



Shirpur Education Society's

R. C. Patel Institute of Technology, Shirpur

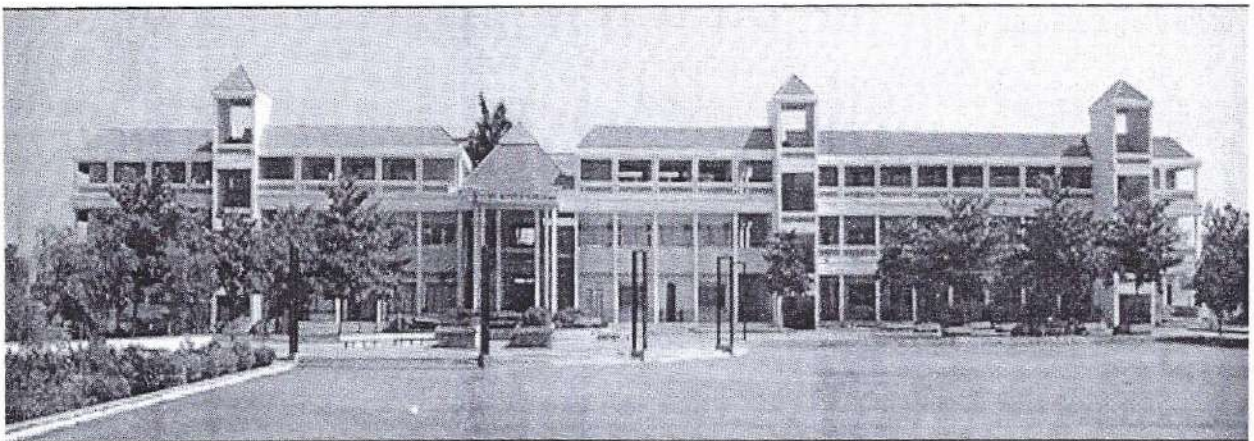
(An Autonomous Institute)

Course Structure & Syllabus

Second Year B. Tech

(Department of Civil Engineering)

With effect from Year 2025-26 (Scheme-2023)



**Shahada Road, Near Nimzari Naka Shirpur Maharashtra 425405 Ph:
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Second Year B. Tech Civil Engineering - Semester-III (w. e. f. 2025-26)

S. No.	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme					Total	Credit	Total
				L	T	P	Continuous Assessment				ESE			
							TA	Term Test 1 (TT1)	Term Test 2 (TT2)	Average of (TT1 & TT2)				
1	PC	RCP23VPC201	Mathematics for Civil Engineering	3	-	-	25	15	15	15	60	100	3	3
2	PC	RCP23VPC202	Mechanics of Solids	3	-	-	25	15	15	15	60	100	3	4
3	PC	RCP23VPC202L	Mechanics of Solids Laboratory	-	-	2	25	-	-	-	25	50	1	
4	PC	RCP23VPC203	Concrete Technology	3	-	-	25	15	15	15	60	100	3	4
5	PC	RCP23VPC203L	Concrete Technology Laboratory	-	-	2	25	-	-	-	25	50	1	
6	PC	RCP23VPC204L	Building Construction Material Laboratory	-	-	2	25	-	-	-	25	50	1	1
7#	OE	RCP23XOE211	Product Life Cycle Management	3	-	-	25	15	15	15	60	100	3	3
		RCP23XOE212	Management Information System											
		RCP23XOE213	Operations Research											
		RCP23XOE214	Personal Finance Management											
		RCP23XOE215	Public System and Policies											
		RCP23XOE216	Fundamentals of Biomedical											
		RCP23XOE217	IPR and Patenting											
		RCP23XOE218	Entrepreneurship and Startup Ecosystem											
8	MD	RCP23VMD201	Automation in Construction	2	-		25	15	15	15	60	100	2	2
9	HS	RCP23XHS232	Universal Human Values	3	-	-	25	15	15	15	60	100	3	3
10	SC	RCP23XSC201P	Semester Project-I	-	-	2	25	-	-	-	25	50	1	1
11	EL	RCP23XEL201	Community Engagement Service	-	-	2	25	-	-	-	-	25	1	1
Total				17	-	10	275	90	90	90	460	825	22	22

TA-Teacher Assessment, ESE- End Semester Examination

Prepared by

Checked by

BOS Chairman

Dean Academic/Dy. Director

C.O.E



Director

Second Year B. Tech Civil Engineering - Semester-IV (w. e. f. 2025-26) NEP

S. No.	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme					Credit	Total	Total	Total
				L	T	P	Continuous Assessment (CA)				ESE				
							T A	Term Test 1 (TT1)	Term Test 2 (TT2)	Average of (TT1 & TT2)					
1	PC	RCP23VCPC401	Fluid Mechanics	3	-		25	15	15	15		60	100	3	4
2	PC	RCP23VLP401	Fluid Mechanics - Laboratory			2	25					25	50	1	
3	PC	RCP23VCPC402	Surveying	2			25	15	15	15		60	100	2	3
4	PC	RCP23VLP402	Surveying Laboratory			2	25					25	50	1	
5	PC	RCP23VCPC403	Structural Analysis	3	-		25	15	15	15		60	100	3	3
6	PC	RCP23VCPC404	Building Planning & Design	2			25	15	15	15		60	100	2	
7	PC	RCP23VLP404	Building Planning & Design Laboratory			2	25					25	50	1	2
8	MD	RCP23VCMD401	Remote Sensing & GIS	2			25	15	15	15		60	100	2	
8#	OE	RCP23OCOE401	Project Management												3
		RCP23OCOE402	Cyber Security & Laws												
		RCP23OCOE403	Advanced Operations Research												
		RCP23OCOE404	Corporate Finance Management												
		RCP23OCOE405	Corporate Social Responsibility	3			25	15	15	15		60	100	3	
		RCP23OCOE406	Bio Informatics												
		RCP23OCOE407	Human Resource Management												
		RCP23OCOE408	Digital Marketing Management												
		RCP23OCOE409	Logistics & Supply Chain Management												
10	HS	RCPXHS281T	Professional Business communication Tutorial		2		50						50	1	1
11	SC	RCP23XSC202P	Semester Project-II			2	25					25	50	1	
12	HS	RCP23XHS283L	Design Thinking Laboratory			2	50						50	2	2
			TOTAL	15	2	10	350	90	90	90		460	900	22	22

TA-Teacher Assessment, ESE- End Semester Examination

Prepared by

Checked by

Dean Academic/Dy. Director




 BOS Chairman

 Director

Program: Civil Engineering	SY B Tech	Semester: III
Mathematics for Civil Engineering (RCP23VPC201)		

Pre-requisite

- 1) Engineering Mathematics

Course Objectives

To inculcate an ability to relate engineering problems to mathematical context.

1. To provide a solid foundation in mathematical fundamentals required to solve engineering problems.
2. To inculcate an ability to use the fundamentals of linear algebra to solve Civil engineering problems.
3. To study the basic principles of linear algebra, vector calculus, and transforms like Laplace and Fourier.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Evaluate functions of square matrices using eigenvalues and eigenvectors	L3	Apply
CO2	Use Laplace and Inverse Laplace to solve Ordinary Differential Equations.	L1	Remember
CO3	Expand periodic functions into infinite Fourier series and represent them as Fourier integrals. Interpret Fourier transform and inverse Fourier transform	L3	Apply
CO4	Correlate the mechanical engineering problem with vector integration and solve them	L4	Analyze



Course Contents

Unit-I Linear Algebra

08 Hrs

Linear Algebra

Characteristic equation, Eigenvalues and Eigenvectors with properties. Cayley- Hamilton theorem. Diagonalizability of matrices. Functions of square matrix.

Unit-II Laplace Transform (LT)

07 Hrs

LT of standard functions such as 1, tn , $\sin at$, $\cos at$, $\sinh at$, $\cosh at$. Linearity property of Laplace Transform, First Shifting property, Change of Scale property of L.T. (without proof)

$$L\{t^n f(t)\}, L\left\{\frac{f(t)}{t}\right\}, L\left\{\int_0^t f(u) du\right\}, L\left\{\frac{d^n f(t)}{dt^n}\right\}$$

Unit-III Inverse Laplace Transform

06 Hrs.

Inverse Laplace Transform

Linearity property, Partial fractions method and convolution theorem. Applications to solve ordinary differential equations with one dependent variable with given boundary conditions. **Laplace Transform of special functions** (Flip classroom - self-study)
Heaviside Unit step function, Dirac Delta function, Periodic functions

Unit-IV Fourier series

06 Hrs.

Fourier series

Definition, Dirichlet's conditions, Fourier series of periodic function with period 2π & $2l$. Even and odd functions, Half range sine and cosine series, Parseval's identities (without proof)

Vector Integration

Fourier integral theorem (only statement), Fourier transform, Fourier sine & cosine transforms, Inverse Fourier Transforms

Unit-V Statistic & Probability Distribution

07 Hrs

Coefficient of Correlation, Lines of Regression if Bivariate Data fitting of curve (Line and Parabola) by Least square,
Random Variable, Discrete and Continuous Probability Distribution Binomial, Poisson and Normal Distribution, Application to Civil Engineering

Text Books

1. Seymour Lipschutz and Marc Lipson, "Linear Algebra", 4th Edition, Schaum's outlines, 2008.
2. Gilbert Strang, "Linear Algebra and its Applications", 4th Edition, Cengage, 2005.
3. B. S. Grewal, 'Higher Engineering Mathematics', Khanna Publication.

Reference Books:

1. Erwin Kreyszig, 'Advanced Engineering Mathematics', Wiley India
2. Deisenth, Faisal, Ong, 'Mathematics for machine learning', Cambridge University Press



Program : Civil Engineering	SY B Tech	Semester: III
Mechanics of Solids (RCP23VPC202)		
Mechanics of Solids Laboratory (RCP23VPC202L)		

Pre-requisite

- 1) Engineering Mechanics
- 2) Engineering Physics
- 3) Engineering Mathematics

Course Objectives:

1. To gain knowledge of the effect of external action on elastic body.
2. To understand the different engineering properties of the materials.
3. To analyses the stress, strain and deformation of elastic bodies under external actions and to compute design forces.

Course Outcomes (COs): After completion of this course students will be able to:

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Evaluate stress, strain, deformation, strain energy, and material behavior in determinate and composite structures using theoretical approaches and experimental validation	1,5	Knowledge, Evaluating
CO2	Apply principles of elasticity, thermal response, and constitutive relationships to solve structural problems, and demonstrate teamwork and communication in collaborative lab tasks.	3,6	Applying, Creating
CO3	Analyze the structural response of elements under bending, shear, torsion, and axial loading, and represent their behavior through graphical and experimental methods.	4,5	Analyzing, Evaluating

Course Contents

Unit I **Simple Stresses and Strains** **(08 Hrs.)**

Moment of Inertia:

Centroid, Area Moment of Inertia, Parallel Axis theorem, Polar Moment of Inertia, Principal axes, Principal moment of inertia.

Stress and strain:

Definitions of stress, strain, modulus of elasticity, modulus of rigidity, bulk modulus, and yield stress, ultimate stress, factor of safety and shear stress. Hooke's law, and stress – strain relationship, Poisson ratio, bars of varying sections, stress due to self-weight. Composite sections, volumetric strain, elastic constants and relations between them. Thermal/temperature stresses.

Unit-II **Shear Force and Bending Moment Diagram** **(07 Hrs.)**

Axial force, shear force and bending moment diagrams for statically determinate beams (excluding beams with internal hinges), relationship between rates of loading, shear force and bending moment. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads, application of moments.

Unit III **Flexural and Shear Stresses** **(08 Hrs.)**

a) Flexural Stresses-Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = \sigma/y = E/R$ - Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I and T sections. Moment of Resistance of cross-section.
b) Shear Stresses- Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections

Unit IV **Torsion and Strain Energy** **(06 Hrs.)**

a) Torsion of circular shafts: Theory of pure torsion, torsional moment of resistance, power transmitted by shafts, torsional rigidity, shear stresses in shafts due to torsion, stress & strain in determinate shafts of hollow or solid cross-sections.

b) Strain energy and impact: concept of strain energy, expression of strain energy for axially loaded member under gradual, sudden and impact loads. Strain energy due to self-weight.

Unit-V **Columns and Struts, Principal Stresses and Strains** **(10 Hrs.)**

a) Columns and Struts: Euler's theory for columns – Different end conditions – Rankine's formula – Limitations of Euler's theory. Direct and bending stresses in columns. Limit of eccentricity
b) Concept of principal stresses and planes, normal and tangential stress on any oblique plane, determination of principal stresses and principal planes, Mohr's circle method.



Text Books:

1. S. B. Junnarkar & H. J. Shah, Mechanics of Structures – Volume I (S. B. Junnarkar, revised with H. J. Shah), 32nd Edition (2016), Charotar Publishing House, ISBN 10: 938503927X, ISBN 13: 978 9385039270
2. S. S. Bhavikatti, Strength of Materials, 5th Edition (2022), Vikas Publishing House, ISBN 13: 978 9354531972
3. R. K. Rajput, A Textbook of Strength of Materials (Mechanics of Solids), 7th Edition (2022), S. Chand Publishing, ISBN 10: 9352533690, ISBN 13: 978 9352533695
4. R. K. Bansal, A Textbook of Strength of Materials (in S.I. Units), 7th Edition (2023), Laxmi Publications, ISBN 13: 978 8131808917

Reference Books:

1. D. S. Bedi, Strength of Materials, 6th Revised Edition (2020), Khanna Publishing House, India, ISBN 10: 9382609113, ISBN 13: 978 9382609117
2. S. P. Timoshenko & D. H. Young, Elements of Strength of Materials, 5th Edition (MKS Units), Krieger Publishing (latest reprint), ISBN 13: 978 0824774828
3. S. M. A. Kazmi, Solid Mechanics, 1st Edition (2022), Tata McGraw Hill Education, India, ISBN 13: 978 9356340005
4. R. C. Hibbeler, Mechanics of Materials, 11th Edition (2022/2023), Pearson Prentice Hall, USA, ISBN 10: 0137605587, ISBN 13: 978 0137605583
5. W. K. Hall, Laboratory Manual for Testing Materials, Latest Edition (2021), McGraw Hill Education, ISBN 13: 978 9390157057
6. F. P. Beer, E. Russell Johnston Jr., & J. T. DeWolf, Mechanics of Materials, 8th Edition (SI Units) (2020), McGraw Hill Education, ISBN 10: 1260113272, ISBN 13: 978 1260113273

Mechanics of Solids Laboratory (RCP23ESCE302)

List of the Experiments

Perform minimum five experiments from the below-suggested list which would help the learner to apply the concept learnt

1. Tensile test on Mild steel.
2. Torsion test on Mild steel.
3. Compression test on concrete
4. Rockwell hardness test on different metals.
5. To determine impact strength of steel. (By Izod test)
6. To determine impact strength of steel. (By Charpy test)
7. Bending test on timber
8. Graphical solution method for principal stress problems
9. Tests on bricks:
 - a) Compressive strength test, b) Water absorption test, c) Efflorescence Test

Assignments:

Minimum five assignments based on syllabus will be conducted which would help the learner to apply the concept learnt.

Program : Civil Engineering	SY B Tech	Semester: III
Concrete Technology (RCP23VPC203)		
Concrete Technology Laboratory (RCP23VPC203L)		

Pre-requisite

- 1) Element of Civil Engineering

Course Objectives:

1. To introduce the student's Basic ingredients of concrete and their properties.
2. The students should be able to design and recommend the mix of concrete for given materials.
3. Students will able to Learn various NDT methods used for inspection of concrete.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Students will able to learn and finding the different Properties Material (cement, sand, aggregate)	1,5	Knowledge, Evaluating
CO2	Students will able to understand process of concrete and Evaluate different test on fresh and Hardened concrete	3,5	Knowledge Evaluating
CO3	Analyze the design of Concrete mix and Evaluate various NDT test on concrete	4,5	Analyzing, Evaluating



Course Contents

Unit-I Cement, Aggregate and water

06 Hrs.

Prerequisite: NA

Cement: - Manufacture of cement, chemical composition, setting and hydration of cement. Types of cement, Properties and testing of cement. Aggregates – Classification, properties, grading, impurities in aggregates and testing of aggregates, its effect on strength of concrete. Quantity of water for concrete.

Unit-II Fresh and Hardened Concrete

08 Hrs.

Prerequisite: NA

Fresh Concrete: - Definition and its ingredients, grades of concrete, concreting process, Significance of water cement ratio. Properties of fresh concrete.

Hardened Concrete- Various properties of hardened concrete, factors affecting various properties, and stress - strain relation, Creep and Shrinkage testing of hardened concrete. Permeability and Durability of concrete.

Unit-III Admixture and Special Concrete

06 Hrs.

Prerequisite: NA

Admixtures in Concrete: Types, Plasticizers and Super-plasticizers & their Effects on Workability.

Types of Concrete: - Lightweight concrete, polymer concrete, fiber reinforced concrete, ready mixed concrete, self-compacting and high performance concrete, Ferro cement concrete. Special concrete- Transparent concrete, cellular light wt. concrete, pre-stressed concrete, under water concreting, concreting in extreme weather conditions

Unit-IV Concrete mix Design

08 Hrs.

Prerequisite: NA

Introduction, to concrete mix design object of mix design, factors to be considered, statistical quality control, different methods of mix design. Concrete mix design by I.S. (10262-456) method and IRC method.

Unit-V Introduction to NDT & Deterioration of concrete

08Hrs.

Introduction to non-destructive testing of concrete, rebound hammer, ultrasonic pulse velocity, pull out test, impact echo test. Deterioration of concrete Sulphate Attack, Alkali Aggregate Reaction (AAR) factors affecting on AAR, Deteriorating effects of AAR, Chloride Attack, Corrosion of Steel.

Text books:

1. M.S. Shetty & A.K. Jain, Concrete Technology: Theory and Practice, S. Chand Publishing, 8th Edition, 2022, (ISBN-9789352533801)
2. M.L. Gambhir, Concrete Technology: Theory and Practice, McGraw Hill Education (India), 5th Edition, 2017, (ISBN-9781259062554/978-1-259-06255-4).
3. A.M. Neville, Properties of Concrete, Pearson Education, 6th Edition, 2019, (ISBN-9780273755807/978-0-273-75580-7).
4. John Newman, Ban Seng Choo & Philip Owens, Advanced Concrete Technology, Wiley-Blackwell, 2nd Edition, 2021, (ISBN-9781119806219/978-1-119-80621-9).
5. A.M. Neville & J.J. Brooks, Concrete Technology, Pearson Education, 2nd Edition, 2020, (ISBN-9780273732198/978-0-273-73219-8)

Reference Books:

1. A.M. Neville, Properties of Concrete, Pearson Education, 6th Edition, 2019, (ISBN-9780273755807/978-0-273-75580-7).
2. John Newman, Ban Seng Choo & Philip Owens, Advanced Concrete Technology, Wiley-Blackwell, 2nd Edition, 2021, (ISBN-9781119806219/978-1-119-80621-9).
3. P. Kumar Mehta & Paulo J.M. Monteiro, Concrete: Microstructure, Properties and Materials, McGraw Hill, 4th Edition, 2023, (ISBN-9781264258789/978-1-264-25878-9).
4. Gert De Schutter (Editor), Modern Concrete Technology Series - Sustainable Concrete, CRC Press/Taylor & Francis, 1st Edition, 2018, (ISBN-9781138745523/978-1-138-74552-3).
5. Mark Alexander, Concrete Durability and Service Life Planning, CRC Press, 1st Edition, 2024, (ISBN-9781032456789/978-1-032-45678-9)

Concrete Technology Laboratory (23PCCE3040L)

List of Experiments

Term work shall consist of performing minimum five experimental sets from the list below.

- 1) Testing of Cement: Consistency, Fineness, Setting Time, Specific Gravity,
- 2) Soundness and Strength Test for Cement
- 3) Testing of Aggregates: Specific Gravity, Sieve Analysis, Bulking of Fine Aggregate, Flakiness Index, Elongation Index and Percentage Elongation
- 4) Placement Tests on Concrete: Workability Tests: Slump, Compaction,
- 5) Strength Tests on Concrete: Compression, Flexure, Split & Tensile Test,
- 6) Effects of Admixture: Accelerator, Retarder, Super Plasticizer,
- 7) Exercise and verification of Concrete Mix Design,
- 8) Non-destructive Testing for Concrete.



Program: Civil Engineering	SY B Tech	Semester: III
Product Life Cycle Management (RCP23XOC211)		

Pre-requisite: Nil

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	2	Understand
CO2	Illustrate various approaches and techniques for designing and developing Products	1	Remember
CO3	Acquire knowledge in applying virtual product development tools	1	Remember
CO4	Acquire knowledge in implementation of Environmental aspects in PLM.	1	Remember



Course Contents

Unit-I Introduction to Product Lifecycle Management 08 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, and Relation with the Post Design Planning Phase.

Unit-III Methodological Evolution of Product Design 06 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 06 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 06 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 Realisationl, Springer-Verlag, 2004. ISBN: 1852338105.
2. Fabio Giudice, Guido La Rosa, Antonino Risitano, — Product Design for the environment-A life cycle approachl, 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. Fran,cois Villeneuve, Luc Mathieu, Max Giordano —Product Life-Cycle Management: Geometric Variations. (2010). United Kingdom: Wiley.

Program: Civil Engineering	SY B Tech	Semester: III
Management Information System (RCP23XOC212)		

Pre-requisite: Nil

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 analyse 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	BloomsLevel	Blooms Description
CO1	Explain the fundamental concepts of the management information Systems used in business.	4, 6	Analyze, Evaluate
CO2	Describe IT infrastructure and its components and its current Trends.	1	Knowledge
CO3	Use the tools and technologies for accessing information from databases to improve business performance and decision making	3	Apply
CO4	Identify and explain the security and ethical challenges in MIS along with the measures to be taken	2	Understand
CO5	Select a suitable social computing platform for the given requirements that integrates AI and IoT.	2	Understand
CO6	Explain the processes involved in the information system within the organization includes information acquisition and enterprise and global management technologies.	1	Apply



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 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

010 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-VI 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)

08 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 Social Computing (SC)

08 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, Incorporated, 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/>



Program: Civil Engineering	SY B Tech	Semester: III
Operation Research (RCP23XOC213)		

Pre-requisite: Nil

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 optimization problem into a Linear Programming Problem (LPP) and analyses the solution obtained using LPP optimization models	2	Comprehension
CO2	Solve Linear Programming Problems using transportation and assignment models.	4	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	3	Apply
CO4	Apply Game Theory for decision making under conflicting situations where there are one or more opponents (players).	3	Apply
CO5	To breaking down a large problem into smaller sub problems and solved recursively or iteratively using Dynamic Programming models.	6	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 – Northwest 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 Lieberman, 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



Program: Civil Engineering	SY B Tech	Semester: III
Personal Finance Management (RCP23XOC214)		

Pre-requisite: Nil

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.	2	Understand
CO2	Use a framework for financial planning to understand the overall role finances play in his/her personal life.	3	Apply
CO3	Compute income from salaries, house property, business/ Profession, capital gains and income from other sources.	3	Apply
CO4	Compute the amount of CGST, SGST and IGST payable after considering the eligible input tax credit.	3	Apply
CO5	Understand how Microfinance can help in financial inclusion	2	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 Goods and Services Tax 08 Hrs.

Introduction to Micro-finance Micro-Finance: Definitions, Scope & Assumptions, Types of Microfinances, Customers of Microfinance, 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 (1st) , 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



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 Defense 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" 10th Edition, McGraw-Hill Education, 2013.
8. Richard A Musgrave and Peggy B Musgrave, "Public Finance in Theory and Practice", 5th Edition, Mcgraw Hill Book, 2017.



Program: Civil Engineering	SY B Tech	Semester: III
Fundamentals of Biomedical Instruments (RCP23XOC216)		

Pre-requisite: Nil

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.	2	Comprehension
CO2	Identify the use of biomaterials and apply principles of various transducers and sensors.	4	Analyze
CO3	Demonstrate the working principle of various medical instruments	4,5	Analyze Evaluate
CO4	Demonstrate principles used in imaging modalities and analysis.	6	Evaluate
CO5	Identify different processes used in telemetry and telemedicine	4	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, 2nd 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, 3rd 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



Program: Civil Engineering	SY B Tech	Semester: III
IPR & Patenting (RCP23XOC217)		

Pre-requisite: Nil

Course Objectives:

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

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Map a given project/ idea to a suitable intellectual property Rights.	4	Analyze
CO2	Explain the fundamentals of the patents, copyrights, and Design registrations.	1	Knowledge
CO3	Draft applications to protect various intellectual property rights	3	Apply
CO4	Communicate with national and/or international intellectual property organizations.	1	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, start up 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/noc24hs59/preview>



Program: Civil Engineering	SY B Tech	Semester: III
Entrepreneurship and Startup Ecosystem (RCP23XOC218)		

Pre-requisite: Nil

Course Objectives:

1. To foster an entrepreneurial mind-set
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.	2	Comprehension
CO2	Cultivate an Entrepreneurial Mindset.	4	Analyze
CO3	Create Effective Business Models.	4,6	Create
CO4	Understand the significance of Intellectual Property rights	2	Understand
CO5	Master Fundraising Strategies	6	Evaluate



Course Contents

Unit-I Understanding the Entrepreneurial Ecosystem

06 Hrs.

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

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 Start-ups, • Angel Investors and Venture Capital, • Crowdfunding Platforms • Financial Modelling for Start-ups, • 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

Program: Civil Engineering	SY B Tech	Semester: III
Automation in Construction (RCP23VMD201)		

Pre-requisite

- 1) Element of Civil Engineering

Course Objectives:

1. To understand the fundamentals of automation in the construction industry.
2. To explore various automated systems and technologies used in construction.
3. To analyze the impact of automation on construction productivity, safety, and quality.
4. To evaluate the future trends and challenges in construction automation.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Comprehend the basic concepts and significance of automation in construction.	1,2	Learn
CO2	Identify and describe various automated technologies used in construction.	1,3	Understand
CO3	Assess the benefits and challenges associated with implementing automation in construction projects.	3	Analyze
CO4	Anticipate future trends in construction automation and adapt to emerging technologies.	1,2	Learn



Course Contents

Unit-I Introduction to Automation in Construction 06 Hrs.

Prerequisite: NA

Definition and importance of automation in construction. History and evolution of construction automation. Types of automation: Mechanization, robotic automation, and information automation. Benefits and challenges of automation in construction.

Case studies on successful automation implementation in construction projects.

Unit-II Automated Construction Equipment System 06 Hrs.

Automated earth-moving and excavation equipment. Robotics in construction: Types, applications, and limitations. 3D printing in construction: Technology, materials, and applications. Automated bricklaying and masonry systems. Drones and UAVs in construction: Applications and regulations.

Unit-III Application of Robotics in Construction 06 Hrs.

Robotic Systems for Specific Tasks: Bricklaying robots, Concrete dispensing and finishing robots, Welding and cutting robots, Inspection and maintenance robots

Automation in Construction Processes: Earthmoving and excavation, Material handling and transportation, Prefabrication and modular construction

Unit-VI Safety, Quality, and Productivity in Construction 06 Hrs.

Impact of automation on construction safety. Quality control and assurance in automated construction. Enhancing productivity through automation. Human-robot collaboration in construction. Regulatory and ethical considerations in construction automation.

Unit-V Future Trends and Challenges in Construction Automation 06 Hrs.

Emerging technologies in construction automation. The role of artificial intelligence and machine learning in construction. Internet of Things (IoT) and smart construction sites. Challenges and barriers to adopting automation in construction. The future of the construction workforce in an automated environment.



Textbooks:

1. Benny Raphael, Construction and Building Automation: From Concepts to Implementation, Routledge/Taylor & Francis, 1st Edition, 2021
2. Kenji Itoh & Shigeo Kitahara, Automation in Construction Engineering: Digital Transformation and Smart Construction, Wiley-IEEE Press, 1st Edition, 2022,
3. Reza Akhavian & Amir H. Behzadan, Construction Automation and Robotics: Principles and Applications, CRC Press, 1st Edition, 2023, (ISBN-9781032156781/978-1-032-15678-1).

Reference Books:

1. Thomas Bock, Thomas Linner & Willi Viktor Mörtz, Automation and Robotics in the Architecture, Engineering, and Construction Industry, Springer Nature, 1st Edition, 2022, (ISBN-9783030771621/978-3-030-77162-1).
2. Carlos Balaguer & Mohamed Abderrahim (Editors), Robotics and Automation in Construction: Advanced Technologies and Applications, IntechOpen, 2nd Edition, 2019
3. Javad Majrouhi Sardroud, Automation in Construction Management: RFID and IoT Technologies, LAP Lambert Academic Publishing, 1st Edition, 2018,
4. Robotics and Automation in Construction by Behzad Sodagar
5. 3D Printing in Construction: Applications, Performance, and Challenges by Munir M. Hamad
6. Construction Technology: Analysis and Choice by Tony Bryan and Andrew E. Powell
7. Automation and Robotics in Construction XI by Alan Chamberlain



Program: Civil Engineering	SY B Tech	Semester: III
Universal Human Values (RCP23XHS232)		

Pre-requisite: Nil

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	2	Understand
CO2	Distinguish between the Self and the Body, understand the meaning Of Harmony in the Self the Co-existence of Self and Body.	4	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.	2	Understand
CO4	Understand the harmony in nature and existence and work out Their mutually fulfilling participation in the nature.	2	Understand
CO5	Distinguish between ethical and unethical practices and start working out the strategy to actualize a harmonious environment Wherever they work.	4	Analyze

Course Contents

Unit-I

04 Hrs.

Introduction:

Need, Basic Guidelines, Content and Process for Value Education Purpose and motivation for the course. Self-Exploration—what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration.

Continuous Happiness and Prosperity- A look at basic Human Aspirations.

Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Unit-II

05 Hrs.

Understanding Harmony in the Human Being –

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' - happiness and physical facility. Understanding the Body as an instrument of 'I' (I am 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: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Health.

Unit-III

09 Hrs.

Understanding Harmony in the Family and Society:

Harmony in Human-Human Relationship. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; 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 Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Unit-IV

04 Hrs.

Understanding Harmony in Nature and Existence: Whole existence as Coexistence 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

04 Hrs.

Implications of the above Holistic Understanding of Harmony on Professional Ethics: 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, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

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.

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. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.
5. Small is Beautiful - E. F Schumacher. 6. Slow is Beautiful - Cecile Andrews.
7. Economy of Permanence - J C Kumarappa.
8. Bharat Mein Angreji Raj – PanditSunderlal.
9. Rediscovering India - by Dharampal.
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi.
11. India Wins Freedom - Maulana Abdul Kalam Azad.
12. Vivekananda - Romain Rolland. (English)
13. Gandhi - Romain Rolland. (English)



Program: Civil Engineering	SY B Tech	Semester: III
Universal Human Values Tutorial (RCP23HSCE306)		

Pre-requisite: Nil

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	2	Understand
CO2	Distinguish between the Self and the Body, understand the meaning Of Harmony in the Self the Co-existence of Self and Body.	4	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.	2	Understand
CO4	Understand the harmony in nature and existence and work out Their mutually fulfilling participation in the nature.	2	Understand
CO5	Distinguish between ethical and unethical practices and start working out the strategy to actualize a harmonious environment Wherever they work.	4	Analyze



Tutorial (Term work):

1. Practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony, and co-existence) rather than as arbitrariness in choice based on liking-disliking.
2. Practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.
3. Practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.
4. Practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.
5. Practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions e.g. To discuss the conduct as an engineer or scientist etc.

(Term work shall consist of minimum 5 activities based on above activities conducted. The final certification and acceptance of term work will be subject to satisfactory performance of activities and upon fulfilling minimum passing criteria in the term work)

The final certification and acceptance of term work will be subject to satisfactory performance of activities and upon fulfilling minimum passing criteria in the term work.

Text Books

1. Gonzales and Woods, Digital Image Processing, Pearson Education, India, 3rd Edition,
2. Milan Sonka, Vaclav Hlavac, Roger Boyle, Image Processing, Analysis, and Machine Vision,
Cengage Engineering, 3rd Edition, 2013

Reference Books

1. Anil K. Jain, Fundamentals of Image Processing, Prentice Hall of India, First Edition, 1989.
2. W Pratt, Digital Image Processing, Wiley Publication, 3rd Edition, 2002



Program : Civil Engineering	SY B Tech	Semester: III
Semester Project – I (RCP23XSC201P)		

Pre-requisite: Nil

Course Objectives:

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

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Conduct a survey of several available literatures in the preferred field of study.	4	Analyze
CO2	Demonstrate various/alternate approaches to complete a Project.	2	Understand
CO3	Ensure a collaborative project environment by interacting And dividing project work among team members.	3	Apply
CO4	Present their project work in the form of a technical report / paper and thereby improve the technical communication skill.	3	Apply
CO5	Demonstrate the ability to work in teams and manage the conduct of the research study.	2	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 fulfillment 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 deferent 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.

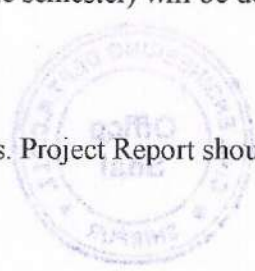
Assessment Criteria:

- _ 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 detail
- _ 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/Tech Fest/Magazine/ before the end of the semester.

Table 1 Log Book format

S.NO.	Week (Start date / End date)	Work done	Sign of Guide	Sign of Coordinator
1				
2				

Table 2 Continuous Assessment sheet

S.NO.	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

S.NO.	Exam Seat No	Name of Student	Project Selection	Design Simulation logic	PCB hardware programing	Result Verification	Presentation	Total
			5	5	5	5	5	25



Program: Civil Engineering	SY B Tech	Semester: III
Community Engagement Services – I (RCP23XEL201)		

Pre-requisite: Nil

Course Objectives:

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

S. No.	Course outcome	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.	6	Evaluate
CO2	Commitment for cause: Identify and experience commitment for community engagement activities that reinforce sense of belongingness And gratitude towards societal cause.	4	Analyze
CO3	Diversity: Witness diversity in communities and cultures and demonstrate change in approach / attitude as, an evidence of unconditional Acceptance. .	3	Apply
CO4	Team: Recognize, experience and value, effectiveness of working in a team, demonstrating co-existence of the roles - sincere worker and effective leader.	4	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.

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 Mem- bers	Energy Usage (kWh)	Water Usage (liters)	Waste Pro- duction (kg)	Transportation Habits	Green Foot- print

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 contam- ination 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 coexistence 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
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1. Rubric for Field Survey Activity

2.

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	

