NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Syllabus for
Third Year Electronics Engineering
Faculty of Engineering and Technology

COURSE OUTLINE
SEMESTER – V
W.E.F 2014 – 2015

TE Semester – V

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Microcontroller Systems (TH)	D	3	---	---	3	20	80	---	---	100	3
Network System & Filter Design (TH)	D	3	---	---	3	20	80	---	---	100	3
Biomedical Engineering (TH)	D	3	---	---	3	20	80	---	---	100	3
Control System Techniques (TH)	D	3	---	---	3	20	80	---	---	100	3
Industrial Organization & Management (TH)	C	3	---	---	3	20	80	---	---	100	3
Microcontroller Systems (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Network System & Filter Design (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Biomedical Engineering (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Control System Techniques (LAB)	D	---	---	2	2	---	---	25	---	25	1
Electronic Workshop Practice-I (LAB)	B	1	---	2	3	---	---	50	---	50	2
Industrial Training / EDP / Special Study	D	---	---	---	---	---	---	25	---	25	2
Total		16	---	10	26	100	400	175	75	750	23

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

TE Semester – VI

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Electromagnetic Engineering (TH)	D	3	--	---	3	20	80	---	---	100	3
Communication System-II (TH)	D	3	---	---	3	20	80	---	---	100	3
Electronic Measurement Techniques (TH)	D	3	---	---	3	20	80	---	---	100	3
Electronic Circuit Design (TH)	D	3	---	---	3	20	80	---	---	100	3
Entrepreneurship & Business Planning (TH)	C	3	---	---	3	20	80	---	---	100	3
Communication System-II (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Electronic Measurement Techniques (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Electronic Circuit Design (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Electronic Workshop Practice-II (LAB)	B	---	---	2	2	---	---	25	---	25	1
Minor Project	D	---	---	2	2	---	---	50	---	50	2
Seminar - I	D	---	---	2	2	---	---	25	---	25	2
Total		**15**	**---**	**12**	**27**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

Microcontroller Systems

COURSE OUTLINE

Microcontroller Systems	**MS**	
Course Title	Short Title	Course Code

Course Description:

Introduction to the 8-bit microcontroller (8051), Course includes instruction set, assembly language programming of 8051 microcontroller, Timer/Counter, serial communication and interrupt programming. Interfacing of memory, LED, LCD Display, ADC, DAC, Stepper motor. Course also includes introduction to the PIC controller.This course is designed to give a broad understanding of the 8-bit microcontroller and its assembly language programming.

Lecture	**Hours / Week**	**No .of Weeks**	**Total Hours**	**Semester Credits**
	03	**14**	**42**	**03**

Prerequisite Course(s): Digital Electronics**,** Microprocessor**.**

COURSE CONTENT

Microcontroller Systems **Semester-V**

Teaching scheme:
Lectures: 3 hrs/week

Examination scheme:
End Semester Examination (ESE): 80Marks
Paper Duration (ESE): 03 Hours
Internal Seasonal Exam (ISE): 20 Marks

UNIT I **Lectures 9, Marks 16**

a) Functional pin diagram and architecture of 8051 microcontroller.
b) Architecture of 8051 microcontroller**:** Oscillator and clock, program-counter, Data-pointer, Stack pointer, Program status word.
c) Memory organization**:** Data memory (Internal Ram (SFRs), External Ram), Program memory (Internal Rom, External Rom)
d) I/O port Pins and their functions, 8051 I/O Port structures.

UNIT II **Lectures 8, Marks 16**

a) Addressing modes of 8051 microcontroller. Instruction set of 8051.
b) Data transfer group of instructions.
c) Arithmetic and logical group of instructions.
d) Control transfer group of instructions
e) Bit operated instructions (Boolean group)

UNIT III **Lectures 8, Marks 16**

a) Timer/counter: TMOD AND TCON Register, Modes of operation, Programming timer/ counter.
b) Interrupt structure and Interrupts programming.
c) Serial communication programming in 8051 (only Standard 8-Bit UART Mode). Serial data transfer and serial data reception programming example.

UNIT IV **Lectures 9, Marks 16**

a) Memory interfacing (RAM, ROM, EPROM) - Basic concept in memory interfacing and address decoding. Interfacing of external RAM and ROM, with 8051.
b) Interfacing of LED, Switch, 7-Segment display, Multiplexed 7-Segment display, with programs.
c) Interfacing of Matrix Key-Board with programs.
d) Interfacing of Liquid Crystal Display with programs.
e) Interfacing of DAC, ADC and Stepper Motor with programs.

UNIT V **Lectures 8, Marks16**

a) Buses and Protocols – RS 232, RS 485, I^2C, MODBUS, IEEE 488.
b) Interfacing to EEPROM 93C46 / 56 / 66, 24C16 / 32 / 64, RTC DS1307.
c) Introduction to PIC microcontroller. Block Diagram of PIC 16C61, Pin diagram of PIC 16C61.

References:

1. Kenneth J. Ayala - 8051 Microcontroller, PHI.
2. Mazidi and Mazidi - The 8051 Microcontroller and Embedded Systems, Pearson. 2nd ed.
3. Ajay V Deshmukh: Microcontrollers- Theory and applications TMH.

Network System & Filter Design

COURSE OUTLINE

Network System & Filter Design	**NSFD**	
Course Title	Short Title	Course Code

Course Description:

This course introduces the student to Network System and Filter Design. The student will learn network topology and state variable analysis. The student will also learn types of signals and systems. The student will also learn passive and active filter design.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	**14**	**42**	**03**

Prerequisite Course (s): knowledge of basic Electrical network, Signals, Systems and filters concept.

COURSE CONTENT

Network System & Filter Design **Semester-V**

Teaching Scheme
Lecture: 3 Hours / week

Examination Scheme
End Semester Examination (ESE): 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

UNIT-I **No. of Lect. – 08, Marks: 16**

Network Topology

a) Directed graph, trees, co-tree and loops, incidence matrix.
b) Tie-set matrix and fundamental tie-set matrix.
c) Cut- set and fundamental Cut- set matrix.
d) Network equilibrium equation based on KVL and KCL.
e) Duality and general network transformations.

State Variable analysis

a) State space models, State variables-inputs and outputs, Continuous time models.
b) Classification of circuits in State variable analysis, solutions of state equations.
c) Formation of state equation using network graph theory.
d) Zero state response of state vector, complete response of the state vector.

Unit II: Introduction to Signals and Systems **No. of Lect. – 08, Marks: 16**

a) Definition of signals and systems, communication and control systems as examples.
b)Classification of signals: Continuous time and discrete time, even, odd, periodic and non periodic, deterministic and non deterministic, energy and power.
c) Operations on signals: Amplitude scaling, addition, multiplication, differentiation, integration, time scaling, time shifting and folding, precedence rule.
d) Elementary signals: exponential, sine, step, impulse and its properties, ramp, rectangular, triangular, signum, sinc.
e) Systems: Definition, Classification, linear and non linear, time variant and invariant, causal and non-causal, static and dynamic, stable and unstable, invertible.

Unit III: System Analysis **No. of Lect. – 09, Marks: 16**

a) System modeling: Input output relation, impulse response, block diagram, integro-differential equations and state-space representation.
b) Definition of impulse response, convolution integral, convolution sum.
c) Computation of convolution integral using graphical method.
d) Computation of convolution sum by all methods.
e) Properties of convolution, system interconnection.
f) System properties in terms of impulse response, step response in terms of impulse response.

Unit IV: Passive Filter Design **No. of Lect. – 08, Marks: 16**

a) Butterworth and Chebyshev approximation.
b) Derivation of normalized low pass filter transfer function up to 3^{rd} order by Butterworth approximation from basic principles.
c) Evaluation of transfer function for Chebyshev filters from pole zero plots.
d) Synthesis of above mentioned filters with 1ohm termination.
e) Frequency transformation to high pass, band pass and band stop filter from Normalized low pass filter.
f) Frequency scaling and Impedance scaling.

Unit V: Active Filter Design **No. of Lect. – 09, Marks: 16**

a) Factored forms of the functions, cascade approach.
b) Biquad topologies: positive and negative feedback topology.
c) Coefficient matching techniques for obtaining element values.
d) Sallen Key low pass circuits.
e) RC to CR transformations for high pass filter,
f) Design of Sallen Key band pass circuit.

References:

1. Gobind Daryanani, “Principles of Active Network Synthesis and Design”, Wiley international.
2. Lawrence Huelsman, “Active and Passive Analog Filter Design”, McGraw-Hill Inc.
3. A. Chakrabarti,” Circuit Theory”, Dhanpat Ray & Co.
4. Simon Haykins and Barry Van Veen, “Signals and Systems”, 2nd Edition, Wiley India.
5. Charles Phillips, “Signals , Systems and Transforms” , 3rd Edition, Pearson Education.

Biomedical Engineering

COURSE OUTLINE

Biomedical Engineering	**BME**	
Course Title	Short Title	Course Code

Course Description:

This course includes introduction to the Biomedical Instrumentation and Measurement. The Anatomy of Heart, Function of Heart. The Human Nervous and Muscular System. Human Respiratory System and Its Measurements, Imaging Techniques & telemetry system. This course is designed to introduce the students to the basic principles and applications of sensors, medical oscilloscopes, analog and digital instruments. It includes basic knowledge of heart, brain and muscular system and different types of signals. This course provides instruction in the theory and application of biomedical instruments.

Lecture	**Hours / Week**	**No .of Weeks**	**Total Hours**	**Semester Credits**
	03	**14**	**42**	**03**

Prerequisite Course(s): Digital Electronics**,** Microprocessor**.**

COURSE CONTENT

Biomedical Engineering **Semester-V**

Teaching scheme:
Lectures: 3 hrs/week

Examination scheme:
End Semester Examination (ESE): 80Marks
Paper Duration ESE): 03 Hours
Internal Seasonal Exam (ISE): 20 Marks

UNIT I **Lectures 09, Marks 16**

Introduction to the Biomedical Instrumentation and Measurement: Basics of biomedical Instrumentation system, Anatomy and Physiology of the Human Body, Cells & Generation of potential in Body, Body potential, Transducers And Sensors. Transducers: Pressure transducers, transducer for temperature measurement, Ultrasonic Transducers, Sensors, Pulse sensors, Respiration sensors, Optical sensors, Recorders and displays. Permanent magnet moving coil instruments, PMMC writing system, X-Y Recorders, Medical oscilloscopes, Multi-beam oscilloscope, Non-fade oscilloscope, Digital storage oscilloscopes. Bedside monitor.

UNIT II **Lectures 08, Marks 16**

The Anatomy of Heart, Function of Heart: The circulatory system, Electro conduction system of the heart, Electrocardiographs, ECG waveforms, Standard lead system, ECG measurements, ECG preamplifier, Readout device, Heart problems, Heart blocks, Pacemakers, Types of Pacemakers, Defibrillators, Ventricular Fibrillation; Heart rate measurement, Cardiotachometers, Average Heart rate meter, Electrode theory; Biopotential electrode : skin surface, Suction pasteless disspossible & air jet electrode. Unipolar & bipolar limb system, eithoven triangle, Blood pressure measurement, introduction & techniques.

UNIT III **Lectures 06, Marks 16**

The Human Nervous and Muscular System: The Nervous System, The peripheral nervous system, Central nervous system, Anatomical and physiological parameter of brain, Behavior and Nervous system, Study of Brain Signals, Different waveforms of the Brain, Evoked potential, Type of electrodes, EEG Amplifier, Recording the EEG signals, Electrode, micro & needle electrode, Artifacts, Processing Artifacts, Analysis of Disease using EEG & sleep patterns, Electromyography, (EMG), How muscles work, paralysis, myograph, Nerve conduction velocity.

UNIT IV **Lectures 08, Marks 16**

Human Respiratory System and Its Measurements:
Respiratory Measurements, Spirometer, Respiratory gas analyzers infra red gas analyzer, oxygen analyzer, nitrogen analyzer, 8-channel EEG system. Blood : Measurement of blood flow, Radiographic technique, Indicator Dye dilution methods, Thermal convection, Magnetic blood flow rate, Ultrasonic blood flow meter, Blood gas Pressure, Blood gas analyzer, PH measurement of blood, Oximetry, Measurement of partial pressure of CO_2 in blood, Measurement of blood PaO_2, In vitro Oximetry. Patient Safety, Galvanic skin resistance; Patient safety: Macro shock, Macrocurrent shock. Block diagram of visual & auditory evoked potential system.

UNIT V **Lectures 09, Marks 16**

Imaging Techniques & telemetry system.
Imaging Techniques : X ray imaging and CT Scan : Properties of X ray Production of X ray, Application of X ray in medicine, CAT Scan, X-ray therapy; Digital radiography, ultrasound therapy units: physics, medical ultrasound, basic pulse echo system. Instruments of surgery, Principle, type of electro-surgery technique, surgical diathermy machine, electrode used for surgical diathermy, safety aspects in electro-surgical units, microwave diathermy,

Telemetry, single channel telemetry, ECG telemetry, Temperature telemetry, multichannel telemetry.

References:

1) R.S.Khandpur - Bio-medical Instrumentation , TMH 2nd ed
2) Nandini K. Jog - Electronics in Medicine and Biomedical Instrumentation, PHI.
3) Cromwell - Biomedical Instrumentation and Measurements, PHI. 2nd ed/Pearson 4th ed
4) H. S. Kalsi – Electronics Instrumentation, TMH 2nd ed

Control System Techniques

COURSE OUTLINE

Control System Techniques	**CST**	
Course Title	Short Title	Course Code

Course Description:

This course includes introduction to control system, feedback systems, its parameters, mathematical models, signal flow graph, Block diagram algebra, standard test signals, Time response of system, steady state errors. Root locus concept, Bode plots, Nyquist plot, State space models, PLC.

Lecture	**Hours / Week**	**No .of Weeks**	**Total Hours**	**Semester Credits**
	03	**14**	**42**	**03**

Prerequisite Course(s): Engineering mathematics-III, Electrical engineering.

COURSE CONTENT

Control System Techniques **Semester-V**

Teaching scheme:
Lectures: 3 hrs/week

Examination scheme:
End Semester Examination (ESE): 80Marks
Paper Duration (ESE): 03 Hours
Internal Seasonal Exam (ISE): 20 Marks

Unit I **Lectures 8, Marks 16**

Introduction to control system, its types, Adaptive control, Mathematical Models of physical systems, Reduction of parameter variation by use of feedback, Control over system dynamics by use of feedback, control of effect of disturbance single by Use of feedback, Linearizing effect and of feedback, Regenerative feedback. Block diagram Algebra. Signal flow graph – mason's gain formula.

Unit II **Lectures 8, Marks 16**

Standard test signals, Time Response of first order system and second order system, Time Response specification. Steady state analysis, Steady state error and error constants. Stability, necessary condition for stability, Routh-Hurwitz criterion. Root locus concept-Plotting root locus. Design of compensator using root locus.

Unit III **Lectures 8, Marks 16**

Correlation between time and frequency response. Bode plot, Gain margin, phase margin, stability. Design of compensator using Bode plot. Polar plot, Nyquist plot, criterion, stability using Nyquist plot.

Unit IV **Lectures 8, Marks 16**

Review of state space , state model for continuous time system, controllability, observability, solution of state equation. State feedback using pole placement, Observer.

Unit V **Lectures 8, Marks 16**

PLC: Block diagram, system components, operation of PLC, scan rate, ladder diagram, logical function, PLC wiring, internal relays, sequencers, flip-flops, timers, counters, shift register, Mnemonic programming, PLC power connection, various types of PLC input and output circuits, analogue I / O, selection of PLC, connecting sensors with PLC.

References:

1) I.J. Nagrath and M. Gopal- Control system Engineering- New age international Publisher. 4th Ed.
2) Katsuhiko Ogata – Modern Control Engineering – Pearson education publication, 4th ed.
3) Ashok kumar – Control system – Tata Mc-graw – hill Publication Company.
4) Automatic control Engineering – Raven F. H McGraw Hill, 5th edition,1995.
5) Bolton - Mechatronics, Pearsons, 3/ed.

Industrial Organization & Management

COURSE OUTLINE

Industrial Organization & Management **IOM**
Course Title Short Title Course Code

Course Description:

A proper introduction and understanding of Business and Management processes is essential for all Engineering students. Management is a field which deals with basics of Managerial science required to understand the processes in Industrial & Commercial environment. This will enable the students to become familiar and to understand various Business Organizational structures, their functioning and the Role these technicians will have to play in these setups with responsibilities. This course will help to minimize the gap of industry and institution by bringing in an awareness of Industrial organization & Management.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	14	40	03

Prerequisite Course(s): Basic of business and management.

COURSE CONTENT

Industrial Organization & Management **Semester-V**

Teaching scheme:
Lectures: 3 hrs/week

Examination scheme:
End Semester Examination (ESE): 80Marks
Paper Duration (ESE) :03 Hours
Internal Seasonal Exam (ISE) :20 Marks

Unit-I: Introduction to business, Industry and management No of Lect. 8, Marks: 16

Management: various definitions, nature, importance, Overview of business- Types of Business: service, manufacturing, trade. Industrial sectors: introduction to Engineering, process, textile chemical, agro industry, Globalization, I.P.R.

Unit-II: Management Process No of Lect. 8, Marks: 16

Evolution of management thought, Concept of Management , Administration and Management, Scientific Management by F W Taylor**,** Principles of Management (14 principles of Henry Fayol), Levels and skills of management, Functions of Management: planning – types and features, organizing, coordinating, directing, controlling, decision making - types.

Unit-III: Organizational Management **No of Lect. 8, Marks: 16**

Organization: definition, steps in forming organization. Types of organization: line, line & staff, functional, project type. Departmentation: centralized & decentralized, authority & responsibility, span of control. Forms of ownerships: proprietorship, partnership, Joint Stock Company, cooperative society, government sector.

Unit-IV: Human Resource Management **No of Lect. 8, Marks: 16**

Personnel Management: Introduction, definition, function. Staffing: introduction to HR, HR Planning, recruitment procedure, Personnel – Training & Development, Types of training, Induction, skill enhancement, Leadership & Motivation, Leadership- Styles & types, Motivation: definition, Intrinsic & Extrinsic, Moslow's theory of Motivation and its significance. Safety Management.

Unit-V: Ethical and Legislative Management **No of Lect. 8, Marks: 16**

Ethics: Meaning and Nature of Ethics. Meaning, Moral & Ethics, Types of Ethics, Importance of Ethics, Nature of Ethics. Ethics in management and qualities and social responsibility of managers, Introduction, Objectives & feature of Industrial Legislation: factory Act, ESI Act, workman compensation Act, industrial dispute Act.

REFERENCE BOOKS:

1. Dr. O.P. Khanna - Industrial Engg & Management (Dhanpat Rai & sons New Delhi)
2. Dr. S.C. Saksena - Business Administration & Management (Sahitya Bhavan Agra)
3. W.H. Newman, E.Kirby Warren, Andrew R. McGill- The process of Management (Prentice- all of India Pvt. Ltd. New Delhi - 110001)
4. Rustom S. Davar - Industrial Management (Khanna Publication)
5. Banga & Sharma - Industrial Organisation & Management (Khanna Publication)
6. Jhamb & Bokil - Industrial Management (Everest Publication, Pune)
7. Koontz – Principles of Management (Tata McGrew Hill, 1st Edition 2008)
8. L.M. Prasad – Principles & Practices of Management (Sultanchand & Sons, New Delhi)
9. Robbins & Caulter – Management (Prentice Hall of India, 8th Edition)
10. Parag Diwan – Management Principles and Practices (Excel Books, New Delhi)
11. Gautam Pherwani - Business Ethics

Microcontroller Systems Lab

COURSE OUTLINE

Microcontroller Systems Lab	**MS Lab**	
Course Title	Short Title	Course Code

Course Description:

In this Course emphasis is on instruction set, assembly language programming of 8051 microcontroller, Timer/Counter, serial communication and interrupt programming. Interfacing, of memory, LED, LCD Display, ADC, DAC, Stepper motor

Laboratory	**Hours/Week**	**No. Of Weeks**	**Total Hours**	**Semester Credits**
	2	**10**	**20**	**1**

ICA: Internal Continuous Assessment-25 ESE: End Semester Examination – 25(PR)

LAB COURSE CONTENT

(Minimum **EIGHT** practical's are to be performed)

List of Practicals:

1. Study of 8051 assembler and Simulator.
    a) This is to be studied by writing program for addition/subtraction, multiplication / division.
    b) Executing external memory related instructions using MOVC/MOVX instruction (8051 only) *OR*
2. Write and Execute program to flash LED.
3. Write and Execute program to display 0 to 9 continuously on 7-Segment display,
4. Write and Execute program to demonstrate interfacing of 4 X 4 matrix Key-Board.
5. Write and Execute program to demonstrate interfacing of multiplexed 7-Segment display.
6. Write and Execute program to demonstrate interfacing of Liquid Crystal display.
7. Write and Execute program to demonstrate interfacing of DAC.
8. Write and Execute program to demonstrate interfacing of ADC.
9. Write and Execute program to demonstrate interfacing of Stepper Motor.
10. Write and Execute program to demonstrate Serial data Transmission.
11. Write and Execute program to demonstrate Serial data Reception.
12. Write and Execute program to demonstrate interfacing of Serial EEPROM 93C14 / 56 / 66 or 24C16 / 32 / 64.
13. Write and Execute program to demonstrate interfacing of RTC DS1307.

Note: Experiments 2 to 13should be performed with 8051 / 89c51 / 89c51RD2 kits using Assembler and downloading program.

Guidelines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

Network System & Filter Design Lab
COURSE OUTLINE

Network System & Filter Design Lab **NSFD Lab**
Course Title Short Title Course Code

Course Description:

In this laboratory course emphasis is on the understanding of basic signals, systems and filters concept. The students can also analyze and synthesize networks, systems and design of filters.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	14	28	1

ICA: Internal Continuous Assessment-25 ESE: End Semester Examination – 25 (PR)

Prerequisite Course(s): Course on Electrical and Electronics engineering and software like Matlab/Scilab.

LAB COURSE CONTENT

(Note: Minimum EIGHT practical's to be performed out of which FOUR practical's must be performed using software like Matlab/Scilab)

1. Sketch and write defining mathematical expression for the following signals in CT.

a) Unit Step
b) Rectangular
c) Exponential
d) Signum
e) Sine
f) Sinc
g) Triangular
h) Unit impulse
i) Unit ramp.

2. Classify and find the respective value for the following signals
Periodic / Non Periodic
Energy / Power /Neither.
a) Unit Step
b) Rectangular

c) Exponential
d) Signum
e) Sine
f) Sinc
g) Triangular
h) Unit impulse
i) Unit ramp.

3. Take any two CT signals and perform the following operation on:
Amplitude scaling, addition, multiplication, differentiation, integration, time scaling, time shifting and folding.

4. Express any two system mathematical expressions in input output relation form and determine whether each one of them is, Memory less, Causal, Linear, Stable, Time in variant, Invertible.

5. Express any two system mathematical expressions in impulse response form and determine whether each one of them is, Memory less, Causal, Linear, Stable, Time in variant, Invertible.

6. **Design and test a second order Butterworth low pass filter Sallen Key circuit**

a) Design a second order Butterworth low pass filter Sallen Key circuit for given cut-off frequency.
b) Take different readings of V_O for varying frequency of input signal from function generator.
c) Calculate gain (A_V) in dB for each frequency.
d) Plot the graph of gain V_S frequency and determine the cut-off frequency from graph. Compare this practical cut-off frequency with the design value.

7. Design and test a second order Butterworth high pass filter Sallen Key circuit

a) Design a second order Butterworth high pass filter Sallen Key circuit for given cut-off frequency.
b) Take different readings of V_O for varying frequency of input signal from function generator.
c) Calculate gain (A_V) in dB for each frequency.
d) Plot the graph of gain V_S frequency and determine the cut-off frequency from graph. Compare practical cut-off frequency with the design value.

8. Design a second order Chebyshev low pass filter Sallen Key circuit.

a) Design a Chebyshev low pass filter Sallen Key circuit for given cut-off frequency.

b) Take different readings of V_O for varying frequency of input signal from function generator.
c) Calculate gain (A_V) in dB for each frequency.
d) Plot the graph of gain V_S frequency and determine the cut-off frequency from graph. Compare
practical cut-off frequency with the design value.

9. Design a second order Chebyshev high pass filter Sallen Key circuit.

a) Design a Chebyshev high pass filter Sallen Key circuit for given cut-off frequency.
b) Take different readings of V_O for varying frequency of input signal from function generator.
c) Calculate gain (A_V) in dB for each frequency.
d) Plot the graph of gain V_S frequency and determine the cut-off frequency from graph. Compare
practical cut-off frequency with the design value.

10. Design of Sallen Key band pass filter.

a) Design a Sallen Key band pass filter for given specification.
b) Take different readings of V_O for varying frequency of input signal from function generator.
c) Calculate gain (A_V) in dB for each frequency.
d) Plot the graph of gain V_S frequency and determine the cut-off frequency from graph. Compare practical value cut-off frequency with the design value.

References:

1. Gobind Daryanani, “Principles of Active Network Synthesis and Design”, Wiley international.
2. Lawrence Huelsman, “Active and Passive Analog Filter Design”, McGraw-Hill Inc.
3. A. Chakrabarti,” Circuit Theory”, Dhanpat Ray & Co.
4. Simon Haykins and Barry Van Veen, “Signals and Systems”, 2nd Edition, Wiley India.
5. Charles Phillips, “Signals , Systems and Transforms” , 3rd Edition, Pearson Education.

Guidelines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

Biomedical Engineering Lab
COURSE OUTLINE

Biomedical Engineering Lab **BME Lab**
Course Title Short Title Course Code

Course Description:

In this laboratory course emphasis is on the understanding of medical electronics components & system application.

Laboratory	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
	2	**09**	**18**	**1**

ICA: Internal Continuous Assessment-25 ESE: End Semester Examination – 25 (PR)

Prerequisite Course(s): CDIT

LAB COURSE CONTENT
(Note: Minimum EIGHT Experiments from below list.)

1. **Study of blood pressure measurement.**
   a. Measurement of systolic & diastolic pressure

2. **Study of ECG amplifier to measure amplitude and frequency components**.
   a. Measurement of ECG Waveform & amplitude

3. **Measurement of pulse Rate.**
   a. Measurement of pulse rate.

4. **Study of measurement of temperature of human body direct and indirect method.**
   a. Measurement of body temperature.

5. **Study of pace maker unit to compare the operation of heart with the normal functioning of heart.**
   a. Demonstration of pace maker working & modes of pacemaker.

6. **Study of blood cell counter to measure cell counts**.
   a. Measure cell count

7. **Study of spectrophotometer.**
   a. Analysis of chemical composition of body fluids.

8. **Use of ultrasound in medical electronics**.

9. **Study of temperature telemetry system to measure the received data.**
   a. Observe sending & receiving data

Guidelines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

Control System Techniques Lab

COURSE OUTLINE

Control System Techniques Lab	**CST Lab**	
Course Title	Short Title	Course Code

Course Description:

In this laboratory course emphasis is on the understanding the need of control system and their application.

	Hours/Week	**No. Of Weeks**	**Total Hours**	**Semester Credits**
Laboratory	**2**	**14**	**28**	**1**

ICA: Internal Continuous Assessment-25 Marks

Prerequisite Course(s): Engineering mathematics-III, Electrical engineering.

LAB COURSE CONTENT

(Note: Minimum EIGHT Experiments from the list.)

1. To plots poles and zeros of a system.
2. To obtain the impulse and step response of the system.
3. To find the transfer function of given system using block diagram reduction and plot poles and zeros of the system.
4. To find the system response of the system using Bode plot.
5. To find the system response of the system using Root locus.
6. To find the system response of the system using Nyquist plot.
7. To find the frequency response of the LEAD network.
8. To find the frequency response of the LAG network.
9. To find the frequency response of the feedback amplifier.
10. To find the system response of the system using Polar plot.
11. Study the specification and operation of PLC and its programming.

Guide lines for ICA:
ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Electronic Workshop Practice- I Lab

COURSE OUTLINE

Electronic Workshop Practice-I Lab **EWP-I Lab**
Course Title Short Title Course Code

Course Description:

This laboratory course emphasizes on the use of various software tools in the design, simulation and testing of electronic circuits.

	Hours/Week	No.of Weeks	Total Hours	Semester Credits
Laboratory	**2**	**14**	**28**	**2**
Lecture	**1**	**14**	**14**	

Total Semester Credits: 2

Prerequisite Courses: Digital Techniques & Applications, Network Analysis & Synthesis, Control System Techniques, Electromagnetic Engineering

THEORY COURSE CONTENTS

Teacher should facilitate basic of open source simulation and circuit design tools.

1) **Scilab** - Installation of Scilab, Basic matrix operations, Basics element of language – Creating real variables, Variable name, Comments and continuation lines, Elementary mathematical functions, Pre-defined mathematical variables, Boolean, Complex number, String, Dynamics type of variables.
   Matrices- create a matrix of real value, The empty matrix, Query matrix, Accessing the elements of matrix, low level and element wise operation, High level linear algebra features. Looping and Branching- The statement are if, while, select, for, break. Plotting- 2D plot, Title, axis and legends, Export. Functions- Overview, Defining a functions, Function libraries, managing output arguments.

2) **Oscad -** Installing and setting up Oscad. Architecture of Oscad- Modules used in Oscad, work flow of Oscad. Getting started – Schematic Editor, analysis inserter, netlist converter, Ngsipce, Footprint editor, layout editor, model builder, subcircuit builder Schematic Creation- Famillarising the Schematic editor interface, Components and component libraries, schematic creation for simulation Simulation-

Analysis Inserter, Modifying Ki Cad netlist for Ngspice simulation, examples. PCB Design- schematic creation for PCB, Creation of PCB layout

LAB COURSE CONTENTS

(Note: Two Experiments in each group)

Section A:

Simulation of analog circuits using any software tool:

1) To find voltage and current of the given network using simulation tool.

2) To find transfer / Driving point impedance of two port network.

3) To design and test active filter.

4) Frequency domain analysis of given filter.

Section B:

Simulation of digital circuits using any software tool:

1) Combinational Logic Circuits- Multiplexer, Demultiplexer, Decoder, Encoder (Any One)

2) Sequential Logic Circuits- Flip-Flops, Counter, Register (Any One)

Section C:

Simulation of control systems, analog systems using any software tool:

1) Control Systems- Pole-Zero plot, polar/ Nyquist plot, Transient response (Any One)

2) Analog Systems- Generation of standard signals, Operations on signals, Transformation (Laplace) (Any One)

Section D:

Applications of MATLAB/ Scilab to Electronics Engineering subjects (2 Practicals)

Note: Minimum **EIGHT** assignments, **TWO** from **EACH** section.

References:

i. www.scilab.org
ii. http://oscad.in

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Industrial Training / EDP / Special Study

COURSE CONTENT

Industrial Training / EDP / Special Study	**IT/EDP/SS**
Course Title	Short Title Course Code

Semester-V	**Examination Scheme**
Total Semester Credits: 02	**Internal Continuous Assessment (ICA): 25 Marks**

Industrial Training

- Student shall undergo industrial training for a minimum period of **two weeks** during summer vacations between fourth semester and fifth semester.
- The industry in which industrial training is taken should be a medium or large scale industry
- The paper bound report on training must be submitted by the student in the beginning of Fifth semester along with a certificate from the company where the student took training.
- Every student should write the report separately.
- Institute / Department/T&P Cell have to assist the students for finding Industries for the training.
- Students must take prior permission from Department before joining for Industrial Training.

OR

EDP (Entrepreneurship Development Program)

- Student has to participate in Entrepreneurship Development Program for a minimum period of **One week** during summer vacations between fourth semester and fifth semester.
- Every student must submit the paper bound report based on the program in the beginning of Fifth semester along with a certificate (Course / Program completion) from the program organizers.
- Every student should write the report separately.
- Institute / Department may arrange Entrepreneurship Development Program at their campus.
- Students must take prior permission from Department before attending any Entrepreneurship Development Program.

OR

Special Study

- Student has to submit name of three topics of his interest to the department.
- Special study in a group shall not be allowed.
- The three-member committee appointed by Head of Department shall allot one topic out of the three topics submitted by the student.

- Every student must submit the paper bound report based on special study at the end of Firth semester.
- Department should allot guide to all such students, for monitoring their progress and guide them for literature survey / report writing etc.
- Evaluation of special study shall be done based on presentation made by student, followed by brief question answer session.

Evaluation of Industrial Training / EDP / Special Study

ICA: The Internal Continuous Assessment shall be based on the active participation of the students in the training / EDP / Special study and based on knowledge / skill acquired by the student. The three-member committee appointed by Head of Department shall assess the reports and award marks based on following:

(a) Report	10 marks.
(b) Presentation	10 marks.
(c) Viva-voce at the time of presentation	05 marks.
Total:	**25 marks.**

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Syllabus for

Third Year Electronics Engineering

Faculty of Engineering and Technology

COURSE OUTLINE

SEMESTER – VI

W.E.F 2014 – 2015

Electromagnetic Engineering

COURSE OUTLINE

Electromagnetic Engineering **EME**
Course Title Short Title Course Code

Course Description:

This course includes electrostatics, magnetostatics, conductors, dielectrics Maxwell`s equations, transmission lines and antenna. This course is designed to introduce to students to the basic principles and applications of electric field, magnetic field, electromagnetic waves. This course provides instruction in the theory and application of electromagnetic waves in the electronics industry. Emphasis is placed on the applications of electromagnetic theory.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**03**	**14**	**42**	**03**

Prerequisite Course(s): Engineering Physics–I, Engineering Physics –II, M-I, M-II and Knowledge of Elements of Electronics Engineering

COURSE CONTENT

Electromagnetic Engineering **Semester-VI**

Teaching Scheme **Examination Scheme**
Lecture: 3 hours/week **End Semester Examination (ESE): 80 Marks**
Paper Duration (ESE): 03Hrs
Internal Sessional Exam (ISE): 20 Marks

UNIT I **Lectures 12, Marks 16**

Vector calculus - Coordinate System, Transformations of coordinate systems

Electrostatics:- Coulomb's law, Electric field due to line charge, Sheet charge and volume charge Densities, Electric flux density, Gauss's law and Divergence theorem. Energy, Work-done, Potential and Potential gradient. Dipole and its electric field, Dipole moment. Energy density in electrostatic field.

UNIT II **Lectures 7, Marks 16**

Conductor, Dielectrics and Capacitance:-Current and current density, Current continuity equation, Properties of conductors, Boundary conditions. Energy stored in capacitors (between parallel plates and co-axial cable), Poisson's and Laplace's equation's.

UNIT III **Lectures 8, Marks 16**

Magnetostatics:- Biot-Saverts law and its vector form, Magnetic field due to infinitely long current carrying conductor, Ampere's Circuital law. Application to co-axial cable. Curl operator, Magnetic flux density, Stoke's theorem. Scalar and Vector magnetic potential, Lorentz's Force equation. Energy stored in magnetic field.

UNIT IV **Lectures 8, Marks 16**

Time Varying Fields: -Faradays law, Maxwell's equations (Differential, Integral and Phasor forms). Uniform plane waves. Representation of wave motion in free space, perfect dielectrics and Lossy dielectrics (Wave equations). Poyinting Theorem and Power density. Propagation in good conductor and Skin depth. Reflection of Uniform plane waves, VSWR. **Transmission Line**: - Impedance matching, Single stub and Double stub transmission line. Introduction to Smith Chart.

UNIT V **Lectures 8, Marks 16**

Waveguides, Radiation and antennas

Waveguides: modes in rectangular waveguides; boundary conditions; cut-off frequencies; dispersion relations. Basics of propagation in dielectric waveguide

Radiation and antennas: - Radiation resistance, Radiation pattern. Calculation of Radiation resistance for short dipole, Short monopole, Half-wave dipole and Quarter-wave monopole antennas. Directivity, Reciprocity between Transmitting and Receiving antennas, Hertzian dipole, folded dipole antenna, Principle of pattern multiplication, General pattern of two isotropic radiators. Yagi-Uda antenna

References:

1) W. Hayt - Engineering Electromagnetics, TMH. (5^{th} or 7^{th} edition).
2) K. D. Prasad - Antenna and Wave Propagation, Satya Prakashan.
3) Guru and Hizirogli - Electromagnetic field theory fundamental, Thomson Publication
4) Narayan Rao - Basic Electromagnetics with application, PHI
5) J D Kraus - Electromagnetics, MGH, 4th edition.
6) Jordan E. C. and K. G. Balman- Antenna Theory and Design, PHI 2^{nd} edition.

Communication System-II

COURSE OUTLINE

Communication System-II **CS-II**
Course Title Short Title Course Code

Course Description:

This course includes basics of electronic communication system, fundamentals and details of Television, Telephone, mobile communication, Microwave, Radio communication and Satellite communication.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Analog and Digital Modulation techniques, Noise and SNR,SSB techniques, Antennas and their radiation patterns.

COURSE CONTENT

Communication System-II **Semester-VI**

Teaching scheme:
Lectures: 3 hrs/week

Examination scheme:
End Semester Examination(ESE):80Marks
Paper Duration (ESE):03 Hours
Internal Seasonal Exam (ISE):20 Marks

UNIT I: Communication &Television Fundamentals: Lectures 13, Marks 16

Power measurements, electronics communication system, EM spectrum, bandwidth and information capacity.

Television fundamentals: Introduction, picture transmission, television transmitter, television receivers, synchronization, aspect ratio, image continuity, interlaced scanning.

Camera tube types, mono and colour cameras, mono and colour picture tubes, composite video signal.

Television systems and standards: NTSC, PAL, Mono chrome system.

Cable T.V. Introduction, signals sources, processing, distribution, bidirectional networks, converters, digital system hardware. Introduction to DTH, 3D T.V, EDTV, HDTV etc.

Unit II: Telephone Instruments and Signals **Lectures 8, Marks 16**

Introduction, subscriber loop, standard telephone set, block diagram of Telephone set, basic telephone call producer, call progress tone and signals, DTMF, Caller ID system, cordless telephones, electronic telephones, paging systems

Telephone circuit: - Introduction, , local loop, transmission parameters and private lines circuits, voice frequency circuit arrangements, cross talk, ECHO Suppressers and Cancellers**.**

Unit III: Microwave Radio Communication and Systems **Lectures 11, Marks 16**

Introduction, advantages and disadvantages, analog vs. digital microwave, FM microwave radio system, radio repeaters, diversity, protection switching arrangements, FM microwave radio stations, repeater stations, line of sight path characteristic, microwave system gain.

RADAR: principles, block diagram, radar frequency, power used in radar, radar range equation, pulse radar system, antenna and scanning, display methods, Introduction to MTI and CW radar system.

Unit IV: Cellular Telephone Concepts **Lectures 7, Marks 16**

Introduction, Mobile telephone Service, Evolution of Cellular Telephone, Cellular Telephone, frequency reuse, Interference, Cell Splitting, sectoring, Segmentation and dualization ,cellular system topology, roaming and handoff, cellular telephone network components, cellular telephone call processing

Multiplexing And Multiple Access Techniques: TDMA, CDMA, FDMA, Spread Spectrum.

Unit V: Satellite Communication **Lectures 7, Marks 16**

Introduction, History of satellite, Kepler's Law, Satellite orbits, Geo-synchronous satellites, Antenna look angles, satellite classifications, spacing and frequency allocation, Satellite Antenna, Radiation Patterns And Foot Prints. Satellite system link models, parameters, link equations, link budget.

Reference Books:

1. Tomasi – Electronics Communication Systems, TMH, 5/e.
2. R.G.Gupta – Audio Video System ,TMH
3. R.R Gulati- Modern Television Practice , New age, 2/e
4. George Kennedy- Electronics Communication Systems,TMH,5/e

Electronic Measurement Techniques

COURSE OUTLINE

Electronic Measurement Techniques	**EMT**	
Course Title	Short Title	Course Code

Course Description:

This course includes Sensors and converters, Analog and Digital Instruments, Signal Generators and Analyzers, Oscilloscope, Data Acquisition and Transmission systems. This course is designed to introduce the students to the basic principles and applications of sensors analog and digital instruments. It includes basic knowledge of different types of Oscilloscopes. This course provides instruction in the theory and application of electronics instruments, data acquisition and transmission in the electronics industry. Emphasis is given on the physical characteristics and uses of various electronics circuits and devices.

Lecture	**Hours / Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	**14**	**42**	**03**

Prerequisite Course(s): Component Devices & Instrumentation Technology

COURSE CONTENT

Electronic Measurement Techniques **Semester-VI**

Teaching Scheme
Lecture: 3 hours/week

Examination Scheme
End Semester Examination(ESE):80 Marks
Paper Duration (ESE):03 Hours
Internal Sessional Exam (ISE):20 Marks

UNIT I: Sensors and converters **Lectures 08, Marks 16**

Linear Variable Differential Transformer, Resistance Strain Gauges, Capacitance Sensors. Pressure gauges, Elastic Pressure Transducers, Ultrasonic transducer. Restriction type Flow meters-Orifice and Venturi, Rotameter V to F and F to V converter, Instrumentation Amplifier, Smart Sensors

UNIT II: Analog and Digital Instruments **Lectures 08, Marks 16**

Analog Instruments

LCR Q-meter, vector voltmeter, Electronic multimeter, Vector impedance meter, Output power meter, Field strength meter.

Digital Instruments

Digital counters and timers, Basic counter circuitry, main gate, Time base control circuit, Frequency measurement, measurement errors, Ratio of frequency measurement, , Digital tachometer, Phase meter, capacitance meter

UNIT III: Signal Generators and Analyzers **Lectures 8, Marks 16**

Sweep generator, Sweep marker generator, Color bar generator, Vectroscope.

Basic wave analyzer, Frequency selective wave analyzer, harmonic distortion analyzer, spectrum analyzer, Digital Fourier analyzer, logic analyzer, signature analyzer, OTDR meter, Wobbuloscope.

UNIT IV: Oscilloscope **Lectures 10, Marks 16**

Introduction, principle, feature, block diagram, sweep types, CRT diagram, CRT basics, PDA Tubes, dual beam CRO, dual trace CRO, VHF oscilloscope , VLF signal scope (analog storage and digital storage scopes), digital read out scopes, probes for CRO, attenuators, fiber optic CRT, hall effect probe , power scope.

UNIT V: Data Acquisition and Transmission systems **Lectures 8, Marks 16**

Automatic bridge transmitter, interfacing transducer to electronic control, objectives of DAS, single channel and multi channel DAS, ATS, computer based testing of audio amplifier, radio receiver, data loggers and digital transducers. Introduction to Programmable logic controller.

Computer aided measurements, Introduction to Data transmission systems, advantages and disadvantages of digital over analog transmission. Introduction to MODEMs. Data communication System using Modems

References:

1)Helfrick and Cooper – Modern Electronics Instrumentation and Measurement Techniques, Pearson

2) H. S. Kalsi – Electronics Instrumentation, TMH 2nd Ed

3) Alan S. Morris – Measurements and Instrumentation Principles, Butterworth Heinemann

4) Deoblin – Measurements systems: Applications and Design, TMH 5th ed

5) Nakra, Choudhari -- Instrumentation Measurements and analysis, 2/E TMH

Electronic Circuit Design

COURSE OUTLINE

Electronics Circuit Design	**ECD**	
Course Title	Short Title	Course Code

Course Description:

This course provides the basic concepts in electronic circuit design, Design emphasis in the area of various electronic circuits. Design of unregulated, regulated power supplies and IC regulators along with heat sink calculation. Course include designing of BJT & FET single stage and multistage amplifiers. Course includes design of power amplifiers, oscillators & V-I ,V-F convertors also filter designing.

Lecture	**Hours / Week**	**No .of Weeks**	**Total Hours**	**Semester Credits**
	03	**14**	**42**	**03**

Prerequisite Course(s): Solid State Devices & Circuits-I, Solid State Devices & Circuits-II

COURSE CONTENT

Electronics Circuit Design **Semester VI**

Teaching scheme:
Lectures: 3 hrs/week

Examination scheme:
End Semester Examination (ESE): 80 Marks
Paper Duration (ESE): 03 Hours
Internal Seasonal Exam (ISE):20 Marks

UNIT I: Design of Power Supplies **Lectures 09, Marks 16**

a) Design of Unregulated power supply, selection of transformer, diodes, capacitors, calculation of surge resistance (using bridge rectifier and capacitor filter only).

b) Design of Discrete series regulated power supply with protection circuit (simple and fold back).

c) Design of regulated power supply using IC LM-340 series along with heat sink calculations.

d) Design of Dual power supply using LM-317 and LM-337 IC's along with heat sink calculations.

e) Design of switching regulators, Buck regulator , Boost regulator, and Buck – Boost using switching regulator IC–LM 1577/2577 along with heat sink calculations..

UNIT II: Design of Small Signal (Voltage) Amplifier BJT/FET Lectures 09, Marks 16

a) Design of Bias circuits (BJT / FET)

For BJT- Voltage divider bias circuit.

For FET-self bias circuit and Voltage divider bias circuit.

b) Design of single stage amplifiers for CE / CS, CB / CG, CC / CD configurations (design of bias network and calculations of bypass and coupling capacitors).

c) Designing of negative feedback amplifiers:- voltage series, voltage shunt, current series and current shunt topology. (Design of bias network, feedback network and calculations of bypass and coupling capacitors).

UNIT III: Design of Large Signal (power) Amplifiers Lectures 08, Marks 16

a**)** Class – A transformer coupled power amplifier [design of bias network, transistor ratings and transformer rating calculations]

b) Class –B Push-pull amplifier [design of bias network, transistor ratings and transformer rating calculations].

c) Class - AB [Push-pull amplifier and complementary symmetry amplifiers] [design of bias network, transistor ratings and transformer rating calculations].

d) Monolithic power amplifier design using power amplifier IC LM-379.

UNIT IV: Design of High Frequency Amplifier Lectures 08, Marks 16

a) Design of Tuned amplifier using BJT/FET single tuned amplifier [design of bias network: voltage divider bias for BJT and self bias and voltage divider bias for FET, tuned network and calculations of bypass and coupling capacitors].

b) Design of cascode amplifier [CE-CB].

c) Design of oscillator circuits using BJT/FET : Clapp, Colpitt and Hartley oscillator [design of bias network: voltage divide bias for BJT , self bias and voltage divider bias for FET, tank circuit, calculations of bypass and coupling capacitors].

d) Design of switching circuits: Astable multivibrator using BJT [design of bias network: and time constant circuits for variable duty cycle] and Monostable multivibrator using BJT. [Design of bias network: and time constant circuits for variable pulse width]

UNIT V: Design using Analog Integrated Circuits Lectures 08, Marks 16

a) Design of Single supply amplifiers using OP-Amp IC-741/324 (AC inverting, AC Non inverting amplifiers)

b) Instrumentation amplifier design using IC-AD – 620.

c) Design of V - I converter, I - V converter, V – F and F – V converter using OP-Amp.

d) Design of Non-linear circuits: Voltage comparators, Peak detectors. , True RMS converter.

e) Sallen-key active filter design :for N^{th} order Sallen-key low pass, high pass, band pass and band reject filter, [Using unity gain and equal component circuit design approach for Butterworth and Chebyshev response].

References:

1) M.M. Shah - Design of Electronics Circuits and Computer Aided Design, Wiley Eastern.
2) Michael Jacob - Application and Design with Analog Integrated Circuits, PHI 2/e
3) Sergio Franco – Design with OP-AMP and Analog Integrated Circuits, TMH, 3/e.
4) Bell - Electronics Devices and Circuits, PHI or Pearson 4/e
5) Martin S Roden, Gordon – Electronics Design, Shroff Pub. - 4/e.
6) Bell – Solid State Pulse Circuits, PHI 4/e

Entrepreneurship & Business Planning

COURSE OUTLINE

Entrepreneurship & Business Planning **EBP**
Course Title Short Title Course Code

Course Description:
This course will develop the competencies of the students in both the entrepreneurial aspect and continuing management of small businesses. The objective of this course is to introduce the concepts, issues, and themes related to business planning, strategy, and entrepreneurship. The course will provide an overview of the functional activities in a typical business venture, such as organizational behaviour, human resources, finance, marketing, and operations. This course focuses on the engineer as an entrepreneur. Students will be encouraged to combine and apply their creativity and technical skills to develop a business strategy for a technology-based idea.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Industrial Organization & Management.

COURSE CONTENT

Entrepreneurship & Business Planning **Semester-VI**

Teaching Scheme:
Theory: 3 hours/week

Examination Scheme:
End Semester Examination (ESE):80 Marks
Paper Duration (ESE):03 Hours
Internal Seasonal Examination(ISE):20Marks

Unit-I: Introduction of Entrepreneurship **No of Lect. 8, Marks 16**
Entrepreneur and Entrepreneurship: Definition, Concept, meaning and functions of an entrepreneur Entrepreneurship: Function, need and importance, Entrepreneurship Characteristics and competency, Relevance of Entrepreneurship to socio economic gain, Problem of unemployment & important of wealth creation and self employment, Micro, small and medium Enterprise, Enterprise v/s Entrepreneurship, Self employment v/s Entrepreneurship, Entrepreneurial career as an option.

Unit-II: Business Planning **No of Lect. 8, Marks: 16**
Business Planning: Introduction, Meaning, Definition, Characteristic & objective period, Nature of Planning, Importance of planning, Advantages of planning, Steps in planning process, Methods of planning, Limitations of planning, Essentials of a good planning,

obstacles in planning, Planning Premises and Classification of Planning Premises. Qualities of good business plan, Business plan Components, The elements of business plan, questions for every business plan.

Unit-III: Entrepreneurial and Business Opportunities No of Lect. 8, Marks: 16

Process of Entrepreneurship development, Sensing Entrepreneurial opportunity, environmental scanning, market assessment, identification of Entrepreneurial opportunity, selection of Enterprise, steps in setting up of an enterprise. Small Business: Opportunities and Rewards, Small Business Entrepreneurs: Characteristics and Competencies, Business Ideas: Creativity, Opportunity, Feasibility and Business Plans.

Unit-IV: Market Analysis No of Lect. 10, Marks: 16

Financial Management- Objectives & Functions, Capital Generation & Management, Types of Capitals, Sources of raising Capital, Budgets and accounts, Types of Budgets: Production Budget, (including Variance Report), Labour Budget, Introduction to Profit & Loss Account (only concepts); Balance Sheet, Introduction to –Excise Tax, Service Tax, Income Tax, VAT, Custom Duty.

Unit-V: Study of Entrepreneurs Biographies: No of Lect. 6, Marks: 16

(a) Pramod Choudhari
(b) Vitthal Kamat
(c) Dr. Neelkantha Kalyani
(d) Anu Aga .

REFERENCE BOOKS:

1. Desai Vasant: Management of Small Scale Industries, Himalaya Publishing House.
2. Taneja Satish and Gupta S.L: Entrepreneurship Development, New Venture Creations, Galgotia Publishing Company, New Delhi
3. Gupta C.B. & Srinivas: Entrepreneurial Development, Sultan D, S. Chand & sons, New Delhi
4. Yogiraj Devkar 'Udyogsandhi' : 'Shodha Mhanje Sapdel' continental Prakashan.
5. Katz, J. and Green, R. (2013). Entrepreneurial Small Business (4th. ed.). McGraw-Hill Irwin
6. Dr. O.P. Khanna - Industrial Engg & Management (Dhanpal Rai & sons New Delhi)
7. Dr. S.C. Saxena - Business Administration & Management (Sahitya Bhavan Agra)
8. T. Ramaswamy, Principles of Management –Himalaya Publishing House
9. S.S. Khanna - Enterprenurial Development, (S. Chand & Comp. Ltd, New Delhi)
10. D. N. Mishra - Entrepreneur and Entrepreneurship Development and Planning in India, Chugh Publication, Allahabad.

Communication System-II Lab

COURSE OUTLINE

Communication System-II Lab	**CS-II Lab**	
Course Title	Short Title	Course Code

Course Description:

This Laboratory course deals with the Receiver kits of colour and black and white television. Also it includes the study of directivity. It also contains the study of telephone trainers.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Laboratory	**2**		**28**	**1**

ICA: Internal Continuous Assessment-25 **ESE:** End Semester Examination – 25(PR)

Prerequisite: Study of radiation patterns, directivity, composite video signal, contents of black and white and colour signals, DTMF keyboard.

LAB COURSE CONTENT

1. Study the test points of Colour TV and observe various waveforms.
   a. To observe and draw the waveforms at test points present in the various sections such as sound section, Horizontal, Vertical oscillating sections, Video And Chroma sections, tuner section etc.
2. Fault Finding in Colour TV
   a. To create the faults in the various sections such as sound section, Horizontal, Vertical oscillating sections, Video And Chroma sections tuner section etc and to note down and justify the disturbances due to fault creation.
3. Study the test points of Black And White TV and observe various waveforms.
   a. To observe and draw the waveforms at test points present in the various sections such as sound section, Horizontal, Vertical oscillating sections, Video section, tuner section etc.
4. Fault Finding in Black And White TV
   a. To create the faults in the various sections such as sound section, Horizontal, Vertical oscillating sections, Video sections, tuner section etc and to note down and justify the disturbances due to fault creation.
5. Study of the Telephone Demonstrator to observe various signals, ringing patterns, spectrum analysis of DTMF frequencies.

a. To measure the voltages at various test points on the trainer kit in On-hook and Off-hook positions.
b. To measure the voltages and frequencies at the various test-points on the DTMF keyboard in On-hook and Off-hook positions.

6. Application of EPABX as to use it as intercom,, programming in EPABX to study different facilities offered in EPABX such as no dial calls, call divert, call transfer etc. Measurement of signals at various level of communication.
7. Establishing direct communication link between uplink transmitter and downlink receiver using tone signal.

Guidelines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

Electronic Measurement Techniques Lab

COURSE OUTLINE

Electronics Measurements Techniques Lab **EMT Lab**
Course Title Short Title Course Code

Course Description:

In this laboratory course emphasis is on the understanding of analog and digital instruments and its application for various.

Laboratory	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
	2	14	28	1

ICA: Internal Continuous Assessment-25 **ESE:** End Semester Examination – 25 (PR)

Prerequisite Course(s): EEEE, SSDC-I

LAB COURSE CONTENT
(Note: Minimum EIGHT Experiments from below list.)

1 **Measurement of reactive and resistive components with LCR Q meter.**
a. Measurement and calculation of values theoretically and practically

2. Study of true RMS meter/DMM for measurement of RMS value of any AC signal.
a. Measurement of RMS value of voltage and current theoretically and practically
b. Measurement of ac and dc voltage, current, resistances theoretically and practically

3. **Measurement of frequency, Time with the help of frequency counter.**
a. Measurement of time and frequency for various types of signals, theoretically and practically.

4. **Study of Digital Tachometer for measurement of motor speed.**
a. Measurement of speed with armature voltage or current keeping constant.

5. **Measurement of distortion and nature of distortion by harmonic distortion analyzer.**
a. Measurement with various types of signals.
b. Calculation of % harmonic distortion.

6. **Study of spectrum analyzer for its application**.
    a. Harmonic distortion measurement
    b. Noise measurement

7. **Measurement techniques using CRO (frequency, amplitude, phase, time and component tester).**
    a. Measure amplitude, frequency, phase.
    b. Test components such as diode, transistor, zener etc.

8. **Study of DSO to measure and store frequency and amplitude.**
    a. Measure and store various types and different frequency signals.

9. **Study of DATA loggers for various parameter measurements.**
    a. Measure various parameters such as pressure, temperature, speed, signals from pneumatic transducer etc.
10. **Study of computerized analysis of radio receiver and measurement of power with it.**
    a. Measure signal to noise ratio
    b. Measure output power
11. **Study of ATS.**
    a. Testing of components such as capacitor, inductor.

Guidelines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

Electronic Circuit Design Lab
COURSE OUTLINE

Electronics Circuit Design Lab **ECD lab**
Course Title Short Title Course Code

Course Description:

In this laboratory course emphasis is on the understanding of combinational and sequential circuit design

Laboratory	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
	2	14	28	1

ICA: Internal Continuous Assessment-25 **ESE:** End Semester Examination – 25 (PR)

Prerequisite Course(s): EEEE, SSDC-I

LAB COURSE CONTENT

(Minimum **FIVE** practical are to be performed, at least **ONE** from **EACH** unit.)

UNIT – I

1) Design of Regulated power supply.
   a) Transformer selection.
   b) Rectifier (Bridge)
   c) Filter Designing (Capacitor)
   d) Transistor series Regulator (Feedback type) with current protection circuit (or) Design of Regulated power supply using IC LM 340/317 series.
2) Design of switching regulator circuit using switching Regulator IC LM1577 / 2577

UNIT – II

3) Design of single stage amplifier circuits using BJT / FET
   a) Inverting / non inverting amplifier.
   b) Self bias for BJT and potential divider for FET.
   c) Calculation of Performance parameters like A_v, R_i and R_o
4) Design Test and verify the negative feedback amplifier circuits using BJT / FET
   a) Design biasing network
   b) Feedback network
   c) Calculation of performance parameters like A_{vf}, R_{if} and R_{of}

UNIT – III

5) Design and Testing of monolithic power amplifier using IC LM 379
   a) Designing of External Components required.
   b) Measurement of output power.
6) Design of Transformer less class B push pull amplifier using BJT.
   a) With cross over Distortion.
   b) Elimination of Cross over distortion.

UNIT – IV

7) Design the single stage tuned amplifier using BJT/FET for given center frequency.
   a) Design of biasing circuit
   b) Designing of tuned circuit
   c) Calculations and verification of f_o and Bandwidth.
8) Design of Astable multivibrator using BJT
   a) Selection of Transistor
   b) Design of all external components.
   c) Calculation and verification of desired output frequency and amplitude of output voltage.

UNIT – V

9) Design of Inverting/Non inverting single supply amplifier using LM 324
   a) Designing of Biasing circuits
   b) Verification of the given gain and input impedance.
10) Designing of Instrumentation Amplifier using AD 620
   a) Designing of External components for given value of gain.

OR

Design of voltage to frequency converters using IC AD 537 for given requirements and verification of the same.

11) Design and test a sallen – key second order low pass/high pass filter for given specifications.
12) Design and test a sallen – key second order band pass filter for given specifications.

NOTE: 1) **EACH** experiments should be carried out in **TWO** turns. In **FIRST** turn Designing calculations are expected and in **SECOND** turn a complete circuit or major part of it be implemented.

2) Design using BJT must be carried out using h- parameters only.

Guidelines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

Electronic Workshop Practice- II Lab

COURSE OUTLINE

Electronics Workshop Practice-II Lab **EWP-II Lab**
Course Title Short Title Course Code

Course Description:

This laboratory course emphasizes on the use of various measuring instrument tools in the Electronics Engineering.

Laboratory	Hours/Week	No.of Weeks	Total Hours	Semester Credits
	2	14	28	1

ICA: Internal Continuous Assessment-25

Prerequisite Courses: Elements of Electronics and Electrical Engineering

LAB COURSE CONTENTS

(Note: Each Experiment in two turns)

1. Perform following using DSO

a. Perform Roll, Average, and Peak detection operations on signal

b. Capture transients

c. Perform various math operations like addition, subtraction and multiplication of two waves.

2. Study of True RMS meter

a. Measure RMS, peak, average voltages for half controlled rectifier or Full controlled rectifier by varying firing angle.

3. Study of programmable LCR meter

a. Measure L, C & R

b. Measure Q and Dissipation factor.

4. Study of Spectrum Analyzer

a. Perform harmonic analysis and Total Harmonic Distortion (THD) measurement for sine and square waves.

b. Verify frequency response of filters & high frequency (HF) amplifier.

c. Analyze Spectrum of AM & FM and to measure percent modulation and bandwidth.

5. Study of Frequency Counter

a. Carry out measurements through different modes of measurement.

b. Measure frequency, time, ratio, events & pulse width.

6. Calibration of Digital Voltmeter (DVM)

a. Calibrate DVM for dc voltage, ac voltage and dc current.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Minor Project

COURSE CONTENT

Minor Project | **MIP**
Course Title | Short Title | Course Code

Semester-VI

Laboratory	Hours per	No. of Weeks	Total Hours	Semester Credits
	2	**10**	**20**	**2**

Examination Scheme
Internal Continuous Assessment (ICA): 50 Marks

- Every student shall undertake the Minor Project in semester VI.
- Each student shall work on an approved project, a group of **05 students (maximum)** shall be allotted for the each minor project.
- Minor project may involve fabrication, design or investigation of a technical problem that may take design, experimental or analytical character or combine element of these areas. The project work shall involve sufficient work so that students get acquainted with different aspects of fabrication, design or analysis.
- Each student is required to maintain separate log book for documenting various activities of minor project.
- The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of minor project. Maximum four minor project groups shall be assigned to one teaching staff.
- Assessment of the project for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-A.**
- Before the end of semester, student shall deliver a seminar and submit the seminar report (paper bound copy)in following format:
    - Size of report shall be of minimum 25 pages.
    - Student should preferably refer minimum five reference books / magazines/standard research papers.
    - Format of report
        - Introduction.
        - Literature survey.
        - Theory (Implementation, Methodology, Applications, Advantages, Disadvantages. etc)
        - Future scope.
        - Conclusion.

Assessment of Minor Project

Name of the Project: _____

Name of the Guide: _____

Table-A

SN	Exam Seat No	Name of Student	Project Selection	Documentation	Design /Simulation/Logic	PCB/hardware/programming	Result Verification	Presentation	Total
			5	10	10	10	10	5	50

Seminar-I

COURSE CONTENT

Seminar-I **S-I**
Course Title Short Title Course Code

Semester-VI

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	**10**	**20**	**2**

Examination Scheme
Internal Continuous Assessment (ICA): 25 Marks

1. For Seminar-I every student will individually study a topic assigned to him / her and submit a report and shall deliver a short lecture / Seminar on the topic during the term.
2. The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Seminar-I. Seminar shall be related state of the art topic of his choice approved by the committee.
3. Seminar topic should not be repeated and registration of the same shall be done on first come first serve basis.
4. Topic of Seminar shall be registered within a two week from commencement of VI Semester and shall be approved by the committee.
5. Maximum six seminar supervision shall be allotted to each teacher.
6. Before the end of semester, student shall deliver a seminar and submit the seminar report (paper bound copy).

7. ASSESSMENT OF SEMINAR-I

Assessment of the Seminar-I for award of ICA marks shall be done by the guide and a departmental committee jointly, as per the guidelines given in **Table- B**

Title of Seminar: _____

Name of Guide: _____

Table-B

SN	Exam Seat No	Name of Student	Topic Selection	Literature survey	Report writing	Depth of understanding	Presentation	Total
			5	5	5	5	5	25