**Shirpur Education Society's**

# R. C. Patel Institute of Technology, Shirpur
## ( An Autonomous Institute)

# Course Structure

## Second Year B.Tech
## (Department of Electrical Engineering])

**with effect from Year 2024-25 (07/02/2025) (Scheme 2023)**



**Shahada Road, Near Nimzari Naka, Shirpur, Maharashtra 425405**
**Ph: 02563 259 802, Web: www.rcpit.ac.in**

## Second Year B. Tech Electrical Engineering Semester-III (w.e.f 2024-2025) (NEP)(RCP23 Scheme)

| SN | Course Category | Course Code | Course Title | Teaching Scheme | | | Evaluation Scheme | | | | ESE | Total | Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | TA | Term Test 1 (TT 1) | Term Test 2 (TT 2) | Average of TT 1 / TT2 | | | |
| | | | | | | | A | | | B | C | [A+B+C] | |
| 1 | PC | RCP23LCPC301 | Engineering Mathematics for Electrical Engineering | 3 | | | 25 | 15 | 15 | 15 | 60 | 100 | 3 |
| 2 | PC | RCP23LCPC302 | Analog and Digital Electronics | 3 | | | 25 | 15 | 15 | 15 | 60 | 100 | 3 |
| 3 | PC | RCP23LLPC302 | Analog and Digital Electronics Laboratory | | | 2 | 25 | | | | 25 | 50 | 1 |
| 4 | PC | RCP23LCPC303 | Electrical Measurement and Instrumentation | 3 | | | 25 | 15 | 15 | 15 | 60 | 100 | 3 |
| 5 | PC | RCP23LLPC303 | Electrical Measurement and Instrumentation Laboratory | | | 2 | 25 | | | | 25 | 50 | 1 |
| 6 | MD | RCP23LLMD301 | Python Programming Laboratory | | | 2 | 25 | | | | 25 | 50 | 1 |
| 7# | OE# | RCP23OCOE301 | Product Lifecycle Management | 3 | | | 25 | 15 | 15 | 15 | 60 | 100 | 3 |
| | | RCP23OCOE302 | Management Information System | | | | | | | | | | |
| | | RCP23OCOE303 | Operations Research | | | | | | | | | | |
| | | RCP23OCOE304 | Personal Finance Management | | | | | | | | | | |
| | | RCP23OCOE305 | Public Systems and Policies | | | | | | | | | | |
| | | RCP23OCOE306 | Fundamentals of Biomedical Instruments | | | | | | | | | | |
| | | RCP23OCOE307 | IPR & Patenting | | | | | | | | | | |
| | | RCP23OCOE308 | Entrepreneurship and Startup Ecosystem | | | | | | | | | | |
| 8 | SC | RCP23IPSC301 | Semester Project-I | | | 2 | 25 | | | | 25 | 50 | 1 |
| 9 | HS | RCP23ICHSX03 | Economics and Financial Management | 2 | | | 25 | 15 | 15 | 15 | 60 | 100 | 2 |
| 10 | HS | RCP23ICHSX04 | Universal Human Values | 3 | | | 25 | 15 | 15 | 15 | 60 | 100 | 3 |
| 11 | EL | RCP23ILELX05 | Community Engagement Service | | | 2 | 25 | | | | | 25 | 1 |
| | | | **Total** | 17 | | 10 | 275 | 90 | 90 | 90 | 460 | 825 | 22 |

PC: Professional Course, MD: Multidisciplinary, OE: Open Elective, SC: Skill Course, HS: Humanity and Science, EL: Experimental Learning, # Any 1 Open Elective

Prepared By

Checked By

BOS Chairman

Controller of Examination
COE
R.C.Patel Institute of Technology
Shirpur Dist.Dhule 425 405

Dy. Director
Deputy Director
R. C. Patel Institute of Technology
Shirpur, Dist. Dhule (MS)

DIRECTOR
Director
R C Patel Institute of Technology
Shirpur Dist Dhule (MS)

| SN | Course Category | Course Code | Course Title | Teaching Scheme L | T | P | TA | Term Test 1 (TT 1) | Term Test 2 (TT 2) | Average of TT 1 / TT2 | ESE | Total | Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | A | | | B | C | [A+B+C] | |
| 1 | PC | RCP23LCPC401 | Power System-I | 3 | | | 25 | 15 | 15 | 15 | 60 | 100 | 3 |
| 2 | PC | RCP23LLPC401 | Power System-I Laboratory | | | 2 | 25 | | | | 25 | 50 | 1 |
| 3 | PC | RCP23LCPC402 | Electrical Machine-I | 3 | | | 25 | 15 | 15 | 15 | 60 | 100 | 3 |
| 4 | PC | RCP23LLPC402 | Electrical Machine-I Laboratory | | | 2 | 25 | | | | 25 | 50 | 1 |
| 5 | PC | RCP23LCPC403 | Microcontroller & Applications | 3 | | | 25 | 15 | 15 | 15 | 60 | 100 | 3 |
| 6 | PC | RCP23LLPC403 | Microcontroller & Applications Laboratory | | | 2 | 25 | | | | 25 | 50 | 1 |
| 7 | MD | RCP23LCMD401 | Data Structures & Algorithms | 2 | | | 25 | 15 | 15 | 15 | 60 | 100 | 2 |
| 8 | MD | RCP23LLMD401 | Data Structures & Algorithms Laboratory | | | 2 | 25 | | | | 25 | 50 | 1 |
| 9# | OE# | RCP23OCOE401 | Project Management | 3 | | | 25 | 15 | 15 | 15 | 60 | 100 | 3 |
| | | RCP23OCOE402 | Cyber Security, Policies and Laws | | | | | | | | | | |
| | | RCP23OCOE403 | Advanced Operations Research | | | | | | | | | | |
| | | RCP23OCOE404 | Corporate Finance Management | | | | | | | | | | |
| | | RCP23OCOE405 | Corporate Social Responsibility | | | | | | | | | | |
| | | RCP23OCOE406 | Bio Informatics | | | | | | | | | | |
| | | RCP23OCOE407 | Human Resource Management | | | | | | | | | | |
| | | RCP23OCOE408 | Digital Marketing Management | | | | | | | | | | |
| | | RCP23OCOE409 | Logistics & Supply Chain Management | | | | | | | | | | |
| 10 | SC | RCP23IPSC401 | Semester Project-II | | | 2 | 25 | | | | 25 | 50 | 1 |
| 11 | HS | RCP23ITHSX01 | Professional & Business Communication Tutorial | | 2 | | 25 | | | | | 25 | 2 |
| 12 | HS | RCP23ITHSX02 | Design Thinking Laboratory | | | 2 | 25 | | | | | 25 | 1 |
| | | | **Total** | **14** | **2** | **12** | **300** | **75** | **75** | **75** | **425** | **800** | **22** |

PC: Professional Course, MD: Multidisciplinary, OE: Open Elective, SC: Skill Course, HS: Humanity and Science, # Any 1 Open Elective

Prepared By    Checked By    BOS Chairman

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R.C.Patel Institute of Technology
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Shirpur Education Society's

# R. C. Patel Institute of Technology, Shirpur
# (An Autonomous Institute)

### Syllabus Booklet
### Departemtn of Electrical Engineering

## Second Year B.Tech.

### With Effect from Academic Year 2024-25

**Shahada Road, Near Nimzari Naka, Shirpur, Maharashtra 425405**
**Ph: 02563 259 802, Web: www.rcpit.ac.in**

# Engineering Mathematics for Electrical Engineering (RCP23LCPC301)

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**Teaching Scheme**

Lectures: 03 Hrs./Week

Credit: 03

**Examination**

Term Test: 15 Marks

Teacher Assessment: 25 Marks

End Sem Exam: 60 Marks

Total: 100 Marks

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## Course Objectives

1. To build the strong foundation in Mathematics of learner needed for the field of Electronics and Telecommunication Engineering.

2. To provide learner with mathematics fundamentals necessary to formulate, solve and analyses complex engineering problems.

3. To prepare student to apply reasoning informed by the contextual knowledge to engineering practice.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | Identify diagonalizable and derogatory matrices and find functions as a square matrix using eigenvalues and eigenvectors | L1 | Remembering |
| CO2 | Find Fourier Series of periodic functions and simplify infinite series | L4 | Analyzing |
| CO3 | Evaluate vector diffentiations and integrals | L4 | Analyzing |
| CO4 | Identify analytic and harmonic functions. | L1 | Remembering |
| CO5 | Use Laplace and inverse Laplace Transform to solve the Ordinary Differential Equations. | L3 | Applying |

# Course Contents

### Unit-I        Matrix theory        08 Hrs.

Eigenvalues and Eigenvectors, properties of Eigenvalues and Eigenvectors, Cayley-Hamilton theorem, Examples based on verification of Cayley-Hamilton theorem, Similarity of matrices, Diagonalization of matrices,Function of square matrix, Quadratic forms over real field, Reduction of quadratic form to a diagonal, canonical form, Rank, index and signature of quadratic form, class value of quadratic forms, definite, Semi-definite and indefinite.

### Unit-II        Fourier Series        08 Hrs.

Introduction: Orthogonal and orthonormal set of functions,Introduction of Dirichlet's conditions, Euler's formulae. Fourier Series of Functions: Exponential, trigonometric functions of any period 2L. Even and odd functions, half range sine and cosine series. Complex form of Fourier series.

### Unit-III Vector Algebra, Vector Differentiation & Vector Integral 06 Hrs.

Vector differentiation, Gradient of scalar point function, Divergence and Curl of vector point function Properties: Solenoidal and irrotational vector fields, conservative vector field.

**Vector Integral:** Green"s theorem in a plane, Gauss divergence theorem and Stokes' theorem.

### Unit-IV        Complex Variable        06 Hrs.

Analytic Function: Necessary and sufficient conditions (No Proof), Cauchy Riemann equation Cartesian form (No Proof) Cauchy Riemann Equation in polar form (with Proof), Milne Thomson Method and its application, Harmonic function, orthogonal trajectories.

**Mapping:** Conformal mapping, Bilinear transformations, cross ratio, fixed points.

### Unit-V        Laplace Transform        05 Hrs.

LT of standard functions such as Heaviside Unit step function, Dirac Delta function, Periodic functions Linearity property of Laplace Transform, First Shifting property, Second Shifting property, Change of Scale property, Multiplication by power of t property of LT, Division by power of t property, LT of Integral, LT of Derivatives(without proof).

### Unit-VI        Inverse Laplace Transform        05 Hrs.

Properties, Partial fractions method and convolution theorem. Applications to solve ordinary differential equations with one dependent variable with given boundary conditions.

### Text Books

1. Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publication, 43$^{rd}$ Edition, 2020.

2. B. V. Ramana, Higher Engineering Mathematics, Tata Mc-Graw Hill Publication, 6$^{th}$ Edition, 2017.

## Reference Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern Limited, 10$^{th}$ Edition,2009.

2. Wylie and Barret, Advanced Engineering Mathematics, Tata Mc-Graw Hill, 6$^{th}$ Edition, 1995.

3. Dennis G. Zill & Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett Publishers, 1$^{st}$ Edition, 2009.

## Evaluation Scheme:

**Continuous Assessment (A):**

Subject teacher will declare Teacher Assessment criteria at the start of semester.

**Continuous Assessment (B):**

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average in both the tests will be considered for final grading.

**End Semester Examination (C):**

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

# Analog and Digital Electronics (RCP23LCPC302)

**Teaching Scheme**

Lectures: 03 Hrs./Week

Credit: 03

**Examination Scheme**

Term Test: 15 Marks

Teacher Assessment: 25 Marks

End Sem Exam: 60 Marks

Total: 100 Marks

## Prerequisites

Basic Electrical and Electronics Engineering, Concepts of semiconductors and P-N junction, gate and number system

## Course Objectives

1. To provide an understanding of the fundamental concepts of analog and digital electronics

2. To develop skills in analyzing, designing, and troubleshooting analog and digital circuits.

3. To introduce students to the practical applications of analog and digital electronics in electrical engineering

4. To familiarize students with the use of simulation tools for circuit analysis and design.

5. To encourage critical thinking and problem-solving skills through practical laboratory experiments.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | Understand the Fundamental Concepts of Analog and Digital Electronics. | L2 | Understand |
| CO2 | Analyze and Interpret Characteristics and Operation of Electronic Components | L4 | Analyze |
| CO3 | Design Analog and Digital Circ | L6 | Create |
| CO4 | Evaluate Performance of Electronic Circuits | L5 | Evaluate |
| CO5 | Apply Knowledge of Analog and Digital Electronics to Solve Engineering Problems | L3 | Apply |

# Course Contents

**Unit-I**          **Diode, BJT and coupling**          **08 Hrs.**

P-N junction diode, V-I characteristics of a diode, half-wave, full wave rectifiers and bridge rectifiers, Filter circuit, clamper, clipper, Introduction, Types of Configuration: common base, common emitter and common collector configurations, operating point, DC load line analysis, stability and DC biasing circuits, Cascade amplifier and introduction of MOSFET

**Unit-II**          **Op-Amp Its Linear and Non-Linear Applications and Timer IC**          **08 Hrs.**

Ideal op-amp, non-idealities in an op-amp. Linear Applications: Idealized analysis of op-amp circuits, virtual ground concept, inverting and non-inverting amplifier, differential amplifier, adder, subtractor, Integrator, Differentiator, instrumentation amplifier, Non-Linear Applications: Comparator, Zero Crossing Detector, Schmitt trigger with hysteresis, active filters-Low pass, high pass, band pass, all pass, band reject (notch) filters. Multivibrator: IC 555 Astable, Monostable and Bistable.

**Unit-III**          **Combinational and Sequential Circuits**          **08 Hrs.**

MOS Review of postulates of Boolean algebra, Theorems of Boolean algebra, Boolean function and k- map minimization technique for multiple outputs, multiplexer, de- multiplexer, priority encoder, comparator, half  full adders, tristate buffers. Latches – S-R latch, D latch, flip-flops-D, J-K , T , master slave J-K F/F, conversion of one F/F to another F/F.

**Unit-IV**          **Sequential Circuits and its Applications**          **08 Hrs.**

Counters: Modulus of Counter, Synchronous and Asynchronous counters, Ripple counters, drawbacks of ripple counters, Ring counters, Twisted Ring Counters, Shift registers, types of shift registers, design using Flip Flops- Bidirectional shift register, Universal shift register,

**Unit-V**          **DA, AD Converters and Memory**          **08 Hrs.**

Digital to analog converters: weighted resistor/convertor, R-2R Ladder D/A converter, specifications for D/A converters, analog to digital converters, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, specifications of A/D and Digital memories: RAM, ROM and content addressable memory (CAM), ROM as a PLD, Programmable logic array, Programmable array logic,

# Text Books

1. Sergio Franco, Design with Op-Amps and analog Integrated Circuits, Tata McGraw-Hill Publication, Third Edition, 2001.

2. Allen Mottershead, Electronic Devices Circuits: An Introduction, Prentice Hall India, 2010

3. A. Anand Kumar, Fundamentals of Digital Circuits, Prentice Hall India, Fourth Edition, 2014

# Reference Books

1. R.A. Gayakwad, "Op-Amps Linear Integrated Circuits", Prentice Hall India, Fourth Edition, 2012.

2. R. L. Boylestad and Louis Nashelsky, "Electronic Devices Circuit Theory", Pearson Publications, Tenth Edition, 2009.

3. M. Moris Mano and Michael Ciletti, "Digital Design", Pearson Publications, Fifth Edition,

# Evaluation Scheme:

**Continuous Assessment (A):**

Course teacher will declare Teacher Assessment criteria at the start of semester.

**Continuous Assessment (B):**

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average in both the tests will be considered for final grading.

**End Semester Examination (C):**

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

# Analog and Digital Electronics Laboratory (RCP23LLPC302)

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**Teaching Scheme**

Practical: 02 Hrs/Week

Credit: 01

**Examination Scheme**

Teacher Assessment: 25 Marks

End Sem Exam : 25 Marks

Total: 50 Marks

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## Course Objectives

1. This lab course intends to provide basic practical knowledge of various ICs for developing linear integrated circuits.

2. It intends to impart skills to implement different electronic circuits using operational amplifier.

3. It aims to develop an ability to design and implement combinational and sequential circuits.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | Distinguish various analog and digital circuits | L2 | Understand |
| CO2 | Illustrate linear integrated circuits using electronic components like Op-amps, transistors, etc. | L3 | Apply |
| CO3 | Implement applications of various analog and digital circuits. | L3 | Apply |
| CO4 | Analyze and design the given digital circuits. | L4,L6 | Analyze, Create |
| CO5 | Acquire experience of working individually as well as a team in designing, building and troubleshooting simple digital electronics circuits. | L3 | Apply |

# List of the Experiments

List of Laboratory Experiments (minimum 10 to be covered)

**Part A**

**Any 5 experiments from Part-A (3- Hardware base, 1- Simulation and 1- Innovative experiments)**

1. To design, assemble and test the wave shaping circuit using diode - clipping and clamping circuits.

2. To Plot I/P and O/P characteristics of BJT (CE Configuration)

3. To Plot DC Load Line for BJT (Voltage Divider biasing circuit)

4. Design and implementation of integrator, differentiator

5. Design and implementation of instrument amplifier

6. Setup ADC circuit Using IC LM 741 and study its performance

7. Design of the astable multivibrator using IC 555

8. Voltage Follower and Buffer Circuit Design: To design and implement a voltage follower and buffer circuit using the IC741 operational amplifier, and to analyze its characteristics and applications. (Innovative)

9. Sequential Timer(IC-555) for DC Motor Control(Innovative

**Part B**

**Any 5 experiments from Part-B (3- Hardware base, 1- Simulation and 1- Innovative experiments))**

1. Design and implementation of 4 bit Gray to Binary Code Converter

2. Design and implementation of Half and Full Adder circuits

3. Design and implementation of Half and Full subtractor circuits

4. Demonstration of the JK, D and T flip flops using ICs

5. Implement BCD adder using four-bit binary adder IC-7483.

6. Design and implementation of multiplexer and de-multiplexer using ICs

7. Design and implementation of ripple counter using ICs.

8. Design and implementation of 3-bit Synchronous Up/Down counter

9. Construction of adder circuit using Shift Register and full Adder. (Innovative)

10. Code conversion circuits- BCD to Excess-3 and vice-versa. (Innovative

## Computer Usage / Lab Tools

of software simulation tools like Proteus, PSpice etc.Use of analog and digital circuit trainer kits.

### Reference Books

1. R.A. Gayakwad, "Op-Amps Linear Integrated Circuits", Prentice Hall India, Fourth Edition, 2012.

2. R. L. Boylestad and Louis Nashelsky, "Electronic Devices Circuit Theory", Pearson Publications, Tenth Edition, 2009.

3. M. Moris Mano and Michael Ciletti, "Digital Design", Pearson Publications, Fifth Edition,

**Evaluation Scheme:**

**Continuous Assessment (A):**

Laboratory work shall consist of minimum 8 experiments and subject specific lab assignment/case study/mini project.

The distribution of marks shall be as follows:

1. Performance in Experiments: 05 Marks

2. Journal Submission: 05 Marks

3. Viva-voce: 05 Marks

4. Subject Specific Lab Assignment/Case Study/mini project: 10 Marks

The final certification and acceptance of laboratory journal/manual/report will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the teacher assessment.

**End Semester Examination (C):**

Oral / Practical examination will be based on the entire syllabus including, the practicals performed during laboratory sessions.

# Electrical Measurement and Instrumentation (RCP23LCPC303)

**Teaching Scheme**

Lectures: 03 Hrs./Week

Credit: 03

**Examination**

Term Test: 15 Marks

Teacher Assessment: 25 Marks

End Sem Exam: 60 Marks

Total: 100 Marks

**Prerequisites** Basic Electrical and Electronics Engineering

## Course Objectives

1. Basic concepts of errors in measurements and basic fundamentals of measuring systems, philosophy of measurement and standards.

2. Skills to classify bridges, measuring instruments and equipment's and also demonstrate digital instruments, advance instruments.

3. Basic knowledge of transducer and recorders.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | To understand the philosophy of measurement systems, types of errors, standards. | L2 | Understand |
| CO2 | To understand the construction, working principle of analog and digital instruments, bridges, transducers and recorders. | L2 | Understand |
| CO3 | To analyze the different parameters of electrical quantity in analog and digital instruments. | L4 | Analyze |
| CO4 | To analyze the various parameters of DC and AC bridges. | L4 | Analyze |
| CO5 | To analyze the various errors produced in analog and digital instruments. | L4 | Analyze |

# Course Contents

### Unit-I Introduction to Measurement and Instrumentation 08 Hrs.

Philosophy of Measurement: Methods of Measurement, Measurement System, Classification of instrument system, Characteristics of instruments & measurement system, Errors in measurement & its analysis, Standards. .

### Unit-II    Analog Measurement of Electrical Quantities    08 Hrs.

Philosophy of Measurement: Methods of Measurement, Measurement System, Classification of instrument system, Characteristics of instruments measurement system, Errors in measurement its analysis, Standards.

### Unit-III    Digital Measurement of Electrical Quantities    08 Hrs.

Concept of digital measurement, block diagram Study of digital voltmeter, frequency meter Power Analyzer and Harmonics Analyzer; Electronic Multimeter

### Unit-IV      Measurement of Parameters      08 Hrs.

Different methods of measuring low, medium and high resistances, measurement of inductance capacitance with the help of AC Bridges, Q Meter.

### Unit-V      Introduction to Transducers      08 Hrs.

Semiconductor Memory: Classification and Characteristics of memory, SRAM, DRAM, ROM, PROM, EPROM and Flash memories Programmable Logic Devices (PLD): Programmable Array Logic (PAL), Programmable Logic Array (PLA), designing combinational circuits using PLDs.

## Text Books

1. E. W. Golding, "Electrical Measurements and Measuring instruments", Reem Publication, 23$^{rd}$ edition.

2. C. T. Baldwin, "Fundamentals of Electrical Measurements", Kalyani Publication, 2$^{nd}$ edition.

3. Cooper and Derfllick, "Electronic Instrumentation and Measurements Techniques", Prentice-Hall of India, , 3$^{rd}$ edition.

4. J. B. Gupta, "Electrical  Electronic Measurement and Instrumentation", S. K. Kataria  Son, 14$^{th}$ edition.

5. R. K. Rajput, "Electrical  Electronic Measurement and Instrumentation", S. Chand.

## Reference Books

1. A. K. Sawhney. "Electrical  Electronic Measurement and Instrumentation", Dhanpant Rai  Co.

## Evaluation Scheme:

### Continuous Assessment (A):

Course teacher will declare Teacher Assessment criteria at the start of semester.

### Continuous Assessment (B):

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average in both the tests will be considered for final grading.

### End Semester Examination (C):

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

# Electrical Measurement and Instrumentation Laboratory (RCP23LLPC303)

**Teaching Scheme**

Practical: 02 Hrs/Week

Credit: 01

**Examination**

Teacher Assessment: 25 Marks

End Sem Exam : 25 Marks

Total: 50 Marks

## Course Objectives

The objective of the laboratory is to impart the fundamental knowledge of measuring instruments. Students develop their ability to select the specific instrument in reference of ranges and resolution of instruments for proper and correct analysis. The students will able to understand the characteristic of measuring instruments. In this lab course, students will be familiar with the use of different equipments, safety precautions on work place. This makes bridge on theoretical knowledge and practical practices.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | To Understand the real and reactive power flow in power system network. | L2 | Understand |
| CO2 | To Understand the importance of load flow study. | L2 | Understand |
| CO3 | To Demonstrate the concept of power system stability using equal area criteria, load frequency control. | L3 | Apply |
| CO4 | To Understand the concept of economic load dispatch | L2 | Understand |
| CO5 | To determine the reactive power and voltage for a given system. | L4 | Analyze |

# List of the Experiments

**List of Laboratory Experiments (minimum 10 to be covered)**

**Part A**

**Any 5 experiments from Part-A**

1. Study of Various analog and Digital measuring Instruments.

2. Measurement of active power by using two wattmeter method.

3. Measurement of reactive power by using two wattmeter method.

4. Calibration of single phase energy meter.

5. Study of different bridges.

6. Earth resistance measurement using earth tester.

7. Insulation measurement using megger.

8. Design and implementation of bridges.(Innovative)

9. Voltage Measurement. (Innovative)

**Part B**

**Any 5 experiments from Part-B**

1. Study of DSO, Power Analyzer.

2. Study of Instrument T/F and its types.

3. Study of Digital torque measurement.

4. Study of Linear Variable differential Transformer.

5. Study of digital frequency meter and digital Voltmeter.

6. Construction of ammeter and voltmeter.

7. Strain measurement using strain gauge.

8. Current Measurement using Falstad. (Innovative)

9. Power Measurement using Matlab. (Innovative)

## Lab Tools

1. Use of software simulation tools like Matlab, Proteus.

2. Use of Measuring and Instrument trainer kits.

## Web Resources

1. www.Falstad.com/circuit/( Circuit Simulator Applet)

## Reference Books

1. E. W. Golding, "Electrical Measurements and Measuring instruments", Reem Publication, 23rd edition.

2. C. T. Baldwin, "Fundamentals of Electrical Measurements", Kalyani Publication, 2nd edition.

3. Cooper and Derfllick, "Electronic Instrumentation and Measurements Techniques", Prentice-Hall of India, 3rd edition.

4. J. B. Gupta, "Electrical  Electronic Measurement and Instrumentation", S. K. Kataria  Son, 14th edition.

## Evaluation Scheme:

### Continuous Assessment (A):

Laboratory work shall consist of minimum 8 experiments and subject specific lab assignment/case study/mini project.

The distribution of marks shall be as follows:

1. Performance in Experiments: 05 Marks

2. Journal Submission: 05 Marks

3. Viva-voce: 05 Marks

4. Subject Specific Lab Assignment/Case Study/mini project: 10 Marks

The final certification and acceptance of laboratory journal/manual/report will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the teacher assessment.

### End Semester Examination (C):

Oral / Practical examination will be based on the entire syllabus including, the practicals performed during laboratory sessions.

# Python Programming Laboratory (RCP23LLMD304)

**Teaching Scheme**                                    **Examination**

Practical: 02 Hrs/Week              Teacher Assessment: 25 Marks

Credit: 01                                End Sem Exam : 25 Marks

Total: 50 Marks

## Course Objectives

1. Python programming basics, Functions in Python and files handling.

2. GUI Programming and Databases operations in Python

3. Data handling using Python

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | Describe the various data types, control statements, conditional statements and functions in Python | L2 | Understand |
| CO2 | Understand different File handling and exception handling operations using Python | L2 | Understand |
| CO3 | Apply Database techniques in python using MySQL with Python | L3 | Apply |
| CO4 | Design GUI, apply different database operations and array handling in Python | L3 | Apply |
| CO5 | Implement Visualization of dataset using Pandas Dataframe and Matplotlib | L3 | Apply |

# Course Contents

## Unit-I       Introduction to Python       06 Hrs.

**Introduction to Python**

History of Python, Data types & Regular expression, Basic Data types identifiers, Basic Data types, Integer Data Type, Float and Complex Data Type, Mathematical Functions, String Data Types, String Manipulation Functions, String Slices Basic Data Types Collections- Lists: Working with Lists, Basic Operations, Sorting, Count & Append, List Comprehension , Dictionary: Definition, Update dictionary, Dictionary Comprehension , Sets, Tuples and Frozen Sets, Data type Conversion

**List of Suggested Practical (Any three)**

1. To read a number 'n' and print patterns

2. Program to map a list into a dictionary and vice versa

3. Program to study list and dictionary comprehension

4. To implement different string manipulation functions.

5. To count the number of letters/ vowels/ consonants in a string or a list or a dictionary. (Multiple variations of the above suggested programs can be performed)

## Unit-II     Control statements and Functions in Python     06 Hrs.

While, for, Nested loops. Use of Continue, Pass and Break statement. Range function, Conditional Statements: if, else, elif, nested if and Switch Case statements , Function arguments pass by value and reference, Recursive Functions.

**List of Suggested Practical (Any three)**

Use of the control statements to implement: -

1. Factorial of a number

2. Palindrome of number or a string

3. Fibonacci series

4. Sine and Cosine series

5. Pythagoras triplets

6. Any one program to demonstrate the method of recursive function

## Unit-III       Files Directories & Flow control       06 Hrs.

**Files Directories & Flow control:**

Making and List directories, Changing directory, List files in directories. File & Directory manipulation. File functions, File object attributes, close () method, Opening a binary file. File Attributes, read (read fixed size) readline ( ) tell (). Read data from keyboard. File handling: Opening and closing file, Reading and writing files. Exception Handling, Except Clause, User defined Exceptions

**List of Suggested Practical (Any three)**

1. Open a file and read the contents of a file and print

2. Open a file and write to a file (overwrite and append).

3. Open a file and count the characters present in the file.

4. Program to demonstrate Exception Handling

5. Splitting of lines by file handling.

## Unit-IV        Python Database        04 Hrs.

Introduction to Python Database, Connections and Executing queries, Transactions and Handling Errors

**List of Suggested Practical (Any Two)**

1. Install MySQL db

2. Establish database connection

3. Creating Database Table.

4. Use of Insert/Read/Update Operations in database.

## Unit-V        Introduction to GUI Programming        04 Hrs.

Introduction to Tkinter  Working with Widgets  Controlling Layout with Geometry Managers ,  Creating and using labels, Buttons, Check buttons, Radio Buttons ,  Making Applications Interactive

**List of Suggested Practical (Any Two)**

1.Example App: Temperature Converter

2. Example App: Text Editor

3. Tic tac toe Game using GUI

4. Scientific calculator.

## Unit-VI        Visualization of Data        04 Hrs.

Working with numpy, constructing numpy arrays, Printing arrays,  Arithmetic operations on matrix, Slicing Arrays, Random number generation.   Working with Matplotlib,  Working with pandas: Installation and implementation

**List of Suggested Practical (Any Two)**

1. Data visualization with matplotlib.

2. Array manipulation/strings/indexing/slicing and other numpy library functions.

3. Histogram using matplotlib.

4. Statistical functions in numpy.

5. Any one tool kits to extend python matplotlib functionality.

## Text Books

1. James Payne,"Beginning Python: Using Python 2.6 and Python 3.1",Wrox Publication

2. Dr. R. Nageswara Rao,"Core Python Programming" Dreamtech Press, Wiley Publication.

## Reference Books

1. Lutz, "Learning Python" O'Really Publication

2. E. Balaguruswamy," Introduction to Computing and Problem Solving using Python", McGraw Hill Education India Pvt.,Ltd..

3. Magnus Lie Hetland,"Beginning Python from Novice to Professional", Second Edition", Apress Publication.

4. Charles Dierbach, Introduction to Computer Science using Python, Wiley, 2013

5. Laura Cassel, Alan Gauld "Python Projects", Wrox Publication

## Evaluation Scheme:

## Continuous Assessment (A):

Laboratory work shall consist of minimum 8 experiments and subject specific lab assignment/case study/mini project.

The distribution of marks shall be as follows:

1. Performance in Experiments: 05 Marks

2. Journal Submission: 05 Marks

3. Viva-voce: 05 Marks

4. Subject Specific Lab Assignment/Case Study/mini project: 10 Marks

The final certification and acceptance of laboratory journal/manual/report will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the teacher assessment.

## End Semester Examination (B):

Oral / Practical examination will be based on the entire syllabus including, the practicals performed during laboratory sessions.

## Laboratory: (Suggested experiments)

1. Installing python and setting up environment. Simple statements like printing the names, numbers, mathematical calculations, etc.

2. Programs related to string manipulation.

3. Programs Lists, Tuples, Sets, arrays and dictionaries.

4. Programs based on various loops, conditional constructs and functions.

5. PYTHON program to update in the file "friends Contact.txt" which has name and contact and change the number of an old contact.

6. Write a program to demonstrate the BPSK signal of sequence [1 0 0 0 1 0 1 0 0 1].

7. Write a program create a table for books and extract the author's name and book title for books made after and 2022

8. Create a GUI that converts temperature input in Celcius to Farenheit

9. Read a csv dataset using pandas datafrme and create a scatter plot.

   Any other experiment based on syllabus may be included, which would help the learner to understand topic/concept.

# Product Life Cycle Management (RCP23OCOE301)

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**Teaching Scheme**
Lectures: 03 Hrs./Week
Credit: 03

**Examination**
Term Test: 15 Marks
Teacher Assessment: 25 Marks
End Sem Exam: 60 Marks
Total: 100 Marks

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## Course Objectives

1. To familiarize the students with the need, benefits and components of PLM.

2. To acquaint students with Product Data Management & PLM strategies.

3. To give insights into new product development program and guidelines for designing and developing a product.

4. To familiarize the students with Virtual Product Development.

5. To acquaint students with the need of Environmental aspects in PLM & its implementation

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | Gain knowledge about phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation. | L2 | Understand |
| CO2 | Illustrate various approaches and techniques for designing and developing products. | L1 | Remember |
| CO3 | Acquire knowledge in applying virtual product development tools. | L1 | Remember |
| CO4 | Acquire knowledge in implementation of Environmental aspects in PLM. | L1 | Remember |

# Course Contents

## Unit-I Introduction to Product Lifecycle Management (PLM) 07 Hrs.

**Introduction to Product Lifecycle Management (PLM):**

Product Lifecycle management (PLM), Need for PLM, Product Lifecycle Phases, Opportunities of Globalization, Pre-PLM Environment, PLM Paradigm, Importance & Benefits of PLM, Widespread Impact of PLM, Focus and Application, A PLM Project, Starting the PLM Initiative, PLM Applications.

**PLM Strategies:** Industrial strategies, Strategy elements, its identification, selection and implementation, Developing PLM Vision and PLM Strategy, Change management for PLM.

## Unit-II    Product Design and Development    07 Hrs.

**Product Design and Development:**

Product Design and Development Process, Engineering Design, Organization and Decomposition in Product Design, Typologies of Design Process Models, Reference Model, Product Design in the Context of the Product Development Process, Relation with the Development Process Planning Phase, Relation with the Post design Planning Phase.

## Unit-III    Methodological Evolution of Product Design    10 Hrs.

**Methodological Evolution of Product Design:**

Concurrent Engineering, Characteristic Features of Concurrent Engineering, Concurrent Engineering, Life Cycle Approach, Characteristic Features of Life Cycle Approach. The Design for X System, Objective Properties and Design for X Tools, Choice of Design for X Tools and Their Use in the Design Process. New Product Development (NPD) and Strategies, Product Configuration and Variant Management.

**Integration of Environmental Aspects in Product Design:**

Sustainable Development Design for Environment, Need for Life Cycle Environmental Strategies, Useful Life Extension Strategies, End-of-Life Strategies, Introduction of Environmental Strategies into the Design Process, Life Cycle Environmental Strategies and Considerations for Product Design, Tools and techniques for integrated design, Implementation of international standards.

## Unit-IV    Product Data Management (PDM)    07 Hrs.

**Product Data Management (PDM):**

Product and Product Data, PDM systems and importance, Components of PDM, Reason for implementing a PDM system, financial justification of PDM, barriers to PDM implementation.

**Virtual Product Development Tools:**

For components, machines, and manufacturing plants, 3D CAD systems and realistic rendering techniques, Digital mock-up, Model building, Model analysis, Modelling and simulations in Product Design, Examples/Case studies.

## Unit-V    Engineering Methods for product Duration design & evaluation    08 Hrs.

**Engineering Methods for product Duration design & evaluation:**

Durability of Products and Components, Design for Fatigue, Infinite Life Approach, Design for Finite Life.

**Product Recovery Planning & Analysis:**

Approach to the Recovery Problem, Method for Recovery Cycles Planning, Calculation Models for Recovery Cycles Planning, Basic procedure, Determinant Factors for Recovery, Effective Component Reusability, Recovery Fractions, Extension of Useful Life.

## Text Books

1. John Stark, — Product Lifecycle Management: Paradigm for 21$^{(}$st$^{)}$ Century Product Realisation‖, Springer-Verlag, 2004. ISBN: 1852338105.

2. Fabio Giudice, Guido La Rosa, Antonino Risitano, — Product Design for the environment-A life cycle approach‖, Taylor & Francis 2006, ISBN: 0849327229

## Reference Books

1. Saaksvuori Antti, Immonen Anselmie, — Product Life Cycle Management, Springer, Dreamtech, ISBN: 3540257314

2. Michael Grieve, — Product Lifecycle Management: Driving the next generation of lean thinking, Tata McGraw Hill, 2006, ISBN: 0070636265

3. François Villeneuve, Luc Mathieu, Max Giordano —Product Life-Cycle Management: Geometric Variations. (2010). United Kingdom: Wiley.

## Evaluation Scheme:

**Continuous Assessment (A):**

Subject teacher will declare Teacher Assessment criteria at the start of semester.

**Continuous Assessment (B):**

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average in both the tests will be considered for final grading.

**End Semester Examination (C):**

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

# Management Information System (RCP23OCOE302)

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**Teaching Scheme**

Lectures: 03 Hrs./Week

Credit: 03

**Examination Scheme**

Term Test: 15 Marks

Teacher Assessment: 25 Marks

End Sem Exam: 60 Marks

Total: 100 Marks

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## Course Objectives

1. The course is blend of management and technical field.

2. Discuss the roles played by information technology in today's business and define various technology architectures on which information systems are built.

3. Define and analyze typical functional information systems and identify how they meet the needs of the firm to deliver efficiency and competitive advantage.

4. Identify the basic steps in systems development.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|---|---|---|---|
| CO1 | Explain the fundamental concepts of the management information systems used in business. | L4, L6 | Analyze, Evaluate |
| CO2 | Describe IT infrastructure and its components and its current trends. | L1 | Knowledge |
| CO3 | Use the tools and technologies for accessing information from databases to improve business performance and decision making | L3 | Apply |
| CO4 | Identify and explain the security and ethical challenges in MIS along with the measures to be taken | L2 | Understand |
| CO5 | Select a suitable social computing platform for the given requirements that integrates AI and IoT. | L2 | Understand |
| CO6 | Explain the processes involved in the information system within the organization includes information acquisition and enterprise and global management technologies. | L1 | Knowledge |

# Course Contents

Unit-I **Foundation Concepts** 04 Hrs.

**Foundation Concepts**

Definition and scope of Management Information Systems (MIS) in business, Functional area information system, The components of information systems, Impact of IT on organizations and society, Business Process : BPR and BPI. Business Pressure, Organizational responses. Competitive Advantage and Strategic IS's.

Unit-II **Information Technology Infrastructure** 05 Hrs.

**Information Technology Infrastructure** • Overview of IT infrastructure, • Hardware and software, • Computer systems: End user and enterprise, • Computing computer peripherals: Input, output, and storage technologies, • Application software: End user applications, • System software: Computer system management, • Data resource management: Technical foundations of database management, Managing data resources, Big data, Data warehouse and data marts, Knowledge management, • Networks: The networked enterprise (wired and wireless), Pervasive computing, Cloud computing models,

Unit-III **MIS Tools and applications for Decision making** 10 Hrs.

**MIS Tools and applications for Decision making**

• ERP and ERP support of business • Business intelligence (BI): Managers and Decision Making. • Decision Support System (DSS): types, components, Data mining. • Executive information system. • Role of AI in decision making. • Role of predictive analytics and data visualization in business

Unit-IV **Security and Ethical Challenges** 08 Hrs.

**Security and Ethical Challenges**

• Information security fundamentals, • Key principles of information security , • Common threats and vulnerabilities in MIS , • Security measures and controls, • Access control mechanisms: authentication, authorization, and accounting (AAA), • Encryption techniques and cryptographic protocols , • Ethical, and societal challenges of IT , • Legal and regulatory framework, • Privacy Policies

Unit-V **Social Computing (SC)** 06 Hrs.

**Social Computing (SC)**

• Web 2.0 and 3.0: static and dynamic platform, integration with AI and IoT , • SC in business-shopping: leveraging social media platforms, Social listening and sentiment analysis, • Social computing in Customer Relationship Management (CRM) , • Marketing, operational and analytic CRM, • E-business and E-commerce – B2B B2C, E-commerce platforms and payment gateways , • Mobile

commerce: growth trends, mobile wallets, contactless payments, shopping apps and platforms .

## Unit-VI      Information System within Organization      06 Hrs.

**Information System within Organization**

• Acquiring Information Systems and Applications: Various System development life cycle models, •
Enterprise and Global Management of Information Technology: Managing Information Technology,
Managing Global IT , • Business processes and information systems.

## Text Books

1. A. K. Gupta, "Management Information System", S. Chand Limited, 2010.

2. K. K. Ghosh, Saini Das, and S. Mukherjee, "Management Information System", Management,
   IIT, Kharagpur, 2021

## Reference Books

1. J. A. O'Brien, G. Marakas, "Management Information Systems", McGraw-Hill Companies, In-
   corporated, 2006.

2. K. Rainer, B. Prince, "Management Information Systems", Wiley, 2016.

# Web References

- Management Information System:

  https://nptel.ac.in/courses/110105148

- Management Information System (Archive):

  https://archive.nptel.ac.in/courses/110/105/110105148/

# Evaluation Scheme:

## Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

## Continuous Assessment (B):

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average in both the tests will be considered for final grading.

## End Semester Examination (C):

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

# Operations Research (RCP23OCOE303)

**Teaching Scheme**

Lectures: 03 Hrs./Week

Credit: 03

**Examination Scheme**

Term Test: 15 Marks

Teacher Assessment: 25 Marks

End Sem Exam: 60 Marks

Total: 100 Marks

## Course Objectives

1. Formulate a real-world problem as a linear programming problem and able to solve.

2. Understand the optimisation tools that are needed to solve linear programming problems.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | Formulate the real-world optimisation problem into a Linear Programming Problem (LPP) and analyse the solution obtained using LPP optimisation models. | L2 | Comprehension |
| CO2 | Solve Linear Programming Problems using transportation and assignment models. | L4 | Analyze |
| CO3 | Apply Decision Theory to determine the optimal course of action when a number of alternatives are available, and their consequences cannot be forecast with certainty and uncertainty. | L3 | Apply |
| CO4 | Apply Game Theory for decision making under conflicting situations where there are one or more opponents (players). | L3 | Apply |
| CO5 | To breaking down a large problem into smaller sub problems and solved recursively or iteratively using Dynamic Programming models. | L6 | Evaluate |

# Course Contents

**Unit-I**      **Introduction to Operations Research**      **12 Hrs.**

**Introduction to Operations Research:**

Introduction, Structure of the Mathematical Model, Limitations of Operations Research.

**Linear Programming:**

Introduction, Linear Programming Problem, Requirements of LPP, Mathematical Formulation of LPP, Graphical method, Simplex Method, Penalty Cost Method or Big M-method, Two Phase Method.

**Unit-II**      **Transportation Problem**      **08 Hrs.**

**Transportation Problem:**

Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions – North-west corner rule, least cost method and Vogel's approximation method. Optimality test: MODI method.

**Assignment Problem:**

Introduction, Mathematical Formulation of the Problem, Hungarian Method Algorithm, Processing of n Jobs Through Two Machines and m Machines, Graphical Method of Two Jobs m Machines Problem Routing Problem

**Unit-III**      **Decision Theory**      **06 Hrs.**

**Decision Theory:**

Steps in Decision Theory approach, Decision-making Environment, Decision making under condition of certainty, Decision making under condition of uncertainty, Decision making under condition of risk, Maximum likelihood criterion.

**Unit-IV**      **Game Theory**      **6 Hrs.**

**Game Theory:**

Competitive games, rectangular game, saddle point, minimax/maximin method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games.

**Unit-V**      **Dynamic programming**      **07 Hrs.**

**Dynamic programming:**

Characteristics of dynamic programming. Dynamic programming approach for Priority Management employment smoothening, capital budgeting, Stagecoach/Shortest Path, cargo loading and Reliability problems.

## Text Books

1. . Operations Research - An Introduction: Taha, H. A., Pearson Education, 2022.

2. Operations Research, Gupta, P. K. and Hira, D. S., S. Chand Publications, 2014.

## Reference Books

1. Operations Research: Introduction to Models and Methods, Boucherie, R. J., Tijms, H. and Braaksma, A., 2021.

2. Introduction to Operations Research: Hiller, F. S. and Liebermann, G. J., McGrawHill Higher Education, 2010.

3. Operations Research: Principles and Practice: Ravindran, A., Phillips, D. T. and Solberg, J. J., Wiley India Pvt. Limited, 2009

## Evaluation Scheme:

### Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

### Continuous Assessment (B):

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average in both the tests will be considered for final grading.

### End Semester Examination (C):

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

# Personal Finance Management (RCP23OCOE304)

**Teaching Scheme**

Lectures: 03 Hrs./Week

Credit: 03

**Examination Scheme**

Term Test: 15 Marks

Teacher Assessment: 25 Marks

End Sem Exam: 60 Marks

Total: 100 Marks

## Course Objectives

1. To create awareness and educate consumers on access to financial services.

2. To make the students understand the basic concepts, definitions and terms related to direct taxation.

3. To help the students compute the Goods and Service Tax (GST) payable by a supplier after considering the eligible input tax credit.

4. To familiarize the students with micro finance for accelerating the expansion of local microbusinesses

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | Understand the Indian financial system. | L2 | Understand |
| CO2 | Use a framework for financial planning to understand the overall role finances play in his/her personal life. | L3 | Apply |
| CO3 | Compute income from salaries, house property, business/profession, capital gains and income from other sources. | L3 | Apply |
| CO4 | Compute the amount of CGST, SGST and IGST payable after considering the eligible input tax credit. | L3 | Apply |
| CO5 | Understand how Microfinance can help in financial inclusion. | L2 | Understand |

# Course Contents

## Unit-I      Overview of Indian Financial System      07 Hrs.

**Overview of Indian Financial System:**

Characteristics, Components and Functions of Financial System. Financial Instruments and Financial Markets, Financial inclusion.

**Introduction to Personal Finance**

Personal Financial Planning in Action, Money Management Skills, Taxes in Your Financial Plan, Savings and Payment Services. Consumer Credit: Advantages, Disadvantages, Sources and Costs.

## Unit-II      Personal Financial Management      07 Hrs.

Personal Financial Management

**Loans:**

Home, Car, Education, Personal, Loan against property and Jewel loan.

**Insurance:**

Types of Insurance – ULIP and Term; Health and Disability Income Insurance, Life Insurance.

**Investment:**

Investing Basics and Evaluating Bonds, Investing in Stocks and Investing in Mutual Funds, Planning.

## Unit-III      Income Tax & Dynamics      09 Hrs.

**Income Tax**

**Income Tax Act Basics**

- Introduction to Income Tax Act, 1961 **Heads of Income and Computation of Total Income and Tax Liability-** Heads of Income and Computation of Total Income under various heads, Clubbing Provisions, Set off and carry forward of Losses, Deductions, Assessment of Income and tax liability of different persons.

**Tax Management, Administrative Procedures and ICDS -**

TDS,TCS and Advance Tax Administrative Procedures, ICDS.

## Unit-IV      Goods and Services Tax      08 Hrs.

**Goods and Services Tax**

GST Constitutional framework of Indirect Taxes before GST (Taxation Powers of Union & State Government); Concept of VAT: Meaning, Variants and Methods; Major Defects in the structure of Indirect Taxes prior to GST; Rationale for GST; Structure of GST (SGST, CGST, UTGST & IGST); GST Council, GST Network, State Compensation Mechanism, Registration.

**Levy and Collection of GST**

Taxable event "Supply" of Goods and Services; Place of Supply: Within state, Interstate, Import and

Export; Time of supply: Valuation for GST- Valuation rules, taxability of reimbursement of expenses; Exemption from GST: Small supplies and Composition Scheme: Classification of Goods and Services

| Unit-V | Introduction to Micro–finance | 08 Hrs. |

**Introduction to Micro–finance**

Micro-Finance: Definitions, Scope & Assumptions, Types of Microfinances, Customers of Micro-finance, Credit Delivery Methodologies, SHG concept, origin, Formation & Operation of Self-Help Groups (SHGs).

**Models in Microfinance -** Joint Liability Groups (JLG), SHG Bank Linkage Model and GRAMEEN Model: Achievements & Challenges.

**Institutional Mechanism**

Current Challenges for Microfinance, Microfinance Institutions (MFIs): Constraints & Governance Issues, Institutional Structure of Microfinance in India: NGO MFIs, NBFC MFIs, Co-operatives, Banks, Microfinance Networks and Associations; Demand & Supply of Microfinance Services in India, Impact assessment and social assessments of MFI

## Text Books

1. Banking and Financial Sector Reforms in India, by Asha Singh, M.S. Gupta, Serials Publication.

2. Indian Banking Sector: Essays and Issues ($1^{st}$) , by M.S. Gupta & J.B. Singh, Serials Publication.

3. Basics Of Banking & Finance, by K.M. Bhattacharya O.P. Agarwal, Himalaya Publishing House.

4. Agricultural Finance and Management, by S. Subba Reddy, P. Raghu Ram.

5. The Indian Financial System and Development, by Dr.Vasant Desai, Himalaya Publishing House; Fourth Edition.

6. Income Tax Management, Simple Way of Tax Management, Tax Planning and Tax Saving, By Sanjay Kumar Satapathy.

7. Direct Tax System Income Tax by Dr. R. K. Jain, SBPD Publications.

8. Simplified Approach to GST Goods and Services Tax, By S K Mishra, Educreation Publishing.

9. Introduction To Microfinance, By Todd A Watkins, World Scientific Publishing company

## Evaluation Scheme:

**Continuous Assessment (A):**

Subject teacher will declare Teacher Assessment criteria at the start of semester.

**Continuous Assessment (B):**

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average of the marks scored in both the tests will be considered for final grading.

## End Semester Examination (C):

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 3 hrs.

# Public Systems and Policies (RCP23OCOE305)

**Teaching Scheme**

Lectures: 03 Hrs./Week

Credit: 03

## Course Objectives

1. To explain public policy and its operations with special focus on policy relating to Government finance.

2. To analyze and evaluate the impact of public policy on firms and the economy at large.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | Understand the importance of public systems in a fast-changing environment in the global context. | L2 | Understand |
| CO2 | Analyse the transformations in public systems with emphasis on current initiatives and emerging challenges in the field. | L4 | Analyze |
| CO3 | Explain public policy and its operations with special focus on policy relating to Government finance. | L1 | Knowledge |
| CO4 | Make policies and know about the happenings in the world, in the nation and those in their locality. | L4,L5 | Analyze, Evaluate |
| CO5 | Analyze and evaluate the impact of public policy on firms and the economy at large and work under various fields as policymakers. | L4 | Analyze |

# Course Contents

## Unit-I    Introduction and Overview of Public Systems    10 Hrs.

**Introduction and Overview of Public Systems:**

Ideology of Public Systems; Mechanistic and Organic view of Society and Individuals, The Legal Framework; Federal Government; State and Local Governments, Government growth; The size of Government.

## Unit-II    Public Sector in the Economics Accounts    06 Hrs.

**Public Sector in the Economics Accounts:**

Public Sector in the circular flow; Public Sector in the National Income Accounts.

## Unit-III    Public Choice and Fiscal Politics    08 Hrs.

**Public Choice and Fiscal Politics:**

Direct Democracy; Representative Democracy; The Allocation Function; The Distribution Function; The Stabilization Function; Coordination of Budget Functions; The Leviathan Hypothesis.

## Unit-IV    Introduction and Overview of Public Policy    10 Hrs.

**Introduction and Overview of Public Policy:**

Markets and Government; Social goods and Market failure, public expenditure and its evaluation; Cost Benefit Analysis, Public policy and Externalities, Taxation Policy and its impact, Income distribution, redistribution and social security issues Fiscal & Budgetary Policy, Fiscal Federalism in India.

## Unit-V    Case Studies in Expenditure Policy    05 Hrs.

**Case Studies in Expenditure Policy:**

Public Services A) National Defence B) Highways C) Outdoor Recreation D) Education

## Text Books

1. Charles J, Wheelan, "Introduction to Public Policy", W.W. Norton & Company, New York, 2011.

2. Thomas R, Dye, "Understanding Public Policy", Prentice Hall, 2008.

3. Anderson, James E, "Public Policy-Making: An Introduction", Boston, 2011.

4. Avasthi & Maheshwari, "Public Administration", Lakshmi Narain Agarwal, 2008.

5. Mohit Bhattacharya, "New Horizons of Public Administration", Jawahar Publishers, New Delhi, 2011

6. Nicholas Henry, "Public Administration and Public Affairs", Prentice Hall of India, New Delhi, 2017.

7. Harvey S Rosen and Ted Gayer, "Public Finance" 10<sup>th</sup> Edition, McGraw-Hill Education, 2013.

8. Richard A Musgrave and Peggy B Musgrave, "Public Finance in Theory and Practice", 5<sup>th</sup> Edition, Mcgraw Hill Book, 2017.

## Evaluation Scheme:

### Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

### Continuous Assessment (B):

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average in both the tests will be considered for final grading.

### End Semester Examination (C):

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

# Fundamentals of Biomedical Instruments (RCP23OCOE306)

**Teaching Scheme**  
Lectures: 03 Hrs./Week  
Credit: 03

<div align="right">

**Examination Scheme**  
Term Test: 15 Marks  
Teacher Assessment: 25 Marks  
End Sem Exam: 60 Marks  
Total: 100 Marks

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## Course Objectives

1. To understand the basic principles and working of various medical instruments.

2. To familiarize the learners with the various medical imaging modalities, their operating principles, instrumentation and clinical applications

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | Associate and describe the different physiological processes taking place within the human body. | L2 | Comprehension |
| CO2 | Identify the use of biomaterials and apply principles of various transducers and sensors. | L4 | Analyze |
| CO3 | Demonstrate the working principle of various medical instruments. | L4, L5 | Analyze, Synthesize |
| CO4 | Demonstrate principles used in imaging modalities and analysis. | L6 | Evaluate |
| CO5 | Identify different processes used in telemetry and telemedicine. | L6 | Evaluate |

# Course Contents

## Unit-I        Basic Human Physiology        04 Hrs.

**Basic Human Physiology**

● **Cell:** Electrical activity of excitable cells (Structure and functions of cell. Polarization and depolarization of cell)

● **Cardiovascular System:** Heart, Conductive tissues of heart, Cardiac cycle, Heart Valves, System and Pulmonary Circulation, Transmission of Cardiac Impulse, Blood Pressure, ECG (Einthoven's Triangle, Various leads and Waveforms).

● **Muscle Physiology:** Muscle physiology and aspects of skin resistance. Generation of EMG

● **Nervous System:** Different parts, their functions. Reflex actions and reflex arc, Function of Sympathetic and Parasympathetic nervous system. Generation of EEG

## Unit-II        Biomaterial, Transducers and Sensors        10 Hrs.

**Biomaterial, Transducers and Sensors:**

● Biomaterials used in fabrication of biodevices and implants: Polymeric, Composite biomaterials, Metallic biomaterials, and Ceramic biomaterials. ● Biopotential electrodes: Electrode tissue interface, Electrode electrolyte interface Electrodes used for ECG, EEG & EMG. ● Transducers & sensors: temperature transducer, pulse sensor, glucose sensor, respiration sensor , ● Introduction of biomaterials, Classification of biomaterials

## Unit-III        Overview of Medical Instruments        08 Hrs.

**Overview of Medical Instruments**

● Classification, application and specifications of diagnostic, therapeutic and clinical laboratory equipment , ● Method of operation of these Bio Medical Instruments , ● ECG , EEG,EMG

## Unit-IV        Imaging Modalities and Analysis        09 Hrs.

**Imaging Modalities and Analysis:**

● Radio graphic techniques, Computer Tomography, ● MRI, PET, SPECT , ● Ultrasonography , ● Endoscopy , ● Thermography, Retinal Imaging , ● Imaging application in Biometric systems, ● Analysis of digital images

## Unit-V        Telemetry & Telemedicine        08 Hrs.

**Telemetry & Telemedicine:**

● Introduction to Biotelemetry , ● Physiological parameters compliant to biotelemetry, ● Components of Biotelemetry system , ● Applications of telemetry in medical field (ECG, EEG & EMG)

## Text Books

1. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice hall of India, New Delhi,2007.

2. M.Arumugam, "Bio-Medical Instrumentation", Anuradha Agencies, 2003.

3. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, $2^{nd}$ Edition, 2003.

4. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, NewYork, 1998.

5. "Biomaterials Science - An Introduction to Materials in Medicine", B.D. Ratner, A.S. Hoffmann, F. J. Schoen, J. E. Lemons, Academic Press, 1997.

## Reference Books

1. Electronic Measurement and Instrumentation by Dr Rajendra Prasad

2. Ed. Joseph D. Bronzino, The Biomedical Engineering Hand Book, $3^{rd}$ Edition, Boca Raton, CRC Press LLC, 2006.

3. Curry, T. S., Dowdey, J. E., & Murry, R. C. (1990). Christensen's physics of diagnostic radiology. Lippincott Williams & Wilkins.

4. Biomaterials: An Introduction, Joon Park, R. S. Lakes, Springer Science & Business Media

## Evaluation Scheme:

### Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

### Continuous Assessment (B):

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average in both the tests will be considered for final grading.

### End Semester Examination (C):

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

# IPR & Patenting (RCP23OCOE307)

| **Teaching Scheme** | **Examination Scheme** |
|---|---|
| Lectures: 03 Hrs./Week | Term Test: 15 Marks |
| Credit: 03 | Teacher Assessment: 25 Marks |
| | End Sem Exam: 60 Marks |
| | Total: 100 Marks |

## Course Objectives:

1.To promote the knowledge of intellectual property laws of India and international treaties.

2. To encourage innovation.

| CO | Course Outcomes | Blooms Level | Blooms Description |
|---|---|---|---|
| CO1 | Map a given project/ idea to a suitable intellectual property rights. | L4 | Analyze |
| CO2 | Explain the fundamentals of the patents, copyrights, and design registrations. | L1 | Knowledge |
| CO3 | Draft applications to protect various intellectual property rights. | L3 | Apply |
| CO4 | Communicate with national and/or international intellectual property organisations. | L1 | Knowledge |

# Course Contents

## Unit-I Introduction to Intellectual Property Rights (IPR) 03 Hrs.

**Introduction to Intellectual Property Rights (IPR):**

• Concept meaning of IP and IPR. • General principles of intellectual property rights, • Need for intellectual property, • Categories of IPR instruments - Patents, Trademarks, Copyrights, Industrial. Designs, Plant variety protection, Trade secrets, Geographical Indications etc., • Ownership, assignment, licenses, infringement, validity period. • International treaties on IPR.

## Unit-II Copyright and Design 09 Hrs.

**Copyright and Design**

1. The Indian Copyright Act, 1957, 2. Meaning of copyrights and rights of copyrighted works, 3. Types of copyright, 4. Process of filing a copyright application, 5. Introduction to Designs Law – Definitions, 6. Registration of designs and procedure.

## Unit-III Basics of Patents 09 Hrs.

**Basics of Patents**

• The Indian Patent Act and The Indian Patent Rules, • Conditions of patentability, • Patentable and non-patentable inventions, • Types of patent applications and patent specification, • Inventors and Applicants, • Category of applicants - natural person, small entity, startup and others, • Patent databases and patent search, • International Patent Classification code.

## Unit-IV Patent Application Drafting 09 Hrs.

**Patent Application Drafting**

**• Patent application drafting:**

Application, Specification, Claims drafting:Independent and dependent claims drafting, Process patent and product patent claims, Abstract, Drawings, Declaration as to inventorship, Statement and undertaking.

**• Drafting response to communications from patent office.**

Reading and understanding examination reports, Drafting response.

## Unit-V Procedure for Filing a Patent Application, Timelines and Fees 09 Hrs.

**Procedure for Filing a Patent Application, Timelines and Fees**

• Application for grant of patent, • Forms and Fees, • Request for (early) publication and / or (early) examination, • Patent examination and hearing, • Pre-grant and post-grant opposition.

## Text Books

1. A Durafe and D Toradmalle,"Intellectual Property Rights", Wiley, 2020.

2. H Rockman, "Intellectual property law for engineers, scientists, and entrepreneurs", Wiley-IEEE Press, 2020.

## Reference Books

1. Bare Act, "The Patents Act, 1970 with The Patents Rules, 2003", Universal, 2023.

2. Bare Act, "The Copyright Act, 1957", Universal and LexisNexis, 2021.

3. Bare Act, "The Designs ACT, 2000", Commercial Law Publishers (India) Pvt. Ltd. 2021

## Online Resources:

1. W. Fisher,"Maps of Intellectual Property"

   https://cyber.harvard.edu/people/tfisher/IP/IPMaps.htm

2. World Intellectual Property Organisation courses

   https://www.wipo.int/academy/en/

3. Prof. Feroz Ali, "Patent Drafting for Beginners"

   https://onlinecourses.nptel.ac.in/noc24$_h$s59/preview

## Evaluation Scheme:

### Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

### Continuous Assessment (B):

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average in both the tests will be considered for final grading.

### End Semester Examination (C):

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

# Entrepreneurship and Startup Ecosystem (RCP23OCOE308)

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**Teaching Scheme**
Lectures: 03 Hrs./Week
Credit: 03

**Examination Scheme**
Term Test: 15 Marks
Teacher Assessment: 25 Marks
End Sem Exam: 60 Marks
Total: 100 Marks

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## Course Objectives

1. To foster an entrepreneurial mindset.

2. To guide participants in building effective Business Models.

3. To educate participants regarding Intellectual property and Fundraising for Innovative Ventures.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | Effectively Navigate the Global Startup Landscape. | L2 | Comprehension |
| CO2 | Cultivate an Entrepreneurial Mindset. | L4 | Analyze |
| CO3 | Create Effective Business Models. | L4, L6 | Create |
| CO4 | Understand the significance of Intellectual Property rights | L2 | Understand |
| CO5 | Master Fundraising Strategies. | L6 | Evaluate |

# Course Contents

## Unit-I  Understanding the Entrepreneurial Ecosystem    06 Hrs.

• Introduction to Entrepreneurship and Startups, • Role of Entrepreneurship in economy, • Global and Local Entrepreneurial Landscapes , • Role of Incubators and Accelerators , • Case Studies of Successful Startups

## Unit-II        Developing a Startup Mindset        08 Hrs.

• Cultivating an Entrepreneurial Mindset , • Market Analysis and Segmentation, • Opportunity Recognition , • Innovation and Idea Generation , • Feasibility Analysis of Business Ideas , • Role of innovation in Entrepreneurship , • Fostering creativity , • Practical Exercises and Workshops on Creative Problem Solving

## Unit-III        Business Model Development        10 Hrs.

• Introduction to Business Models , • Lean Startup Methodology , • Prototyping and Minimum Viable Product (MVP) , • Financial Projections and Budgeting , • Various forms of Business Ownership , • Compliance and Legal Regulations , • Operations and Supply Chain Management , • Human Resource Management , • Developing a marketing Strategy , • Managing Growth Challenges

## Unit-IV  Technological Innovation and Intellectual Property    08 Hrs.

• Technology and Entrepreneurship , • Intellectual Property Basics (Patents, Trademarks, Copyrights) , • Patent Search and Analysis , • Strategies for Protecting Intellectual Property , • Ethical Considerations in Technology and Innovation

## Unit-V        Fundraising and Investment Strategies        07 Hrs.

• Fundraising Options for Startups, • Angel Investors and Venture Capital , • Crowdfunding Platforms , • Financial Modelling for Startups , • Crafting an Effective Pitch

## Text Books

1. Alexander Osterwalder and Yves Pigneur, Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers, John Wiley & Sons, Jul2010.

2. Peter Thiel and Blake Masters, Zero to One: Notes on Startups, or How to Build the Future, Virgin Books, 2015.

3. Alejandro Cremades, The Art of Startup Fundraising: Pitching Investors, Negotiating the Deal, and Everything Else Entrepreneurs Need to Know" by, John Wiley & Sons, Inc., Hoboken, New Jersey, 2016.

4. Christensen, Clayton M. The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail. Boston, MA: Harvard Business School Press, 1997.

5. Brad Feld and Jason Mendelson, Venture Deals: Be Smarter Than Your Lawyer and Venture Capitalist, Wiley; 4th edition, 1 October 2019

## Evaluation Scheme:

**Continuous Assessment (A):**

Subject teacher will declare Teacher Assessment criteria at the start of semester.

**Continuous Assessment (B):**

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average in both the tests will be considered for final grading.

**End Semester Examination (C):**

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

# Semester Project -I (RCP23IPSC301)

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**Practical Scheme**                          **Examination Scheme**

Practical  : 02 Hrs./week          Teacher Assessment : 25 Marks

Credit     : 01                                      Total : 25 Marks

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## Course Objectives:

Students are expected to design, simulate/implement a project based on the knowledge acquired from current semester subjects.

| CO | Course Outcomes | Blooms Level | Blooms Description |
|----|-----------------|--------------|--------------------|
| CO1 | Conduct a survey of several available literatures in the preferred field of study. | L4 | Analyze |
| CO2 | Demonstrate various/alternate approaches to complete a project. | L2 | Understand |
| CO3 | Ensure a collaborative project environment by interacting and dividing project work among team members. | L3 | Apply |
| CO4 | Present their project work in the form of a technical report /paper and there by improve the technical communication skill | L3 | Apply |
| CO5 | Demonstrate the ability to work in teams and manage the conduct of the research study. | L2 | Understand |

**Semester Project:**

The purpose of introducing semester project at second year level is to provide exposure to students with a variety of projects based on the knowledge acquired from the semester subjects. This activity is supposed to enrich their academic experience and bring enough maturity in student while selecting the project. Students should take this as an opportunity to develop skills in implementation, presentation and discussion of technical ideas/topics. Therefore, proper attention shall be paid to the content of semester project report which is being submitted in partial fulfilment of the requirements of the Second Year and it is imperative that a standard format be prescribed for the report.

Each student shall work on project approved by departmental committee approved by the Head of Department, a group of 03 to 05 students (max allowed: 5 students in extraordinary cases, subject to the approval of the department committee and the Head of the department) shall be allotted for each Semester Project. Each group shall submit at least 3 topics for the Semester Project. The departmental committee shall finalize one topic for every group. Semester Project Title or Theme should be based on knowledge acquired during semester. The project work shall involve sufficient work so that students get acquainted with different aspects of knowledge acquired from semester subjects.

**Student is expected to:**

- Select appropriate project title based on acquired knowledge from current semester subjects.

- Maintain Log Book of weekly work done(please see attached log book format).

- Report weekly to the project guide along with log book.

**Assessment Criteria:**

- At the end of the semester, after conformation by the project guide, each project group will submit project completion report in prescribed format for assessment to the departmental committee (including project guide)

- Assessment of the project (at the end of the semester) will be done by the departmental committee (including project guide)

**Prescribed project report guidelines:**

Size of report shall be of minimum 25 pages. Project Report should include appropriate content for:

- Introduction

- Literature Survey

- Related Theory

- Implementation details

- Project Outcomes

- Conclusion

- References

**Assessment criteria for the departmental committee (including project guide) for Continuous Assessment:**

Guide will monitor weekly progress and marks allocation will be as per Table 2.

**Assessment criteria for the departmental committee (including project guide) for End Semester Exam:**

Departmental committee (including project guide) will evaluate project as per Table 3.

Each group shall present/publish a paper based on the semester project in reputed/peer reviewed Conference/Journal/TechFest/Magazine/ before the end of the semester.

Table 1: Log Book Format

| Sr | Week (Start Date:End Date) | Work Done | Sign of Guide | Sign of Coordinator |
|----|----------------------------|-----------|---------------|---------------------|
| 1  |                            |           |               |                     |
| 2  |                            |           |               |                     |

Table 2: Continuous Assessment Sheet

| Sr | Exam Seat No | Name of Student | Student Attendance | Log Book Maintain | Literature Review | Depth of Understanding | Report | Total |
|----|--------------|-----------------|--------------------|--------------------|--------------------|------------------------|--------|-------|
|    |              |                 | 5                  | 5                  | 5                  | 5                      | 5      | 25    |

Table 3: Evaluation Sheet

| Sr | Exam Seat No | Name of Student | Project Selection | Design/ Simulation/ Logic | PCB/ hardware/ programming | Result Verification | Presentation | Total |
|----|--------------|-----------------|-------------------|---------------------------|----------------------------|---------------------|--------------|-------|
|    |              |                 | 5                 | 5                         | 5                          | 5                   | 5            | 25    |

# Economics and Financial Management(RCP23ICHSX03)

**Teaching Scheme**

Lectures: 02 Hrs./Week

Credit: 02

**Examination Scheme**

Term Test: 15 Marks

Teacher Assessment: 25 Marks

End Sem Exam: 60 Marks

Total: 100 Marks

## Course Objectives

1. To describe the relationships among variables to analyse economic issues

2. To Explain the function of the market and prices as an allocative mechanism.

3. To identify key macroeconomic indicators and measures of economic change, growth,and development

4. To understand basic concepts of financial management and their application in investment and financing decisions

5. To explore the relationship between Financial Management and Financial Statements.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|---|---|---|---|
| CO1 | Analyse individual decision making, how prices and quantities are determined in product and factor markets, microeconomic and macroeconomic outcomes | L4 | Analyse |
| CO2 | Analyse the performance and functioning of government, RBI, markets, and institutions in the context of social and economic problems. | L4 | Analyse |
| CO3 | Analyse the current economic status of India at global levels and provision in budget to address economic issues at national level. | L4 | Analyse |
| CO4 | Describe an understanding of the overall role and importance of the finance function. | L2 | Understand |
| CO5 | Analyse financial performance and make appropriate inferences | L4 | Analyse |

# Course Contents

**Unit-I**          **Introduction to Economics**        **06 Hrs.**

Fundamentals of Economics, Definition and scope of economics, the nature of the economic problem, finite resources and unlimited wants, definitions of the factors of production and their rewards, definition of opportunity cost, the influence of opportunity cost on decision making.

**Microeconomics and Macroeconomics** The role of markets in allocating resources, the market system, introduction to the price mechanism, Demand, Supply and Price determination, Price elasticity of demand and supply (PED),

**Unit-II**          **Role of Government and RBI**        **04 Hrs.**

Money, Banking, Households, Firms, economies and diseconomies of scale, Market Structure, Fiscal Policy, Monetary Policy, Economic Growth, causes and consequences of recession, causes of economic growth, measurement of economic growth inflation and deflation, living standards, indicators of living standards

**Unit-III**          **Government Policies**        **04 Hrs.**

Last 20 years Journey of Indian Economy, Measures taken to grow Indian Economy, Meaning of India is the world's fifth-largest economy by nominal GDP and the third-largest by purchasing power parity (PPP), On a per capita income basis, India ranked 139th by GDP (nominal) and 127th by GDP (PPP) (Data reference year 2023), Comparison of top 5 largest economies in world, Discuss key points of India latest union budget and its impact on Indian economy and citizens, Meaning of Initiatives like Make in India, Digital India, Skill India etc. and expected impact on Indian Economy

**Unit-IV**          **Overview of Financial Management**        **04 Hrs.**

Fundamentals of financial management, principles and functions of the financial management, Strategy, methods, and techniques of the financial management, Overview of financial instruments, financial markets, financial Institutions

**Unit-V**          **Overview of Financial Statements**        **08 Hrs.**

Balance Sheet, Profit and Loss Account, and Cash Flow Statement; Purpose of Financial Ratio Analysis; Liquidity Ratios; Efficiency or Activity Ratios; Profitability Ratios; Capital Structure Ratios; Stock Market Ratios;

## Text Books

1. Datt & Sundharam's Indian Economy by Gaurav Datt & Biswajit Nag, S. Chand Publications, 73$^{rd}$ Edition,2024

2. Fundamentals of Financial Management by Prasanna Chandra, McGraw Hill Publications, 7$^{th}$ Edition, 2020

## Reference Books

1. Public Economics: The Macroeconomic Perspective by Burkhard Heer, Springer International Publications,2019

2. Indian Economy: Economic Ideas, Development, and Financial Reforms by Raj Kumar Sen, Deep & Deep Publications, 2008

3. Indian Economy: Performance and Policies by Dr. V. C. Sinha, SBPD Publications,2021

4. Financial Management by C. Paramasivan, T. Subramanian, New Age Publications,2009

5. Financial Management Practices in India by Sandeep Goel, Taylor & Francis Publications,2016

## Evaluation Scheme:

### Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

### Continuous Assessment (B):

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average of the marks scored in both the tests will be considered for final grading.

### End Semester Examination (C):

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 3 hrs.

# Universal Human Values (RCP23ICHSX04)

**Teaching Scheme**

Lectures: 02 Hrs./Week

Credit: 02

**Examination Scheme**

Term Test: 15 Marks

Teacher Assessment: 25 Marks

End Sem Exam: 60 Marks

Total: 100 Marks

## Course Objectives

1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.

2. To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession.

3. To help students understand the meaning of happiness and prosperity for a human being.

4. To facilitate the students to understand harmony at all the levels of human living and live accordingly.

5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society | L2 | Understand |
| CO2 | Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body. | L4 | Analyze |
| CO3 | Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society. | L2 | Understand |
| CO4 | Understand the harmony in nature and existence and work out their mutually fulfilling participation in the nature. | L2 | Understand |
| CO5 | Distinguish between ethical and unethical practices and start working out the strategy to actualize a harmonious environment wherever they work. | L4 | Analyze |

# Course Contents

## Unit-I                    Introduction                    04 Hrs.

Need, Basic Guidelines, Content and Process for Value Education Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

## Unit-II    Understanding Harmony in the Human Being    05 Hrs.

Harmony in Myself Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body'. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Self-regulation and health.

## Unit-III    Understanding Harmony in the Family and Society    09 Hrs.

Harmony in Human-Human Relationship Understanding harmony in the Family- the basic unit of human interaction, understanding values in human-human relationship; meaning of Justice and program for its fulfilment. Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family). Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family

## Unit-IV Understanding Harmony in the Nature and Existence 04 Hrs

Whole existence as Co-existence Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence

## Unit-V      Implications of the above Holistic Understanding of Harmony on Professional Ethics      04 Hrs.

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations.

## Text Books

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010. Education, New Delhi.

## Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

3. The Story of Stuff (Book).

4. Mohandas Karamchand Gandhi, The Story of My Experiments with Truth.

5. E. F Schumacher, Small is Beautiful.

6. Cecile Andrews, Slow is Beautiful.

7. J C Kumarappa, Economy of Permanence.

8. Pandit Sunderlal, Bharat Mein Angreji Raj.

9. Dharampal, Rediscovering India.

10. Mohandas K. Gandhi, Hind Swaraj or Indian Home Rule.

11. Maulana Abdul Kalam Azad, India Wins Freedom.

12. Romain Rolland, Vivekananda(English).

13. Romain Rolland, Gandhi(English).

## Evaluation Scheme:

**Continuous Assessment (A):**
Subject teacher will declare Teacher Assessment criteria at the start of semester.

**Continuous Assessment (B):**

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average of both the tests will be considered for final grading.

**End Semester Examination (C):**

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

# Community Engagement Service (RCP23ILELX05)

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**Teaching Scheme**

Tutorial: 02 Hrs./Week

Credit: 02

**Examination Scheme**

Teacher Assessment: 25 Marks

Total: 25 Marks

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## Course Objectives

1. To sensitise the student / learner into recognising community level problems & challenges and give them an opportunity to engage in activities for solving the same.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | Knowledge application: Applies knowledge understandings acquired from one's academic study/ field/ discipline for community level education, information dissemination by participation and engagement in community welfare activities. | L6 | Evaluate |
| CO2 | Commitment for cause: Identify and experience commitment for community engagement activities that reinforce sense of belongingness and gratitude towards societal cause. | L4 | Analyze |
| CO3 | Diversity: Witness diversity in communities and cultures and demonstrate change in approach / attitude as, an evidence of unconditional acceptance. . | L3 | Apply |
| CO4 | Team: Recognise, experience and value, effectiveness of working in a team, demonstrating co-existence of the roles - sincere worker and effective leader. | L4 | Analyze |

# Course Contents

**Unit-I**        **Open Activities**        **04 Hrs.**

Participation in: blood donation camps organizer / donor, day-long tree plantation or afforestation / seed dispersal / cleanliness (water bodies, surrounding etc.) drives. Literacy drives for children / youth / adults. One day hand holding activities in work-shop conduct for under privilege kids in the areas of basic science, math, technical skill demonstration and building.

**Unit-II**        **Technical (Program core related)**        **05 Hrs.**

Cyber-crime, security awareness and vulnerabilities – sensitization, information dissemination and awareness sessions in indicated focus areas. Promotion and Sensitization for Sustainable living – focusing on solar power, water recycling, e-waste responsible disposal, waste recycling etc. in indicated focus areas.

Focus areas: residential societies, schools, under-privileged areas, governments /private offices, and similar other establishments.

**Field Survey:**

Reporting on proactively conducted survey in the areas of resource management for – water, vegetables, electricity, crops etc

**Activities to be performed:**

Among the listed activities students are expected to complete one open activity mandatorily, and one technical (program core) OR field survey activity. The activities mentioned are exemplary in nature and any other additional activity of similar nature too can be undertaken by the learners, provided it is approved and endorsed by the faculty mentor / head of the department.

**Suggested Activities**

1. Undertaking cyber safety / security awareness sensitization drive / program especially for un-initiated students / individuals in schools / colleges / residential complex / offices etc. Typical suggested tabulation.

| Participant No. | Name | Age | School/ College/ Residence/ Office | Email | Contact Number | Awareness Level | Remarks |
|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

2. Energy / Power assessment for establishments (societies, schools, colleges, residential complex, shops etc.) involving computing power devices ratings, power consumption over operating period, calculating energy cost from tariff card / rates for every group of appliances / devices or equipment. Typical suggested tabulation pattern.

| Device/Appliance Group | Number of appliances /devices | Power Rating (kW) | Operating Hours (h/day) | Energy Consumption (kWh/day) | Tariff Rate (Rs./ kWh) | Energy Cost (Rs.) |
|---|---|---|---|---|---|---|
| Lighting Fixtures | | | | | | |
| Ceiling Fans | | | | | | |
| Air Conditioner (AC) | | | | | | |
| Security Systems | | | | | | |
| Water Pump | | | | | | |

3. Traffic light monitoring viz-e-viz average traffic density on road. Analysing the data and commenting on results. Evaluating and comparing impact on road repairs related lane blockage and proportional recommendation for lights timing variations. Typical suggested tabulation pattern.

| Sr. No. | Timestamp | Traffic Density | Traffic Light Status | Road Repair Status | Remarks |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

4. Help compute green footprint of select number of household (per member) - say 10 houses of 3+ members. This is for evaluating dependence upon non green energy sources and habits and changes in lifestyle for attempts at their reductions. Learners are

encouraged to use typically available online carbon-footprint calculators. The table herewith maybe used for reference calculations.

| House No. | House hold Name | Number of Members | Energy Usage (kWh) | Water Usage (liters) | Waste Production (kg) | Transportation Habits | Green Footprint |
|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

5. Compulsion of having a borewell for non-potable water supply in city residential complexes is a modern-day rule. Increased pace of re-development, as well as number of occupants in given area, has resulted in increased number of borewells being dug within and outside city limits. Reduced yield, quality and quantity of water adds to the recurring maintenance cost of borewells, especially in the city areas. Poor water recharge systems along-with depleting open soil cover area in wake of wall-to-wall of concrete carpet aggravate the problem. Study, analyse and report a residential society's – capacity of water requirement, present day borewells in action, approximate yield, maintenance cost and frequency, borewell flushing iterations in wake of redevelopment in neighborhood. A typical tabulation mechanism for inferences can be as below:

| Borewell No. | Location | Depth (ft) | Yield (Liters/Day) | Water Quality | Maintenance Cost (Rs.) | Remarks |
|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

6. Detection of Adulteration in food / fruits / vegetables / milk / mava /saffron etc. or contamination of potable drinking water. Ex. Adulteration in fruits could be apple waxing, injecting chemicals in watermelon, pomegranate etc. to give it a bright red color, artificial ripening of mangos etc. For a given activity, samples from more than one area, specifically from mofussil /interiors / 'gaothans' etc, may be obtained, to evaluate sample purity or extent of adulteration. Learners are encouraged to use online resources provided by 'Food Safety and Standards Authority of India' (fssai), for handholding in requisite procedures.

**YouTube link:**

Food Safety and Standards Authority of India: https://goo.gl/Y8Lzbu

Ex. 1 Milk Adulteration: https://www.youtube.com/watch?v=pbnmeRUBxKk

Ex. 2 Watermelon Adulteration: https://www.youtube.com/watch?v=yrLAj7oJies

| Product | Adulterant | Testing Method | Result | Remarks |
|---------|-----------|----------------|--------|---------|
|         |           |                |        |         |
|         |           |                |        |         |

**Certificates and Formats:**

## Activity Endorsement Certificate

**Date:**

Community engagement service is a mandatory course, of two credits, introduced at second year of engineering under the autonomous structure of the institute.

**Course objective:** To sensitize the student / learner into recognizing social problems & challenges and give them an opportunity to engage in activities for solving the same.

**Course outcomes:**

1. **Knowledge application:** Applies knowledge understandings acquired from one's academic study/ field/ discipline for community level education, information dissemination by participation and engagement in community welfare activities.

2. **Commitment for cause:** Identify and experience commitment for community engagement activities that reinforce sense of belongingness and gratitude towards societal cause.

3. **Diversity:** Witness diversity in communities and cultures and demonstrate change in approach / attitude as an evidence of unconditional acceptance.

4. **Team:** Recognize, experience and value effectiveness of working in a team, demonstrating co-existence of the roles - sincere worker and effective leader.

This is to certify that Mr./Ms. _____ bearing PRN _____ is a student of S.Y. B.Tech., _____ branch of engineering. He / She is a bonafide student of SES's R. C. Patel Institute of Technology, Shirpur. He / She is reliable, sincere, hardworking and capable of conducting _____ activity in your premises. We request you to kindly allow for the conduction of the activity and we also solicit your earnest co-operation in the same.

**Signature**

**Department Head:**

# Disclaimer

(This form must be read, signed, and submitted prior to the beginning of the community service activity.)

| Student Details | Activity Details |
|---|---|
| Name | |
| SAPID | Date |
| Program | Time |
| Class/Div | Address |

I, the undersigned _____ accept the following terms and conditions unconditionally:

1. I accept and understand that the community activity identification and selection has been done willingly by me.

2. I undertake to convey that, I am apparently in good health and well-being, and suffer no physical impairment that would or should prevent my participation in the activity.

3. I undertake to bear all related expenses and risk of travel related to the activity and shall not hold any personnel from the institute responsible with regards to claims and / or loss in the process of conduct of activity.

4. I undertake that my parents or legal/local guardians are aware of said activity and agree to above mentioned terms and conditions.

**Student's name & signature:** _____

**Parent or Guardian's name & signature:** _____

## Guidelines for Assessment of the work

- The review/progress monitoring committee shall be constituted by the Head of the Department. The progress of selected/assigned activities is to be evaluated on a continuous basis, holding at least one review in the semester.

- In the continuous assessment, focus shall also be on each individual student's contribution to the team activity, their understanding and involvement as well as responses to the questions being raised at all points in time.

- Each group needs to submit the following forms to the respective supervisor after conducting both the activities:

  – Activity Conduction Report

  – Participant Feedback (online / offline)

  – Participant Attendance (online / offline)

  – Survey Report

  – Participation certification

**Forms for Technical Activity:**

1. **Activity Conduction Report**

| Sr. No. | Name of the Activity | |
|---|---|---|
| 1 | Date of Activity | |
| 2 | Activity type (Open / Technical) | |
| 3 | Activity objectives | |
| 4 | Place of Activity | |
| 5 | SAP id and Names of students | |
| 6 | Name of the Association | |
| 7 | Activity description | |
| 8 | No. of participants | |
| 9 | Photos (Geo tagged) | |

2. **Participant feedback (online / offline):**

| Sr. No. | Indicators | Scale: 1 (Lowest) to 5 (Highest) |
|---|---|---|
| 1 | The objectives of the training were clearly defined. | |
| 2 | The content was organized and easy to follow. | |
| 3 | This training experience will be useful to me. | |
| 4 | The trainer was knowledgeable about the training topics. | |
| 5 | The training objectives were met | |

**Evaluation Scheme:**

**Continuous Assessment (A):**

Term Work: - 25 marks, distribution as herewith:

1. **Rubric for Open Ended Activity (10 marks)**

   - Activity Conduction Report

2. **Rubric for Technical Activity (15 marks)**

| Sr. No. | Performance Indicators (Maximum marks per indicator are given in bracket) | Marks |
|---|---|---|
| 1 | Pre-requisite documents (permission letter, presentation material, permission letters, etc.) [05 marks] | |
| 2 | Participant Feedback [05 marks] | |
| 3 | Participant attendance [05 marks] | |
| | **TOTAL** | |

**OR**

3. **Rubric for Field Survey Activity:**

| Sr. No. | Performance Indicators (Maximum 03 marks per indicator) | Marks |
|:---:|:---|:---:|
| 1 | Topic selection | |
| 2 | Survey preparation | |
| 3 | Field work | |
| 4 | Analysis | |
| 5 | Report writing | |
| | **TOTAL** | |

# HONORS Track: AIML(Sem III) Mathematics for AIML (RCP23LCH1301)

## Course Objectives

1. To build an intuitive understanding of Mathematics and relating it to Artificial Intelligence, Machine Learning.

2. To provide a strong foundation for probabilistic and statistical analysis mostly used in varied applications in Engineering. engineering practice.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | Recall the Basic Concepts of Linear Algebra Probability and Statistics | L3 | Apply |
| CO2 | Understand linear algebra, probability, and statistical fundamentals. | L2 | Understand |
| CO3 | Apply linear algebra, probability, and statistical concepts to solve problems. | L3 | Apply |

# Course Contents

**Unit-I**           **Matrices and Vector Spaces**         **06 Hrs.**

The geometry of linear equations, Elimination with Matrices, Multiplication, Transpose and Inverse of Matrices, Factorization into $A = LU$ form, Vectors, Lengths and Distances, Angles, Inner Product, Vector Spaces and Subspaces, Solving $Ax = 0$; Pivot Variables, Solving $Ax = b$; Rank and Nullity of a Matrix, Row Reduced Form $R$, Linear Independence, Basis, Dimension, Span, Norm

**Unit-II**     **Orthogonality & Projections onto Subspaces**     **06 Hrs.**

Orthogonal vectors and subspaces, Orthogonal and Orthonormal Basis, Projection onto 1-D Subspaces, Projection onto 2-D Subspaces, Projection Matrices and Least Squares, Orthogonal Matrices, Gram-Schmidt Procedure

**Unit-III**        **Eigen Values, Eigen Vectors & Positive Definite Matrices**        **07 Hrs.**

Concepts of Eigenvalues and Eigenvectors, Diagonalization of a Matrix, Eigen Decomposition, Symmetric Matrices and Positive Definiteness, Positive Definite Matrices, Similar Matrices, Singular Value Decomposition, Linear Transformation of Matrices

**Unit-IV**       **Probability & Probability distribution**       **05 Hrs.**

Probability Definition, Conditional Probability, The Chain Rule of Conditional Probabilities, Independence and Conditional Independence, Binary Variables, Bernoulli Distribution, Binomial Distribution, Normal Distribution, Student's t Distribution, Chi-Squared Distribution, Sample and Sampling, Sampling Distribution and Central Limit Theorem

**Unit-V**    **Statistics, Statistical Inference & Bayesian Statistics**    **08 Hrs.**

Mean, Variance, and Covariance, Covariance Matrix, Covariance and Correlation, Mean of a Dataset, Variance of One-Dimensional Datasets, Variance of Higher-Dimensional Datasets, Linear Transformation of Datasets: Effect on the Mean, Effect on the (Co)Variance, Estimation, Hypothesis Testing, Confidence Interval, Bayesian Concept Learning: Likelihood, Prior, Posterior, Posterior Predictive Distribution, Maximum A Posteriori (MAP) Estimation

# Unit-VI    Continuous Optimization & Markov Process    07 Hrs.

Continuous Optimization, Optimization Using Gradient Descent, Stochastic Gradient Descent, Convex Optimization, Definition of Markov Process, Discrete Markov Chains, The $n$-Step Transition Probabilities, Steady State Probabilities, Chapman-Kolmogorov Theorem

## Text Books:

1. Gilbert Strang, *Linear Algebra and its Applications*, 4th edn, Cengage India Private Limited, 2005.

2. Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, *Mathematics for Machine Learning*, Cambridge University Press, 2020.

## Reference Books:

1. Kevin P. Murphy, *Machine Learning: A Probabilistic Perspective*, MIT Press, 2012.

2. Mehryar Mohri, Afshin Rostamizadeh, and Ameet Talwalkar, *Foundations of Machine Learning*, MIT Press, 2018.

3. Kuldeep Singh, *Linear Algebra Step by Step*, Oxford Publications.

## Evaluation Scheme:

### Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

### Continuous Assessment (B):

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average in both the tests will be considered for final grading.

### End Semester Examination (C):

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

# HONORS Track: IoT & 5G Technology
# Sensors & Actuators for IoT (RCP23LCH2301)

**Teaching Scheme**

Lectures: 03 Hrs./Week

Credit: 03

**Examination**

Term Test: 15 Marks

Teacher Assessment: 25 Marks

End Sem Exam: 60 Marks

Total: 100 Marks

## Course Objectives

1. To provide an understanding of the physical parameters and sensing techniques of various sensors.

2. To provide an understanding of the signal conditioning principle.

3. To familiarize with MEMS sensors and actuators.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|---------------------|
| CO1 | Describe applications in areas of IoT using sensors and actuators. | L1 | Remember |
| CO2 | To understand the transduction principle of various sensors and actuators. | L2 | Understnd |
| CO3 | Apply knowledge of data acquisition and signal conditioning for interfacing of sensors. | L3 | Apply |
| CO4 | Identify signal conditioning methods for applications. | L1 | Remember |

# Course Contents

### Unit-I   Introduction to Sensors and Internet of Things:   08 Hrs.

Introduction to Internet of Things (IoT), brief review of applications of IoT, Sensors, transducers, classification of sensors–analog, digital, electrical, mechanical, characteristics of sensors, specifications, selection of sensors, smart sensors, actuators, basic interfacing and block diagram of instrumentation system, measurement and calibration requirements, role of sensors and actuators in IoT.

### Unit-II                          Sensors                          8 Hrs.

Temperature – Resistance Temperature Detectors Pt100/1000, Semiconductor PN junction sensors-LM35, Pressure – Concept of Pressure, Semiconductor Pressure Sensor (BMP380)Ultrasonic Sensors (HC-SR04), Proximity Sensors, Humidity Sensors, Pyroelectric sensors. Photoelectric Sensors, Coupled Charge Devices

### Unit-III                          Actuators                          10 Hrs.

Mechanical Actuation Systems, Electrical Actuation Systems. Motors- Servo, DC continuous and stepper, BLDC, Relay- SPDT, DPDT, Solenoid.

### Unit-IV      Data Acquisition and Signal Conditioning      06 Hrs.

Data Acquisition: Signal conditioning, input characteristics, Amplifiers, ADC—basic concepts, successive approximation ADC (ADC 0808), Integration type ADC, Sigma delta ADC(16 bit/24-bit) (ADS1115), DAC: R-2-R

### Unit-V Current Trends in Sensors and Technology Smart Sensors 07 Hrs.

Automation Sensor Technologies: Introduction to Semiconductor IC Technology, Standard Methods, Nano sensors (MPU 9250), Microelectromechanical Systems. Sensors Applications: Introduction, On-board Automobile Sensors (Automotive Sensors), Home Appliance Sensors, Aerospace Sensors, Medical Diagnostic Sensors, Sensors for Manufacturing, Sensors for environmental Monitoring.

## Text Books

1. D. Patranabis, "Sensor and Actuators", $2^{nd}$ Edition, Prentice Hall of India.

2. A. K. Sawhney, "A Course in Electronic Measurements and Instrumentation", $19^{th}$ Edition, Dhanpat Rai & Co.

3. H. S. Kalsi, "Electronic Instrumentation and Measurements", $4^{th}$ Edition, McGraw-Hill.

4. Nathan Ida, "Sensors, Actuators and their Interfaces", SciTech Publishing, 2013.

## Reference Books:

1. Jacob Fraden, "Handbook of Modern Sensors: Physics, Designs, and Applications", 4th Edition, Springer, 2010.

2. Clarence. W. de Silva, "Sensors and Actuators: Engineering System Instrumentation", 2nd Edition, CRC Press, 2015.

3. Ernest. O. Doebelin, "Measurement Systems, Application and Design", Tata McGraw-Hill Publishing Company Ltd., 5th Edition, 2004.

4. D. A. Bradley, D. Dawson, N. C. Burd, A. J. Loader, "Mechatronics", Thomson Press India Ltd., 2004.

5. S. Renganathan, "Transducer Engineering", Allied Publishers (P) Ltd., 2003.

6. W. Bolton, "Mechatronics", 4th Edition, Pearson Education, 2011.

## Evaluation Scheme:

### Continuous Assessment (A):

Course teacher will declare Teacher Assessment criteria at the start of semester.

### Continuous Assessment (B):

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average in both the tests will be considered for final grading.

### End Semester Examination (C):

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

# HONORS Track: IoT & 5G Technology Sensors & Actuators for IoT Laboratory (RCP23LLH2301)

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**Teaching Scheme**
Practical: 02 Hrs/Week
Credit: 01

**Examination Scheme**
Teacher Assessment: 25 Marks
End Sem Exam : 25 Marks
Total: 50 Marks

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## Course Objectives

1. To provide an understanding of the physical parameters and sensing techniques of various sensors.

2. To provide an understanding of the signal conditioning principle.

3. To familiarize with MEMS sensors and actuators.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | Describe applications in areas of IoT using sensors and actuators. | L1 | Remember |
| CO2 | To understand the transduction principle of various sensors and actuators. | L2 | Understnd |
| CO3 | Apply knowledge of data acquisition and signal conditioning for interfacing of sensors. | L3 | Apply |
| CO4 | Identify signal conditioning methods for applications. | L1 | Remember |

# Course Contents

**List of Laboratory Experiments:**

1. To study Performance Characteristics of temperature/pressure/proximity sensors

2. To study Arduino architecture and basic programming.

3. Interfacing with Arduino to Evaluate the characteristics of temperature sensors - semiconductor, RTD, thermistor etc. (e.g., LM35, Pt – 100/1000, MLX 90614, DHT22/DHT11)

4. Interfacing with Arduino to Evaluate the characteristics of 9 DOF (accelerometer + gyro + magnetometer) (e.g., BMP180).

5. Interfacing to Arduino based platform for IR based sensor for obstacle detection

6. Interfacing to Arduino for Piezo sensor.

7. Arduino programming for home automation systems based on motion detection.

8. Measure the distance using an Ultrasonic sensor and display it on an LCD module.

9. To study ESP32 and detect available Wi-Fi networks.

10. Upload sensor data on ThingSpeak using ESP32.

11. To Study and implement interfacing of actuators based on data collected using IoT sensors.

12. Interface the Camera module with Arduino/ESP32.

13. Interface the motor drivers with Arduino/ESP32.

14. Implementation of Data transfer using wireless devices.

Batch wise laboratory work of a minimum eight experiments from the above suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt. Batch wise tutorial sessions are to be conducted on topics which would help the learner to identify/analyze the problem and to apply problem solving techniques learnt.

## Text Books

1. D. Patranabis, "Sensor and Actuators", $2^{nd}$ Edition, Prentice Hall of India.

2. A. K. Sawhney, "A Course in Electronic Measurements and Instrumentation", $19^{th}$ Edition, Dhanpat Rai & Co.

3. H. S. Kalsi, "Electronic Instrumentation and Measurements", $4^{th}$ Edition, McGraw-Hill.

4. Nathan Ida, "Sensors, Actuators and their Interfaces", SciTech Publishing, 2013.

## Reference Books:

1. Jacob Fraden, "Handbook of Modern Sensors: Physics, Designs, and Applications", $4^{th}$ Edition, Springer, 2010.

2. Clarence. W. de Silva, "Sensors and Actuators: Engineering System Instrumentation", $2^{nd}$ Edition, CRC Press, 2015.

3. Ernest. O. Doebelin, "Measurement Systems, Application and Design", Tata McGraw-Hill Publishing Company Ltd., $5^{th}$ Edition, 2004.

4. D. A. Bradley, D. Dawson, N. C. Burd, A. J. Loader, "Mechatronics", Thomson Press India Ltd., 2004.

5. S. Renganathan, "Transducer Engineering", Allied Publishers (P) Ltd., 2003.

6. W. Bolton, "Mechatronics", $4^{th}$ Edition, Pearson Education, 2011.

## Evaluation Scheme:

## Continuous Assessment (A):

Laboratory work shall consist of minimum 10 experiments and subject specific lab assignment/case study/mini project.

The distribution of marks shall be as follows:

1. Performance in Experiments: 05 Marks

2. Journal Submission: 05 Marks

3. Viva-voce: 05 Marks

4. Subject Specific Lab Assignment/Case Study/mini project: 10 Marks

The final certification and acceptance of laboratory journal/manual/report will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the teacher assessment.

## End Semester Examination (C):

Oral / Practical examination will be based on the entire syllabus including, the practicals performed during laboratory sessions.

# HONORS Track: Robotics & Automation Sensors & Instrumentation (RCP23LCH3301)

**Teaching Scheme**

Lectures: 03 Hrs./Week

Credit: 03

**Examination**

Term Test: 15 Marks

Teacher Assessment: 25 Marks

End Sem Exam: 60 Marks

Total: 100 Marks

## Course Objectives

1. To understand the concepts of measurement technology.

2. To learn the various sensors used to measure various physical parameters.

3. To learn the fundamentals of signal conditioning, data acquisition and communication systems used in mechatronics system development.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | Familiar with various calibration techniques and signal types for sensors. | L1 | Remember |
| CO2 | Apply the various sensors in the Automotive and Mechatronics applications | L3 | Apply |
| CO3 | Describe the working principle and characteristics of force, magnetic and heading sensors. | L1 | Knowledge |
| CO4 | Understand the basic principles of various pressure and temperature, smart sensors. | L2 | Understand |
| CO5 | Ability to implement the DAQ systems with different sensors for real time applications. | L6 | Evaluate |

# Course Contents

**Unit-I**                    **Introduction**                    **08 Hrs.**

Basics of Measurement – Classification of errors ,Error analysis – Static and dynamic characteristics of transducers ,Performance measures of sensors ,Classification of sensors ,Sensor calibration techniques ,Sensor Output Signal Types

**Unit-II**        **Motion, Proximity and Ranging Sensors**        **8 Hrs.**

Introduction, classifications ,calibration and performance measurements. , Motion sensor, Optical encoder. , magnetic, Inductive, capacitive. ,Accerometer, Range sensors (RF Beacon), Ultrasonic and Laser Range Sensor (LIDAR).

**Unit-III**        **Force, Magnetic and Heading Sensors**        **08 Hrs.**

Strain guage, Load cell Magnetic sensor ,Types, principle, requirement and advantage , Magneto, resistive-hall effect, current sensor ,Heading sensors, gyroscope, inclinometers

**Unit-IV**        **Optical Pressure and Temperature sensors**        **06 Hrs.**

Photo conductive cell, fiber optic sensors. ,Pressure-Diaphragm, Piezoelectric-tactile sensor. ,RTD, Thermocouple. , Acoustic sensors – flow and level measurement. , Radiation sensors, smart sensors, LASER sensor.

**Unit-V**        **Signal Conditioning and DAQ Systems**        **09 Hrs.**

Amplification – Filtering – Sample and Hold circuits ,Data Acquisition: Single channel and multichannel data acquisition ,Data logging ,Applications - Automobile, Aerospace, Home appliances, Manufacturing, Environmental monitoring

## Text Books:

1. S. Gupta, J.P. Gupta, "PC Interfacing for Data Acquisition & Process Control", $2^{nd}$ ED, Instrument Society of America, 1994.

2. A.K. Sawney and Puneet Sawney, "A Course in Mechanical Measurements and Instrumentation and Control", $12^{th}$ edition, Dhanpat Rai & Co, New Delhi, 2013.

3. Hans Kurt Tönshoff (Editor), Ichiro, "Sensors in Manufacturing", Volume 1, Wiley-VCH, April 2001.

# Reference Books:

1. A.D. Helfrick and W.D. Cooper, Modern Electronic Instrumentation & Measurement Techniques", PHI, 2001.

2. Arun K. Ghosh, "Introduction to Measurements and Instrumentation", PHI, 4$^{th}$Edition, 2012.

3. D. Patranabis, "Sensors and Transducers", 2$^{nd}$ Edition, PHI, New Delhi, 2011.

# Evaluation Scheme:

## Continuous Assessment (A):

Course teacher will declare Teacher Assessment criteria at the start of semester.

## Continuous Assessment (B):

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average in both the tests will be considered for final grading.

## End Semester Examination (C):

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

Shirpur Education Society's

# R. C. Patel Institute of Technology, Shirpur
# (An Autonomous Institute)

## Syllabus Booklet
## Department of Electrical Engineering

## Second Year B.Tech. Semester- IV

### With Effect from Academic Year 2024-25

Shahada Road, Near Nimzari Naka, Shirpur, Maharashtra 425405
Ph: 02563 259 802, Web: www.rcpit.ac.in

# Power System-I (RCP23LCPC401)

| **Teaching Scheme** | **Examination** |
|---|---|
| Lectures: 02 Hrs./Week | Term Test: 15 Marks |
| Credit: 02 | Teacher Assessment: 25 Marks |
| Tutorial : 02 Hrs / Week | End Sem Exam: 60 Marks |
| | Total: 100 Marks |

## Prerequisites

1. Knowledge of Basic Electrical Energy.

2. Knowledge of Electrical Energy Generation System.

3. Present scenario of power

## Course Objectives

1. To understand the different types of power generating stations.

2. To examine A.C. and D.C. distribution systems.

3. To understand and compare overhead line insulators and Insulated cables.

4. To illustrate the economic aspects of power generation and tariff methods.

5. To evaluate the transmission line parameters calculations

| COs | Course Outcomes | Blooms Level | Blooms Description |
|---|---|---|---|
| CO1 | Understanding the basics of power system generation, transmission, distribution system. | L2 | Understand |
| CO2 | Classification of overhead line insulators and evaluation of string efficiency. | L2, L4 | Understand, Apply |
| CO3 | Modeling, Design, and Evaluation of various parameters of transmission lines. | L2, L4 | Understand, Apply |
| CO4 | Acquire knowledge of underground cables: Construction and methods of laying. | L2, L4 | Understand, Apply |
| CO5 | To understand power Distribution System. | L4 | Analyze |

# Course Contents

**Unit-I**  **Generation of Electric Power**  **08 Hrs.**

Introductions to Power Plant: Hydro station, Steam Power Plant, Nuclear Power Plant and Gas Turbine Plant. Ocean Energy, Tidal Energy, Wave Energy, wind Energy, Fuel Cells, and Solar Energy.

**Unit-II**  **Transmission System**  **08 Hrs.**

Electric supply system, A.C power supply scheme, D.C transmission scheme, Comparison of AC and DC transmission system, advantages of A.C. transmission system, Comparison of various transmission system (Two wire dc system, Single phase two wire A.C system, Single phase three wire system, three phase three wire system, Three phase four wire system), Economic choice of transmission voltage, requirements of satisfactory electric supply.

**Unit-III**  **Mechanical Design of Overhead Transmission Line**  **08 Hrs.**

Main components of overhead line, conductor materials, line supports, Type of insulators, Testing of Insulators, potential distribution over suspension insulator string, string efficiency, methods of improving string efficiency. Phenomenon of corona, factors affecting corona, advantages and disadvantages of corona, methods of reducing corona, Sag in overhead line, calculation of sag, Effects of wind and ice coating on transmission line.

**Unit-IV**  **Transmission Line Parameters**  **08 Hrs.**

Resistance, Inductance: Definition, Inductance due to internal flux of two wire single phase line of composite conductor line, GMD and GMR, Inductance and Capacitance of single  three phase line with equal and unequal spacing, Skin effect, Proximity Effect, Ferranti effect. Phenomenon of Corona, Corona loss, Factors affecting Corona.

**Transmission Line Performance:** Characteristics and performance of power transmission lines: Short, Medium, Long lines, Generalized constants, Power flow, regulation, Power circle diagrams, Series and shunt compensation, Surge impedance loading.

**Unit-V**  **Distribution System and Underground Cables**  **08 Hrs.**

Distribution System Classification  Requirements of distribution system, Types of distribution AC and DC, Voltage drop calculations in different distribution system, Tariff, desirable characteristics of tariff, types of tariff, Numericals on tariff.

**Underground cable:** Introductions, Classification, Types of Cables, Insulation resistance and Capacitance, Grading, Dielectric stress in cable, Heating, Current rating of cable, Numericals on insulation resistance  capacitance of cable.

# Text Books

1. Mehta, V.K, "Electrical Power system", S. Chand and Co., New Delhi, 2011.

2. Ashfaq Hussain, "Electrical Power System", CBS Publishers and Distributors,2015

3. J.B. Gupta, "Electrical Power", SK Kataria and Sons 2012.

4. Debapriya Das, Electrical Power Systems, New Age International Private Limited, 2016.

# Reference Books

1. M.V. Deshpande, Elements of Elect Power, Transmission and Distribution, Tata McGraw-Hill.2004

2. Uppal, S.L., "Electrical Power", Khanna publication, New Delhi, 2011

3. Solanki, Chetan S., "Renewable Energy Technologies", PHI Learning, New Delhi, 2011

4. B.R. Gupta., "Generation of Electrical Energy", S. Chand and Co., Seventh Edition, New Delhi,2017

5. C.L. Wadhwa, "Generation, Distribution and Utilization of Electrical Energy", 7th edition, New Age International, 2016.

## Evaluation Scheme:

**Continuous Assessment (A):**

Subject teacher will declare Teacher Assessment criteria at the start of semester.

**Continuous Assessment (B):**

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average of both the tests will be considered for final grading.

## End Semester Examination (C):

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

# Power System-I Laboratory (RCP23LLPC401)

**Teaching Scheme**
Practical: 02 Hrs/Week
Credit: 01

**Examination Scheme**
Teacher Assessment: 25 Marks
End Sem Exam : 25 Marks
Total: 50 Marks

## Course Objectives

1. This course aims to develop familiarity with power system.

2. To understand and estimation of transmission line parameters.

3. To obtain the equivalent circuits of the transmission lines for determining voltage regulation and efficiency.

4. To gain knowledge on design of insulators and their performance.

5. To develop an understanding of the environmental aspects of power transmission & distribution.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | Understand the general structure of power system. | L2 | Undesrstand |
| CO2 | Apply the real time electrical transmission system with respect to various electrical parameters. | L3 | Apply |
| CO3 | Analyze the experimental results and correlating them with the practical power system. | L4 | Analyze |
| CO4 | Understand, Identify and select appropriate sub–station location. | L2 | Unde |
| CO5 | Analyze the electrical parameters by using modern tools for fault analysis | L4 | Analyze |
| CO6 | Function as an effective member in multidisciplinary teams, and Understanding of professional and ethical responsibilities. | L2 | Understand |

# List of the Experiments

List of Laboratory Experiments (minimum 10 to be covered)

## Part A

### Any 5 experiments from Part-A

1. Study of Hydro Power Plant layout & its components.

2. Study of Thermal Power Plant layout & its components.

3. Study of Nuclear Power Plant layout & its components.

4. Study of line conductors and insulators of OHT system

5. To Determine Regulation and Transmission Efficiency for Short and Medium transmission line.

6. To Determine ABCD parameters of short, medium and long transmission lines.

7. To study the Ferranti effect of Long Transmission Line

## Part B

### Any 5 experiments from Part-B

1. To Study Various Types of Distribution systems

2. To Design substation models.

3. Case study on different types of Tariff.

4. To Determine Voltage regulation, efficiency and Power factor of long transmission line by using MATLAB Software.

5. To Determine sag of transmission line by using MATLAB Software.

6. Measurement of Insulation Resistance of Power Cables.

7. To study control Panel and Metering Equipment of Industries

### Reference Books

1. Mehta, V.K, "Electrical Power system", S. Chand and Co., New Delhi, 2011.

2. Nag, P K, "Power plant Engineering", Tata McGraw Hill, New Delhi, 2011

3. Uppal, S.L., "Electrical Power", Khanna publication, New Delhi, 2011

4. B.R. Gupta., "Generation of Electrical Energy", S. Chand and Co., Seventh Edition, New Delhi, 2017

5. J.B. Gupta, "Electrical Power", SK Kataria and Sons 2012.

6. Ashfaq Hussain, "Electrical Power System", CBS Publishers and Distributors, 2015

7. C.L. Wadhwa, "Generation, Distribution and Utilization of Electrical Energy", 7th edition, New Age International, 2016.

**Evaluation Scheme:**

**Continuous Assessment (A):**

Laboratory work shall consist of minimum 8 experiments and subject specific lab assignment/case study/mini project.

The distribution of marks shall be as follows:

1. Performance in Experiments: 05 Marks

2. Journal Submission: 05 Marks

3. Viva-voce: 05 Marks

4. Subject Specific Lab Assignment/Case Study/mini project: 10 Marks

The final certification and acceptance of laboratory journal/manual/report will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the teacher assessment.

**End Semester Examination (C):**

Oral / Practical examination will be based on the entire syllabus including, the practicals performed during laboratory sessions.

# Electrical Machine-I (RCP23LCPC402)

| **Teaching Scheme** | **Examination Scheme** |
|---|---|
| Lectures: 03 Hrs./Week | Term Test: 15 Marks |
| Credit: 03 | Teacher Assessment: 25 Marks |
| | End Sem Exam: 60 Marks |
| | Total: 100 Marks |

**Course Pre-requisite:** Magnetic circuit, mutually induced EMF, dynamically induced EMF, Direction of magnetic field in current carrying conductor, Flemings LHR & RHR, Electromechanical energy conversion.

## Course Objectives

1. To understand energy conversion process.

2. To understand basic principles operation, performance and control of dc machine and transformer.

3. To understand selection of machines for specific applications.

4. To understand test analysis the performance of machine.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|---|---|---|---|
| CO1 | To understand the basic knowledge of science, mathematics and engineering for understanding the concept of magnetic circuit, electrical machines and transformer. | L2 | Understand |
| CO2 | To Apply engineering concepts in working and characteristics of DC machines | L3 | Apply |
| CO3 | To Analyse the performance of DC machines. | L4 | Analyze |
| CO4 | To Apply engineering concepts in construction & working of Transformers. | L3 | Apply |
| CO5 | To understand selection of machines for specific applications | L4 | Analyze |

# Course Contents

### Unit-I    Electromechanical Energy Conversion Principle    08 Hrs.

Energy stored in the magnetic circuit, rotating magnetic field, field energy and mechanical force, energy in single and multiple excited magnetic systems, Physical concept of torque production, Concept of general terms pertaining to rotating machines, Dynamic equations of electromechanical systems and analytical techniques.

### Unit-II                    DC Generator                    08 Hrs.

Construction, main parts, magnetic circuits, poles, yoke, field winding, armature core, Armature windings, Generating action, E.M.F equation, magnetization curve, armature reaction, characteristic of DC generator, demagnetizing and cross magnetizing, compensating winding, commutation process and methods to improve commutation. Losses, power flow diagram and efficiency of DC generator.

### Unit-III                    DC Motor                    08 Hrs.

Type of DC motors, significance of back E.M.F, torque equation, power stages, losses and efficiency, characteristic of DC motors, speed control of DC motors, necessity and types of starters, solid state starters. Applications of various DC machines, troubleshooting of various DC machines, selection procedure, study of relevant Indian Standard Specifications.

### Unit-IV                    Transformers                    08 Hrs.

Concept of ideal transformer., Cargo core and amorphous core transformers, Phasor diagram, equivalent circuit, voltage regulation, Losses in a transformer, their variation with load and efficiency, testing of transformer open circuit and short circuit tests, polarity test. Three-phase transformer construction, vector groups, V-V connections, Scott connection, parallel operation and load sharing. Applications of various transformers, Distribution Transformer requirements as per Indian Standard.

### Unit-V          Special Machines and Applications          08 Hrs.

Brushless DC Motor (BLDC): Constructional details, working principle, comparison of BLDC motor with conventional DC motor, characteristics and applications, advantages and disadvantages. Permanent Magnet DC Motor (PMDC): Constructional details, working principle, characteristics and applications, advantages and disadvantages. Stepper Motor: Constructional details, working principle, types, characteristics and applications, advantages and disadvantages. Universal Motor, Switched Reluctance Motor.

## Text Books

1. Edward Hughes "Electrical Technology", ELBS, Pearson Education.

2. Ashfaq Husain, "Electrical Machines", Dhanpat Rai and Sons.

3. S. K. Bhattacharya, "Electrical Machine", Tata McGraw Hill publishing Co. Ltd, 2nd Edition.

4. Nagrath and Kothari, "Electrical Machines", Tata McGraw Hill.

5. Bhag S Guru, Husein R. Hiziroglu, "Electrical Machines", Oxford University Press.

6. K Krishna Reddy, "Electrical Machines- I and II", SCITECH Publications (India) Pvt. Ltd.

## Reference Books

1. A.E. Clayton and N. N. Hancock, "Performance and Design of Direct Current Machines", CBS Publishers, 3rd Edition.

2. A.E. Fitzgerald, Charles Kingsley, Stephen D. Umans, "Electrical Machines", Tata McGraw Hill Publication Ltd, 5th Edition.

3. A.S. Langsdorf, "Theory and Performance of DC Machines", Tata McGraw Hill.

4. M.G. Say, "Performance and Design of AC Machines", CBS Publishers and Distributors.

5. Smarajit Ghosh, "Electrical Machines", Pearson Education, New Delhi.

6. Charles I Hubert, "Electrical Machines Theory, Application, and Control", Pearson Education,

## Evaluation Scheme:

**Continuous Assessment (A):**

Course teacher will declare Teacher Assessment criteria at the start of semester.

**Continuous Assessment (B):**

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average of both the tests will be considered for final grading.

**End Semester Examination (C):**

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

# Electrical Machine-I Laboratory (RCP23LLPC402)

**Teaching Scheme**

Practical: 02 Hrs/Week

Credit: 01

**Examination Scheme**

Teacher Assessment: 25 Marks

End Sem Exam : 25 Marks

Total: 50 Marks

## Course Objectives

1. To inculcate in students basic ideas and principle of electrical engineering.

2. To impart the fundamental knowledge of Machines and transformers.

3. To understand the characteristic of DC machines and application.

4. To enhance knowledge of application of transformer in power system.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | Understand basic knowledge of measuring instruments to conduct experiments on machine with safety precautions. | L2 | Understand |
| CO2 | Apply the characteristic of DC machines as generator and its applications. | L3 | Apply |
| CO3 | Analyze the data for determination of parameter by conducting different test on DC machines. | L4 | Analyze |
| CO4 | Explain and Apply the different methods of testing on transformer in manufacturing, utility and service industry. | L3 | Apply |
| CO5 | Demonstrate the application of special purpose machines in power system, utility and different industry. | L2 | Understand |

# List of the Experiments

Perform 10 experiments from the following list of experiments. (7-Hardware, 2-Simulation and 1-Innovative)

1. Familiarization of the electrical machine laboratory apparatus.

2. Speed Control of DC motor by field resistance control.

3. Speed Control of DC motor by Armature Resistance Control.

4. To study Magnetization Characteristics of D C generator.

5. To study External, Internal Characteristics of D C Generator.

6. Determination of performance characteristic of DC series motor by direct load.

7. Determination of Transformer equivalent circuit from Open Circuit and Short Circuit Test.

8. Determination of performance of single phase transformer by direct load test.

9. Polarity and Ratio test on single phase transformer.

10. Parallel operation of two single phase transformer.

11. Study of phasor and vector group of three phase transformer.

12. Scott connection of two single phase transformer.

13. To study DC Machine characteristics using MATLAB.

14. Load test on single phase transformer using MATLAB.

15. Speed control of BLDC motor using Ardiuno (Innovation).

16. Direction control of stepper motor using Ardiuno (Innovation).

## Reference Books

1. Brian D. Hahn, Essential MATLAB for Scientists and Engineers, Elsevier Publication, 2002.

2. www.mathworks.com.

## Evaluation Scheme:

## Continuous Assessment (A):

Laboratory work shall consist of minimum 10 experiments and subject specific lab assignment/case study/mini project.

The distribution of marks shall be as follows:

1. Performance in Experiments: 05 Marks

2. Journal Submission: 05 Marks

3. Viva-voce: 05 Marks

4. Subject Specific Lab Assignment/Case Study/mini project: 10 Marks

The final certification and acceptance of laboratory journal/manual/report will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the teacher assessment.

**End Semester Examination (C):**

Oral / Practical examination will be based on the entire syllabus including, the practicals performed during laboratory sessions.

# Microcontroller & Applications (RCP23LCPC403)

**Teaching Scheme**

Lectures: 03 Hrs./Week

Credit: 03

**Examination**

Term Test: 15 Marks

Teacher Assessment: 25 Marks

End Sem Exam: 60 Marks

Total: 100 Marks

## Course Pre-requisite:

1. Basic Electrical Engineering & Digital Electronics

## Course Objectives

1. To study the Architecture of 8051 microcontroller.

2. To study the addressing modes and instruction set of 8051.

3. To introduce the need and use of Interrupt structure of 8051

4. To develop skill in simple applications development with programming 8051 and to study advanced microprocessor.

5. To introduce Arduino with commonly used peripheral and interfacing

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | To recall describe the architecture of various micro controller. | L1 | Remember |
| CO2 | To understand interpret program for 805l in assembly language and embedded C. | L2 | Understand |
| CO3 | To analyze use the Timers, Interrupts with microcontroller. | L3 | Apply |
| CO4 | To analyze analyze the interfacing of various peripheral devices with microcontroller and outline architecture of advanced microprocessor. | L4 | Analyze |
| CO5 | To Create develop programming and interfacing of I/O devices with Arduino. | L6 | Create |

# Course Contents

### Unit-I 8051 Microcontroller Architecture & Programming 08 Hrs.

Microprocessor vs Microcontroller, Intel 8051 Functional block diagram, Functions of pins of 8051, memory organization of 8051, Stack and Operation of stack, Instruction set of 8051 microcontrollers, Assembly Language Programs based on instructions, Addressing modes of 8051

### Unit-II                8051 Timers and Programming                08 Hrs.

Data types in C, 8051 Programming in embedded C, 8051 ports and programming in embedded C. Time delay programming in embedded C. 8051 Timers and counters and its programming in embedded C

### Unit-III   Interrupts Programming and Advanced Microprocessor 08 Hrs.

8051 interrupts, Interrupts Programming in embedded C, 8051 Serial port Structure and its programming in embedded C. Introduction to Architecture of PIC Microcontroller, ARM Processor, ATMEGA Processor.

### Unit-IV                    8051 Interfacing                    08 Hrs.

Interfacing of Switch, LED, with 8051 and its programming in embedded C, Interfacing and programming of LCD, ADC, DAC, Stepper motor and Relay with 8051 in embedded C.

### Unit-V                Introduction to Embedded System                08 Hrs.

Definition of Embedded System, Embedded Systems vs General Computing Systems, Classification, Major Application Areas, Characteristics and quality attributes (Design Metric) of embedded system. Real time system's requirements, real time issues, interrupt latency. Embedded Product development life cycle.

## Text Books

1. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems", Pearsons, 2nd Edition, 2014.

2. V Udayashankara and M S Mallikarjuna Swamy, "8051 Microcontroller, Hardware, Software and Applications", TATA McGraw Hill, 1st Edition, 2017.

3. R. Theagrajan, "Microprocessor and Microcontroller", BS Publication, 1st Edition, 2010.

4. K. J. Ayala, "The 8051 Microcontrollers- Architecture, Programming and Applications", Peram International Publications, 2nd Edition, 1998

5. Subrata Ghoshal, "8051 Microcontroller", Pearsons Publishers, 2nd Edition, 2014.

6. Han-Way Huang, "Embedded System Design with C8051", Cengage Learning, 1st Edition, 2009.

7. A.K Ray and K.M. Burchandi, "Advanced Microprocessor and Peripherals Architectures,Programming and Interfacing",second edition,Tata McGraw-Hill, 3rd Edition, 2017.

8. James A. Langbridge "Arduino Sketches: Tools and Techniques for Programming Wizardry", Wiley Publication, 1st Edition, 2015.

## Reference Books

1. Scott Mackenzie, "8051 Microcontroller", Pearson Education, 4th Edition, 2006.

2. Intel Microcontroller Data Book. Intel Corporation 1990- 8 bit Embedded Controller Handbook.

## Evaluation Scheme:

### Continuous Assessment (A):

Course teacher will declare Teacher Assessment criteria at the start of semester.

### Continuous Assessment (B):

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average of both the tests will be considered for final grading.

### End Semester Examination (C):

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

# Microcontroller & Applications Laboratory (RCP23LLPC403 ))

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**Teaching Scheme**                                      **Examination**

Practical: 02 Hrs/Week                    Teacher Assessment: 25 Marks

Credit: 01                                         End Sem Exam : 25 Marks

Total: 50 Marks

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**Prerequisites** Basic Electrical Engineering and Digital Electronics.

## Course Objectives

1. To simulate microcontroller using KEIL or Equivalent simulator.

2. To prepare the students to be able to solve different problems by developing different programs

3. Practical hands on experience of programming the 8051 microcontroller

4. To gain knowledge on interfacing of different peripherals to microcontroller.

5. To provide training on programming of microcontrollers and Arduino and understand the interface requirements

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | Analyze architecture of microcontroller IC | L1,L2 | Analyze, Understand |
| CO2 | Interpret the program for 8051 in assembly language and in embedded C for the given operations | L3 | Apply |
| CO3 | Ability to understand basics of software simulators | L2 | Understand |
| CO4 | Understand the interfacing of microcontrollers with various peripherals | L3,L2 | Understand |

# Course Contents

**Par A:**

**Any 5 experiments from Part-A (3- Hardware base, l- Simulation and l- Innovative experiments**

1. Write an Assembly language program to perform 8 bit arithmetic operations Addition and Subtraction

2. Write an Assembly language program to find larger number from given data bytes stored in memory locations

3. Write an Assembly language program to find square of number using Look up table concept

4. Write an Assembly language program to perform 8 bit logical AND, OR operations

5. Write an Assembly language program to arrange an data in ascending or descending order

6. Write an Assembly language program to transfer data from source to destination locations of memory

7. Write a program blinking of LED using Proteus VSM simulation software

8. Design of temperature meter using Arduino (Innovative)

9. Design of DC voltmeter using Arduino (Innovative)

**Par B:**

**Any 5 experiments from Part-A (3- Hardware base, l- Simulation and l- Innovative experiments**

1. Implementation of Serial Communication by using 8051 serial ports

2. Write an embedded C program for interfacing of 8 bit ADC 0809 with 8051 Microcontroller

3. Write an embedded C program for interfacing of 8 bit DAC 0808 with 8051 to generate various waveforms

4. Write an embedded C program for stepper motor control by 8051 Microcontroller

5. Write an embedded C program for interfacing of the relay with 8051

6. Write an embedded C program for LCD interfacing with 8051 microcontroller

7. Write a program for switch and LED interfacing using Proteus VSM simulation software

8. Design of ultrasonic distance meter using Arduino (Innovative)

9. Design of digital ohmmeter using Arduino (Innovative)

## Reference Books

1. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems", Pearsons, 2nd Edition, 2014.

2. V Udayashankara and M S Mallikarjuna Swamy, "8051 Microcontroller, Hardware, Software and Applications", TATA McGraw Hill, 1st Edition, 2017.

3. Ajay V. Deshmukh, "Microcontrollers : Theory and Applications", TATA McGraw Hill, 2nd Edition, 2017.

4. R. Theagrajan, "Microprocessor and Microcontroller", BS Publication, 1st

5. K. J. Ayala, "The 8051 Microcontrollers- Architecture, Programming and Applications", Peram International Publications, 2nd Edition, 1998.

6. Subrata Ghoshal, "8051 Microcontroller", Pearsons Publishers, 2nd Edition, 2014.

7. Han-Way Huang, "Embedded System Design with C8051", Cengage Learning, 1st Edition, 2009.

8. James A. Langbridge "Arduino Sketches: Tools and Techniques for Programming Wizardry", Wiley Publication, 1st Edition, 2015.

## Evaluation Scheme:

### Continuous Assessment (A):

Laboratory work shall consist of minimum 8 experiments and subject specific lab assignment/case study/mini project.

The distribution of marks shall be as follows:

1. Performance in Experiments: 05 Marks

2. Journal Submission: 05 Marks

3. Viva-voce: 05 Marks

4. Subject Specific Lab Assignment/Case Study/mini project: 10 Marks

The final certification and acceptance of laboratory journal/manual/report will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the teacher assessment.

### End Semester Examination (C):

Oral / Practical examination will be based on the entire syllabus including, the practicals performed during laboratory sessions.

# Data Structures and Algorithms (RCP23LCMD401 )

**Teaching Scheme**
Lectures: 02 Hrs./Week
Credit: 02

<div align="right">

**Examination**
Term Test: 15 Marks
Teacher Assessment: 25 Marks
End Sem Exam: 60 Marks
Total: 100 Marks

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## Course Objectives

1. To introduce the concept of data structures.

2. To design and implement various data structure through abstract data type.

3. TTo develop application using data structure algorithms.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | Implement linear data structures using array and linked list. | L4 | Analyze |
| CO2 | Solve problems using non-linear data structures. | L3 | Apply |
| CO3 | Analyze the performance of sorting and searching algorithms. | L2 | Understand |

# Course Contents

**Unit-I**          **Introduction to Data structures**          **04 Hrs.**

Introduction to Data structures, Types of Data structures: Linear and nonlinear data structures, Arrays, Stacks, Queue, Linked list Tree and Graph, Recursion, Introduction to Analysis, Algorithms, characteristics of an algorithms, Time and Space complexities, Order of growth functions, Asymptotic notations.

**Unit-II**          **Stack and Queue data structure**          **05 Hrs.**

Introduction to Stack, Stack as ADT, Operations on Stack, Application of stack: – reversing string, Polish notations, Introduction to Queue, Queue as ADT, Operations on Queue, Linear representation of queue.

**Unit-III**          **Linked List data structure**          **05 Hrs.**

Introduction to Linked List, Singly Linked list, Doubly Linked list, Operations on linked list, Linked representation of stack, Linked representation of Queue .

**Unit-IV**          **Sorting and Searching**          **06 Hrs.**

Introduction to Sorting: Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort. Analysis of Sorting Techniques. Comparison of sorting Techniques Introduction to Searching: Linear search, Binary search, Hashing Techniques, Different Hash functions, Collision & Collision resolution techniques, Analysis of searching Techniques.

**Unit-V**          **Tree**          **06 Hrs.**

Introduction to Trees, Definitions & Tree terminologies, Binary tree representation, Operations on binary tree, Traversal of binary trees, Binary search tree Introduction to Graph, Introduction Graph Terminologies, Graph Representation, Type of graphs, Graph traversal: Depth first search(DFS) & Breadth First search(BFS), Minimum Spanning Tree: Prim's & Kruskal's Shortest Path Algorithm.

## Text Books

1. Tenenbaum, Langsam, Augenstein, "Data structures using C",$1^{st}$ Edition,Pearson Education,2019.

2. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, "Fundamentals of Data Structures in C", $2^{nd}$ Edition, W. H. Freeman and Company, 2008.

3. Reema Thareja, "Data Structures using C", $2^{nd}$ Edition, Oxford, 2017.

## Reference Books

1. Mark A. Weiss, "Data Structures and Algorithm Analysis in C", $4^{th}$ Edition, Pearson Education, 2014. .

2. M. T. Goodritch, R. Tamassia, D. Mount, "Data Structures and Algorithms in C++", $2^{nd}$ Edition, Wiley, 2011.

3. Kruse, Leung, Tondo, "Data Structures and Program Design in C", $2^{nd}$ Edition, Pearson Education, 2013.

4. Seymour Lipschutz, "Data Structures", Schaum's Outline Series, $1^{st}$ Edition, Tata McGraw-Hill, 2014.

# Evaluation Scheme:

**Continuous Assessment (A):**

Course teacher will declare Teacher Assessment criteria at the start of semester.

**Continuous Assessment (B):**

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average of both the tests will be considered for final grading.

**End Semester Examination (C):**

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

# Data Structures and Algorithms Laboratory (RCP23LLMD401)

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**Teaching Scheme**

Practical: 02 Hrs/Week

Credit: 01

**Examination Scheme**

Teacher Assessment: 25 Marks

End Sem Exam : 25 Marks

Total: 50 Marks

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## Course Objectives

1. To introduce the concept of data structures.

2. To design and implement various data structure through abstract data type.

3. TTo develop application using data structure algorithms.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | Implement linear data structures using array and linked list. | L4 | Analyze |
| CO2 | Solve problems using non-linear data structures. | L2 | Understand |
| CO3 | Analyze the performance of sorting and searching algorithms. | L2 | Understand |

# Course Contents

**List of Laboratory Experiments: (Any Eight)**

1. To implement stack.

2. To implement parenthesis checker using stack.

3. To Implement Infix to Postfix conversion.

4. To evaluate prefix and postfix expression.

5. To implement Linear queue.

6. To implement various operations on linked list –copy, concatenate, split, reverse, count no. of nodes.

7. To implement various operations on doubly linked list.

8. To implement Stack using Linked List.

9. To implement Queue using Linked List.

10. To implement Sorting algorithms.

11. To implement Searching algorithms.

12. To create a binary tree and traverse it in Inorder, preorder and Postorder.

13. To implement binary search tree.

14. To implement DFS and BFS in graph theory

    Batchwise laboratory work of minimum eight experiments from the above suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt.

## Text Books

1. Tenenbaum, Langsam, Augenstein, "Data structures using C",$1^{st}$ Edition,Pearson Education,2019.

2. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, "Fundamentals of Data Structures in C", $2^{nd}$ Edition, W. H. Freeman and Company, 2008.

3. Reema Thareja, "Data Structures using C", $2^{nd}$ Edition, Oxford, 2017.

## Reference Books

1. Mark A. Weiss, "Data Structures and Algorithm Analysis in C", 4$^{th}$ Edition, Pearson Education, 2014. .

2. M. T. Goodritch, R. Tamassia, D. Mount, "Data Structures and Algorithms in C++", 2$^{nd}$ Edition, Wiley, 2011.

3. Kruse, Leung, Tondo, "Data Structures and Program Design in C", 2$^{nd}$ Edition, Pearson Education, 2013.

4. Seymour Lipschutz, "Data Structures", Schaum's Outline Series, 1$^{st}$ Edition, Tata McGraw-Hill, 2014.

**Evaluation Scheme:**

**Continuous Assessment (A):**

Laboratory work shall consist of minimum 8 experiments and subject specific lab assignment/case study/mini project.

The distribution of marks shall be as follows:

(a) Performance in Experiments: 05 Marks

(b) Journal Submission: 05 Marks

(c) Viva-voce: 05 Marks

(d) Subject Specific Lab Assignment/Case Study/mini project: 10 Marks

The final certification and acceptance of laboratory journal/manual/report will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the teacher assessment.

**End Semester Examination (C):**

Oral / Practical examination will be based on the entire syllabus including, the practicals performed during laboratory sessions.

# Project Management (RCP23OCOE401)

**Teaching Scheme**

Lectures: 03 Hrs./Week

Credit: 03

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**Examination Scheme**

Term Test: 15 Marks

Teacher Assessment: 25 Marks

End Sem Exam: 60 Marks

Total: 100 Marks

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## Course Objectives

1. To familiarize the students with the use of a structured methodology/approach for every unique project undertaken, utilizing project management concepts, tools and techniques.

2. To appraise the students with the project management life cycle and make them knowledgeable about the various phases from project initiation through closure.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|---|---|---|---|
| CO1 | Explain project management life cycle and the various project phases as well as the role of project manager. | L2 | Understand |
| CO2 | Apply selection criteria and select an appropriate project from different options. | L2 | Understand |
| CO3 | Create a work break down structure for a project and develop a schedule based on it. Manage project risk strategically. | L3 | Apply |
| CO4 | Use Earned value technique and determine and predict status of the project. Capture lessons learned during project phases and document them for future reference. | L6 | Create |
| CO5 | Differentiate between traditional waterfall approach and agile scrum methodology for software development projects. | L6 | Create |

# Course Contents

**Unit-I**        **Project Management Foundation**        **07 Hrs.**

Definition of a project, Project Vs Operations, Necessity of project management, Triple constraints, Project life cycles (typical atypical). Project phases and stage gate process. Role of project manager, Negotiations and resolving conflicts, Introduction to project leadership, ethics in projects, Multicultural and virtual projects, Project management in various organization structures, PM knowledge areas as per Project Management Institute (PMI).

**Unit-II**        **Initiating Projects**        **08 Hrs.**

How to get a project started, selecting project strategically, Project selection models (Numeric /Scoring Models and Non-numeric models), Project portfolio process, Project sponsor and creating charter, Effective project team, Stages of team development growth (forming, storming, norming performing), team dynamics.

**Unit-III**        **Project Planning**        **08 Hrs.**

Work Breakdown structure (WBS) and linear responsibility chart, Project cost estimation and budgeting, Top down and bottoms up budgeting, Networking and Scheduling techniques, PERT, CPM. Crashing project time & Resource loading and levelling (Only Theory), Project Stakeholders and Communication plan. Risk Management in projects: Risk management planning, Risk identification and risk register, Qualitative and quantitative risk assessment, Probability, and impact matrix. Risk response strategies for positive and negative risks.

**Unit-IV**        **Monitoring and Controlling Projects**        **08 Hrs.**

Planning monitoring and controlling cycle, Information needs and reporting, engaging with all stakeholders of the projects, communication and project meetings. Earned Value Management techniques for measuring value of work completed, using milestones for measurement, change requests and scope creep, Project audit, Project Contracting: Project procurement management, contracting and outsourcing. Closing the Project: Customer acceptance, Reasons of project termination, Various types of project terminations (Extinction, Addition, Integration, Starvation), Process of project termination, completing a final report, doing a lessons learned analysis, acknowledging successes and failures.

**Unit-V**        **Agile project management**        **08 Hrs.**

Agile principle, Agile Manifesto, Agile process framework, Characteristics of Agile Approaches and Scrum, Benefits of Agile project management, Implementing Agile project management. Agile Project Planning: Comparison of Agile Project Management with Traditional Waterfall Approach, Project Planning with Scrum, Scrum Artifacts Supporting Project Planning , Scrum Events for Project Plan-

ning. Scheduling with scrum, Techniques for scrum scheduling- Poker estimation. Agile Tools for Tracking Project Progress: Task Boards, Burnup and Burndown Charts.

## Text Books

1. Project Management: A managerial approach, Jack Meredith & Samuel Mantel,11$^{th}$ Edition, Wiley India. ,

2. Project Management: The Managerial Process, 8$^{th}$ edition, Erik Larson, Clifford Gray, McGraw Hill Education.

3. Agile Project Management, Jim Highsmith, Pearson Education, Low Price Edition, India.

## Reference Books

1. A Guide to the Project Management Body of Knowledge (PMBOK® Guide), 7$^{th}$ Edition, Project Management Institute PA, USA.

2. Project Management, Gido Clements, Cengage Learning.

3. Project Management, Gopalan, Wiley India.

4. Project Management, Dennis Lock,9$^{th}$ Edition, Gower Publishing England.

5. Agile Essentials You Always Wanted to Know, Kalpesh Ashar, Vibrant Publishers U.S.A.

## Evaluation Scheme:

### Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

### Continuous Assessment (B):

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average of both the tests will be considered for final grading.

### End Semester Examination (C):

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

# Cyber Security, Policies and Laws (RCP23OCOE402)

**Teaching Scheme**

Lectures: 03 Hrs./Week

Credit: 03

**Examination Scheme**

Term Test: 15 Marks

Teacher Assessment: 25 Marks

End Sem Exam: 60 Marks

Total: 100 Marks

## Course Pre-requisite:

1. Fundametals of Computers

## Course Objectives

1. Familiarize with the provisions and implications of the Digital Personal and Data Protection Act, the obligations of data fiduciaries, the rights and duties of data principals, and mechanisms for resolving breaches.

2. Equip individuals and organizations with the knowledge and tools to create secure cyber ecosystems, strengthen regulatory frameworks, and develop incident response plans.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|----------------|--------------|--------------------|
| CO1 | Understand and describe the major types of cybercrime and navigate legal frameworks and regulations concerning digital personal and data protection. | L2 | Understand |
| CO2 | Implement strategies for cybersecurity outlined in the National Cyber Security Policy. | L3 | Apply |
| CO3 | Apply appropriate law enforcement strategies to both, prevent and control cybercrime. | L3 | Apply |
| CO4 | Comprehend regulations and strategies pertaining to AI (Artificial Intelligence) and large language models. | L2 | Understand |

# Course Contents

**Unit-I**                    **Cyber Crime**                    **08 Hrs.**

Definition and Origin of the Word, Cyber Crime and Information Security, who are Cyber Criminals, Classification of Cybercrimes, E-mail Spoofing, Spamming, Cyber Defamation, Internet Time Theft, Salami Attack, Salami technique Data Diddling, Forgery, Newsgroup Spam, Online Frauds, Pornographic Offenders, Email Bombing, Password Sniffing, Credit Card Frauds.

**Unit-II**                    **Cyber Offenses**                    **08 Hrs.**

How Criminals plan them, Categories of Cyber Crimes, How Criminal Plans the Attack: Active Attacks, Passive Attacks, Social Engineering, Classification of Social Engineering, Cyber Stalking: types of Stalkers, Cyber Cafe and Cyber Crimes, Botnets, Attack Vectors, Cyber Crime and Cloud Computing.

**Unit-III**                    **Indian IT Act .**                    **08 Hrs.**

Cyber Crime and Criminal Justice, Penalties, Adjudication and Appeals Under the IT Act, 2000, IT Act. 2008 and its Amendments Security aspect in Cyber-Law, The Contract Aspects in Cyber Law, The Security Aspect of Cyber Law, Security Standards: SOX,GLBA, HIPAA, NIST Cyber Security Framework (CSF).

**Unit-IV  India's Digital Personal and Data Protection Act (2023)**
**07 Hrs**

Preliminary, Obligations of Data Fiduciary, Rights and Duties of Data Principal, Special Provisions, Data Protection Board of India, Powers, Functions and Procedure to Be Followed by Board, Appeal and Alternate Dispute Resolution, Penalties and Adjudication.

**Unit-V**                    **India's AI Regulation and Strategy**                    **08 Hrs.**

Privacy, Security and Artificial Intelligence, Differential Privacy, Security in AI. National Artificial Intelligence Strategy, Principles for Responsible AI, Information Technology (Intermediary Guidelines and Digital Media Ethics Code-2021), Draft National Data Governance Framework Policy (NDGFP), Rules against Deepfakes, Due diligence advisory for AI, AI regulations framework (June 2024).

## Text Books

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole, Sunit Belapur, Wiley-2011.

2. Understanding Cybersecurity Management in Decentralized Finance: Challenges, Strategies, and Trends by Gurdip Kaur, Springer-2023.

# Reference Books

1. The Information Technology Act, 2000; Bare Act- Professional Book Publishers, New Delhi.

2. Izzat Alsmadi , The NICE Cyber Security Framework: Cyber Security Intelligence and Analytics, Springer-2023.

# References (Web Resources):

1. Digital Personal data Protection act 2023.pdf (meity.gov.in)

2. National cyber security (draft v1) (meity.gov.in)

3. CISCO roles responcibility.pdf

4. Standrads (bis.gov.in)

5. ai-machine-learning-and-big-data-laws-and-regulations/india

# Evaluation Scheme:

## Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

## Continuous Assessment (B):

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average of both the tests will be considered for final grading.

## End Semester Examination (C):

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

# Advanced Operations Research (RCP23OCOE403)

**Teaching Scheme**

Lectures: 03 Hrs./Week

Credit: 03

<div align="right">

**Examination Scheme**

Term Test: 15 Marks

Teacher Assessment: 25 Marks

End Sem Exam: 60 Marks

Total: 100 Marks

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# Course Contents

**Module 1          Dual Linear Programs          06 Hrs.**

Primal, dual, and duality theory - The dual simplex method -The primal-dual algorithm-Duality applications. Post optimization problems: Sensitivity analysis.

**Module 2          Integer Programming          06 Hrs.**

Pure and mixed integer programming problems, Solution of Integer programming problems – Gomory's all integer cutting plane method and mixed integer method, branch and bound method, Zero-one programming.

**Module 3          Goal Programming.          05 Hrs.**

Concept of Goal Programming, GP model formulations, Graphical method of GP, The simplex method of GP, Application areas of GP.

**Module 4    Nonlinear Programming- Unconstrained optimization 11 Hrs**

Minimization and maximization of convex functions- Local & Global optimum- Convergence-Speed of convergence. one-dimensional unconstrained optimization – Newton's method – Golden-section search method , multidimensional unconstrained optimization –Gradient method — steepest ascent (descent) method – Newton's method .

**Module 5  Nonlinear Programming- Constrained optimization  11 Hrs.**

Constrained optimization with equality and inequality constraints. Constrained optimization: Lagrangian method - Sufficiency conditions - Kuhn-Tucker optimality conditions Rate of convergence - Engineering Applications Quadratic programming problems-convex programming problems.
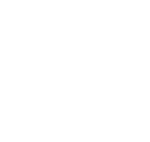
# Evaluation Scheme:

## Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

## Continuous Assessment (B):

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average of both the tests will be considered for final grading.

## End Semester Examination (C):

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

# Corporate Finance Management (RCP23OCOE404)

**Teaching Scheme**

Lectures: 03 Hrs./Week

Credit: 03

<div align="right">

**Examination Scheme**

Term Test: 15 Marks

Teacher Assessment: 25 Marks

End Sem Exam: 60 Marks

Total: 100 Marks

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## Course Objectives

1. Overview of Indian financial system, instruments and market.

2. Basic concepts of value of money, returns and risks, corporate finance, working capital and its management.

3. Knowledge about sources of finance, capital structure, dividend policy.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|---------------------|
| CO1 | Understand Indian finance system. | L2 | Understand |
| CO2 | Apply concepts of time value money and risk returns to product, services and business. | L3 | Apply |
| CO3 | Understand corporate finance and working capital management. | L2 | Understand |
| CO4 | Take Investment and finance decisions. | L5 | Evaluate |
| CO5 | Take dividend decisions. | L5 | Evaluate |

# Course Contents

**Unit-I**  **Overview of Indian Financial System**  **08 Hrs.**

Characteristics, Components and Functions of Financial System. Financial Instruments: Meaning, Characteristics and Classification of Basic Financial Instruments — Equity Shares, Preference Shares, Bonds-Debentures, Certificates of Deposit, and Treasury Bills. Financial Markets: Meaning, Characteristics and Classification of Financial Markets — Capital Market, Money Market and Foreign Currency Market. Financial Institutions: Meaning, Characteristics and Classification of Financial Institutions — Commercial Banks, Investment-Merchant Banks and Stock Exchanges.

**Unit-II**  **Concepts of Returns and Risks**  **08 Hrs.**

Measurement of Historical Returns and Expected Returns of a Single Security and a Two-security Portfolio; Measurement of Historical Risk and Expected Risk of a Single Security and a Two-security Portfolio. Time Value of Money: Future Value of a Lump Sum, Ordinary Annuity, and Annuity Due; Present Value of a Lump Sum, Ordinary Annuity, and Annuity Due; Continuous Compounding and Continuous Discounting.

**Unit-III**  **Overview of Corporate Finance .**  **07 Hrs.**

Objectives of Corporate Finance; Functions of Corporate Finance-investment Decision, Financing Decision, and Dividend Decision.: Working Capital Management: Concepts of Meaning Working Capital; Importance of Working Capital Management; Factors Affecting an Entity's Working Capital Needs; Estimation of Working Capital Requirements; Management of Inventories; Management of Receivables; and Management of Cash and Marketable Securities.

**Unit-IV**  **Capital Budgeting**  **08 Hrs**

Meaning and Importance of Capital Budgeting; Inputs for Capital Budgeting Decisions; Investment Appraisal Criterion—Accounting Rate of Return, Payback Period, Discounted Payback Period, Net Present Value (NPV), Profitability Index, Internal Rate of Return (IRR), and Modified Internal Rate of Return (MIRR)

**Unit-V**  **Capital Structure**  **08 Hrs.**

Factors Affecting an Entity's Capital Structure; Overview of Capital Structure Theories and Approaches — Net Income Approach, Net Operating Income Approach; Traditional Approach, and Modigliani-Miller Approach. Relation between Capital Structure and Corporate Value; Concept of Optimal Capital Structure Dividend Policy: Meaning and Importance of Dividend Policy; Factors Affecting an Entity's Dividend Decision; Overview of Dividend Policy Theories and Approaches — Gordon's Approach, Walter's Approach, and Modigliani-Miller Approach.

# Text Books

1. Financial Management, Theory Practice 8th Edition (2011), by Prasanna Chandra: Tata Mc-Graw Hill Education Private Limited, New Delhi.

2. Indian Financial System, 9th Edition (2015) by M. Y. Khan; Publisher: McGraw Hill Education, New Delhi.

3. Financial Management, 11th Edition (2015) by I. M. Pandey; Publisher: S. Chand (G/L) Company Limited, New Delhi.

# Reference Books

1. Fundamentals of Financial Management, 13th Edition (2015) by Eugene F. Brigham and Joel F. Houston; Publisher: Cengage Publications, New Delhi.

2. Analysis for Financial Management, l0th Edition (2013) by Robert C. Higgins; Publishers: McGraw Hill Education, New Delhi.

# Evaluation Scheme:

**Continuous Assessment (A):**

Subject teacher will declare Teacher Assessment criteria at the start of semester.

**Continuous Assessment (B):**

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average of both the tests will be considered for final grading.

**End Semester Examination (C):**

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

# Corporate Social Responsibility (RCP23OCOE405)

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**Teaching Scheme**

Lectures: 03 Hrs./Week

Credit: 03

**Examination Scheme**

Term Test: 15 Marks

Teacher Assessment: 25 Marks

End Sem Exam: 60 Marks

Total: 100 Marks

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## Course Objectives

1. To make students understand the concept, theories and application of CSR for the Development of the Society.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | Analyse and critique the ethical dimensions of Corporate Social Responsibility initiatives, demonstrating a comprehensive understanding of CSR principles and their ethical underpinnings. | L4 | Analyze |
| CO2 | Demonstrate an understanding of the legislative frameworks shaping Corporate Social Responsibility both in India and globally, alongside recognizing the key drivers fostering CSR practices within the Indian context. | L2 | Understand |
| CO3 | Identify and discuss the significance of social responsibility and community engagement initiatives, demonstrating an understanding of their impact on both businesses and society. | L2 | Understand |

# Course Contents

## Unit-I   Introduction to Corporate Social Responsibility (CSR)   07 Hrs.

Understanding the concept of CSR, Historical evolution and development of CSR, Importance and benefits of CSR for businesses and society, Stakeholder theory and its relevance to CSR.

## Unit-II                Ethical Foundations of CSR                08 Hrs.

Ethical theories relevant to CSR (Utilitarianism, Deontology, Virtue Ethics), Ethical decision-making frameworks in business, Corporate governance and ethics, Ethical issues in supply chain management .

## Unit-III        CSR-Legislation in India and the World        08 Hrs.

Section 135 of Companies Act 2013, Scope for CSR Activities under Schedule VII, Appointment of Independent Directors on the Board, and Computation of Net Profit's Implementing Process in India

## Unit-IV                The Drivers of CSR in India                08 Hrs

Market based pressure and incentives, civil society pressure, the regulatory environment in India Counter trends, Review of current trends and opportunities in CSR, Review of successful corporate initiatives and challenges of CSR. Case Studies of Major CSR Initiatives Corporate Social Responsibility and Public-Private Partnership (PPP)

## Unit-V    Social Responsibility and Community Engagement    08 Hrs.

Social issues and challenges in contemporary society,Corporate philanthropy and community development initiatives, Stakeholder engagement strategies,Corporate volunteering and employee engagement programs, CSR as a strategic business tool vital for sustainable development

## Text Books

1. Andrew Crane, Dirk Matten , "Corporate Social Responsibility: Definition, Core Issues, and Recent Developments" Oxford University Press.

2. IO. C. Ferrell, John Fraedrich, Linda Ferrell , "Business Ethics: Ethical Decision Making Cases", Cengage Learning .

3. Corporate Social Responsibility in India, Sanjay K Agarwal, Sage Publications, 2008.

4. Corporate Social Responsibility in India, Bidyut Chakrabarty, Routledge, New Delhi, 2015.

# Reference Books

1. Corporate Social Responsibility: An Ethical Approach, Mark S. Schwartz, Broadview Press, 2011.

2. Attaining Sustainable Growth through Corporate Social Responsibility, George Pohle and Jeff Hittner, IBA Global Business Services, 2008 .

3. Strategic Corporate Social Responsibility: Stakeholders in a Global Environment, William B. Werther Jr. and David Chandler, 2nd Edition, Sage Publications, 2011 .

## Evaluation Scheme:

### Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

### Continuous Assessment (B):

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average of both the tests will be considered for final grading.

### End Semester Examination (C):

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

# Bioinformatics (RCP23OCOE406)

**Teaching Scheme**

Lectures: 03 Hrs./Week

Credit: 03

**Examination Scheme**

Term Test: 15 Marks

Teacher Assessment: 25 Marks

End Sem Exam: 60 Marks

Total: 100 Marks

## Course Objectives

1. To provide an overview of bioinformatics and its significance in modern biological research.

2. To enable students to apply bioinformatics methods in practical scenarios for biological data analysis and interpretation.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | Understand the structure and function of cells, organelles, and biomolecules. | L2 | Understand |
| CO2 | Understand the types of data stored in bioinformatics databases and their relevance to biological research. | L2 | Understand |
| CO3 | Explore genomic databases and understand the structure and content of protein databases. | L3 | Apply |
| CO4 | Understand system biology concepts and molecular evolution. | L2 | Understand |
| CO5 | Apply knowledge of cellular and molecular biology concepts to analyze a biological problem. | L3 | Apply |

# Course Contents

**Unit-I     Foundations of Molecular and Cellular Biology     08 Hrs.**

Introduction to molecular biology: DNA, RNA, proteins, and their roles in cellular processes Cell structure and function: Organelles, membrane structure, and cellular transport Cell cycle regulation: phases of the cell cycle, checkpoints, and cell cycle control mechanisms .

**Unit-II     Genetics and Genomics     08 Hrs.**

Mendelian genetics: Inheritance patterns, Punnett squares, and genetic crosses Chromosome structure and organization: karyotyping, gene mapping, and genetic linkage Introduction to genomics: genome structure, organization, and variation Techniques in molecular genetics: PCR, DNA sequencing, and gene cloning.

**Unit-III     Genomic and Protein Databases     08 Hrs.**

Types of genomic databases such as GenBank, Ensemble, and UCSC Genome Browser, Understand the structure and content of protein databases such as UniProt and Protein Data Bank (PDB), Searching, Retrieving, and Analysing Genomic and Protein data from online databases.

**Unit-IV     Systems Biology     08 Hrs**

Introduction to Systems Biology: Modeling biological systems and network analysis, Bioinformatics tools for systems biology and modeling complex biological processes. Principles of molecular evolution: Mutation, Selection, and genetic drift. Phylogenetic analysis: Tree construction, sequence alignment, and molecular clock.

**Unit-V     Applications and Case Studies     07 Hrs.**

Applications of Bioinformatics in Medicine, Agriculture, and Biotechnology, Case Studies (Integrating Cellular and Molecular Biology with Bioinformatics) and Research Examples, Ethical and Legal Issues in Bioinformatics, Future Trends and Emerging Technologies in Bioinformatics.

## Text Books

1. Bioinformatics For Dummies, Jean-Michel Claverie and Cedric Notredame, For Dummies. (2019)

2. Bioinformatics Algorithms: An Active Learning Approach by Phillip Compeau and Pavel Pevzner, Active Learning Publishers (2019).

## Reference Books

1. Introduction to Bioinformatics, Arthur Lesk, Biologist Bioinformatics Expert, 2019 .

2. Introduction to Biomedical Data Science, Robert Hoyt, Informatics Education, 2019

3. Python for Biologists: A Complete Programming Course for Beginners, Martin Jones, Oxford University Press, 2013

4. An Introduction to Bioinformatics Algorithms, Neil C. Jones, and Pavel A. Pevzne, MIT Press,2004.

5. Exploring Bioinformatics: A Project-Based Approach, Caroline St. Clair, and Jonathan E. Visick, Jones Bartlett Learning, 2014.

## Evaluation Scheme:

**Continuous Assessment (A):**

Subject teacher will declare Teacher Assessment criteria at the start of semester.

**Continuous Assessment (B):**

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average of both the tests will be considered for final grading.

**End Semester Examination (C):**

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

# Human Resource Management (RCP23OCOE407)

**Teaching Scheme**
Lectures: 03 Hrs./Week
Credit: 03

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**Examination Scheme**
Term Test: 15 Marks
Teacher Assessment: 25 Marks
End Sem Exam: 60 Marks
Total: 100 Marks

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## Course Objectives

1. To introduce the students with basic concepts, techniques and practices of the human resource management .

2. To provide opportunity of learning Human resource management (HRM) processes, related with the functions, and challenges in the emerging perspective of today's organizations .

3. To familiarize the students about the importance of the labour relations in the organization.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|---------------------|
| CO1 | Understand the changing environment of the HRM and the role of the HR managers. | L2 | Understand |
| CO2 | Understand the recruitment process and the application of the IT. | L2 | Understand |
| CO3 | Understand the importance of the training and development. | L2 | Understand |
| CO4 | Understand about the pay plans, performance appraisal and compensation | L2 | Understand |
| CO5 | Understand the importance of the labour relation, the employee security and collective bargaining. | L2 | Understand |

# Course Contents

**Unit-I**          **Human Resource Function**          **07 Hrs.**

Human Resource Philosophy – Changing environments of HRM – Strategic human resource management – Using HRM to attain competitive advantage – Trends in HRM – Organisation of HR departments – Line and staff functions – Role of HR Managers.

**Unit-II**          **Recruitment Placement**          **10 Hrs.**

Job analysis: Methods - IT and computerised skill inventory - Writing job specification - HR and the responsive organisation. Recruitment and selection process: Employment planning and forecasting - Building employee commitment: Promotion from within - Sources, Developing and Using application forms - IT and recruiting on the internet. Employee Testing selection: Selection process, basic testing concepts, types of test, work samples simulation, selection techniques, interview, common interviewing mistakes, Designing conducting the effective interview, small business applications, computer aided interview.

**Unit-III**          **Training Development .**          **08 Hrs.**

Orientation Training: Orienting the employees, the training process, need analysis, Training techniques, special purpose training, Training via the internet. Developing Managers: Management Development - The responsive managers - On-the-job and off the-job Development techniques using HR to build a responsive organisation.Performance appraisal: Methods - Problem and solutions - MBO approach - The appraisal interviews - Performance appraisal in practice. Managing careers: Career planning and development - Managing promotions and transfers.

**Unit-IV**          **Compensation Managing Quality**          **08 Hrs**

Establishing Pay plans: Basics of compensation - factors determining pay rate - Current trends in compensation - Job evaluation - pricing managerial and professional jobs - Computerised job evaluation. Pay for performance and Financial incentives: Money and motivation - incentives for operations employees and executives - Organisation wide incentive plans - Practices in Indian organisations. Benefits and services : Statutory benefits - non-statutory (voluntary) benefits - Insurance benefits -retirement benefits and other welfare measures to build employee commitment.

**Unit-V**          **Labour relations and employee security**          **06 Hrs.**

Industrial relation and collective bargaining: Trade unions - Collective bargaining - future of trade unionism. Discipline administration - grievances handling - managing dismissals and separation. Labour Welfare: Importance Implications of labour legislations - Employee health - Auditing HR functions, Future of HRM function.

## Evaluation Scheme:

### Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

### Continuous Assessment (B):

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average of both the tests will be considered for final grading.

### End Semester Examination (C):

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

# Digital Marketing Management (RCP23OCOE408)

**Teaching Scheme**

Lectures: 03 Hrs./Week

Credit: 03

**Examination Scheme**

Term Test: 15 Marks

Teacher Assessment: 25 Marks

End Sem Exam: 60 Marks

Total: 100 Marks

## Course Objectives

1. Explain the evolution and technology of digital marketing, including underlying frameworks.

2. Understand digital business strategy and emerging business structures.

3. Cover digital marketing planning, operations setup, and implementation of search campaigns, alongside emerging concepts like Big Data, IoT, SMB, B2B marketing, and SoLoMo.

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | Understand the digital marketing framework and model and consumer behaviour. | L2 | Understand |
| CO2 | Develop digital marketing strategy roadmap. | L6 | Create |
| CO3 | Explain the terminology and concepts for developing web-specific media plans. | L2 | Understand |
| CO4 | Understand concepts related to digital campaign management and revenue generation models. | L2 | Understand |
| CO5 | Get a perspective on global digital marketing technology/tools and future trends. | L2 | Understand |

# Course Contents

## Unit-I      Introduction to Digital Marketing      06 Hrs.

Emergence of Digital Marketing as a tool, media consumption drivers for new marketing environment, applications and benefits of digital marketing. Digital Marketing Framework Delivering enhanced customer value, market opportunity analysis and digital services development, ASCOR framework Digital Marketing Models Creation Factors impacting digital marketplace, value chain digitization, business models. The Consumer for Digital Marketing, Consumer behavior on the internet, evolution of consumer behavior models, managing consumer demand, integrated marketing communications (IMC)

## Unit-II      Digital marketing Strategy Development      12 Hrs.

Elements of assessment phase, macro-micro environmental analysis, marketing situation analysis. Digital Marketing Internal Assessment and Objectives Planning Analyzing present offerings mix, marketing mix, core competencies analysis and internal resource mapping. Digital presence analysis, digital marketing objectives development and review. Digital Marketing Strategy Definition Understanding digital business strategy and structures, consumer development strategy, offering mix for Digital, digital pricing models, managing promotional channels and developing the extended Ps- People, process, programs and performance. Digital marketing Strategy Roadmap Developing digital marketing strategy roadmap, the 6s digital marketing implementation strategy, marketing across the product life cycle.

## Unit-III      Digital Marketing Planning and Setup      08 Hrs.

Understanding digital media planning terminology and stages, steps to creating marketing communications strategy, introduction to search marketing, display marketing, social media marketing. Digital Marketing Operations Setup Basics of lead generation and conversion marketing, website content development and management, elements of user experience, web usability and evaluation.

## Unit-IV      Digital marketing Execution      08 Hrs

Basic elements of digital campaign management, search execution, display execution, social media execution, content marketing. Digital marketing Execution Elements Digital revenue generation models, managing service delivery and payments, managing digital implementation challenges like e commerce, internal  external and consumer specific challenges.

## Unit-V      Digital Business – Present and Future      05 Hrs.

Digital Marketing – Global Landscape, digital marketing overview – global spend, advertising spend, and technology/tools landscape. Data technologies (Big data and IOT) impacting marketing, segment based digital marketing and SoLoMo – the next level of hyperlocal marketing.

# Text Books

1. Fundamentals of Digital Marketing by Puneet Singh Bhatia, Pearson Education Limited,2017

2. Digital Marketing by Seema Gupta- McGraw Hill Education, 2022

# Reference Books

1. Digital Marketing Excellence: Planning, Optimizing and Integrating Online Marketing by Dave Chaffey and P. R. Smith, 5 th edition, Taylor Francis, 2017.

2. Digital Marketing: Strategy, Implementation and Practice- 6 th edition by Dave Chaffey Fiona Ellis-Chadwick, Pearson Education Limited,2019

3. Digital marketing by Vandana Ahuja, Oxford University Press, 2015.

4. The Art of Digital Marketing by Ian Dodson, John Wiley Sons, 2016.

# Evaluation Scheme:

**Continuous Assessment (A):**

Subject teacher will declare Teacher Assessment criteria at the start of semester.

**Continuous Assessment (B):**

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average of both the tests will be considered for final grading.

**End Semester Examination (C):**

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

# Logistics & Supply Chain Management (RCP23OCOE409)

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**Teaching Scheme**
Lectures: 03 Hrs./Week
Credit: 03

**Examination Scheme**
Term Test: 15 Marks
Teacher Assessment: 25 Marks
End Sem Exam: 60 Marks
Total: 100 Marks

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# Course Contents

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| Module 1 | Introduction | 05 Hrs. |

What Is Supply Chain Management? The Development Chain, Global Optimization, Managing Uncertainty and Risk, The Complexity in Supply Chain Management, Key Issues in Supply Chain Management

| Module 2 | Network planning | 06 Hrs. |

Introduction, Network Design- Data Collection, Data Aggregation, Transportation Rates, Mileage Estimation, Warehouse Costs, Warehouse Capacities, Potential Warehouse Locations, Service Level Requirements, Future Demand, Model and Data Validation, Solution Techniques, Key Features of a Network Configuration Supply Chain Planning; Inventory Positioning and Logistics Coordination -Strategic Safety Stock.

| Module 3 | THE VALUE OF INFORMATION | 08 Hrs. |

Introduction, The Bullwhip Effect-Quantifying the Bullwhip Effect, The Impact of Centralized Information on the Bullwhip Effect, Methods for Coping with the Bullwhip Effect, Information Sharing and Incentives, Effective Forecasts, Information for the Coordination of Systems, Locating Desired Products, Lead-Time Reduction, Information and Supply Chain Trade-offs-Conflicting Objectives in the Supply Chain, Designing the Supply Chain for Conflicting Goals ,Decreasing Marginal Value of Information.

| Module 4 | Supply chain integration | 08 Hrs. |

Introduction, Push, Pull, and Push-Pull Systems-Push-Based Supply Chain, Pull-Based Supply Chain, Push-Pull Supply Chain ,Identifying the Appropriate Supply Chain Strategy, Implementing a Push-Pull Strategy The Impact of Lead Time Demand-Driven Strategies The Impact of the Internet on Supply Chain Strategies-what is E-Business, the Grocery Industry , the Book Industry , the Retail Industry and Impact on Transportation and Fulfillment.

## Module 5   Information Technology and Business Process   06 Hrs.

Introduction, The Importance of Business Processes, Goals of Supply Chain IT Supply Chain Management System Components, Decision-Support Systems IT for Supply Chain Excellence, Sales and Operations Planning Integrating Supply Chain Information Technology. Implementation of ERP and Decision Support System.

## Module 6                    Technology standards                    06 Hrs.

Introduction, IT Standards, Information Technology Infrastructure Interface Devices, System Architecture and Electronic Commerce. Service-Oriented Architecture (SOA)-Technology Base: IBM and Microsoft and ERP Vendor Platform: SAP and Oracle. Radio Frequency Identification (RFID)- applications, point of sale data , business benefits and supply chain efficiency.

## Text Books

1. Supply Chain Management-Strategy, Planning, and Operation by Sunil Chopra, Peter Meindl, Pearson Publications 2016

2. Designing and Managing the Supply Chain-Concepts, Strategies, and Case Studies by David Simchi-Levi, Philip Kaminsky, Edith Simchi-Levi , McGraw-Hill/Irwin 2008.

## Evaluation Scheme:

### Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

### Continuous Assessment (B):

1. Two term tests of 15 marks each will be conducted during the semester.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Average of both the tests will be considered for final grading.

### End Semester Examination (C):

1. Question paper will be based on the entire syllabus summing up to 60 marks.

2. Total duration allotted for writing the paper is 2 hrs.

# Semester Project -II (RCP23IPSC401 )

| Practical Scheme | Examination Scheme |
|---|---|
| **Practical Scheme** | **Examination Scheme** |
| Practical : 02 Hrs./week | Teacher Assessment : 25 Marks |
| Credit : 01 | End Sem Exam : 25 Marks |
| | Total : 50 Marks |

## Course Objectives:

Students are expected to design, simulate/implement a project based on the knowledge acquired from current semester subjects.

| CO | Course Outcomes | Blooms Level | Blooms Description |
|---|---|---|---|
| CO1 | Conduct a survey of several available literatures in the preferred field of study. | L4 | Analyze |
| CO2 | Demonstrate various/alternate approaches to complete a project. | L2 | Understand |
| CO3 | Ensure a collaborative project environment by interacting and dividing project work among team members. | L3 | Apply |
| CO4 | Present their project work in the form of a technical report /paper and there by improve the technical communication skill | L3 | Apply |
| CO5 | Demonstrate the ability to work in teams and manage the conduct of the research study. | L2 | Understand |

**Semester Project:**

The purpose of introducing semester project at second year level is to provide exposure to students with a variety of projects based on the knowledge acquired from the semester subjects. This activity is supposed to enrich their academic experience and bring enough maturity in student while selecting the project. Students should take this as an opportunity to develop skills in implementation, presentation and discussion of technical ideas/topics. Therefore, proper attention shall be paid to the content of semester project report which is being submitted in partial fulfilment of the requirements of the Second Year and it is imperative that a standard format be prescribed for the report.

Each student shall work on project approved by departmental committee approved by the Head of Department, a group of 03 to 05 students (max allowed: 5 students in extraordinary cases, subject to the approval of the department committee and the Head of the department) shall be allotted for each Semester Project. Each group shall submit at least 3 topics for the Semester Project. The departmental committee shall finalize one topic for every group. Semester Project Title or Theme should be based on knowledge acquired during semester. The project work shall involve sufficient work so that students get acquainted with different aspects of knowledge acquired from semester subjects.

**Student is expected to:**

- Select appropriate project title based on acquired knowledge from current semester subjects.

- Maintain Log Book of weekly work done(please see attached log book format).

- Report weekly to the project guide along with log book.

**Assessment Criteria:**

- At the end of the semester, after conformation by the project guide, each project group will submit project completion report in prescribed format for assessment to the departmental committee (including project guide)

- Assessment of the project (at the end of the semester) will be done by the departmental committee (including project guide)

**Prescribed project report guidelines:**

Size of report shall be of minimum 25 pages. Project Report should include appropriate content for:

- Introduction

- Literature Survey

- Related Theory

- Implementation details

- Project Outcomes

- Conclusion

- References

**Assessment criteria for the departmental committee (including project guide) for Continuous Assessment:**

Guide will monitor weekly progress and marks allocation will be as per Table 2.

**Assessment criteria for the departmental committee (including project guide) for End Semester Exam:**

Departmental committee (including project guide) will evaluate project as per Table 3.

Each group shall present/publish a paper based on the semester project in reputed/peer reviewed Conference/Journal/TechFest/Magazine/ before the end of the semester.

Table 1: Log Book Format

| Sr | Week (Start Date:End Date) | Work Done | Sign of Guide | Sign of Coordinator |
|----|----------------------------|-----------|---------------|---------------------|
| 1  |                            |           |               |                     |
| 2  |                            |           |               |                     |

Table 2: Continuous Assessment Sheet

| Sr | Exam Seat No | Name of Student | Student Attendance | Log Book Maintain | Literature Review | Depth of Understanding | Report | Total |
|----|--------------|-----------------|--------------------|-------------------|-------------------|------------------------|--------|-------|
|    |              |                 | 5                  | 5                 | 5                 | 5                      | 5      | 25    |

Table 3: Evaluation Sheet

| Sr | Exam Seat No | Name of Student | Project Selection | Design/ Simulation/ Logic | PCB/ hardware/ programming | Result Verification | Presentation | Total |
|----|--------------|-----------------|-------------------|---------------------------|----------------------------|---------------------|--------------|-------|
|    |              |                 | 5                 | 5                         | 5                          | 5                   | 5            | 25    |

# Professional and Business Communication Tutorial (RCP23ITHSX01)

**Teaching Scheme**

Tutorial: 02 Hrs./Week

Credit: 02

**Examination Scheme**

Teacher Assessment: 25 Marks

Total: 25 Marks

## Course Objectives

1. To inculcate professional and ethical attitude at the workplace.

2. To enhance communication and interpersonal skills

3. To develop effective employability skills

4. To hone written skills for technical documentation

| COs | Course Outcomes | Blooms Level | Blooms Description |
|-----|-----------------|--------------|--------------------|
| CO1 | Apply group discussion techniques in professional situations | L3 | Apply |
| CO2 | Use employability skills to optimize career opportunities | L3 | Apply |
| CO3 | Employ storytelling techniques for effective presentation | L3 | Apply |
| CO4 | Prepare technical documents using appropriate style, format, and language | L6 | Create |
| CO5 | Analyze the concept of professional ethics | L4 | Analyze |
| CO6 | Demonstrate interpersonal skills in professional and personal situations | L2 | Understand |

# Course Contents

The course is designed to equip students with essential skills, crucial for navigating the contemporary job market successfully and fostering a positive work environment through effective communication and collaboration. The assignments comprise of a combination of interactive activities, discussions, case studies and real-world simulations, to help students, not only to ace job interviews and professional interactions, but also to contribute positively to the ethical and productive functioning of any organization. For the project work, students must prepare and present a well-researched and persuasive business proposal, in groups, integrating the skills and knowledge acquired throughout the course

| Unit | Description of Tutorial Activity | No of assignment |
|------|-------------------------------|------------------|

## Unit-I        Group Discussion        1 Assignment

Purpose of a GD, types of GD, criteria for evaluating GD, Dos and Don'ts of GD

**Activity:** The students will be divided into groups of 8-12 and each group will be given a topic/case to discuss within a given time frame. Each student will submit a write-up on their observations of the GD.

## Unit-II      Employment Skills Resume Writing      2 Assignment.

Types of resumes, structure, content, and formatting of resume

**Activity:** The students will prepare and submit their individual resume according to the professional requirements.

Interview Skills:

Types and modes of interview, Preparation for interview, Dos and Don'ts of interview, frequently asked questions during interview **Activity:** The students will submit a write-up on the FAQs and participate in mock interviews

## Unit-III        Corporate Story Telling        1 Assignment

Elevator pitch, product stories, event stories, stories in presentations, storytelling in SOPs and interviews, storytelling to manage conflict or to motivate.

**Activity:** The students will be divided into groups of 8-12 and asked to give a team presentation using storytelling technique and submit the hardcopy of the ppt.

## Unit-IV Technical Writing and Documentation Business Proposal Writing        1 Assignment

Types of business proposals, format of proposal, language and style, presentation of proposal

**Meeting Documentation:** Planning layout of meetings, observing meeting decorum, drafting notice, agenda, and minutes of meeting

**Activity:** The students will be divided into groups of 8-12 and each group will conduct a mock meeting based on an agenda and submit a writeup of the meeting documentation.

| Unit-V | Professional Ethics | 1 Assignment |
| --- | --- | --- |

Effective work habits, accountability, integrity, and excellence

**Activity:** The students will be divided into groups of 8-12 and each group will analyse a case involving an ethical issue and submit the writeup.

| Unit-VI | Interpersonal Skills | 2 Assignment |
| --- | --- | --- |

**Team Building:**

Difference between group and team, importance of teamwork, strategies to be a good team player

**Activity:** The students will be divided into groups of 8-12 and each group will be assigned a task to be accomplished as a team, for which they will submit the write up.

**Leadership:** Types of leadership, leadership styles, case studies

**Activity:** Each student will submit a write up involving a leader they admire, analysing various aspects of his leadership style.

**Time Management:** Importance of time management, cultural views of time, 80/20 rule, time wasters, setting priorities and goals

**Activity:** Each student will submit a write up about a case involving time management.

Batchwise tutorial work of minimum eight assignments from the above suggested list or any other assignments based on the syllabus will be included, which would help the learner to apply the concepts learnt.

## Text Books

1. Fred Luthans, "Organizational Behavior", McGraw Hill, edition

2. Lesiker and Petit, "Report Writing for Business", McGraw Hill, edition.

3. Huckin and Olsen, "Technical Writing and Professional Communication", McGraw Hill.

4. Wallace and Masters, "Personal Development for Life and Work", Thomson Learning, 12<sup>th</sup> edition

5. Heta Murphy, "Effective Business Communication", Mc Graw Hill, edition

6. Sharma R.C. and Krishna Mohan, "Business Correspondence and Report Writing", Tata McGraw-Hill Education

7. Ghosh, B. N., "Managing Soft Skills for Personality Development", Tata McGraw Hill.Lehman

8. Bell, Smith, "Management Communication" Wiley India Edition, 3<sup>rd</sup>edition

9. Dr. Alex, K., "Soft Skills", S Chand and Company

10. Subramaniam, R., "Professional Ethics" Oxford University Press

11. Sandeep Das, "How Business Story Telling Works: Increase Your Influence and Impact" Penguin Random House India Pvt. Ltd.

# Design Thinking Laboratory(RCP23ILHSX02)

**Practical Scheme**

Practical : 02 Hrs./week

Credit : 01

**Examination Scheme**

Teacher Assessment : 25 Marks

Total : 25 Marks

## Prerequisite:

1. Understanding of product / process / software / service development life cycle.

2. Knowledge of agile frameworks (or any similar iterative framework) would be added advantage but will not be mandatory.

## Course Objectives:

1. To instill an innovative mindset in students to solve the digital-age business, societal and wicked type of problems using design thinking methods and tools, and its application.

2. To equip students with techniques to empathize with users, and ideate innovative and sustainable solutions for real-world problems through an iterative approach to design.

## Course Outcomes:

| CO | Course Outcomes | Blooms Level | Blooms Description |
|-----|------------------|--------------|---------------------|
| CO1 | Understand the importance of a Human-Centric design approach for developing a solution. | L2 | Understand |
| CO2 | Generate innovative ideas to design sustainable solutions for real world problems. | L3 | Apply |
| CO3 | Apply design thinking principles to solve the real-world problems. | L3 | Apply |

# Course Contents

## Unit-I                                                                06 Hrs.

**Introduction to Design Thinking :**

• Understanding the fundamentals of design thinking.

• Exploring the history and evolution of design thinking.

• The importance of empathy in the design thinking process.

• Conduct market & industry research by observing and contextualizing various macro & micro trends.

• Case Study - conduct their research on how Design Thinking helped solve some of the biggest and most critical problems of our time.

## Unit-II                                                               04 Hrs.

**Empathize Phase:**

• Techniques for conducting user research and gathering insights.

• Creating user personas and empathy maps.

• Practicing active listening and observation skills.

• To apply various empathizing techniques to the problem statement selected.

• Use walk-a-mile immersion and heuristic reviews to first empathize with end users and then to build an empathy map and customer journey map.

## Unit-III                                                              04 Hrs.

**Define Phase:**

• Defining problem statements and reframing challenges.

• Tools for synthesizing research findings.

• Developing a clear and actionable problem statement.

• Start building from Persona map and conduct interviews/ Gemba walk to plot user's journeys from start to end.

• Define the problem space using the HMW statement. Now highlight areas of opportunities in the journey map and enlist potential channels/touchpoints as well as stakeholders for proposed solution interventions.

## Unit-IV                                                               04 Hrs.

**Ideate Phase:**

• Generating creative ideas through brainstorming sessions.

• Techniques for divergent and convergent thinking.

• Prototyping and experimenting with ideas.

• Apply suitable ideation technique to quickly generate diverse ideas that could be applied to target

problem space – either partially or in full.

• Brain Writing – Build on each other's ideas and constructively & creatively develop better ideas using SCAMPER technique.

## Unit-V                                                    06 Hrs.

**Prototype and Validation:**

• Introduction to prototyping tools and techniques.

• Rapid prototyping methods.

• Testing prototypes with users and gathering feedback.

• Refining solutions based on user insights.

• Develop user storyboard to layout solution proposition in visual and easily explainable form. Run a quick peer validation.

• peer-validated the storyboard.

• Build an interactive digital prototype using any digital rapid prototyping platform and seek user validation.

## Unit-VI                                                   02 Hrs.

**Design Thinking for Strategic Innovation:**

• Types of innovations, strategic innovation.

• Features of strategic innovation.

• Design thinking and strategic innovation.

• Practices of integrating design thinking in strategic innovation

# Suggested List of Laboratory Experiments:

• Below is a list of assignments/ activities/ experiments that would be carried out by students as a mini project in groups consisting of 3-4 students.

• Problem statement for these assignments/ activities/ experiments will be provided by facilitator/ instructor/ faculty to the groups/ teams/ batches within each class.

• This list of experiments will help students learn various design thinking methods and practice the corresponding tools available.

1. To conduct market and industry research and analyze case studies demonstrating the application of design thinking. (Increased understanding of how design thinking has been applied to solve critical problems in various contexts.)

2. To exercise empathizing techniques to understand the needs and pain points of a target audience.

3. Developing empathy maps and customer journey maps based on collected insights.

4. To exercise different tools and techniques (such as affinity diagrams, journey mapping, and user story mapping) for synthesizing research findings.

5. Develop user personas to represent different user archetypes and their needs concerning the problem at hand.

6. To practice SCAMPRE technique, Brainstorming and brain writing as a collaborative ideation technique to create multiple creative ideas / solution for the problem at hand.

7. Create a mind map to generate a wide range of solutions to a problem at hand.

8. To explore different prototyping tools and platforms, such as Adobe XD, Figma, Sketch, and InVision.

9. To Conduct rapid prototyping sessions to build low fidelity / High fidelity prototype based on the ideas generated in Ideation phase and iterate based on feedback received.

10. Develop a plan for implementing the final solution, considering factors like scalability and feasibility.

11. 
   - Conduct usability testing to gather feedback on prototypes.
   - Use A/B testing to compare different versions of a solution and determine which performs better.

A minimum of five experiments from the above-suggested list or any other assignment based on the syllabus will be included, which would help the learner to apply the concept. The mini-project is mandatory.

## Text Books:

1. I. Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School",Wiley, 2013.

2. M. Lewrick, P. Link, and L. Leifer, "The Design Thinking Playbook: Mindful Digital Transformation of Teams, Products, Services, Businesses and Ecosystems", Wiley, 2018.

3. T. Lockwood, "Design Thinking: Integrating Innovation, Customer Experience, and Brand Value", Allworth Press, 2010.

4. K. T. Ulrich and S. D. Eppinger, "Product Design and Development", McGraw-Hill Hill Education, $6^{th}$ Edition, 2016.

5. C. J. Meadows and C. Parikh, "The Design Thinking Workbook: Essential Skills for Creativity and Business Growth", Emerald Publishing, 2022.

## Reference Books:

1. T. Kelley and D. Kelley, "Creative Confidence: Unleashing the Creative Potential Within Us All", HarperCollins Publisher, 2013.

2. T. Brown, "Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation", HarperCollins, 2013.

3. J. Knapp, J. Zeratsky, and B. Kowitz, "Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days", Simon & Schuster, 2016.

4. Chakrabarti, "Engineering Design Synthesis: Understanding, Approaches and Tools", Springer, 2002.

5. K. Otto, and K. Wood, "Product Design", Prentice Hall, 2000.

## Online Reference:

- Design and Innovation

  - https://openstax.org/books/entrepreneurship/pages/4-suggested-resources

- Overview of Design Thinking

  - https://www.interaction-design.org/literature/topics/design-thinking

  - 10 Models for Design Thinking. In 2004, business consultants Hasso... — by Libby Hoffman — Medium

  - https://www.tcgen.com/design-thinking/What_is_Design_Thinking_and_How_Does_it_Relate_to_Product_Development

- Understand, observe and define the problem

  - https://www.nngroup.com/articles/empathy-mapping/

  - https://uxdesign.cc/the-purpose-of-a-journey-map-and-how-can-it-galvanize-action-9a628b7ae6e

- Ideation and prototyping

  - https://www.interaction-design.org/literature/topics/prototyping

  - https://www.uxmatters.com/mt/archives/2019/01/prototyping-user-experience.php

- Testing and implementation

  - https://www.nngroup.com/articles/usability-testing-101/

– https://www.interaction-design.org/literature/article/test-your-prototypes-how-to-gather
feedback and-maximise-learning

- Design thinking in various sectors

  – https://www.tutorialspoint.com/design_thinking/design_thinking_quick_guide.htm

## Web References:

1. Creative Engineering Design (https://nptel.ac.in/courses/107108010)

2. Understanding Creativity and Creative Writing (https://nptel.ac.in/courses/109101017)

3. Understanding Design Thinking & People Centred Design (https://nptel.ac.in/courses/109104109)

4. Design Thinking - A Primer (https://nptel.ac.in/courses/110106124)

5. Product Engineering and Design Thinking (https://nptel.ac.in/courses/112105316)

## Evaluation Scheme:

**Laboratory:**

**Continuous Assessment (A): 25 Marks:**

Laboratory work will be based on RCP23ILHSX06 with minimum 08 experiments to be incorporated.
The distribution of marks for term work shall be as follows:

1. Assignments (minimum 05) : 15 Marks

2. Mini Project (individual or in a group of 2-3 students): 10 Marks

The final certification and acceptance of term work will be subject to satisfactory performance of
laboratory work and upon fulfilling minimum passing criteria in the term work.