

NIRMA UNIVERSITY

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|------------------------------|---|
| Institute: | School of Engineering, Institute of Technology |
| Name of Programme: | M. Tech. in Civil Engineering (Construction Technology and Management) |
| Course Code: | 6CL221 |
| Course Title: | Quantitative Techniques in Management |
| Course Type: | (<input type="checkbox"/> Core/ <input type="checkbox"/> Value Added Course/ <input checked="" type="checkbox"/> Departmental Elective/ <input type="checkbox"/> Institute Elective/ <input type="checkbox"/> University Elective/(<input type="checkbox"/> Open Elective <input type="checkbox"/> Any other) |
| Year of introduction: | 2022-23 |

| L | T | Practical component | | | | C |
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| | | LPW | PW | W | S | |
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Course Learning Outcomes (CLOs):

At the end of the course, the students will be able to –

1. solve the deterministic optimization problems (BL3)
2. categorize risk and uncertainty in construction projects (BL4)
3. apply optimization techniques for decision making under uncertainty (BL3)
4. justify the use of simulation techniques in construction projects. (BL5)



Syllabus:

Teaching hours: 45

| Unit | Syllabus | Teaching hours |
|-------------|---|-----------------------|
| Unit-I | Introduction and concepts of probability and Statistics Probability, Conditional probability, Probability distributions (Normal, Bayesian, Poisson, Exponential), Probability density functions Sampling, Uni-square and analysis of variance, simple regression and correlation, multiple regression and modelling techniques. | 12 |
| Unit-II | Operation Research Introduction to operations research, linear programming, graphical and simplex methods, duality and post-optimality analysis, transportation and assignment problems, queuing theory, queuing model, Simplex method (Tabular and Matrix form). Integer linear programming | 10 |
| Unit-III | Production Management Inventory control, EOQ, quantity discounts, safety stock-replacement theory modification and improvement on PERT and CPM | 05 |
| Unit-IV | Decision Theory Decision theory, decision rules, decision making under conditions of certainty, risk and uncertainty, decision trees utility theory, decision making techniques. Deterministic and probabilistic | 05 |

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| | situation, single and multiple person decision making | |
| Unit-V | Managerial Economics & Forecasting Cost concepts, break-even analysis, pricing techniques, game theory and its applications. Quantitative methods-Time series (average method, moving average method, exponential smoothing, mean square error), Regression analysis. Qualitative methods. | 08 |
| Unit-V | Simulation Techniques Monte-Carlo Simulation, Sensitivity Analysis and Analytical Hierarchy Process (AHP). | 05 |
| Self Study: | The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents. | |
| Suggested Readings/ References: | <ul style="list-style-type: none"> • Taha, H. A. <i>Operations research: An introduction</i> Pearson Education India. • Render, B., & Stair Jr, R. M., <i>Quantitative Analysis for Management</i>, Pearson Education India. • Freund, J.E. and Miller, <i>Probability and Statistics for Engineers</i>, Pearson • Pant, J. C., <i>Introduction to Optimization</i>, Jain Brothers. | |
| Suggested List of Experiments: | - | |
| Suggested Case List: | - | |

NIRMA UNIVERSITY

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|------------------------------|---|
| Institute: | School of Engineering, Institute of Technology |
| Name of Programme: | M. Tech. in Civil Engineering (Construction Technology and Management) |
| Course Code: | 6CL222 |
| Course Title: | Infrastructure Project Development and Management |
| Course Type: | (<input type="checkbox"/> Core/ <input type="checkbox"/> Value Added Course/ <input checked="" type="checkbox"/> Departmental Elective/ <input type="checkbox"/> Institute Elective/ <input type="checkbox"/> University Elective/(<input type="checkbox"/> Open Elective <input type="checkbox"/> Any other) |
| Year of introduction: | 2022-23 |

| L | T | Practical component | | | C |
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Course Learning Outcomes (CLOs):

At the end of the course, the students will be able to –

1. apply concept of-infrastructure risk management strategies (BL3)
2. analyze urban and rural infrastructure based on policy requirements (BL4)
3. examine the public-private participation for infrastructure projects (BL4)
4. propose maintenance plan for infrastructure projects. (BL6)



Syllabus:

Teaching hours: 45

| Unit | Syllabus | Teaching hours |
|----------|--|----------------|
| Unit-I | Introduction and Infrastructure scenario Types, role, need and scenario of infrastructure, infrastructure crisis. | 06 |
| Unit-II | Urban Infrastructure Concept of urbanization and economic development, scenario of municipal infrastructure, models of urban governance, municipal finances, major municipal reforms, legislations pertaining to urban infrastructure. | 09 |
| Unit-III | Rural Infrastructure Overview, concept of rural infrastructure planning, state of rural infrastructure, growth, rural characteristics, strategies to improve infrastructure in rural areas. | 09 |
| Unit-IV | Public – Private Sector Participation Overview, benefits, problems, challenges and financial models. | 07 |
| Unit-V | Infrastructure Risk Management Risks in infrastructure, quantitative risk analysis, qualitative risk management, risk management strategies. | 07 |
| Unit-VI | Infrastructure Maintenance Introduction, need and requirement and preventive techniques for maintenance | 07 |

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| Self Study: | The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents. |
| Suggested Readings/ References: | <ul style="list-style-type: none"> • Parkin, J., Sharma, D., <i>Infrastructure Planning</i>, Thomas Telford • Chandra, P., <i>Projects: Planning, Analysis, Selection, Financing, Implementation, and Review</i>, Tata McGraw-Hill • Goodman, S., Hastak, M., <i>Infrastructure planning handbook: Planning, Engineering, and Economics</i>, McGraw-Hill. • Webster, T. J., <i>Managerial economics: Theory and practices</i>, Elsevier. • Tan, W., <i>Principles of Project and Infrastructure Finance</i>, Taylor and Francis. • Grigg, N., <i>Infrastructure Engineering and Management</i>, Wiley. • Hudson, Haas, Uddin, <i>Infrastructure Management: Integrating Design, Construction, Maintenance, Rehabilitation, and Renovation</i>, McGraw Hill. |
| Suggested List of Experiments: | - |
| Suggested Case List: | - |

NIRMA UNIVERSITY

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|------------------------------|---|
| Institute: | School of Engineering, Institute of Technology |
| Name of Programme: | M. Tech. in Civil Engineering (Construction Technology and Management) |
| Course Code: | 6CL223 |
| Course Title: | Building Automation and Smart City Planning |
| Course Type: | (<input type="checkbox"/> Core/ <input type="checkbox"/> Value Added Course/ <input checked="" type="checkbox"/> Departmental Elective/ <input type="checkbox"/> Institute Elective/ <input type="checkbox"/> University Elective/(<input type="checkbox"/> Open Elective <input type="checkbox"/> Any other) |
| Year of introduction: | 2022-23 |

| L | T | Practical component | | | | C |
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Course Learning Outcomes (CLOs):

At the end of the course, the students will be able to –

1. identify the need of building automation and energy efficient design (BL3)
2. make use of various control systems in building (BL3)
3. plan and develop sustainable smart cities (BL6)



Syllabus:

Teaching hours: 45

| Unit | Syllabus | Teaching hours |
|-------------|---|-----------------------|
| Unit-I | Building Automation Introduction to Building Automation System, intelligent architecture and structure, evaluation of intelligent buildings, Intelligent Building criteria –the internet of things, intelligent homes | 05 |
| Unit-II | Energy Efficient Building Design Natural building design consideration, energy efficient design strategies, contextual factors -longevity and process assessment, renewable energy sources and design, advanced building technologies, smart buildings, energy efficient and environment friendly building, thermal phenomena, thermal comfort, indoor air quality, passive heating and cooling systems | 10 |
| Unit-III | Control Systems in Building Lighting and other electrical system, automatic control systems, control issues related to energy conservation, interior air quality and thermal comfort in buildings, ventilation. classification of HVAC control system, selection and size of sensors, actuators and controllers. practical HVAC control system, designing and turning controllers, advanced plumbing systems, surveillance and security system, fire safety in building, monitoring system in building, use of mobile applications, automation in parking system. | 15 |
| Unit-IV | Smart City Planning, Development and Management Introduction to smart city planning, stakeholders, key trends in smart | 10 |

city developments, dimension of smart city, global standards and performance benchmarks, practice codes, financing, governance, maintenance and management

Unit-V **Sustainable Smart Cities**

05

Concept of sustainability, rating systems, planning of sustainable smart cities, application of computer in planning and management

Self Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Suggested Readings/ References:

- James Sinopoli, *Advanced Technology for Smart Buildings*, Artech House.
- James Kachadorian, *Passive Solar House: The Complete Guide to Heating and Cooling Your Home*, Chelsea Green Publishing
- James M. Sinopoli, *Smart Buildings Systems for Architects, Owners and Builders* Publisher: Butterworth-Heinemann.
- Jo Beall, *A city for all: valuing differences and working with diversity*; Zed book.
- UN-Habitat; *Inclusive and sustainable urban planning: a guide for municipalities*; Volume 3: Urban Development Planning; United Nations Human Settlements Programme.

Suggested List of Experiments:

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Suggested Case List:

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|------------------------------|---|
| Institute: | School of Engineering, Institute of Technology |
| Name of Programme: | M. Tech. in Civil Engineering (Construction Technology and Management) |
| Course Code: | 6CL224 |
| Course Title: | Real Estate Development and Management |
| Course Type: | (<input type="checkbox"/> Core/ <input type="checkbox"/> Value Added Course/ <input checked="" type="checkbox"/> Departmental Elective/ <input type="checkbox"/> Institute Elective/ <input type="checkbox"/> University Elective/(<input type="checkbox"/> Open Elective <input type="checkbox"/> Any other) |
| Year of Introduction: | 2022-23 |

| L | T | Practical component | | | | C |
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| | | LPW | PW | W | S | |
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Course Learning Outcomes (CLOs):

At the end of the course, the students will be able to –

1. examine the process involved in real estate management (BL4)
2. discover the need of urban land policy (BL4)
3. identify the role of various stake holders in real estate development (BL3)
4. compare the global real estate with Indian scenario (BL5)
5. estimate the value of civil engineering structures. (BL5)



Syllabus:

Teaching hours: 45

| Unit | Syllabus | Teaching hours |
|-------------|--|-----------------------|
| Unit-I | Introduction to Real Estate Development Real estate market, historical perspective of real estate development, characteristics of real estate, market research, Real Estate Development Process, Factors affecting different land uses such as residential, commercial, industrial, public and semipublic; role of different professionals and companies involved in the development process, forms of real estate ownership, real estate contracts, assessment of environmental impact, real estate financing, forecasting cash flows and estimating risk in real estate investments, Development of real estate securitization and structured financing including mortgage contract, Mortgage and options including calculation of various durations to evaluate risk sharing. | 15 |
| Unit-II | Urban Land Policy Contents, importance, objectives, measures, instruments for its implementation, direct Govt. action, legal and physical controls; Relationship between economic trends, land market and urban development | 05 |
| Unit-III | Global Real Estate & Current Real Estate Trend in India Rationales for Cross Border RE Investing, Facilitators of Real | 10 |

Estate Globalization: public markets, professionalization, Types of Global Real Estate Investors and Developers, Understanding Global, Linkages, Rewards of International RE Investing, Risks and Costs of Cross-border Investing: transaction and information costs, political risk, transparency, currency risk, liquidity, reputation. SEZ, SPV, Joint ventures, Smart city concepts, Types & Parameters, Franchisee systems, green building, Rating of Buildings (CARE, CRIL, ICRA).

Unit-IV **Valuation**

15

Concept of valuation, need of valuation, forms of value, factors affecting valuation, role of valuer, gross income, out goings, net income, year's purchase, capitalized value, depreciation, valuation methods – rental, direct comparison, based on profit, development method, depreciation method etc. valuation of residential, commercial, public building, industry etc., issues in valuation of property, valuation report. Valuation of plants & equipment's, case study.

Self Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Suggested Readings/ References:

- Fillmore W Galaty, *Modern Real Estate Practice*, Dearborn Trade Publishing.
- Tanya Davis, “*Real Estate Developer's handbook*”, Atlantic pub company
- Brown, G. & Matysiak, G., *Real Estate Investment*, FT/Prentice Hall.
- Edwards V and Ellision L, *Corporate Property Management: Aligning Real Estate with Business Strategy*, Blackwell
- Ira Nachem, *The complete guide to “Financing real estate development”*, Mc Graw Hill
- Nathan. S. Collier, “*Construction finding – the process of RE development, Appraisal & finance*”, John Wiley & Sons
- Terrence M Clauritie, “*Real estate finance: Theory & practice*”, Prentice hall
- Mathur, G. C., *Law of Land acquisition and compensation*, Eastern Book Company
- Mallik, S. *Urban Land Ceiling and regulation act*, Law Publishers (India).
- Dutta S, *Valuation of real properties*, Eastern Law House.
- Rangwala S., *Valuation of Real Property*, Charotar Publishing House
- Das B., Pani A., *Real Estate Market – New Economy*, New Business, Excel book

Suggested List of Experiments: -
Suggested Case List: -

NIRMA UNIVERSITY

| | |
|------------------------------|---|
| Institute: | School of Engineering, Institute of Technology |
| Name of Programme: | M. Tech. in Civil Engineering (Construction Technology and Management) |
| Course Code: | 6CL225 |
| Course Title: | Safety, Health and Quality Management for Construction Projects |
| Course Type: | (<input type="checkbox"/> Core/ <input type="checkbox"/> Value Added Course/ <input checked="" type="checkbox"/> Departmental Elective/ <input type="checkbox"/> Institute Elective/ <input type="checkbox"/> University Elective/(<input type="checkbox"/> Open Elective <input type="checkbox"/> Any other) |
| Year of Introduction: | 2022-23 |

| L | T | Practical component | | | | C |
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Course Learning Outcomes (CLOs):

At the end of the course, the students will be able to –

1. identify accident pattern and its effect on construction projects (BL3)
2. choose safety management practices for construction projects (BL3)
3. discover the need of quality assurance, quality control and total quality management (BL4)
4. decide quality management practices for construction projects. (BL5)



Syllabus:

Teaching hours: 45

| Unit | Syllabus | Teaching hours |
|----------|--|----------------|
| Unit-I | Introduction to Safety and Construction Accidents Basic terminology in safety, types of injuries, safety pyramids, accident pattern, accidents and their Causes, accident investigation, Human Factors in Construction Safety, Costs of Construction Injuries, Occupational and Safety Hazard Assessment, role of stakeholders in safety | 05 |
| Unit-II | Implements Safety Practice at Construction site Legal Implications for safety, Problem Areas in Construction Safety, Elements of an Effective Safety Programme, Safety Culture, safety committees, safety representatives, Safe Workers, Safety Meetings, Safety Incentives, Job-Site Safety Assessment, Safety Record Keeping, Safety and First Line Supervisors, Safety and Middle Managers, Top Management Practices, Safety Personnel, Owner's responsibility for safety, Owner preparedness, Safety clause in contract document, Sub contractual Obligation, Workers Compensation, Safety policies, outside agencies, Government intervention, international agreements | 12 |
| Unit-III | Implement Safety for various Construction Activities Safety operating procedure for handling construction plants, tools, | 08 |

equipment's and material, safety during excavation, working at height, confined space, steel work, concrete work, temporary structures, demolition, cutting, welding, electrical and plumbing work.

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| Unit-IV | Quality Systems and Planning Quality system standard, ISO 9000 family of standards, Preparing Quality System Documents, Implementing a Quality system, Third party Certification, Quality Policy, Objectives and methods in Construction industry, Consumer's satisfaction, Ergonomics, Taguchi's concept of quality, Codes and Standards, Contract and construction programming, Inspection procedures, Total QA / QC programme and cost implication. | 07 |
| Unit-V | Quality Assurance and Control Objectives, Regularity agent, owner, design, contract and construction-oriented objectives, methods, Techniques and needs of QA/QC, Different aspects of quality, Appraisals, Factors influencing construction quality, Critical, major failure aspects and failure mode analysis, Stability methods and tools, optimum design, Reliability testing, reliability coefficient and reliability prediction. | 06 |
| Unit-VI | Quality Improvement Techniques Selection of new materials, Influence of drawings, detailing, specification, standardization, Bid preparation, Construction activity, environmental safety, social and environmental factors, Natural causes and speed of construction, Life cycle costing, Value engineering and value analysis. | 07 |

Self-Study: The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

- Suggested Readings/
References:
- David Gold Smith, "*Safety Management in construction and Industry*", Mc Graw Hill
 - K N Vaid, "*Construction Safety Management*", NICMAR, Bombay
 - *Construction Safety Manual*, National Safety Commission of India
 - Levitt, R.E. and Samelson, N.M., *Construction Safety Management*, McGraw Hill
 - Hinze, J. W., *Construction Safety*, Prentice Hall
 - Coble, R. J., Jimmie Hinze and Theo C. Haupt, *Construction Safety and Health Management*, Prentice Hall
 - D S Rajendra Prasad, *Quality Management System in Civil Engineering*, Sapna Book House
 - Juran Frank, J.M. and Gryna, F.M., *Quality Planning and Analysis*, Tata McGraw Hill
 - Ron Baden Hellard, *Total Quality in Construction Projects*, Thomas Telford, London.

- N. Logothetis, *“Management for Total Quality”*, Prentice Hall
- Brian, J.J.O., *Construction Inspection Handbook – Total Quality Management*, Van Nostrand.

Suggested List of Experiments: -

Suggested Case List: -

NIRMA UNIVERSITY

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|------------------------------|---|
| Institute: | School of Engineering, Institute of Technology |
| Name of Programme: | M. Tech. in Civil Engineering (Construction Technology and Management) |
| Course Code: | 6CL226 |
| Course Title: | Human Resource Management and Organizational Behaviour |
| Course Type: | (<input type="checkbox"/> Core/ <input type="checkbox"/> Value Added Course/ <input checked="" type="checkbox"/> Departmental Elective/ <input type="checkbox"/> Institute Elective/ <input type="checkbox"/> University Elective/(<input type="checkbox"/> Open Elective <input type="checkbox"/> Any other) |
| Year of Introduction: | 2022-23 |

| L | T | Practical component | | | | C |
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| | | LPW | PW | W | S | |
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Course Learning Outcomes (CLOs):

At the end of the course, the students will be able to –

1. identify the need of human resource management for infrastructure (BL3)
2. take part in training and development practices for various personnel (BL4)
3. evaluate the performance of various personnel by implementing methods and motivation theory (BL5)
4. develop organizational structure for project. (BL6)

Syllabus:

Teaching hours: 45

| Unit | Syllabus | Teaching hours |
|----------|--|----------------|
| Unit-I | Perspectives in Human Resource Management Evolution of human resource management, the importance of the human factor, Challenges, Inclusive growth and affirmative action, Role of human resource manager, Human resource policies, Computer applications in human resource management, Human resource accounting and audit, Human Resource Planning, Forecasting human resource requirement, matching supply and demand, Internal and External sources, Recruitment, Selection, induction, Socialization benefits. | 10 |
| Unit-II | Training and Executive Development Types of training methods, purpose, benefits, resistance, Executive development programmes, Common practices, Benefits, Self-development, Knowledge management, Compensation Plan, Reward, Motivation, Application of Theories of Motivation, Career Management. | 10 |
| Unit-III | Performance Evaluation and Control Process Method of Performance Evaluation, Feedback, Industry Practices. Promotion, Demotion, Transfer and Separation, Implication of Job Change, The Control Process, Importance, Methods, Requirement | 10 |

of Effective Control Systems Grievances, Causes, Implications, Redressal Methods.

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| Unit-IV | Organizational Behaviour Concept and significance, Relationship between management and organisational behaviour, organizational culture, Attitudes, Perception, Learning, Personality and values, emotions and moods, Process of motivation, Theories of motivation, need hierarchy theory, theory X and theory Y, two factor theory, Alderfer's ERG theory, McClelland's learned need theory, Victor Vroom's expectancy theory, Stacy Adams equity theory. | 05 |
| Unit-V | Leadership and Team Development Concept, Leadership styles, Theories - trait theory, behavioural theory, Fielder's contingency theory, Harsey and Blanchard's situational theory, Managerial grid, Likert's four systems of leadership, contemporary issues in leadership, Group dynamics - definition and importance, types of groups, group formation, group development, group composition, group performance factors, Principle-centred approach to team development. | 05 |
| Unit-VI | Organizational Conflict and Negotiations Dynamics and management, Sources, patterns, levels, and types of conflict, Traditional and modern approaches to conflict, Functional and dysfunctional organizational conflicts, Resolution of conflict. | 05 |

Self Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Suggested Readings/ References:

- Griffin, Ricky W, *Organisational Behaviour*, Houghton Mifflin Co.
- Hellreigel, Don, John W. Slocum, Jr., and Richard W. Woodman, *Organizational Behavior*, South Western College Publishing
- Hersey, Paul, Kenneth H. Blanchard and Dewey E. Johnson, *Management of Organisational Behaviour: Utilising Human Resources*, Prentice Hall.
- Ivancevich John and Micheel T. Matheson, *Organisational Behaviour and Management*, Business Publication Inc.
- Koontz, Harold, Cyril O'Donnell, and Heinz Weihrich, *Essentials of Management*, Tata McGraw-Hill.
- Luthans, Fred, *Organizational Behaviour*, McGraw-Hill.
- Gupta C.B., *Human Resource Management*, Sultan and Sons.

- P. Subba Rao, *Personnel & Human Resource Management*, Himalaya Publishing House.
 - K. Aswathappa, *Human Resource and Personnel Management*, Tata Mc Graw Hill
 - Gary Dessler, Biju Varkkey, “*Human Resource Management*”, Pearson Prentice Hall.
 - H John Bernardin, “*Human Resource Management*”, Tata McGraw Hill.
- Decenzo and Robbins, “*Human Resource Management*”, Wiley.

Suggested List of Experiments: -

Suggested Case List: -

NIRMA UNIVERSITY

| | |
|------------------------------|---|
| Institute: | School of Engineering, Institute of Technology |
| Name of Programme: | M. Tech. in Civil Engineering (Construction Technology and Management) |
| Course Code: | 6CL227 |
| Course Title: | Value Engineering |
| Course Type: | (<input type="checkbox"/> Core/ <input type="checkbox"/> Value Added Course/ <input checked="" type="checkbox"/> Departmental Elective/ <input type="checkbox"/> Institute Elective/ <input type="checkbox"/> University Elective/(<input type="checkbox"/> Open Elective <input type="checkbox"/> Any other) |
| Year of Introduction: | 2022-23 |

| L | T | Practical component | | | C |
|---|---|---------------------|----|---|---|
| | | LPW | PW | W | S |
| 3 | 0 | 0 | - | - | - |

Course Learning Outcomes (CLOs):

At the end of the course, the students will be able to –

1. discover the importance of value engineering related to construction projects (BL4)
2. appraise the concept of life cycle costing for construction projects (BL5)
3. select appropriate value engineering methodology for construction projects. (BL5)



Syllabus:

Teaching hours: 45

| Unit | Syllabus | Teaching hours |
|----------|---|----------------|
| Unit-I | Introduction Introduction to value engineering (VE), definition, objective, importance to contractors, factor contributing to value such as aesthetic, ergonomic, technical, economic, identifying reasons for unnecessary costs, interface with the other programs, elements of the project budget, need for cost control, meaning of capitalization, capitalization process | 10 |
| Unit-II | Life Cycle Costing Life cycle cost (LCC) and building cost, Forecasting of Capital as well as operating & maintenance costs, time value, present worth analysis, DCF methods, ROR analysis, and sensitivity analysis. Different methods of performing value engineering, LCC formats and analysis and weighted evaluation, application of LCC to building, case study | 10 |
| Unit-III | Value Engineering Methodology Orientation phase, information phase, function analysis phase, creative phase, evaluation phase, development phase, presentation phase, implementation phase | 07 |
| Unit-IV | Functional System Classifying function, defining function, project level function system techniques, creativity and fixation, interpersonal skills, generation of ideas, brainstorming, rules for brainstorming, Delphi | 10 |

techniques, application of Delphi techniques in civil engineering projects

Unit-V **Application in Construction Projects**

08

VE during the Planning Phase of a Construction Project, VE during the Design Phase of a Construction Project, VE during the Construction Phase of a Construction Project

Self Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Suggested Readings/ References:

- Anil Kumar Mukhopadhyaya, *Value Engineering: Concepts Techniques and applications*, SAGE Publications.
- Alphonse Dell'Isola, *Value Engineering: Practical Applications for Design, Construction, Maintenance & Operations*, R S Means Co.
- Richard Park, *Value Engineering: A Plan for Invention*, St. Lucie Press.
- Del L. Younker, *Value Engineering Analysis and Methodology*, Marcel Dekker Inc, New York.
- Miles, L.D, *Techniques of Value Analysis and Engineering*, McGraw Hill.
- Khanna, O.P, *Industrial Engineering and Management*, Dhanpat Rai & Sons.

Suggested List of Experiments:

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Suggested Case List:

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NIRMA UNIVERSITY

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|------------------------------|---|
| Institute: | School of Engineering, Institute of Technology |
| Name of Programme: | M. Tech. in Civil Engineering (Construction Technology and Management) |
| Course Code: | 6CL228 |
| Course Title: | Insurance & Risk Management for Construction Projects |
| Course Type: | (<input type="checkbox"/> Core/ <input type="checkbox"/> Value Added Course/ <input checked="" type="checkbox"/> Departmental Elective/ <input type="checkbox"/> Institute Elective/ <input type="checkbox"/> University Elective/(<input type="checkbox"/> Open Elective <input type="checkbox"/> Any other) |
| Year of introduction: | 2022-23 |

| L | T | Practical component | | | C |
|---|---|---------------------|----|---|---|
| | | LPW | PW | W | S |
| 3 | 0 | 0 | - | - | 3 |

Course Learning Outcomes (CLOs):

At the end of the course, the students will be able to –

1. develop understanding of the types of risks involved in construction projects (BL3)
2. analyze the risk and implement the risk response planning & strategies (BL4)
3. propose risk mitigation strategy for construction projects (BL6)
4. assess the principles and practices of insurance in construction projects. (BL5)



Syllabus:

Teaching hours: 45

| Unit | Syllabus | Teaching hours |
|----------|---|----------------|
| Unit-I | Overview of Construction Project Risk Management Introduction of risk and uncertainty, Overview of risk management; risk and Construction project s, professional risk, contractors risk, technical risk, feasibility study of risk, Types of Risks, Risk inspection, techniques, steps in risk management. | 13 |
| Unit-II | Risk Assessment and Approaches Identify and investigate risk for projects; methods and tools to identify risks, Investigate and analyse potential risk for project through qualitative and quantitative measures, prioritizing risks, techniques for calculating risk; Risk response planning and strategies. | 13 |
| Unit-III | Risk Mitigation and Control Risk Mitigation strategy. Apportionment and Allocation of Risks. Development of Risk Response Plan. Project Risk Control methodology. Project Manager and Risk Management. Benefits of Managing Project Risks. | 13 |
| Unit-IV | General principles and practices of insurance Basic principles of insurance; CAR, SCE, EAR, MCE, CPM, CECR, liability, case-study | 06 |

Self Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Suggested Readings/ References:

- Nigel J. Smith, Tony Merna and Paul Jobling, Managing Risk in Construction Projects, Wiley-Blackwell
- *Project Management Body of Knowledge (PMBOK)*, Project Management Institute.
- Burtonshaw-gunn, S.A., Risk and Financial Management in Construction, Gower Publishing Ltd.
- Kendrick, Tom, Identifying and Managing Project Risk, PHI Learning.

Suggested List of Experiments:

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Suggested Case List:

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NIRMA UNIVERSITY

| | |
|------------------------------|---|
| Institute: | School of Engineering, Institute of Technology |
| Name of Programme: | M. Tech. in Civil Engineering (Construction Technology and Management) |
| Course Code: | 6CL229 |
| Course Title: | Sustainable Construction Technologies and Management |
| Course Type: | (<input type="checkbox"/> Core/ <input type="checkbox"/> Value Added Course/ <input checked="" type="checkbox"/> Departmental Elective/ <input type="checkbox"/> Institute Elective/ <input type="checkbox"/> University Elective/(<input type="checkbox"/> Open Elective <input type="checkbox"/> Any other) |
| Year of introduction: | 2022-23 |

| L | T | Practical component | | | | C |
|----------|----------|----------------------------|-----------|----------|----------|----------|
| | | LPW | PW | W | S | |
| 3 | 0 | 0 | - | - | - | 3 |

Course Learning Outcomes (CLOs):

At the end of the course, the students will be able to –

1. apply concepts of sustainable development and rating systems (BL3)
2. analyze building materials and technologies for sustainable construction (BL4)
3. discover concepts of sustainable construction management (BL4)
4. appraise strategies for resource conservation and waste management. (BL5)



Syllabus:

Teaching hours: 45

| Unit | Syllabus | Teaching hours |
|-------------|--|-----------------------|
| Unit-I | Introduction to Sustainability Concept, need and life cycle analysis for sustainability, Meteorological and climatic considerations, Sustainable site selection and planning, carbon footprint. | 04 |
| Unit-II | Green Building Rating Systems Introduction to Leadership in Energy and Environment Design (LEED), Indian Green Building Council (IGBC), Green Rating for Integrated Habitat Assessment (TERI-GRIHA). | 06 |
| Unit-III | Energy Conservation Embodied energy of materials, energy efficient lighting, building automation, ventilation and air quality requirement passive cooling and thermal comfort. renewable energy harvesting and usage in buildings. | 08 |
| Unit-IV | Building Materials and Technologies Features and characteristics of alternative and natural materials like bamboo, timber, rammed earth, stabilized mud blocks, agro and industrial wastes; Alternative technologies like filler slab, ferrocement, rat trap bond for sustainable construction | 12 |
| Unit-V | Water Conservation and Waste Management Water usage minimization, planning and systems for water conservation, sustainable wastewater treatment techniques; Solid | 08 |

Waste Management: objectives and scope, type of solid wastes, vermi-composting and other methods of domestic solid waste management, , E-waste management, Plastic waste management.

Unit-VI **Green Construction Management**

07

stakeholders and their roles, Life cycle cost analysis, government policies, incentives and tax benefits, Construction waste management: construction and demolition waste utilization, use of regional materials.

Self Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Suggested Readings/ References:

- Kubba, S., *Green Construction Project Management and Cost Oversight*, Elsevier Science
- Oke, A.E., Aigbavboa, C.O., *Sustainable Value Management for Construction Projects*, Springer International Publishing
- Jagadish K.S. *Sustainable Building Technologies*, IK International Publishing House
- Jagadish K.S. Venkatarama Reddy B.V. and Nanjunda Rao K.S.. *Alternative building Materials and Technologies*, New Age International.
- Wright, R.T. & Boorse, D.F. *Environmental Science towards a sustainable development*, Pearson.
- Pandel, U. & Poonia, M.P. *Environmental Technologies for Sustainable Development*, Prime Publishing.

Suggested List of Experiments:

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Suggested Case List:

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NIRMA UNIVERSITY

| | |
|------------------------------|---|
| Institute: | School of Engineering, Institute of Technology |
| Name of Programme: | M. Tech. in Civil Engineering (Construction Technology and Management) |
| Course Code: | 6CL230 |
| Course Title: | Advances in Construction Materials |
| Course Type: | (<input type="checkbox"/> Core/ <input type="checkbox"/> Value Added Course/ <input checked="" type="checkbox"/> Departmental Elective/ <input type="checkbox"/> Institute Elective/ <input type="checkbox"/> University Elective/(<input type="checkbox"/> Open Elective <input type="checkbox"/> Any other) |
| Year of Introduction: | 2022-23 |

| L | T | Practical component | | | C |
|---|---|---------------------|----|---|---|
| | | LPW | PW | W | S |
| 3 | 0 | 0 | - | - | - |

Course Learning Outcomes (CLOs):

At the end of the course, the students will be able to –

1. evaluate performance and sustainability requirements of construction materials (BL5)
2. select relevant building materials for application in construction activities (BL3)
3. discover use of polymers, architectural and smart materials in construction industry (BL4)
4. recommend appropriate type of cementitious material, chemical admixture and concrete type for using in construction field (BL5)



Syllabus:

| Unit | Syllabus | Teaching hours: 45 Teaching hours |
|----------|---|--------------------------------------|
| Unit-I | Characterization and Performance of Materials Classification, standardization, types, applications, physical and chemical properties and micro-structure of construction materials; environmental influences, thermal effects, effects of chemicals, fire resistance, corrosion and oxidation, radiation. | 07 |
| Unit-II | Building Materials Cement: types, properties and testing; Aggregates: types, properties and testing, M sand; Reinforcement: types, manufacturing process, properties, types of coatings & coatings to reinforcement; cladding, light-weight materials: brick, block Metals and special alloys of steel, tendons, GI sheets, tubes and lightweight roofing materials. | 08 |
| Unit-III | Architectural Materials Wood and wood products, glass, floor finishes, paints, tiles: thermal insulation and acoustic absorption materials, decorative panels and laminates, architectural glass and ceramics, ferrocement. | 04 |
| Unit-IV | Polymers | 03 |

| | | |
|---------------------------------|---|----|
| | Polymers: structural plastics and composites, polymer membranes, Coatings: adhesives, non-weathering materials, flooring and facade materials. | |
| Unit-V | Smart Materials Neoprene, bridge pads, thermocole, smart and intelligent materials: special features –case studies showing the applications of smart and intelligent materials. petroleum products, fibre reinforced polymers, bituminous materials. | 04 |
| Unit-VI | Supplementary Cementitious Materials and Construction Chemicals Fly ash, ground granulated blast furnace slag, silica fume, metakaolin, rice husk ash, alccofine: properties, applications, effect on properties of fresh, hardened concrete and on durability. Rheology of concrete, Types and properties of construction chemicals, Water proofing compounds: sealants, engineering grouts, various types of finishes and treatments. | 09 |
| Unit-VII | Special Concretes Lightweight concrete, High density concrete, High performance concrete, self-compacting concrete, recycled aggregate concrete, self-healing concrete, self-cleansing concrete, nano concrete, ready mix concrete, geopolymer concrete, high volume fly ash concrete. | 06 |
| Unit-VIII | Sustainable Materials Sustainability of construction materials, CO ₂ from construction materials, Concept of embodied energy: primary energy and energy concepts, role of quality control in sustainability, durability of construction materials and life cycle sustainability. | 04 |
| Self Study: | The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents. | |
| Suggested Readings/ References: | <ul style="list-style-type: none"> • Mehta, P. K. <i>Concrete: Microstructure, Properties and Materials</i>, McGraw Hill. • Shetty, M. S. <i>Concrete Technology Theory and Practice</i>, S. Chand. • Duggal, S. K. <i>Building Materials</i>, New Age International Publications. • Wu Chung H. <i>Advanced Civil Infrastructure Materials</i>, Woodhead Publishing Limited. • Jagdish K. S. <i>Sustainable Building Technology</i>, I .K. International Publishing House | |
| Suggested List of Experiments: | - | |
| Suggested Case List: | - | |

NIRMA UNIVERSITY

| | |
|------------------------------|---|
| Institute: | School of Engineering, Institute of Technology |
| Name of Programme: | M. Tech. in Civil Engineering (Construction Technology and Management) |
| Course Code: | 6CL231 |
| Course Title: | Business Strategies and Corporate Planning |
| Course Type: | (<input type="checkbox"/> Core/ <input type="checkbox"/> Value Added Course/ <input checked="" type="checkbox"/> Departmental Elective/ <input type="checkbox"/> Institute Elective/ <input type="checkbox"/> University Elective/(<input type="checkbox"/> Open Elective <input type="checkbox"/> Any other) |
| Year of introduction: | 2022-23 |

| L | T | Practical component | | | | C |
|----------|----------|----------------------------|-----------|----------|----------|----------|
| | | LPW | PW | W | S | |
| 3 | 0 | 0 | - | - | - | 3 |

Course Learning Outcomes (CLOs):

At the end of the course, the students will be able to –

1. apply the concepts of business strategies and corporate planning (BL3)
2. examine the business strategies and choose most appropriate alternative (BL4)
3. identify need of corporate governance (BL3)
4. develop appropriate business strategy for corporate governance. (BL6)



Syllabus:

Teaching hours: 45

| Unit | Syllabus | Teaching hours |
|-------------|--|-----------------------|
| Unit-I | Concept of strategy & Environment Analysis Defining strategy, Levels at which strategy operates, Strategic, Decision Making and Approaches to Strategic Decision making, essence of strategic thinking, replacing planning with strategic thinking, strategic management process, Mission and Purpose, Objectives and Goals, Strategic Business Units, Concept of Environment and its components, Environment scanning and appraisal, organizational appraisal, Strategic advantage analysis and diagnosis, SWOT analysis. | 09 |
| Unit-II | Strategy Formulation and Choice of Alternatives Grand Strategies: Stability, growth, retrenchment & combination strategies, Modernization, Diversification, Integration, Merger, Take-over and Joint Venture strategies, Turnaround: divestment and Liquidation strategies. Strategies for competing in globalizing markets. Process of Strategic Choice: Process of strategic choice, Gap analysis. Industry analysis, competitor analysis - Porter's Five forces Model of competition. SWOT analysis- Synergy and Dysynergy, McKinsey's 7's framework; GE-9 Cell Model, Boston's Consultancy | 09 |

Model. Distinctive competitiveness; Factors affecting Strategic Choice.

Unit-III Strategy Implementation 09

Inter-relationship between formulation and implementation, Issues in strategy implementation, Resource Allocation, Budgets, Behavioural Issues, Leadership styles, Charismatic, transformational, visionary, team, cross-cultural & ethical leadership, Corporate culture and values power Social Responsibilities, Ethics, Building capable organization, Functional Issues: Financial, Marketing, Operations and Personnel Plans and policies. Strategy and Structure: Organization structure, Structural Considerations, Structure for strategies, Organizational design and change, Matching structure and strategy

Unit-IV Strategy Evaluation 09

Importance, Overview of strategic evaluation, strategic control, techniques of strategic evaluation and control, Operational Control.

Unit-V Corporate Governance 09

Introduction & meaning, stakeholders, ownership & management, governing board, governance issues, governance & strategic implementation

Self Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Suggested Readings/ References:

- Azhar Kazmi, *Business Policy*, S.Chand & Co.
- Upendra Kachru, *Strategic Management: Concepts & Cases*, Excel Books.
- V.S. Ramaswamy, S. Namakumari, *Strategic Planning: Formulation of Corporate strategy*, Macmillan Publishing House Ltd.
- R.M.Shivastava, *Management Policy & Strategic Management*, Himalaya Publishing House.
- Craig R. Hickman & Michael A. Silva, *Creating Excellence*, London Univeral Book Stall.
- Stephen P. Robinson, *Organizational Behaviour*, PHI

Suggested List of Experiments:

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Suggested Case List:

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NIRMA UNIVERSITY

| | |
|------------------------------|---|
| Institute: | School of Engineering, Institute of Technology |
| Name of Programme: | M. Tech. in Civil Engineering (Construction Technology and Management) |
| Course Code: | 6CL232 |
| Course Title: | Environmental Impact Assessment for Construction Projects |
| Course Type: | (<input type="checkbox"/> Core/ <input type="checkbox"/> Value Added Course/ <input checked="" type="checkbox"/> Departmental Elective/ <input type="checkbox"/> Institute Elective/ <input type="checkbox"/> University Elective/(<input type="checkbox"/> Open Elective <input type="checkbox"/> Any other) |
| Year of introduction: | 2022-23 |

| L | T | Practical component | | | C |
|---|---|---------------------|----|---|---|
| | | LPW | PW | W | S |
| 3 | 0 | 0 | - | - | - |

Course Learning Outcomes (CLOs):

At the end of the course, the students will be able to –

1. identify legal and regulatory aspects of environmental impact assessment (BL3)
2. take part in environment impact & life cycle assessment (BL4)
3. plan environmental impact management (BL3)
4. evaluate the report of environmental impact assessment (BL5)



Syllabus:

Teaching hours: 45

| Unit | Syllabus | Teaching hours |
|----------|---|----------------|
| Unit-I | Introduction Definition, scope, Goals, Need, tools, participants, environmental concerns. | 04 |
| Unit-II | Legal, Policy & Regulatory Framework Policies, history, objectives and principles of legislation, laws and legislations, principles of Indian environmental laws, key international treaties. | 07 |
| Unit-III | Environmental Impact Assessment (EIA) Purpose, process, environmental impact statement, impact indicators, forecasting of environmental changes, strategic environmental assessment, cost benefit analysis, environmental clearance procedure, methods, Review of report, case studies. | 16 |
| Unit-IV | Impact Management Impact Identification & Analysis of Alternatives, Public Involvement in EIA, - Mitigation & Preparation of Environment Management Plans (EMP). | 10 |
| Unit-V | EIA Reporting and Audit EIA reporting, Review of EIA Quality, Decision making & project management, Implementation & Follow up | 08 |

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|---------------------------------|---|
| Self Study: | The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents. |
| Suggested Readings/ References: | <ul style="list-style-type: none"> • Rau, G.J. and Wooten, C.D., <i>Environmental Impact Analysis Handbook</i>, McGraw Hill. • Uberoi, D., <i>Environmental Management</i>, Excel books. • Barthwal, R., <i>Environment Impact assessment</i>, New Age International. • Canter, L., <i>Environmental Impact Assessment</i>, McGraw Hill. • David P., Lawrence, <i>Environmental Impact Assessment: Practical Solutions to Recurrent Problems</i>, John Wiley & Sons. • <i>Handbook on Life Cycle Assessment: Operational Guide to the ISO Standards</i>, Kluwer Academic Publishers. • Woodside G., Aurichio P., <i>ISO 14001: Auditing manual</i>, McGraw Hill. |
| Suggested List of Experiments: | - |
| Suggested Case List: | - |