

Jabalpur Engineering College, Jabalpur
(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)
(AICTE Model Curriculum Based Scheme)
Bachelor of Technology (B.Tech.) V Semester (Civil Engineering)

w.e.f. Jul 2023

w.e.f. July 2023

S.No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours Per Week			Total Credits
				Theory			Practical			L	T	P	
				End. Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work					
1	CE51	PEC	Professional Elective Course-I	70	20	10	-	-	100	3	1	-	4
2	CE52	PCC	Structural Analysis-I	70	20	10	30	20	150	3	-	2	4
3	CE53	PCC	Geotechnical Engineering-II	70	20	10	30	20	150	3	-	2	4
4	CE54	PCC	Structural Design & Drawing-I (RCC)	70	20	10	30	20	150	3	-	2	4
5	BT52	HSMC	Engineering Economics & Management	70	20	10	-	-	100	3	1	-	4
Total				350	100	50	90	60	650	15	2	6	20
6	CE56	DLC	Self-Learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	-	-	-	-	8
7	CE57	MC	NSS/NCC/Swachhata Abhiyan/Rural Outreach	Qualifier									
Additional Course for Honours or Minor Specialization				Permitted to opt for maximum 8 credits against additional MOOC courses in subject code CE56 for the award of Honours (Minor Specialization).									

- Note:** 01. Departmental BOS will decide list of three/four optional subjects those are available in MOOC as well for PEC.
02. MOOC/NPTEL subjects shall be taken with permission of HOD/Coordinator.

Professional Elective Course-I		
S.No.	Subject Code	Subject Name
1	CE51A	Elements of Environmental Engineering
2	CE51B	Water Resource Conservation
3	CE51C	Water Resource Engineering

1 hour lecture (L) = 1 credit

1 hour Tutorial (T) = 1 credit

2 hour Practical (P) = 1 credit

PEC: Professional Elective Course, PCC: Professional Core Course, HSMC: Humanities and Social Sciences including Management Course, DLC: Distance Learning Course, MC: Mandatory Course,


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Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/ Week			Total Credits
CE-51A	Elements of Environmental Engineering	Theory			Practical		100	L	T	P	4
		End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab work					
		70	20	10	-	-					

Module-I

Water sources- origin of waste water - types of water pollutants and their effects, sources of water pollution and their effects

Module-II

Air pollution - causes of air pollution - types & sources of air pollutants- climatic & meteorological effect on air pollution concentration- formation of smog and fumigation, different air pollution episodes in India and abroad.

Module-III

Sources and types of municipal solid wastes - sources and types of solid wastes - factors affecting generation of solid wastes; characteristics - effects of improper disposal of solid wastes - public health effects- principle of solid waste management - social & economic aspects- public awareness- role of NGOs- legislation

Module-IV


Noise pollution & control - noise pollution: intensity, duration - types of industrial noise - ill effects of noise - noise measuring & control - permissible noise limits


Module-V

Environmental Impact Assessment- assessment of impact on land, water and air, noise, social, cultural flora and fauna - Environmental Impact Assessment (EIA) - Environmental Impact Statement (EIS) -EIA capability and limitations - legal provisions on EIA.

References

1. Garg, S.K, (2015) "Environmental Engineering (Vo1.11): Sewage disposal and Air Pollution Engineering" Khanna Publishers (33th Edition, 2008).


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2. Peavy, H.S., Rowe, D.R., and Tchobanoglous, G, (1985), "Environmental Engineering" McGraw-Hill international edition (7th Edition).
3. Dr. B.S.N. Raju, (1995), "Water supply and Waste Water Engineering" McGraw-Hill Education
4. Dr. P.N. Modi, (2010), "Sewage treatment disposal and waste water engineering" Standard Book House-Delhi (4th Edition)
5. Urban and Jain (1993) "Environmental Impact Assessment", McGraw-Hill Education
6. Relevant I.S. Codes.


Course Outcomes-

After the completion of this course student will be able to-

CO1	To develop environmental scientists and engineers and sensitize them towards environmental issues.
CO2	To acquire analytical skills in assessing environmental impacts through a multidisciplinary approach.
CO3	To identify environmental problems and solutions through organized research.



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Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/ Week			Total Credits
CE-51B	Water Resource Conservation	Theory			Practical			100	L 3	T 1	
		End Sem 70	Mid-sem Exam 20	Quiz/ Assignment 10	End sem -	Lab work -					

Module-I

Water and its importance. Scenario of water in Rajasthan: sources, geographical distribution, quality. Water (hydrological) cycle, influence of human activity on the water cycle, Surface water resources. Elementary knowledge of ground water: general aquifer. Water quality and its impact on human beings.

Module-II

Water harvesting: need, principles of water harvesting, general water harvesting methods rain water harvesting roof top rain water harvesting mostly used in urban areas, subsurface barrier/dykes, farm ponding, etc mostly used in rural areas. Groundwater recharge. Revival of traditional techniques for water harvesting. Calculation of available rain water for harvesting. Preparation of suitable technical drawing and design of rain water harvesting structure

Module-III


Water conservation: importance, elementary knowledge regarding conservation/saving of water in daily use, in agriculture, in industries. Subsurface investigation of Ground water: general, geophysical methods and its importance. Present law regarding water management Water footprints.


Module-IV

Community involvement in water management: roles of Panchayati Raj institutions, NGO's, educational institutions, media, political parties and farmers associations.

Module-V

Elementary idea of water analysis and instruments used (chemist). Chemical analysis with the help of portable instrument


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REFERENCES:

1. Ahuja, Satinder 2008, Arsenic Contamination of Groundwater: Mechanism, Analysis, and Remediation WileyIntersci
2. Bennison, E. W. 1947, Ground water: its development, uses & conservation CornellU
3. Bisson 2004, Modern Groundwater Exploration, Drilling, Testing and Integrated WileyIntersci
4. Bitton 2005, Wastewater Microbiology, Third Edition (Online Version) WileyIntersci
5. Edmunds 2008, Natural Groundwater Quality WileyIntersci
6. ErachBharucha Textbook for Environmental Studies For Undergraduate Courses of all Branches of Higher Education by for University Grants Commission

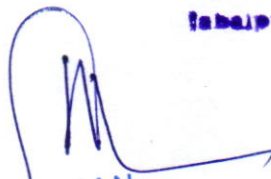
Course Outcomes-

After the completion of this course student will be able to-

CO1	Illustrate Water conservation and its Background.
CO2	Apply different water harvesting techniques and ground water recharge
CO3	Analyze different water management techniques



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Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/ Week			Total Credits
CE-51C	Water Resource Engineering	Theory			Practical		100	L	T	P	4
		End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab work					
		70	20	10	-	-					

Module-I

Hydrology: Hydrological cycle, precipitation and its measurement, recording and non recording rain gauges, estimating missing rainfall data, rain gauge net works, mean depth of precipitation over a drainage area, mass rainfall curves, intensity-duration curves, depth-area duration curves, infiltration and infiltration indices, evaporation stream gauging, run off and its estimation.

Module-II


Hydrographs and Floods: Hydrograph analysis, unit hydrograph and its derivation from isolated and complex storms, S-curve hydrograph, synthetic unit hydrograph, types of floods and their estimation by different methods, probability and frequency analysis, flood routing through reservoirs and channels, flood control measures, economics of flood control.

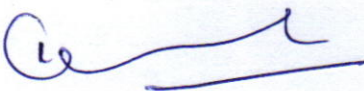
Module-III

Water Resources Planning & Irrigation: Irrigation water requirement and soil-water-crop relationship, irrigation, definition, necessity, advantages and disadvantages, types and methods, irrigation development, soil types and their occurrence, suitability for irrigation purposes, wilting coefficient and field capacity, optimum water supply, consumptive use and its determination, irrigation method, surface and subsurface, sprinkler and drip irrigation, duty of water, factors affecting duty and methods to improve duty, suitability of water for irrigation, crops and crop seasons, principal crops and their water requirement, crop ratio and crop rotation, intensity of irrigation, water logging-causes, effects and its prevention, salt efflorescence-causes and effects, reclamation of water logged and salt affected lands.

Module-IV

Canal Irrigation: Types of canals, alignment, design of unlined and lined canals, Kennedy's and Lacey's silt theories, typical canal sections, canal losses, linings-objectives, materials used, economics, canal falls & cross drainage works, description and design, head and cross regulators, escapes and outlets, canal transitions.


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Module-V

Ground Water & Well Irrigation Confined and unconfined aquifers, aquifer properties, hydraulics of wells under steady flow conditions, infiltration galleries, ground water recharge necessity and methods of improving ground water storage, rain water harvesting, types of wells, well construction, yield tests, specific capacity level and specific yield, hydraulic design of open wells and tube wells, methods of raising well water, characteristics of pumps and their selection, interference of wells, well losses, advantages and disadvantages of well irrigation.

Suggested books :-

1. Engineering Hydrology - J.NEMEC - Prentice Hall
2. Engineering Hydrology by K. Subhramanya - Tata Mc Graw Hills Publ. Co.
3. Hydrology and Water Resources Engineering by S.K.Garg - Khanna Publishers
4. Hydrology: Principles, Analysis, Design by H.M. Raghunath - New Age International Pvt. Ltd.
5. Irrigation Irrigation & Water Power Engineering by B.C.Punmia- Laxmi Publications Pvt. Ltd.
6. Irrigation Engineering and Hydraulic Structures by S.K.Garg- Khanna Publishers

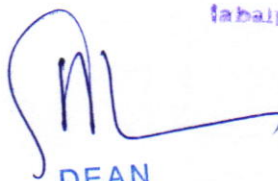
Course Outcomes-

After the completion of this course student will be able to-

CO1	Illustrate Hydrologic Cycle and its Hydrological Background
CO2	Apply different water harvesting techniques and ground water recharge
CO3	Analyze different water management techniques



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Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
CE-52	Structural Analysis-I	Theory			Practical		150	L	T	P	4
		End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab work					
		70	20	10	30	20					

MODULE-I: Static and Kinematics Indeterminacy, Virtual Work and Energy Principles:
Principles of Virtual work applied to deformable bodies, strain energy and complementary energy.
Energy theorems, Maxwell's Reciprocal theorem, Analysis of Pin-Jointed frames for static loads.

MODULE-II: Indeterminate Structures -I:
Analysis of Fixed and continuous beams by theorem of three moments. Effect of sinking and rotation of supports, Moment distribution method (without sway)

MODULE-III: Indeterminate Structures -II:
Analysis of beams and frames by slope deflection method. Column Analogy method.

MODULE-IV: Arches and Suspension Cables:
Three hinged arches of different shapes, Eddy's Theorem, Suspension cable, stiffening girders, Two Hinged and Fixed Arches - Rib shortening and temperature effects.

MODULE-V: Rolling loads and Influence Lines:
Maximum SF and BM curves for various types of Rolling loads, focal length EUDL, influence Lines for Determinate Structures - Beams, Three Hinged Arches.


Books Reference:

1. Wang C.K. Intermediate Structural Analysis, Mc GrawHillNew York.
2. Kinney, Sterling J: indeterminate Structural Analysis Addison wasley
3. Reddy C S Basic Structural Analysis Tata Mc Graw Hill Pub. Co. New Delhi.

List of Experiment:

1. To verify "THEOREM OF RECIPROCAL DEFLECTIONS" or "MAXWELL'S RECIPROCAL THEOREM" using SSB & cantilever beam.
2. To verify "Principle of superposition for deflection" using SSB & cantilever beam made with linearly elastic material.


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3. To draw "INFLUENCE LINE DIAGRAM FOR BENDING MOMENT" at a section of SSB using bending moment apparatus.
4. To obtain horizontal thrust at support of a "Circular three hinged arch" and to draw ILD for this horizontal thrust, also to compare experimental results with analytical solutions
5. To obtain horizontal thrust at support of a "Two hinged parabolic arch" and to draw ILD for this horizontal thrust, also to compare experimental results with analytical solutions
6. To obtain horizontal thrust at support of a "SEMICIRCULAR TWO HINGED ARCH" and to draw ILD for this horizontal thrust, also to compare experimental results with analytical solutions.
7. To obtain force in members of a shear leg apparatus and to compare results with those obtained using analytical method.
8. To obtain deflection at free end of a curved member consist of a "quadrant with straight edge" and to compare results with those obtained by using analytical solutions.
9. To obtain elastic deflection at free end of a "SEMICIRCULAR FRAME WITH STRAIGHT EDGE" due to load applied at free end to compare results with those obtained using analytical solutions.
10. To obtain "INFLUENCE LINE DIAGRAM" for intermediate reaction of a continuous beam of two unequal spans using "MULLER-BRESLAU's PRINCIPLE" and comparing the results with those obtained using analytical solution.

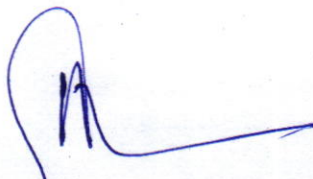
Course Outcomes-

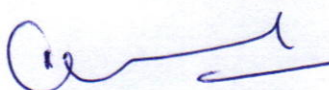
After the completion of this course student will be able to-

CO1	Distinguish between stable and unstable structures; statically determinate and indeterminate structures.
CO2	Draw the influence lines for beams, trusses and arch due to moving load.
CO3	Technically able to analyze the arches and understand the use of different type of arches in structure.
CO4	Understand the concept of Strain energy for the analysis of different structures
CO5	Technically able to analyze the beams, frames and trusses by different methods

After the completion of this lab student will be able to-

CO1	Verification of the structural analysis theorems and principles by conducting the experiments.
CO2	Determine deflection and internal forces for various structures experimentally and validate using classical methods.
CO3	Determine horizontal thrust and obtain the influence lines for statically determinate and indeterminate structures.
CO4	Analyze the determinate and indeterminate structures.
CO5	Understand the behavior of struts with different end conditions.


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Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/ Week			Total Credits
CE-53	Geotechnical Engineering-II	Theory			Practical		150	L	T	P	4
		End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab work		3	-	2	
		70	20	10	30	20					

MODULE - I: Shallow Foundations :

Type of foundations shallow and deep Bearing capacity of foundation on cohesion less and cohesive soils. General and local shear failures. Factors effecting B.C. Theories of bearing capacity, Prandtl, Terzaghi, Balla, Skempton Meyerhof and Hansen, I.S. code on B.C. Determination of bearing capacity limits of total and differential settlements. Plate load test.

MODULE - II: Deep Foundation :

Pile foundation, Types of piles, estimation of individual and group capacity of piles in cohesion less and cohesive soils. Static and dynamic formulae. Pile load test. Settlement of pile group Negative skin friction. Under-reamed piles and their design piles under tension, inclined and lateral load caissons. Well foundation.

MODULE -III: Stability of Slopes:


Infinite and finite slopes. Types of slope failures, Rotational slips. Stability number. Effect of ground water, selection of shear strength parameters in slope stability analysis. Analytical and graphical methods of stability analysis. Stability of Earth Dams.


MODULE - IV: Lateral Earth Pressure :

Active, passive and earth pressure at rest. Rankine, Coulomb, Terzaghi and Culmann's theories. Analytical and graphical methods of determination of earth pressures on cohesion - less and cohesive soils. Effect of surcharge, water table and wall friction. Arching in soils. Reinforced earth retaining walls. Cantilever and anchored sheet piles.

MODULE -V: Soil Exploration and Machine Foundation.

Introduction, Methods of Exploration, Methods of boring, Soil Samples, Soil Samplers and Sampling, Field Tests and Laboratory Tests, Geophysical Methods. Machine Foundation.


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Books Reference :

1. Soil Mechanics & Foundation Engg. By Dr. K.R. Arora - Std Pub. Delhi
2. Soil Mechanics & Foundation Engg. By B.C. Punmia - Laxmi Pub. Delhi
3. Modern Geotechnical Engg. By Dr. Alam Singh-IBT Publishers Delhi
4. Geotechnical Engg. By C. Venkatramaiah- New Age International Pub Delhi
5. Foundation Engg. By G. A. Leonards Mc Graw Hill Book Co. Inc. DT.

List of Experiments:

1. The unconfined compression test
2. Tri-axial compression test.
3. Vane shear test.
4. CBR test.
5. Plate load test.
6. Standard Penetration test.
7. Dynamic cone penetration test
8. Free swelling index and differential free swell test
9. Swelling pressure test.
10. Consolidation test.

Course Outcomes-

After the completion of this course student will be able to-

CO1	Determine allowable bearing pressure of soil for shallow foundations..
CO2	Evaluate individual and group capacity of piles.
CO3	Apply techniques for soil improvement and soil stabilization.
CO4	Explain behavior and construction techniques for expansive and collapsible soil.
CO5	Design sheet pile and machine foundation.

After the completion of this lab student will be able to-

CO1	Evaluate strength of soil through different methods.
CO2	Determine settlement of different types of soil.


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Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/ Week			Total Credits
CE-54	Structural Design & Drawing-I (RCC)	Theory			Practical		150	L	T	P	4
		End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab work					
		70	20	10	30	20					

MODULE – I:

Basic Principles of Structural Design : Assumptions, Mechanism of load transfer, Various properties of concrete and reinforcing steel, introduction to working stress method ; Limit state methods of design, partial safety factors for load and material. Calculation of various loads for structural design . Calculation of moment of resistance of rectangular and flanged sections by WSM and LSM.

MODULE – II:

Design of Beams: Singly & doubly reinforced rectangular & Flanged Beams, Lintel, Cantilever, simply supported and continuous beams, Beams with compression reinforcement: Redistribution of moments in continuous beams, Design of beam for shear, bond and torsion.

MODULE-III:

Design of Slabs: Slabs spanning in one direction. Cantilever, Simply supported and Continuous slabs, Slabs spanning in two directions, Circular slabs.

MODULE –IV:

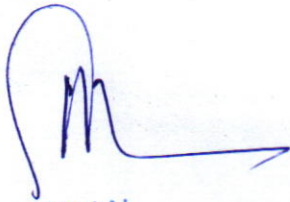
Columns & Footings: Effective length of columns, Short and long columns- Square, Rectangular and Circular columns, isolated footings. Columns subjected to axial loads and bending moments (sections with no tension).


MODULE –V:

Staircases: Staircases with waist slab having equal and unequal flights with different support conditions, Slab less tread-riser staircase. Design of flat slabs and waffle slabs.

NOTE :

All the designs for strength and serviceability should strictly be as per the latest version of IS:456. Use of SP-16 Design aids


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Books Reference :

1. Reinforced Concrete; Pillai & Menon, TMC New Delhi.
2. Plain & Reinforced Concrete Vol. I & II - O.P. Jain & Jay Krishna
3. Limit State Design by P.C. Varghese ; Prentice Hall of India, New Delhi.
4. Design of Reinforced Concrete Elements by Purushothman; Tata McGraw Hill, New Delhi
5. Reinforced Cement Concrete by Gupta & Mallick, Oxford and IBH
6. Reinforced Cement Concrete by P. Dayaratnam, Oxford and IBH
7. Plain & reinforced concrete - Rammurtham
8. Plain & reinforced concrete - B.C. Punmia
9. Structural Design & Drawing by N.K. Raju.

List of Experiment:

1. Detailed of Drawing of Beams.
2. Detailed of Drawing of Slabs.
3. Detailed of Drawing of Columns.
4. Detailed of Drawing of Footings.
5. Detailed of Drawing of Stairs.
6. Determination Of Slump Value Using Slump Cone test
7. Determination Of Slump Value Using Compaction Factor Test
8. Determination Of Compressive Strength Of Cubes
9. Testing Of Aggregates For Concrete
10. Fineness Modulus of fine aggregates & coarse aggregate

Course Outcomes-


After the completion of this course student will be able to-

CO1	Classify different design philosophies used in RCC construction and assess various loads for the buildings.
CO2	Design different types of beams for flexure, shear and torsion.
CO3	Design different types of slabs.
CO4	Identify the effective length of column and design of long and short column and isolated footing.
CO5	Design staircases with different support conditions, design of flat slabs and waffle slabs.

After the completion of this lab student will be able to-

CO1	Identify the major steps and symbol used in civil engineering drawings
CO2	Draw civil engineering drawings for different structural elements like beam, column, slab etc


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Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/ Week			Total Credits
BT-52	Engineering Economics and Management	Theory			Practical		100	L	T	P	4
		End Sem	Mid-sem Exam	Quiz/ Assignment	End sem	Lab work					
		70	20	10	-	-					

Module -I

Introduction to Engineering Economics and Managerial Economics Concept of Efficiency, Theory of Demand , Elasticity of Demand, Supply and Law of Supply indifference Curves, Budget Line; Welfare Analysis, Scope of Managerial Economics, Techniques and Applications of Managerial Economics.

Module -II

Market Structure Perfect Competitions Imperfect - Monopolistic: Oligopoly, duopoly sorbent features of price determination and various market conditions. Demand Forecasting and cost Estimation Characteristics of Forecasts, Forecasting Horizons, Steps to Forecasting, Forecasting Methods, Seasonal Adjustments, Forecasting Performance Measures, Cost Estimation, Elements of cost, Computation of Material Variances Break - Even Analysis.

Module -III


Introduction: Concept, Development, application and scope of Industrial Management. Productivity: Definition, measurement, productivity index, types of production system, Industrial Ownership.

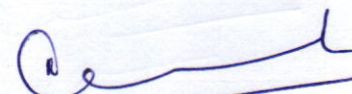
Module -IV

Management Aspects, Functions of Management, Project Management, Value Engineering, Project Evaluation, Work simplification — process charts and flow diagrams, Production Planning, Decision Making.

Module -V

Inventory Control: Inventory, Cost, Deterministic Models Quality Control: Process control, SQC, Control charts, Single, Double and Sequential Sampling, Introduction to TQM.


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TEXT BOOKS:

1. Principles of Management by Tripathy and Reddy
2. Mechanical estimation and costing, T.R. Banga & S.C. Sharma, 17th edition 2015
3. Engineering Economy, Riggs J.L. McGraw Hill, 2002
4. Engineering Economy, Thuesen H.G. PHI, 2002

REFERENCE BOOKS:

1. Management Fundamentals- Concepts, Application, Skill Development - RobersLusier - Thomson

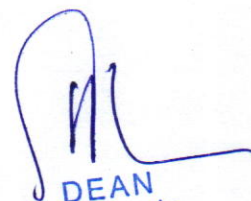
Course Outcomes-

After the completion of this course student will be able to-

CO1	Understand the key management concepts, principles and contribution by different Management thinkers.
CO2	Analyze and design organization for effective management.
CO3	Application of modern management techniques.



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