ENERGY:

- 4.1. Bio mass direct combustion;
- 4.2. Bio mass gasifiers;
- 4.3. Bio gas plants;
- 4.4. Digesters;
- 4.5. Ethanol production;
- 4.6. Bio diesel;
- 4.7. Cogeneration;
- 4.8. Bio mass Applications.

5. OTHER RENEWABLE ENERGY SOURCES:

- 5.1. Tidal energy;
- 5.2. Wave Energy;
- 5.3. Open and Closed OTEC Cycles;
- 5.4. Small Hydro Geothermal Energy;
- 5.5. Hydrogen and Storage;
- 5.6. Fuel Cell Systems;
- 5.7. Hybrid Systems.

REFERENCE BOOKS

1. Non-Conventional Energy Sources, Rai. G. D., Khanna Publishers, New Delhi, 2011.
2. Renewable Energy Sources, Twidell, J.W. & Weir, A., EFN Spon Ltd., UK, 2006.
3. Solar Energy, Sukhatme. S. P., Tata Mc Graw Hill Publishing Company Ltd., New Delhi, 1997.
4. Renewable Energy, Power for a Sustainable Future, Godfrey Boyle, Oxford University Press, U.K., 1996.
5. Fundamental of Renewable Energy Sources, G N Tiwari and M K Ghoshal, Narosa, New Delhi, 2007.
6. Renewable Energy and Environment A Policy Analysis for India ,NH Ravindranath, U K Rao, B Natarajan, P Monga, Tata McGraw Hill.
7. Energy and The Environment, R A Ristinen and J J Kraushaar, second edition, John Willey & Sons, New York, 2006.
8. Renewable Energy Resources, J W Twidell and A D Weir, ELBS, 2006.

PRODUCT DESIGN

CourseCode	EL 63001(Common in all branches of Engg.)
CourseTitle	Product Design
NumberofCredits	3 (L:3,T:0,P:0)
Prerequisites	NIL
CourseCategory	OE

COURSE LEARNING OBJECTIVES

- To acquire the basic concepts of product design and development process
- To understand the engineering and scientific process in executing a design from concept to finished product
- To study the key reasons for design or redesign.

COURSE OUTCOMES

At the end of the course, the student will be able to:

CO1	Understand the basic concepts of product design and development process.
CO2	Illustrate the methods to define the customer needs.
CO3	Describe an engineering design and development process.
CO4	Understand the intuitive and advanced methods used to develop and evaluate a concept.
CO5	Apply modelling and embodiment principles in product design and development process.

COURSE CONTENTS**1. DEFINITION OF A PRODUCT**

- 1.1. Types of product;
- 1.2. Levels of product;
- 1.3. Product-market mix;
- 1.4. New product development (NPD) process;
- 1.5. Idea generation methods;
- 1.6. Creativity;
 - 1.6.1. Creative attitude;
 - 1.6.2. Creative design process;
- 1.7. Morphological analysis;
- 1.8. Analysis of inter-connected decision areas;
- 1.9. Brain storming.

2. PRODUCT LIFECYCLE;

- 2.1. The challenges of Product development;
- 2.2. Product analysis;
- 2.3. Product characteristics;
- 2.4. Economic considerations;
- 2.5. Production and Marketing aspects;
- 2.6. Characteristics of successful Product development;
- 2.7. Phases of a generic product development process;
- 2.8. Customer need identification;
- 2.9. Product development practices and industry-product strategies.

3. PRODUCT DESIGN

- 3.1. Design by evolution;
- 3.2. Design by innovation;
- 3.3. Design by imitation;
- 3.4. Factors affecting product design;
- 3.5. Standards of performance and environmental factors;
- 3.6. Decision making and iteration;
- 3.7. Morphology of design (different phases);
- 3.8. Role of aesthetics in design.

4. INTRODUCTION TO OPTIMIZATION IN DESIGN

- 4.1. Economic factors in design;
- 4.2. Design for safety and reliability;
- 4.3. Role of computers in design;
- 4.4. Modeling and Simulation;
- 4.5. The role of models in engineering design;
- 4.6. Mathematical modeling;
- 4.7. Similitude and scale models;
- 4.8. Concurrent design;
- 4.9. Six sigma and design for six sigma;
- 4.10. Introduction to optimization in design;
- 4.11. Economic factors and financial feasibility in design;
- 4.12. Design for manufacturing;
- 4.13. Rapid Proto typing (RP);
- 4.14. Application of RP in product design;
- 4.15. Product Development versus Design.

5. DESIGN OF SIMPLE PRODUCTS DEALING WITH VARIOUS ASPECTS OF PRODUCT DEVELOPMENT;

- 5.1. Design Starting from need till the manufacture of the product

REFERENCE BOOKS

- 1.Product Design and Development, Karl T.Ulrichand Steven D.Eppinger, TataMc Graw–Hill edition.
- 2.Engineering Design– George E. Dieter.
- 3.An Introduction to Engineering Design methods Vijay Gupta.
- 4.Merie Crawford: New Product management, McGraw-Hill Irwin.
- 5.Chitale A K and Gupta R C,“ Product Design and Manufacturing”, Prentice Hall of India, 2005.
6. Kevin Otto and Kristin Wood, Product Design, Techniques in Reverse Engineering and New Product Development, Pears on education.

DISASTER MANAGEMENT

Course Code	EL 63002(Common in all branches of Engg.)
Course Title	Disaster Management
Number of Credits	3 (L: 3, T: 0 ,P :0)
Prerequisites	NIL
Course Category	OE

COURSE LEARNING OBJECTIVES

Following are the objectives of this course:

- To learn about various types of natural and man-made disasters.
- To know pre and post-disaster management for some of the disasters.
- To know about various information and organizations in disaster management in India.
- To get exposed to technological tools and their role in disaster management.

COURSE OUTCOMES:

- 1.1. After completing this course, student will be:
- 1.2. Acquainted with basic information on various types of disasters
- 1.3. Knowing the precautions and awareness regarding various disasters
- 1.4. Decide first action to be taken under various disasters
- 1.5. Familiarised with organization in India which are dealing with disasters
- 1.6. Able to select IT tools to help in disaster management

COURSE CONTENTS**1. UNDERSTANDING DISASTER**

- 1.1. Understanding the Concepts and definitions of Disaster,
- 1.2. Hazard,
- 1.3. Vulnerability,
- 1.4. Risk,
- 1.5. Capacity–Disaster and Development,
- 1.6. Disaster management.

2. TYPES, TRENDS, CAUSES, CONSEQUENCES AND CONTROL OF DISASTERS

- 2.1. Geological Disasters (earth quakes, land slides,tsunami, mining);
- 2.2. Hydro-Meteorological Di-sasters (floods, cyclones, lightning, thunder-storms, hailstorms, avalanches, droughts, cold and heat waves)
- 2.3. Biological Disasters (epidemics, pestattacks, forestfire);
- 2.4. Technological Disasters (chemical, industrial, radiological, nuclear)
- 2.5. Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters)
- 2.6. Global Disaster Trends
- 2.7. Emerging Risks of Disasters
- 2.8. Climate Change and Urban Disasters.

3. DISASTER MANAGEMENT CYCLE AND FRAME WORK

- 3.1. Disaster Management Cycle
- 3.2. Paradigm Shift in Disaster Management.
- 3.3. Pre-Disaster
- 3.4. Risk Assessment and Analysis,
- 3.5. Risk Mapping,
- 3.6. Zonation and Microzonation,
- 3.7. Prevention and Mitigation of Disasters,
- 3.8. Early Warning System
 - 3.8.1. Preparedness,

- 3.8.2. Capacity Development;
- 3.8.3. Awareness.
- 3.9. During Disaster
 - 3.9.1. Evacuation
 - 3.9.2. Disaster Communication
 - 3.9.3. Search and Rescue
 - 3.9.4. Emergency Operation Centre
 - 3.9.5. Incident Comm and System
 - 3.9.6. Relief and Rehabilitation
- 3.10. Post-disaster
 - 3.10.1. Damage and Needs Assessment,
 - 3.10.2. Restoration of Critical Infra structure
 - 3.10.3. Early Recovery Reconstruction and Redevelopment;
 - 3.10.4. IDNDR, Yokohama Strategy, Hyogo Frame-work of Action.

4. DISASTER MANAGEMENT IN INDIA

- 4.1. Disaster Profile of India
- 4.2. Mega Disasters of India and Lessons Learnt.
- 4.3. Disaster Management Act 2005
- 4.4. Institutional and Financial Mechanism,
- 4.5. National Policy on Disaster Management,
- 4.6. National Guidelines and Plans on Disaster Management;
- 4.7. Role of Government (local, state and national),
- 4.8. Non-Government and Inter Governmental Agencies

5. APPLICATIONS OF SCIENCE AND TECHNOLOGY FOR DISASTER MANAGEMENT

- 5.1. Geo informatics in Disaster Management (RS, GIS, GPS and RS).
- 5.2. Disaster Communication System (Early Warning and Its Dissemination).
- 5.3. Land Use Planning and Development Regulations,
- 5.4. Disaster Safe Designs and Constructions,
- 5.5. Structural and Non Structural Mitigation of Disasters
- 5.6. S & T Institutions for Disaster Management in India

REFERENCES

- 1.Publications of National Disaster Management Authority (NDMA) on Various Templates and Guide lines for Disaster Management
- 2.Bhandani, R. K., An over view on natural & man-made disasters and their reduction, CSIR, New Delhi
- 3.Srivastava, H. N., and Gupta G. D. , Management of Natural Disasters in developing countries, Daya Publishers, Delhi
- 4.Alexander, David, Natural Disasters, Kluwer Academic London
- 5.Ghosh, G .K. ,Disaster Management, APH Publishing Corporation
- 6.Murthy, D. B. N., Disaster Management: Text & Case Studies, Deep & Deep Pvt. Ltd.

INDIAN CONSTITUTION

CourseCode	EL 6333(Common in all branches of Engg.)
CourseTitle	Indian Constitution
NumberofCredits	0 (L:2,T:0;P:0)
Prerequisites(Coursecode)	None
CourseCategory	AU

COURSE CONTENT**1. THE CONSTITUTION –**

- 1.1. Introduction
- 1.2. The History of the Making of the Indian Constitution
- 1.3. Preamble and the Basic Structure, and its interpretation
- 1.4. Fundamental Rights and Duties and their interpretation
- 1.5. State Policy Principles

2. UNION GOVERNMENT

- 2.1. Structure of the Indian Union
- 2.2. President– Role and Power
- 2.3. Prime Minister and Council of Ministers
- 2.4. Lok Sabha and Rajya Sabha

3. STATE GOVERNMENT

- 3.1. Governor– Role and Power
- 3.2. Chief Minister and Council of Ministers
- 3.3. State Secretariat

4. LOCAL ADMINISTRATION

- 4.1. District Administration
- 4.2. Municipal Corporation
- 4.3. Zila Panchayat

5. ELECTION COMMISSION

- 5.1. Role and Functioning
- 5.2. Chief Election Commissioner
- 5.3. State Election Commission

SUGGESTED LEARNING RESOURCES:

S.No.	Title of Book	Author	Publication
1.	Ethics and Politics of the Indian Constitution	Rajeev Bhargava	Oxford University Press, New Delhi, 2008
2.	The Constitution of India	B.L.Fadia	Sahitya Bhawan; New edition(2017)
3.	Introduction to the Constitution of India	D D Basu	Lexis Nexis; Twenty-Third 2018 edition

SUGGESTED SOFTWARE / LEARNING WEBSITES:

1. <https://www.constitution.org/cons/india/const.html>
2. <http://www.legislative.gov.in/constitution-of-india>
3. <https://www.sci.gov.in/constitution>
4. <https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/>

COMPUTER NETWORKING AND DATA COMMUNICATION

Course Code	EL 6001
Course Title	Computer Networking And Data Communication
Number of Credits	4 (L-4, T-0, P-0)
Prerequisites	NIL
Course Category	PC

COURSE CONTENTS:**1. UNIT 1 – DATA COMMUNICATION**

- 1.1 Introduction to data communication.
- 1.2 Concept of analog and digital signals, Bandwidth, Network architecture
- 1.3 Basics of OSI and TCP/IP reference models.
- 1.4 Types of Computer Networks – Personal Area Network, Local Area Network, Metropolitan Area Network, Wide Area Network, Internetwork.
- 1.5 Computer Network Topologies – Point to Point, Bus topology, Star topology, ring topology, mesh topology, tree topology, Daisy Chain, Hybrid Topology.
- 1.6 Computer Network Model. Transmission media, Wired and wireless connectivity

2. UNIT 2 – TRANSMISSION

- 2.1 Digital & Analog Transmission
- 2.2 Digital Transmission – Digital to Digital Conversion, Line Coding, Unipolar Encoding, Polar Encoding, Bipolar Encoding, block Coding
- 2.3 Analog Transmission - Analog-to-Digital Conversion, Digital to analog Conversion, Analog to Analog Conversion
- 2.4 Sampling, Quantization, Encoding, Transmission Modes

3. UNIT 3 – WIRELESS COMMUNICATION

- 3.1 Wireless Communication, Radio, Microwave, Infra-red, Light Transmission
- 3.2 Wireless Communication Standards, Characterization of the Wireless Channel, Receiver Techniques for Fading Dispersive Channels,
- 3.3 Mobility Management in Wireless Networks, Mobile IP, Mobile Ad hoc Networks, Ad hoc Routing Protocols, Performance Analysis of DSR and CBRP,
- 3.4 Cluster Techniques, Incremental Cluster Maintenance Scheme, and Space time coding for Wireless Communication.

4. UNIT 4 –DATA LINK

- 4.1 Data Link Layer Technologies.
- 4.2 Types of Network Routing, Network Layer Protocols. FDM, TDM and CDMA.
- 4.3 Circuit and packet switching. Frame relay and ATM switching. ISDN. Local area network protocols, Fibre optic networks. Satellite networks
- 4.4 Data link layer design issues: its functions and protocols. Internet protocol. Routing algorithms. Congestion control algorithms. IP addressing schemes, Internetworking and sub-netting
- 4.5 Error Detection and Correction - Types of Errors, Detection, Correction Switching and Data link layer, data link control and protocol

5. UNIT 5 – TRANSMISSION MEDIA

- 5.1 Transmission Media & Transmission Control protocol.
- 5.2 Magnetic Media, Twisted Pair Cable, Coaxial Cable, Power Lines, Fiber Optics.
- 5.3 Protocol– Features, Header, Addressing, Connection Management, Error Control and Flow Control, Multiplexing, Congestion Control, Timer Management, Crash Recover

6. REFERENCES / SUGGESTED LEARNING RESOURCES:

1. Computer networking a top down Approach: J.F.Kurose Pearson
2. Computer Networks and Internet D.E. Comer Pearson
3. Wireless Communications: Principles and Practice, 2nd edition T. Rappaport Prentice Hall, 2002
4. Wireless Communication and Networking John W. Mark, Weihua Zhuang
5. Modelling and Analysis of Computer Communication Networks Jeremiah F. Hayes
6. Data communication & Networking Stallings

7. SUGGESTED SOFTWARE/LEARNING WEBSITES:

1. www.tutorialspoint.com/data_communication_computer_network/data_communication_computer_network_tutorial.pdf
2. www.turbofuture.com/industrial/Elements-of-Electronic-Communications-System
3. www.st-andrews.ac.uk/~www_pa/Scots_Guide/iandm/part3/page1.html
4. www.antenna-theory.com/basics/main.php
5. www.explainthatstuff.com/antennas.html
6. www.circuitdiagram.org/am-radio-receiver-with-mk484.html
7. www.circuitstoday.com/single-chip-fm-radio-circuit

(SEMESTER SCHEME-2020-21)

COMPUTER NETWORKING AND DATA COMMUNICATION LAB

Course Code	EL 6002
Course Title	Computer Networking And Data Communication Lab
Number of Credits	1 (L-0,T-0, P-2)
Prerequisites	NIL
Course Category	PC

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

PRACTICALS:-

1. To study the different physical equipment used for networking
2. Study the different internetworking devices in a computer network
3. Study the working of basic networking commands
4. To study PC to PC communication using parallel port
5. Study of LAN in Star Topology
6. Study of LAN in Bus Topology
7. Study of LAN in Tree Topology
8. Study and configuration of modem of computer
9. Study of wireless communication
10. Studying PC Communication using LAN

REFERENCES / SUGGESTED LEARNING RESOURCES:

1. Computer networking a top down Approach: J.F.Kurose Pearson
2. Computer Networks and Internet D.E. Comer Pearson
3. Wireless Communications: Principles and Practice, 2nd edition T. Rappaport Prentice Hall, 2002
4. Wireless Communication and Networking John W. Mark, Weihua Zhuang
5. Modelling and Analysis of Computer Communication Networks Jeremiah F. Hayes
6. Data communication & Networking Stallings

SUGGESTED SOFTWARE/LEARNING WEBSITES:

www.tutorialspoint.com/data_communication_computer_network/data_communication_computer_network_tutorial.pdf
www.turbofuture.com/industrial/Elements-of-Electronic-Communications-System
www.st-andrews.ac.uk/~www_pa/Scots_Guide/iandm/part3/page1.html
www.antenna-theory.com/basics/main.php
www.explainthatstuff.com/antennas.html
www.circuitdiagram.org/am-radio-receiver-with-mk484.html
www.circuitstoday.com/single-chip-fm-radio-circuit
