GOVERNMENT OF RAJASTHAN

BOARD OF TECHNICAL EDUCATION RAJASTHAN JODHPUR

SEMESTER SCHEME-2020-21

IV SEMESTER

(SESSION 2021-2022 & ONWARDS)

MICROCONTROLLER AND APPLICATIONS

Course Code	ER 4001(Same as EF/EL 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 GilliMazidi, 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 8085,8086,8051Soumitra 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

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SUBSYSTEMS OF ROBOTS

Course Code	ER-4002(Same as RA 4002)
Course Title	**SUBSYSTEMS OF ROBOTS**
Number of Credits	3 (L-3,T-0, P-0)
Prerequisites	BASIC KNOWLEDGE OF ROBOTICS
Course Category	PC

UNIT-1ACTUATING SYSTEMS:

1.1 Characteristics of Actuating Systems
- 1.1.1 Nominal Characteristics- Weight, Power to Weight Ratio, Operating Pressure, Voltage
- 1.1.2 Stiffness versus Compliance
- 1.1.3 Use of Reduction Gears

1.2 Comparison of Actuating Systems
1.3 Parameters for Selection of Actuators

UNIT-2 HYDRAULIC ACTUATORS & PNEUMATIC DEVICES

2.1 Cylinders- Types & Construction, Applications
2.2 Hydraulic Cushioning, Hydraulic Motors
2.3 Compressor – Filters, Regulator, Lubricator, Muffler
2.4 Air Control Valves, Quick Exhaust Valves

UNIT-3 GRIPPERS

5.1 Different Methods of Gripping
5.2 Mechanical Grippers-Slider Crank Mechanism, Screw Type, Cam Type Grippers
5.3 Magnetic Grippers, Vacuum Grippers, Air Operated Grippers.

UNIT-4 ROBOTIC VISION SYSTEMS

4.1 Human Vision Considerations
4.2 Machine Vision Approaches
4.3 Image Acquisition and Image Analysis
4.4 Applications and Available Systems
4.5 Ranging Techniques

UNIT-5 ROBOTIC CONTROL SYSTEMS

5.1 Linear Control
- 5.1.1 Control Techniques
- 5.1.2 Dynamic Systems
- 5.1.3 Transfer Function and State Space Representation

5.2 Nonlinear and Force Control
- 5.2.1 Control of a Moving Block
- 5.2.2 Force Control

UNIT-4 MOBILE ROBOTS

4.1 Approaches to Mobility
4.2 Design Considerations
4.3 Locomotion
4.4 Steering
4.5 Power and Stability
4.6 Intelligence
4.7 Error Considerations
4.8 Current Applications

UNIT-6 ROBOT STANDARDS

3.1 RIA Standards Program
3.2 Testing Standards

3.3 Device Communication Standards
3.4 Network Standards
3.5 Other Standards Activity
3.6 Japan Industrial Robot Safety Standards

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. **ROBOTICS: FUNDAMENTAL CONCEPTS AND ANALYSIS , By AshitavaGhosal, Publisher-OUP India, 2006**
2. **Introduction to Robotics, By S K Saha,Publisher- Tata McGraw-Hill Education**
3. **Introduction To Robotics: Analysis,Control,Applications, 2nd EditionBy Saeed Benjamin Niku · 2011, Publisher:Wiley India Pvt. Limited**
4. **Fundamentals of Robotics Engineering, By Harry H. Poole, Publisher:Springer Science & Business Media, 2012**

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SPECIAL MACHINES AND CONTROLLERS

Course Code	ER-4003 (Same as RA 4003)
Course Title	**SPECIAL MACHINES AND CONTROLLERS**
Number of Credits	3 (L-3,T-0, P-0)
Prerequisites	NIL
Course Category	PC

COURSE OBJECTIVES :

To know about stepper motors.
To know about switched reluctance motors
To know about permanent magnet brushless d.c. Motors
To know about permanent magnet synchronous motors
To know about linear motors

COURSE OUTCOMES

Understanding principles of operation, types and applications of stepper motors
Understanding principles of operation, types and applications of switched reluctance motors
Knowledge in evaluating the performance of dc motors
To evaluate knowledge in permanent magnet synchronous motors.
Ability to understand the working and applications linear motors and servo motors.

COURSE CONTENTS

UNIT 1 STEPPER MOTORS

1.1 Types
1.2 Constructional features and Principle of operation
1.3 Variable reluctance motor -single and Multi stack configurations
1.4 Permanent Magnet Stepper motor
1.5 Hybrid stepper motor
1.6 Different modes of Excitation
1.7 Theory of torque predictions
1.8 Drive systems and circuit for open loop and closed loop control of stepper motor.

UNIT 2 SWITCHED RELUCTANCE MOTORS

2.1 Constructional features and principle of operation
2.2 Torque Equation - Power Converters for SR Motor
2.3 Rotor Sensing Mechanism & Logic Controller
2.4 Sensorless Control of SR motor
2.5 Applications.

UNIT3 PERMANENT MAGNET BRUSHLESS D.C. MOTORS

3.1 Principle of operation
3.2 Types
3.3 Magnetic circuit analysis – EMF and torque equations
3.4 Power controllers
3.5 Motor characteristics and control
3.6 Applications.

UNIT 4 PERMANENT MAGNET SYNCHRONOUS MOTORS

4.1 Principle of operation
4.2 EMF, power input and torque expressions
4.3 Phasor diagram, Power Controllers,
4.4 Torque speed characteristics
4.5 Self control, Vector control, Current control Schemes
4.6 Applications.

UNIT 5 LINEAR MOTORS

5.1 Linear Induction motor (LIM)
5.2 Classification , construction , Principle of operation
5.3 Concept of current sheet , goodness factor
5.4 DC Linear motor (DCLM) types , circuit equation , DCLM control applications

5.5 Linear Synchronous motor(LSM) , Types,Applications
5.6 Servomotor Types , Constructional features, Principle of operation
5.7 Control applications of servo motors

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. K. Venkataratnam," Special Electrical Machines", Universities Press (India) Private Limited, India,2009.
2. Kenjo, T and Naganori, S "Permanent Magnet and brushless DC motors", Clarendon Press,Oxford, 1989
3. Kenjo T, "Stepping Motors and their Microprocessor Controls", Clarendon Press London, 2003.
4. Miller T J E, "Brushless Permanent Magnet and Reluctance Motor Drives", Clarendon Press,Oxford, 1989 .
5. Naser A and BoldeaL,"Linear Electric Motors: Theory Design and Practical Applications", Prentice Hall Inc., New Jersey 1987.
6. Floyd E Saner," Servo Motor Applications", Pittman USA, 1993.
7. WILLIAM H YEADON, ALAN W YEADON, Handbook of Small Electric Motors, McGraw Hill, INC.2001

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KINEMATICS AND DYNAMICS OF MACHINCES

Course Code	ER-40041(Same as RA 40041)
Course Title	**KINEMATICS AND DYNAMICS OF MACHINCES**
Number of Credits	3 (L-3,T-0, P-0)
Prerequisites	NIL
Course Category	PC

COURSE OBJECTIVES

- To understand the basic knowledge about kinematics of machines.
- To understand the basic components and layout of linkages in the assembly of a system/machine.
- To understand the principles in analyzing the assembly with respect to the displacement,velocity, and acceleration at any point in a link of a mechanism.
- To understand the motion resulting from a specified set of linkages, design few linkagemechanisms and cam mechanisms for specified output motions.
- To understand the basic concepts of toothed gearing and kinematics of gear trains and the effects of friction in motion transmission and in machine components.

COURSE OUTCOMES

Upon completion of this course,

- The students will be able to understand the basic knowledge of kinematics of machines
- Students will able to apply fundamentals of mechanism for the design of new mechanisms
- Able to know about the linkages, design few linkage mechanisms and cam mechanisms for specified output motions.
- Impart knowledge about the gears and gear trains.
- Ability to analyse them for optimum design

COURSE CONTENTS

UNIT 1 KINEMATIC OF MACHINES

1.1 Mechanisms
1.2 Terminology and definitions
1.3 Kinematics inversions of 4 bar and slide crank chain
1.4 Kinematics analysis in simple mechanisms
    1.4.1Velocity and acceleration polygons
    1.4.2Analytical methods
    1.4.3Computer approach
1.5 Cams
    1.5.1 Classifications
    1.5.2 Displacement diagrams
    1.5.3 Layout of plate cam profiles
    1.5.4 Derivatives of followers motion
    1.5.5 Circular arc and tangent cams.

UNIT 2 GEARS AND GEAR TRAINS

2.1 Spur gear
2.2 Law of toothed gearing
2.3 Involute gearing
2.4 Interchangeable gears
2.5 Gear tooth action
    2.5.1interference and undercutting
    2.5.2 Nonstandard teeth
2.6 Gear trains
    2.6.1 Parallel axis gears trains
    2.6.2 Epicyclic gear trains
    2.6.3 Automotive transmission gear trains.

UNIT 3 FRICTION

3.1 Sliding and Rolling Friction angle
3.2 friction in threads
3.3Friction Drives
3.3.1Belt and rope drives .

UNIT 4 FORCE ANALYSIS

4.1 Applied and Constrained Forces
4.2 Free body diagrams
4.3 static Equilibrium conditions
4.3.1Two, Three and four members
4.4 Static Force analysis in simple machine members
4.5 Dynamic Force Analysis
4.6 Inertia Forces and Inertia Torque
4.7 D"Alembert"s principle
4.8 Superposition principle
4.9 Dynamic Force Analysis in simple machine members.

UNIT 5 BALANCING AND VIBRATION

5.1 Static and Dynamic balancing
5.2 Balancing of revolving and reciprocating masses
5.3 Balancing machines
5.4 Free vibrations
5.5 Equations of motion
5.5.1 Natural Frequency
5.5.2 Damped Vibration
5.6 Bending critical speed of simple shaft .

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Ambekar A.G., "Mechanism and Machine Theory" Prentice Hall of India, New Delhi, 2007
2. Shigley J.E., Pennock G.R and Uicker J.J., "Theory of Machines and Mechanisms", OxfordUniversity Press, 2003
3. Thomas Bevan, "Theory of Machines", CBS Publishers and Distributors, 1984.
4.Ghosh. A, and A.K. Mallick, "Theory and Machine", Affiliated East-West Pvt. Ltd., New Delhi,1988.
5. Rao.J.S. andDukkipatti R.V. "Mechanisms and Machines", Wiley-Eastern Ltd., New Delhi, 1992.
6. John Hannah and Stephens R.C., "Mechanics of Machines", Viva Low Prices Student Edition,1999.
7. V.Ramamurthi, Mechanisms of Machine, Narosa Publishing House, 2002.
8. Robert L.Norton, Design of Machinery, McGraw-Hill, 2004.

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SIMULATION SOFTWARE

Course Code	ER 40042(Same as EF/EL 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/

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LINEAR INTEGRATED CIRCUITS

Course Code	ER 40051(Same as EF/EL 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 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.RoyChoudhry, 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 IcsRamakantA.Gayakwad Prentice Hall / Pearson Education, 4th Edition, 2001
6. Operational Amplifier and Linear Integrated Circuits K Lal Kishore Pearson Education, 2006

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POWER ELECTRONICS

Course Code	ER 40052(Same as EF/EL/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-
- 1-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

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MICROCONTROLLER AND APPLICATIONS LAB

Course Code	ER 4006(Same as EL/EF 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 8051microcontroller.
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 GilliMazidi, 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 8085,8086,8051Soumitra 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

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SPECIAL MACHINES AND CONTROLLERS LAB

Course Code	ER-4007 (Same as RA 4007)
Course Title	**SPECIAL MACHINES AND CONTROLLERS LAB**
Number of Credits	1 (L-0,T-0, P-2)
Prerequisites	NIL
Course Category	PC

COURSE OBJECTIVE

- To impart hands on experience in verification of circuit laws and theorems
- To measure the circuit parameters, study of circuit characteristics and simulation of time response.
- To expose the students to the basic operation of electrical machines and help them to develop experimental skills.

COURSE OUTCOME

Upon successful completion of this course, the students will be able to:

1. Differentiate between various motors.
2. Obtain the equivalent circuit parameters of dc motor, induction motor and stepper motor.
3. Test a dc and induction motor to estimate its efficiency at different load condition.
4. Select ac and dc motors and drives for industrial application

PRACTICALS:

1. Draw the torque speed characterstic of permanent magnet brushless D.C Motor
2. Perform an experiment for circuit equation of D.C.LinearMotor control.
3. Perform an experiment for EMF and Torque equation for permanent magnet synchronous motor
4. Draw load characterstics of D.C.LinearMotor,Linear Induction Motor
5. Starting of synchronous motor and plotting V-curves.
6. Determination of transfer function of AC servomotor and study of synchros.
7. To fully characterize a small permanent magnet stepper motor
8. To drive stepper motor with full half and micro steps
9. Perform an experiment for EMF and Torque equation for permanent magnet stepper motor
10. Determination of transfer function of DC servomotor
11. Speed control of Switched Reluctance Motor.

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. K. Venkataratnam," Special Electrical Machines", Universities Press (India) Private Limited, India,2009.
2. Kenjo, T and Naganori, S "Permanent Magnet and brushless DC motors", Clarendon Press,Oxford, 1989
3. Kenjo T, "Stepping Motors and their Microprocessor Controls", Clarendon Press London, 2003.
4. Miller T J E, "Brushless Permanent Magnet and Reluctance Motor Drives", Clarendon Press,Oxford, 1989 .
5. Naser A and BoldeaL,"Linear Electric Motors: Theory Design and Practical Applications", Prentice Hall Inc., New Jersey 1987.
6. Floyd E Saner," Servo Motor Applications", Pittman USA, 1993.
7. WILLIAM H YEADON, ALAN W YEADON, Handbook of Small Electric Motors, McGraw Hill, INC,2001

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KINEMATICS AND DYNAMICS OF MACHINCES LAB

Course Code	ER-40081(Same as RA 40081)
Course Title	**KINEMATICS AND DYNAMICS OF MACHINCES LAB**
Number of Credits	1 (L-0,T-0, P-2)
Prerequisites	NIL
Course Category	PC

COURSE OBJECTIVES

To supplement the principles learnt in kinematics and Dynamics of Machinery.
To understand how certain measuring devices are used for dynamic testing.

COURSE OUTCOMES

Ability to demonstrate the principles of kinematics and dynamics of machinery
Ability to use the measuring devices for dynamic testing.

PRACTICALS:

1. Study of gear parameters.
2. Experimental study of velocity ratios of simple, compound, Epicyclic and differential gear trains.
3. Kinematics of Four Bar, Slider Crank, Crank Rocker, Double crank, Double rocker, Oscillating cylinder Mechanisms.
4. Determination of Mass Moment of Inertia of axisymmetric bodies using Turn Table apparatus.
5. Determination of Mass Moment of Inertia using bifilar suspension and compound pendulum.
6. Cams – Cam profile drawing, Motion curves and study of jump phenomenon
7. Single degree of freedom Spring Mass System – Determination of natural Frequency and verification of Laws of springs – Damping coefficient determination.
8. Vibration of Equivalent Spring mass system – undamped and damped vibration.
9. Whirling of shafts – Determination of critical speeds of shafts with concentrated loads.
10. Balancing of rotating masses.
11. Balancing of reciprocating masses.

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Ambekar A.G., "Mechanism and Machine Theory" Prentice Hall of India, New Delhi, 2007
2. Shigley J.E., Pennock G.R and Uicker J.J., "Theory of Machines and Mechanisms", OxfordUniversity Press, 2003
3. Thomas Bevan, "Theory of Machines", CBS Publishers and Distributors, 1984.
4.Ghosh. A, and A.K. Mallick, "Theory and Machine", Affiliated East-West Pvt. Ltd., New Delhi,1988.
5. Rao.J.S. andDukkipatti R.V, "Mechanisms and Machines", Wiley-Eastern Ltd., New Delhi, 1992.
6. John Hannah and Stephens R.C, "Mechanics of Machines", Viva Low Prices Student Edition,1999.
7. V.Ramamurthi, Mechanisms of Machine, Narosa Publishing House, 2002.
8. Robert L.Norton, Design of Machinery, McGraw-Hill, 2004.

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SIMULATION SOFTWARE LAB

Course Code	ER 40082(Same as EF/EL 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/

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LINEAR INTEGRATED CIRCUITS LAB

Course Code	ER 40091(Same as EF/EL 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.RoyChoudhry, 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 IcsRamakantA.Gayakwad Prentice Hall / Pearson Education, 4th Edition, 2001
6. Operational Amplifier and Linear Integrated Circuits K Lal Kishore Pearson Education, 2006

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POWER ELECTRONICS LAB

Course Code	ER 40092(Same as EF/EL/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

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ESSENCE OF INDIAN KNOWLEDGE AND TRADITION

Course Code	ER 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 (आयुवेद,धनुवेद,गन्धवेद,स्थान्नत्यआदद)

(iii)वेदथाथांग (शिक्था, कलन्न, ननरुत, व्थाकरण, ज्योनतषछथांद),

(iv)उन्नथाइग (धर्मशथास्त्र, र्ीर्थाथांसथा, न्नुरथाण, तकशरथास्त्र)

•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", BhartiyaVidyaBhavan, Mumbai, fifth Edition, 2014.
2. Swami Jitatmanand, " Modern Physics and Vedant", BhartiyaVidyaBhavan.
3. Fritz of Capra, " The wave of Life".
4. Fritz of Capra, " Tao of Physics".
5. V N Jha, " Tarkasangraha of Annam Bhatta, International" Cinmay Foundation, Velliarnad, Amakuam.
6. R N Jha, " Science of Consciousness Psychotheraphy and Yoga Practices" VidyanidhiPrakasham, Delhi, 2016.

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