A.M. REDDY MEMORIAL COLLEGE OF ENGINEERING AND TECHNOLOGY
Approved by AICTE, New Delhi, Affiliated to JNTU - Kakinada, Accredited by NAAC
An Autonomous Institution
Web : www.amreddyengineering.ac.in., E-mail: principal.amreddyengineering@gmail.com Ph : 98664 14252
Vinukonda Road, Petlurivaripalem, Narasaraopet, Palnadu District, Andhra Pradesh - 522 601.
An ISO 9001:2015 Certified Institution

II -YEAR

II - SEMESTER

Sponsored by ATLURI MASTAN REDDY EDUCATIONAL SOCIETY, REG.NO. 450/2003

ANNEXURE-I

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MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS II-II (CE)

Course Objectives:

1. To inculcate the basic knowledge of microeconomics and financial accounting
2. To make the students learn how demand is estimated for different products, inputoutput relationship for optimizing production and cost
3. To Know the Various types of market structure and pricing methods and strategy
4. To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
5. To provide fundamental skills on accounting and to explain the process of preparing financial statements.

Course Outcomes:

1. Define the concepts related to Managerial Economics, financial accounting and management
2. Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets
3. Apply the Concept of Production cost and revenues for effective Business decision
4. Analyze how to invest their capital and maximize returns
5. Evaluate the capital budgeting techniques.
6. Develop the accounting statements and evaluate the financial performance of business entity

SYLLABUS

UNIT - I

Managerial Economics Introduction – Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

UNIT - II

Production and Cost Analysis Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least- cost combination– Short run and long run Production Function- Isoquants and Is costs, Cost & Break-Even Analysis - Cost concepts and Cost behaviour- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems).

UNIT - III

Business Organizations and Markets Introduction – Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition– Oligopoly-Price-Output Determination - Pricing Methods and Strategies

UNIT - IV

Capital Budgeting Introduction – Nature, meaning, significance. Types of Working Capital, Components, Sources of Short-term and Long-term Capital, Estimating Working

capital requirements. Capital Budgeting– Features, Proposals, Methods and Evaluation. Projects – Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)

UNIT – V

Financial Accounting and Analysis Introduction – Concepts and Conventions- Double-Entry Bookkeeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Introduction to Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

Textbooks:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

Reference Books:

1. Ahuja Hl Managerial economics Schand.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
   Domnick Salvatore: Managerial Economics in a Global Economy, Engage.

Online Learning Resources:

- https://www.slideshare.net/123ps/managerial-economics-ppt
- https://www.slideshare.net/rossanz/production-and-cost-45827016
- https://www.slideshare.net/darkyla/business-organizations-19917607

ANNEXURE-II

AMR- 24

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ENGINEERING GEOLOGY II-II (CE)

Course Learning Objectives:

The objective of this course is:

1. To know the importance of Engineering Geology to the Civil Engineering.
2. To enable the students understand what minerals and rocks are and their formation and identification.
1. To highlight significance/ importance/ role of Engineering Geology in construction of Civil Engineering structures.
2. To enable the student realize its importance and applications of Engineering Geology in Civil Engineering constructions.
4. concepts of Groundwater and its geophysical methods.

Course Outcomes:

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

1. Understand the significance of geological agents on Earth surface and its significance in Civil Engineering.
2. Identify and understand the properties of Minerals and Rocks.
3. Understand the concepts of Groundwater and its geophysical methods.
4. Classify and measure the Earthquake prone areas, Landslides and subsidence to practice the hazard zonation.
5. Investigate the project site for mega/mini civil engineering projects and site selection for mega engineering projects like Dams, Reservoirs and Tunnels.

SYLLABUS

UNIT-I

Introduction: Branches of Geology, Importance of Geology in Civil Engineering with case studies, Weathering of rocks, Geological agents, weathering process of Rock, Rivers and geological work of rivers.

UNIT-II

Mineralogy And Petrology: Definitions of mineral and rock-Different methods of study of mineral and rock. Physical properties of minerals and rocks for megascopic study for the following minerals and rocks. Common rock forming minerals: Feldspar, Quartz Group, Olivine, Augite, Hornblende, Mica Group, Asbestos, Talc, Chlorite, Kyanite, Garnet, Calcite and ore forming minerals are Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Chromite, Magnetite and Bauxite. Classification, structures ,textures and forms of Igneous rocks, Sedimentary rocks, Metamorphic rocks, and their megascopic study of granite varieties, (pink, gray, green). Pegmatite, Dolerite, Basalt etc., Shale, Sand Stone, Lime Stone, Laterite, Quartzite, Gneiss, Schist, Marble, Khondalite and Slate.

UNIT-III

Structural Geology: Strike , Dip and Outcrop study of common geological structures associating with the rocks such as Folds, Faults, Joints and Unconformities- parts, types, mechanism and their importance in Civil Engineering.

1. 2. 3. 4. 5. 9. 6. 7. 8.

UNIT-IV

Ground Water: Water table, Cone of depression, Geological controls of Ground Water Movement, Ground Water Exploration Techniques. Earthquakes and Land Slides: Terminology, Classification, causes and effects, Shield areas and Seismic bells, Richter scale intensity, Precautions of building constructions in seismic areas. Classification of Landslides, Causes and Effects, measures to be taken prevent their occurrence at Landslides. Geophysics: Importance of Geophysical methods, Classification, Principles of Geophysical study by Gravity method, Magnetic method, Electrical methods, Seismic methods, Radiometric method and Electrical resistivity, Seismic refraction methods and Engineering properties of rocks.

UNIT-V

Geology of Dams, Reservoirs and Tunnels: Types and purpose of Dams, Geological considerations in the selection of a Dam site. Geology consideration for successful constructions of reservoirs, Life of Reservoirs. Purpose of Tunnelling, effects, Lining of Tunnels. Influence of Geology for successful Tunnelling.

TEXT BOOKS:

1. Engineering Geology by N. ChennaKesavulu, Laxmi Publications . 2ndEdn 2014.
2. Engineering & General Geology by Parbin Singh Katson educational series 8th 2023

REFERENCES:

1. Engineering Geology by SubinoyGangopadhay Oxford University press 1st edition, 2012.
2. Engineering Geology by D. Venkat Reddy, Vikas Publishing, 2ndEdn , 2017,
3. Geology for Engineers and Environmental Society' Alan E Kehew, 3rd edn., 2013) Pearson publications.
4. Environmental Geology' (2013) K.S.Valdiya, 2nd ed., McGraw Hill Publications.

Web Materials:

1. http://nptel.iitm.ac.in/video.php?subjectId=105105106
2. http://nptel.iitm.ac.in/video.php?courseId=1055&p=1
3. http://nptel.iitm.ac.in/video.php?courseId=1055&p=3
4. http://nptel.iitm.ac.in/video.php?courseId=1055&p=4

ANNEXURE-III

AMR- 24

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CONCRETE TECHNOLOGY II-II (CE)

Course Learning Objectives

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

1. Learn materials and their properties used in the production of concrete
2. Learn the behavior of concrete at fresh stage
3. Learn the behavior of concrete at hardened stage
4. Learn the influence of elasticity, creep and shrinkage on concrete
5. Learn the mix design methodology and special concretes

Course Outcomes: At the end of the course, the student will be able to

1. Familiarise the basic ingredients of concrete and their role in the production of concrete and its behaviour in the field.
2. Test the fresh concrete properties and the hardened concrete properties. Understand the basic concepts of concrete. Design the concrete mix by BIS method.
3. Evaluate the ingredients of concrete through lab test results. realise the importance of quality of concrete
4. Understand the behaviour of concrete in various environments.
5. Familiarize the basic concepts of special concrete and their production and Applications

SYLLABUS

UNIT- I

CEMENTS: Portland cement – Chemical composition – Hydration, Setting of cement, Fineness of cement, Structure of hydrate cement – Test for physical properties – Different grades of cements – Admixtures – Mineral and chemical admixtures – ccelerators, retarders, air entrainers, plasticizers, super plasticizers, fly ash and silica fume

AGGREGATES: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregates – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand –Deleterious substances – Soundness – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Maximum aggregate size- Quality of mixing water

UNIT- II

FRESH CONCRETE: Steps inManufacture of Concrete–proportion, mixing, placing, compaction, finishing, curing – including various types in each stage. Properties of fresh concrete-Workability – Factors affecting workability – Measurement of workability by different tests, Setting times of concrete, Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete, Ready mixed concrete, Shotcrete

UNIT- III

HARDENED CONCRETE: Water / Cement ratio – Abram's Law – Gel/space ratio – Nature of strength of concrete –Maturity concept – Strength in tension & compression –

Factors affecting strength – Relation between compression & tensile strength – Curing, Testing of Hardened Concrete:Compression test – Tension test – Factors affecting strength – Flexure test –Splitting test – Non-destructive testing methods – Codal provisions for NDT.

UNIT- IV

ELASTICITY, CREEP & SHRINKAGE – Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage –types of shrinkage.

UNIT- V

MIX DESIGN AND SPECIAL CONCRETES: Ready mixed concrete, Fibre reinforced concrete – Different types of fibres – Factors affecting properties of FRC, High performance concrete – Self consolidating concrete, Self healing concrete. Factors in the choice of mix proportions –Quality control of concrete- Statistical methods- Acceptance Criteria-Concepts Proportioning of concrete mixes by ACI method and IS Code method

TEXT BOOKS

1. Properties of Concrete by A.M. Neville – PEARSON – 4th edition
2. Concrete Technology by M.L. Gambhir. – Tata Mc.Graw Hill Publishers, New Delhi 5th edition 2013.
3. Concrete Technology by Job Thomas, Cengagae Publications, 1st edition, 2015

REFERENCES

1. Concrete Microstructure, Properties of Materials by P.K. Mehta and Moterio. McGraw Hill 4th edition 2014
2. Concrete Technology, J.J. Brooks and A. M. Neville, Pearson, 2019, 2nd Edition.
3. Concrete Technology by M. S. Shetty. – S. Chand & Co.; 2004
4. Concrete Technology by A.R. Santha Kumar, Oxford University Press, New Delhi

ANNEXURE-IV

AMR- 24

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3	0	0	3

STRUCTURAL ANLAYSISII-II (CE)

Course Learning Objectives

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

1. Learn energy theorems
2. Learn the analysis of indeterminate structures
3. Analysis of fixed and continuous beams
4. Learn about slope-deflection method
5. Learn about Moment – distribution method

Course Outcomes: At the end of the course, the student will be able to

1. Apply energy theorems to analyze trusses
2. analyze indeterminate structures by using Castigliano's–II theorem
3. Analysis of fixed and continuous beams
4. Analyze continuous beams and portal frames by using slope-deflection method
5. Analyze continuous beams and portal frames by using Moment – distribution method

SYLLABUS

UNIT – I

ENERGY THEOREMS: Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces – Castigliano's first Theorem Deflections of simple beams and pin jointed trusses.

UNIT - II

ANALYSIS OF INDETERMINATE STRUCTURES: Indeterminate Structural Analysis – Determination of static and kinematic indeterminacies – Solution of trusses with upto two degrees of internal and external indeterminacies – Castigliano's–II theorem.

UNIT - III

FIXED BEAMS & CONTINUOUS BEAMS : Introduction to statically indeterminate beams with uniformly distributed load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads – Shear force and Bending moment diagrams – Deflection of fixed beams effect of sinking of support, effect of rotation of a support.

UNIT - IV

SLOPE-DEFLECTION METHOD: Introduction-derivation of slope deflection equations application to continuous beams with and without settlement of supports - Analysis of ingle bayportal frames without sway.

UNIT - V

MOMENT DISTRIBUTION METHOD: Introduction to moment distribution method-Application to continuous beams with and without settlement of supports-Analysis of single bay storey portal frames without sway.

Textbooks:

1. Analysis of Structures – Vol-I&II by V.N.Vazirani&M.M.Ratwani, Khanna Publications,New Delhi.

2. Basic Structural Analysis by C.S.Reddy., Tata McGraw Hill Publishers. 3rd edition 2017.

Reference Books:

1. Structural analysis by Aslam Kassimali Cengage publications 6th edition 2020.
2. Structural analysis Vol.I and II by Dr.R.Vaidyanathan and Dr.PPerumal– Laxmi publications. 3rd 2016
3. Introduction to structural analysis by B.D.Nautiyal, New Age international publishers, New Delhi.
4. Structural Analysis – D.S.Prakasarao -Univeristy press.
5. Strength of Materials and Mechanics of Structures by B.C.Punmia, Khanna Publications, New Delhi.

ANNEXURE-V

AMR- 24

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3	0	0	3

HYDRAULICS AND HYRAULIC MACHINERY II-II (CE)

Course Objectives:

1. To Introduce concepts of laminar and turbulent flows
2. To teach principles of uniform flows through open channel.
3. To teach principles of non-uniform flows through open channel.
4. To impart knowledge on design of turbines.
5. To impart knowledge on design of pumps

Course Outcomes:

On Completion of the course, the students will be able to:

1. Understand the characteristics of laminar and turbulent flows.
2. Apply the knowledge of fluid mechanics to address the uniform flow problems in open channels.
3. Solve non-uniform flow problems and hydraulic jump phenomenon in open channel flows.
4. Evaluate the performance of impact of jets on plates and design Pelton wheel, Francis and Kaplan turbine
5. Understand the principles, losses and its efficiencies of centrifugal pumps

SYLLABUS

UNIT – I

Laminar & Turbulent flow in pipes: Laminar Flow- Laminar flow through: circular pipes, annulus and parallel plates. Stoke's law, Measurement of viscosity. Reynolds experiment, Transition from laminar to turbulent flow. Resistance to flow of fluid in smooth and ough pipes-Moody's diagram – Introduction to boundary layer theory.

UNIT - II

Uniform flow in Open Channels: Open Channel Flow - Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channels, classification of open channel flow, Velocity Distribution of channel section. Hydraulically efficient channel sections: Rectangular, trapezoidal and triangular channels, Energy and Momentum correction factors

UNIT - III

Non-Uniform flow in Open Channels: Specific energy, critical flow, discharge curve, Specific force, Specific depth, and Critical depth. Measurement of Discharge and elocity – Gradually Varied Flow- Dynamic Equation of Gradually Varied Flow. Hydraulic Jump and classification - Elements and characteristics- Energy dissipation.

UNIT - IV

Impact of Jets: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes - Velocity triangles at inlet and outlet - Work done and efficiency Hydraulic Turbines: Classification of turbines; pelton wheel and its design. Francis turbine and its design - efficiency - Draft tube: theory - characteristic curves of hydraulic turbines. Cavitation: causes and effects.

1. 2. 3. 4. 5. 9. 6. 7. 8.

UNIT – V

pumps: Working principles of a centrifugal pump, work done by impeller; heads, losses and efficiencies; minimum starting speed; Priming; specific speed; limitation of suction lift, net positive suction head (NPSH); Performance and characteristic curves; Cavitation effects; Multistage centrifugal pumps; troubles and remedies

TEXT BOOKS: -

1. P. M. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House 22nd, 2019.
2. K. Subrahmanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill, 2nd edition 2018

Reference Books:

1. R. K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P) Ltd. New Delhi 11th edition, 2024.
2. Fluid Mechanics by Frank M. White, Henry Xue, Tata McGraw Hill, 9th edition , 2022.
3. C. S. P. Ojha, R. Berndtsson and P. N. Chadramouli, Fluid Mechanics and Machinery, Oxford University Press, 2010.
4. Introduction to Fluid Mechanics & Fluid Machines by S K Som, Gautam Biswas, S Chakraborty 3rd edition 2011

Online Learning Resources:

1. https://nptel.ac.in/courses/105105203
2. https://archive.nptel.ac.in/courses/112/106/112106300/
3. https://archive.nptel.ac.in/courses/112/103/112103249/

ANNEXURE-VI

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CONCRETE TECHNOLOGY LABORATORY II-II (CE)

Course Learning Objectives

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

1. To test basic properties of ingredients of concrete fresh and hardened concrete properties

Course Outcomes:

At the end of the course, the student will be able to

1. Outline importance of testing cement and its properties
2. Assess different properties of Aggregates
3. Assess fresh concrete properties and their relevance to hardened concrete
4. Assess hardened concrete properties

Detailed Syllabus:

1. Tests on Cement
   1. Normal Consistency and Fineness of cement.
   2. Initial setting time and Final setting time of cement.
   3. Specific gravity and soundness of cement.
   4. Compressive strength of cement.
2. Tests on Fine Aggregates
   1. Grading and fineness modulus of Fine aggregate by sieve analysis.
   2. Specific gravity of fine aggregate
   3. Water absorption and Bulking of sand.
3. Tests on Coarse Aggregates
   1. Grading of Coarse aggregate by sieve analysis.
   2. Specific gravity of coarse aggregate
   3. Water absorption of Coarse aggregates
4. Tests on fresh Concrete
   1. Workability of concrete by compaction factor method
   2. Workability of concrete by slump test
   3. Workability of concrete by Vee-bee test.
5. Tests on Hardened Concrete
   1. Compressive strength of cement concrete and Modulus of rupture
   2. Young's Modulus and Poisson's Ratio
   3. Split tensile strength of concrete.
   4. Non-Destructive testing on concrete (for demonstration)

1. 4. 6.
2. 5. 7.
3. 9. 8.

ANNEXURE-VII

AMR- 24

L	T	P	C
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ENGINEERING GEOLOGY LABORATORY II-II (CE)

Course Learning Objectives:

The objective of this course is:

1. To identify the Megascopic types of Ore minerals & Rock forming minerals.
2. To identify the Megascopic types of Igneous, Sedimentary, Metamorphic rocks.
3. To identify the topography of the site & material selection

Course Outcomes:

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

1. Identify Megascopic minerals & their properties.
2. Identify Megascopic rocks & their properties.
3. Identify the site parameters such as contour, slope & aspect for topography.
4. Know the occurrence of materials using the strike & dip problems.

LIST OF EXPERIMENTS

1. Physical properties of minerals: Mega-scopic identification of
   a. Rock forming minerals – Quartz group, Feldspar group, Garnet group, Mica group & Talc, Chlorite, Olivine, Kyanite, Asbestos, Tourmelene, Calcite, Gypsum, etc…
   b. Ore forming minerals – Magnetite, Hematite, Pyrite, Pyralusite, Graphite, Chromite, etc…
2. Megascopic description and identification of rocks.
   a. Igneous rocks – Types of Granite, Pegmatite, Gabbro, Dolerite, Syenite, Granite Poryphery, Basalt, etc.
   b. Sedimentary rocks – Sand stone, Ferrugineous sand stone, Lime stone, Shale, Laterite, Conglamorate, etc.
   c. Metamorphic rocks – Biotite – Granite Gneiss, Slate, Muscovite &Biotiteschist, Marble, Khondalite, etc.
3. Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities etc.
4. Simple Structural Geology problems.
5. Bore hole data.
6. Strength of the rock using laboratory tests.
7. Field work – To identify Minerals, Rocks, Geomorphology& Structural Geology.

REFERENCES:

1. 'Applied Engineering Geology Practicals' by M T Mauthesha Reddy, New Age International Publishers, 2nd Edition.
2. 'Foundations of Engineering Geology' by Tony Waltham, Spon Press, 3rd edition, 2009.

1. 4. 6.
2. 5. 7.
3. 9. 8.

L	T	P	C
3	0	0	3

ANNEXURE-VIII

AMR- 24

REMOTE SENSING AND GIS II-II (CE)

Course Learning Objectives:

The course is designed to

1. Introduce the basic principles of Remote Sensing and GIS techniques and its application to Civil Engineering.
2. Learn various types of sensors and platforms and understand the principles of spatial analysis techniques in GIS.
3. Introduce GIS software to understand the process of digitization, creation of thematic map from toposheets and maps.

Course outcomes

At the end of the course the student will be able to

1. Acquire knowledge about concepts of remote sensing, sensors and their characteristics.
2. familiarize with data models and data structures to introduce various Raster and Vector Analysis capabilities in GIS.
3. digitize and create thematic map and extract important features to calculate geometry.
4. perform surface analysis over Contour to develop digital elevation model.
5. use GIS software to perform simple analysis in water resources and transportation engineering.

SYLLABUS

UNIT – I

Introduction to Remote sensing: History of Remote Sensing, Electromagnetic Radiation, Electromagnetic Spectrum, Energy Interaction with Atmosphere, Energy Interaction with the Earth Surfaces - Characteristics of Remote Sensing Systems, Sensor Resolutions, Advantages & Limitations - Platforms: Types of Sensors, Airborne Remote Sensing, Spaceborne Remote Sensing - IRS, LANDSAT, SPOT & Recent satellite.

UNIT – II

Digital Image analysis: Digital Image Characteristics, Digital Image Data Formats, Band Interleaved by Pixel (BIP), Band Interleaved by Line (BIL), Band Sequential (BSQ) – Visual Interpretation Elements, Preprocessing, Enhancement, Classification, Supervised classification, Unsupervised classification.

UNIT – III

Introduction to Geographic Information System: Principles, Components and Applications of GIS - Map projections, Spatial Data Structures, Raster and Vector Data Formats, Data Inputs, Data Manipulation, Data Retrieval, Data Analysis - Spatial data analysis: Overlay Function-Vector Overlay Operations, Raster Overlay Operations, Arithmetic Operators, Comparison and Logical Operators, Conditional Expressions - Network Analysis: Components of network, Transportation network - Optimum path analysis.

TEXT BOOKS:

1. BasudebBhatta (2021). 'Remote sensing and GIS', 3rdedn., Oxford University Press.
2. S. Kumar, (2016) 'Basics of Remote sensing & GIS', Laxmi Publications.
3. Lillesand, T.M, R.W. Kiefer and J.W. Chipman (2022) 'Remote Sensing and Image Interpretation', 7thedn., Wiley India Pvt. Ltd.
4. Demers, M.N, (2013) 'Fundamentals of Geographic Information Systems', 4thedn. Wiley India Pvt. Ltd.

List of Experiments:

Expt. 1 :Georeferencing a Toposheet or Map
Expt. 2 : Digitization and Attribute table creation.
Expt. 3 : Creation of Thematic Map
Expt. 4 : Calculation of Feature geometry – Length, Area & Perimeter.
Expt. 5 : Contour map – developing TIN & DEM from Contour.
Expt. 6 : Stream network – Stream ordering map.
Expt. 7 : Watershed - calculate Hydro-geomorphological parameters.
Expt. 8 : Transportation Network Map – Route analysis.

GIS SOFTWARE: QGIS / ArcGIS

Web references:

1. https://nptel.ac.in/courses/10510319

ANNEXURE-IX

AMR- 24

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DESIGN THINKING & INNOVATION II-II (CE)

Course Objectives: The objectives of the course are to

1. Bring awareness on innovative design and new product development.
2. Explain the basics of design thinking.
3. Familiarize the role of reverse engineering in product development.
4. Train how to identify the needs of society and convert into demand.
5. Introduce product planning and product development process

Course Outcomes:

1. Define the concepts related to design thinking.
2. Explain the fundamentals of Design Thinking and innovation.
3. Apply the design thinking techniques for solving problems in Various sectors.
4. Analyze to work in a multidisciplinary environment.
5. Evaluate the value of creativity.

UNIT – I

Introduction to Design Thinking Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT – II

Design Thinking Process Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT - III

Innovation Art of innovation, Difference between innovation and creativity, role of reativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity. Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT – IV

Product Design Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies. Activity: Importance of modeling, how to set specifications, Explaining their own product design.

UNIT – V

Design Thinking in Business Processes Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition,

Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes. Activity: How to market our own product, about maintenance, Reliability and plan for startup.

Textbooks:

1. Tim Brown, Change by design, 1/e, Harper Bollins, 2009.
2. Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2. Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3. William lidwell, Kritinaholden, &Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
4. Chesbrough.H, The era of open innovation, 2003.

Online Learning Resources:

1. https://nptel.ac.in/courses/110/106/110106124/
2. https://nptel.ac.in/courses/109/104/109104109/
3. https://swayam.gov.in/nd1_noc19_mg60/preview
4. https://onlinecourses.nptel.ac.in/noc22_de16/preview