



**DEPARTMENT OF CIVIL ENGINEERING**  
**1.1.1 -CO-PO-PSO MAPPING**

**B.TECH (F.T)- 2021R**

Sem	Course Code	Title of the Course	COs	POS										PSO				
				PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3		
SEM 1	21147S11	Professional English - I	To use appropriate words in a professional context	3	3	3	3	1	3	3	3	3	3	3	3	3	3	-
			To gain understanding of basic grammatical structures and use them in right context.	3	3	3	3	1	3	3	3	3	3	3	3	3	3	-
			To read and infer the denotative and connotative meanings of technical texts	3	3	3	3	1	3	3	3	3	3	3	3	3	3	-
			To read and interpret information presented in tables, charts and other graphic forms	3	3	3	3	1	3	3	3	3	3	3	3	3	3	-
			To write definitions, descriptions, narrations and essays on various topics	3	3	3	3	1	3	3	3	3	3	3	3	3	3	-
				<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>-</b>
			AVG															
	21148S12	Matrices and Calculus	Use the matrix algebra methods for solving practical problems	3	3	1	1	0	0	0	0	2	0	2	3	-		
			Apply differential calculus tools in solving various application problems.	3	3	1	1	0	0	0	0	2	0	2	3	-		
			Able to use differential calculus ideas on several variable functions.	3	3	1	1	0	0	0	0	2	0	2	3	-		
			Apply different methods of integration in solving practical problems.	3	3	1	1	0	0	0	0	2	0	2	3	-		

		Apply multiple integral ideas in solving areas, volumes and other practical problems.	3	3	1	1	0	0	0	0	2	0	2	3	-
		<b>Avg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-
21149S13	Engineering Physics	Understand the importance of mechanics.	1	1	1	1	1	3	3	3	1	3	-	3	-
		Express their knowledge in electromagnetic waves.	1	1	1	1	1	3	3	3	1	3	-	3	-
		Demonstrate a strong foundational knowledge in oscillations, optics and lasers.	2	3	2	3	2	3	3	3	2	3	3	3	-
		Demonstrate a strong foundational knowledge in oscillations, optics and lasers.	2	3	2	3	2	3	3	3	2	3	3	3	-
		Comprehend and apply quantum mechanical principles towards the formation of energy bands.	2	3	3	3	-	3	3	3	2	3	-	3	-
		<b>Avg</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
			<b>6</b>	<b>2</b>	<b>8</b>	<b>2</b>	<b>5</b>		<b>6</b>						
21149S14	Engineering Chemistry	To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.	1	1	1	1	1	3	3	3	1	3	-	3	-
		identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.	1	1	1	1	1	3	3	3	1	3	-	3	-
		To apply the knowledge of phase rule and composites for material selection requirements.	2	3	2	3	2	3	3	3	2	3	3	3	-
		To recommend suitable fuels for engineering processes and applications.	2	3	2	3	2	3	3	3	2	3	3	3	-
		To recognize different forms of energy resources and apply them for suitable applications in energy sectors.	2	3	3	3	-	3	3	3	2	3	-	3	-
		<b>Avg</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>-</b>
			<b>6</b>	<b>2</b>	<b>8</b>	<b>2</b>	<b>5</b>		<b>6</b>						
21150S15	Problem Solving and Python Programming	Develop algorithmic solutions to simple computational problems	3	3	1	1	0	0	0	0	2	0	2	3	-
		Read, write, execute by hand simple Python programs.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Structure simple Python programs for solving problems.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Decompose a Python program into functions.	3	3	1	1	0	0	0	0	2	0	2	3	-



		<b>AVg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-		
21148S22	Statistics and Numerical Methods	Apply the concept of testing of hypothesis for small and large samples in real life problems.	3	2	2	1	-	1	1	-	-	-	-	1	-		
		Apply the basic concepts of classifications of design of experiments in the field of agriculture.	2	-	-	1	-	2	2	-	-	-	-	-	-	-	
		Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
		Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.	3	1	1	-	-	1	2	-	-	-	-	-	-	-	-
		Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.	3	1	2	1	-	2	2	-	-	-	-	-	2	-	-
		<b>AVg</b>	<b>2.8</b>	<b>1.3</b>	<b>1.6</b>	<b>1</b>	<b>-</b>	<b>1.5</b>	<b>1.8</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1.5</b>	<b>-</b>	<b>-</b>
21149S23 E	Physics for Civil Engineering	acquire knowledge about heat transfer through different materials, thermal performance of building and thermal insulation.	3	3	1	1	0	0	0	0	2	0	2	3	-		
		gain knowledge on the ventilation and air conditioning of buildings	3	3	1	1	0	0	0	0	2	0	2	3	-		
		understand the concepts of sound absorption, noise insulation and lighting designs	3	3	1	1	0	0	0	0	2	0	2	3	-		
		know about the processing and applications of composites, metallic glasses, shape memory alloys and ceramics	3	3	1	1	0	0	0	0	2	0	2	3	-		
		get an awareness on natural disasters such as earth quake, cyclone, fire and safety measures	3	3	1	1	0	0	0	0	2	0	2	3	-		
		<b>AVg</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>3</b>	<b>-</b>		
21154S24	Engineering Graphics	Use BIS conventions and specifications for engineering drawing.	1	1	1	1	1	3	3	3	1	3	-	3	-		
		Construct the conic curves, involutes and cycloid.	1	1	1	1	1	3	3	3	1	3	-	3	-		
		Solve practical problems involving projection of lines.	2	3	2	3	2	3	3	3	2	3	3	3	-		
		Draw the orthographic, isometric and perspective projections of simple solids.	2	3	2	3	2	3	3	3	2	3	3	3	-		
		Draw the development of simple solids.	2	3	3	3	-	3	3	3	2	3	-	3	-		

				1	2	1	2	1	3	3	3	1	3	3	3	-
			<b>AVg</b>	6	2	8	2	5				6				
	21153S25 C	Basic Electrical,El ectronics and Instrument Engineering	Compute the electric circuit parameters for simple problems	1	1	1	1	1	3	3	3	1	3	-	3	-
			Explain the concepts of domestics wiring and protective devices	1	1	1	1	1	3	3	3	1	3	-	3	-
			Explain the working principle and applications of electrical machines	2	3	2	3	2	3	3	3	2	3	3	3	-
			Analyze the characteristics of analog electronic devices	2	3	2	3	2	3	3	3	2	3	3	3	-
			Explain the types and operating principles of sensors and transducers	2	3	3	3	-	3	3	3	2	3	-	3	-
			<b>AVg</b>	1	2	1	2	1	3	3	3	1	3	3	3	-
			<b>AVg</b>	6	2	8	2	5				6				
	21154L21	Engineering Practices Laboratory	Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.	3	3	1	1	0	0	0	0	2	0	2	3	-
			various electrical joints in common household electrical wire work.	3	3	1	1	0	0	0	0	2	0	2	3	-
			Wire various electrical joints in common household electrical wire work.	3	3	1	1	0	0	0	0	2	0	2	3	-
			Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work.	3	3	1	1	0	0	0	0	2	0	2	3	-
			<b>AVg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-
			<b>AVg</b>	3	3	2	1	2	1	-	-	-	-	-	-	-
	21153L22 D	Basic Electrical, Electronics And Instrumentat ion Engineering Laboratory	Use experimental methods to verify the Ohm's law and Kirchoff's Law and to measure three phase power	3	3	2	1	2	1	-	-	-	-	-	-	-
			Analyze experimentally the load characteristics of electrical machines	3	3	2	2	2	1	-	-	-	-	-	1	-
			Analyze the characteristics of basic electronic devices	3	3	1	1	2	1	-	-	-	-	-	-	-
			Use LVDT to measure displacement	3	3	1	1	2	1	-	-	-	-	-	-	-
			<b>AVg</b>	3	3	1	1	1	1	-	-	-	-	-	1	-
			<b>AVg</b>	6	2	8										
<b>SEM 3</b>	21148S31 D	Transforms and Partial Differential	Understand how to solve the given standard partial differential equations.	1	1	1	1	1	3	3	3	1	3	-	3	-

	Equations	Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.	1	1	1	1	1	3	3	3	1	3	-	3	-		
		Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.	2	3	2	3	2	3	3	3	2	3	3	3	3	-	
		Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.	2	3	2	3	2	3	3	3	2	3	3	3	3	-	
		Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems	2	3	3	3	-	3	3	3	2	3	-	3	3	-	
		<b>Avg</b>	<b>1</b> <b>·</b> <b>6</b>	<b>2</b> <b>·</b> <b>2</b>	<b>1</b> <b>·</b> <b>8</b>	<b>2</b> <b>·</b> <b>2</b>	<b>1</b> <b>·</b> <b>5</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b> <b>·</b> <b>6</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>-</b>
21154S32	Engineering Mechanics	Illustrate the vectorial and scalar representation of forces and moments	1	1	1	1	1	3	3	3	1	3	-	3	-		
		Analyse the rigid body in equilibrium	1	1	1	1	1	3	3	3	1	3	-	3	-		
		Evaluate the properties of distributed forces	2	3	2	3	2	3	3	3	2	3	3	3	3	-	
		Determine the friction and the effects by the laws of friction	2	3	2	3	2	3	3	3	2	3	3	3	3	-	
		Calculate dynamic forces exerted in rigid body	2	3	3	3	-	3	3	3	2	3	-	3	3	-	
		<b>Avg</b>	<b>1</b> <b>·</b> <b>6</b>	<b>2</b> <b>·</b> <b>2</b>	<b>1</b> <b>·</b> <b>8</b>	<b>2</b> <b>·</b> <b>2</b>	<b>1</b> <b>·</b> <b>5</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b> <b>·</b> <b>6</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>-</b>
21155C33	Fluid Mechanics	Demonstrate the difference between solid and fluid, its properties and behaviour in static conditions.	3	2	2	1	-	1	1	-	-	-	-	1	-		
		Apply the conservation laws applicable to fluids and its application through fluid kinematics and dynamics.	2	-	-	1	-	2	2	-	-	-	-	-	-	-	
		Formulate the relationship among the parameters involved in the given fluid phenomenon and to predict the performance of prototypes by model studies.	3	1	-	-	-	-	-	-	-	-	-	-	-	-	
		Estimate the losses in pipelines for both laminar and turbulent conditions and analysis of pipes connected in series and parallel.	3	1	1	-	-	1	2	-	-	-	-	-	-	-	
		Explain the concept of boundary layer and its application to find the drag force exerted by the fluid on the flat solid surface.	3	1	2	1	-	2	2	-	-	-	-	-	2	-	



		surveying.																
		<b>AVg</b>	3	3	1	1	1	1	-	-	-	-	-	-	1	-		
	21155L37	Impart knowledge on the usage of basic surveying instruments like chain/tape, compass and levelling instruments	3	3	1	1	0	0	0	0	2	0	2	3	-			
		Able to use levelling instrument for surveying operations	3	3	1	1	0	0	0	0	2	0	2	3	-			
		Able to use theodolite for various surveying operations	3	3	1	1	0	0	0	0	2	0	2	3	-			
		Able to carry out necessary surveys for social infrastructures	3	3	1	1	0	0	0	0	2	0	2	3	-			
		Quantify the pollutant concentration in water and wastewater	3	3	1	1	0	0	0	0	2	0	2	3	-			
		<b>AVg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-			
	21155L38	Suggest the type of treatment required and amount of dosage required for the treatment	3	3	1	1	0	0	0	0	2	0	2	3	-			
		Examine the conditions for the growth of micro-organisms	3	3	1	1	0	0	0	0	2	0	2	3	-			
	21155L39	Professional Development	1	1	1	1	1	3	3	3	1	3	-	3	-			
		Make effective presentations	1	1	1	1	1	3	3	3	1	3	-	3	-			
		Participate confidently in Group Discussions.	1	1	1	1	1	3	3	3	1	3	-	3	-			
		Attend job interviews and be successful in them.	2	3	2	3	2	3	3	3	2	3	3	3	-			
		Develop adequate Soft Skills required for the workplace	2	3	2	3	2	3	3	3	2	3	3	3	-			
		<b>AVg</b>	2	3	3	3	-	3	3	3	2	3	-	3	-			
	21155C41	Applied Hydraulic Engineering	1	2	1	2	1	3	3	3	1	3	3	3	-			
		Apply their knowledge of fluid mechanics in addressing problems in open channels.	6	2	8	2	5				6							
		Able to identify a effective section for flow in different cross sections.	3	3	1	1	0	0	0	0	2	0	2	3	-			
		To solve problems in uniform, gradually and rapidly varied flows in steady state conditions.	3	3	1	1	0	0	0	0	2	0	2	3	-			
		Understand the principles, working and application of turbines.	3	3	1	1	0	0	0	0	2	0	2	3	-			
		Understand the principles, working and application of pumps.	3	3	1	1	0	0	0	0	2	0	2	3	-			
		<b>AVg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-			
	21155C42	Strength of Materials	3	2	2	1	-	1	1	-	-	-	-	1	-			
		Determine Shear force and bending moment in beams and understand concept of theory of simple bending.	2	-	-	1	-	2	2	-	-	-	-	-	-			



		Calculate the deflection of beams by different methods and selection of method for determining slope or deflection.	3	1	-	-	-	-	-	-	-	-	-	-	-
		Apply basic equation of torsion in design of circular shafts and helical springs, .	3	1	1	-	-	1	2	-	-	-	-	-	-
		Analyze the pin jointed plane and space trusses	3	1	2	1	-	2	2	-	-	-	-	2	-
		<b>AVg</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>-</b>	<b>1</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1</b>	<b>-</b>
			<b>8</b>	<b>3</b>	<b>6</b>			<b>5</b>	<b>8</b>					<b>5</b>	
21155C43	Concrete Technology	The various requirements of cement, aggregates and water for making concrete	3	3	1	1	0	0	0	0	2	0	2	3	-
		The effect of admixtures on properties of concrete	3	3	1	1	0	0	0	0	2	0	2	3	-
		The concept and procedure of mix design as per IS method	3	3	1	1	0	0	0	0	2	0	2	3	-
		The properties of concrete at fresh and hardened state	3	3	1	1	0	0	0	0	2	0	2	3	-
		The importance and application of special concretes.	3	3	1	1	0	0	0	0	2	0	2	3	-
		<b>AVg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-
21155C44	Soil Mechanics Laboratory	Classify the soil and assess the engineering properties, based on index properties.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Understand the stress concepts in soils	3	3	1	1	0	0	0	0	2	0	2	3	-
		Understand and identify the settlement in soils.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Determine the shear strength of soil	3	3	1	1	0	0	0	0	2	0	2	3	-
		Analyze both finite and infinite slopes.	3	3	1	1	0	0	0	0	2	0	2	3	-
		<b>AVg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-
21155C45	Highway and Railway Engineering`	Get knowledge on planning and aligning of highway.	3	3	3	3	2	-	-	-	-	-	2	2	3
		Geometric design of highways	3	3	3	3	2	-	-	-	-	-	2	2	3
		Design flexible and rigid pavements.	3	3	3	3	2	-	-	-	-	-	2	-	3
		Gain knowledge on Highway construction materials, properties, testing methods	2	2	-	2	2	-	-	-	-	-	1	-	3
		Understand the concept of pavement management system, evaluation of distress and maintenance of pavements.	1	2	-	-	1	-	-	-	-	-	1	-	2
		Get to know types of grouts and grouting technique.	2	2	-	-	2	-	-	-	-	-	1	-	2
		<b>AVg</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>2</b>	<b>2</b>	<b>3</b>
21149S46	Environment al Sciences and Sustainabilit	carry out scoping and screening of developmental projects for environmental and social assessments	3	3	2	1	2	1	-	-	-	-	-	-	

	y	explain different methodologies for environmental impact prediction and assessment	3	3	2	2	2	1	-	-	-	-	-	1	-	
		plan environmental impact assessments and environmental management plans	3	3	1	1	2	1	-	-	-	-	-	-	-	-
		evaluate environmental impact assessment reports	3	3	1	1	2	1	-	-	-	-	-	-	-	-
		<b>AVg</b>	3	3	1 · 6	1 · 2	1 · 8	1	-	-	-	-	-	-	1	-
21155L47	Hydraulic Engineering Laboratory	Student knows the techniques to characterize various pavement materials through relevant tests.	3	3	2	1	2	1	-	-	-	-	-	-		
21155L48	Materials Testing Laboratory	the students will have the required knowledge in the area of testing of construction materials and components of construction elements experimentally.	3	3	1	1	0	0	0	0	2	0	2	3	-	
21155L49	Soil Mechanics Laboratory	Students are able to conduct tests to determine both the index and engineering properties of soils and to characterize the soil based on their properties.	3	3	1	1	0	0	0	0	2	0	2	3	-	
<b>SEM 5</b>	21155C51	Understand the various design methodologies for the design of RC elements.	3	3	1	1	0	0	0	0	2	0	2	3	-	
		Know the analysis and design of flanged beams by limit state method and sign of beams for shear, bond and torsion.	3	3	1	1	0	0	0	0	2	0	2	3	-	
		design the various types of slabs and staircase by limit state method.	3	3	1	1	0	0	0	0	2	0	2	3	-	
		Design columns for axial, uniaxial and biaxial eccentric loadings.	3	3	1	1	0	0	0	0	2	0	2	3	-	
		Design of footing by limit state method.	3	3	1	1	0	0	0	0	2	0	2	3	-	
		<b>AVg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-	
21155C52	Structural Analysis I	Analyze continuous beams, pin-jointed indeterminate plane frames and rigid plane frames by strain energy method	3	3	1	1	0	0	0	0	2	0	2	3	-	
		Analyze the continuous beams and rigid frames by slope deflection method.	3	3	1	1	0	0	0	0	2	0	2	3	-	
		Understand the concept of moment distribution and analysis of continuous beams and rigid frames with and without sway.	3	3	1	1	0	0	0	0	2	0	2	3	-	
		Analyze the indeterminate pin jointed plane frames continuous beams and rigid frames using matrix flexibility method.	3	3	1	1	0	0	0	0	2	0	2	3	-	

		Understand the concept of matrix stiffness method and analysis of continuous beams, pin jointed trusses and rigid plane frames.	3	3	1	1	0	0	0	0	2	0	2	3	-
		<b>AVg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-
21155C53	Foundation Engineering	Get knowledge on bearing capacity and testing methods.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Design shallow footings.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Determine the load carrying capacity, settlement of pile foundation.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Determine the earth pressure on retaining walls and analysis for stability.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Determine the earth pressure on retaining walls and analysis for stability.	3	3	1	1	0	0	0	0	2	0	2	3	-
		<b>AVg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-
21155E54 A	Airports and Harbours	Gain an insight on the planning and site selection of Airport Planning and design.	3	2	2	1	-	1	1	-	-	-	-	1	-
		Knowledge on Design of various Airport components.	2	-	-	1	-	2	2	-	-	-	-	-	-
		Analyze and design the elements for orientation of runways and passenger facility systems.	3	1	-	-	-	-	-	-	-	-	-	-	-
		Understand the various features in Harbours and Ports	3	1	1	-	-	1	2	-	-	-	-	-	-
		Knowledge on various Environmental Regulations and Acts	3	1	2	1	-	2	2	-	-	-	-	2	-
		<b>AVg</b>	2	1	1	1	-	1	1	-	-	-	-	1	-
			8	3	6		5	8					5		
21155E54 B	Concrete Structures	Plan a layout of a structure	3	3	1	1	0	0	0	0	2	0	2	3	-
		Calculate loads using IS codes and various computational tools	3	3	1	1	0	0	0	0	2	0	2	3	-
		Analyse the structure for various loads and load combination according to the relevant IS codes	3	3	1	1	0	0	0	0	2	0	2	3	-
		Design and Analysis of structures using computer software/tools	3	3	1	1	0	0	0	0	2	0	2	3	-
		Prepare the complete structural drawings using computer software	3	3	1	1	0	0	0	0	2	0	2	3	-
		<b>AVg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-
21155E54 C	Groundwater Engineering	Define the groundwater system basic, types of aquifers, aquifer parameters, movement and its potential for confined and unconfined aquifers	3	2	2	1	-	1	1	-	-	-	-	1	-
		Apply the knowledge of groundwater flow in steady and unsteady flow characteristics of	2	-	-	1	-	2	2	-	-	-	-	-	-

		well hydraulics																			
		Explain the concept of groundwater model development and data base management for groundwater management	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		Describe the importance of artificial recharge and groundwater quality concepts	3	1	1	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-	
		Apply the creative and innovative technique on conservation of groundwater	3	1	2	1	-	2	2	-	-	-	-	-	-	2	-	-	-	-	
		<b>AVg</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>-</b>	<b>1</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	
			<b>8</b>	<b>3</b>	<b>6</b>			<b>5</b>	<b>8</b>						<b>5</b>						
21155E55 A	Steel Structures	Recognize the design philosophy of steel structures and identify the different failure modes of bolted and welded connections, and determine their design strengths	3	2	2	1	-	1	1	-	-	-	-	-	1	-	-	-	-	-	
		Select the most suitable section shape and size for tension and compression members and beams according to specific design criteria	2	-	-	1	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-
		Apply the principles, procedures and current code requirements to the analysis and design of steel tension members, columns, column bases and beams	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Identify and compute the design loads on Industrial structures, and gantry girder	3	1	1	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-
		Find out ultimate load of steel beams and portal frames using plastic analysis	3	1	2	1	-	2	2	-	-	-	-	-	-	2	-	-	-	-	-
		<b>AVg</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>-</b>	<b>1</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
			<b>8</b>	<b>3</b>	<b>6</b>			<b>5</b>	<b>8</b>					<b>5</b>							
21155E55 C	Rehabilitation/ Heritage Restoration	Know the importance of inspection and maintenance	3	2	2	1	-	1	1	-	-	-	-	-	1	-	-	-	-	-	
		Study the Impacts of cracks, corrosion and climate on structures.	2	-	-	1	-	2	2	-	-	-	-	-	-	-	-	-	-	-	
		Know about various special concretes	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Understand the testing techniques and various protection measures	3	1	1	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-	
		Know the Repair of structures and Restoration of Heritage structures	3	1	2	1	-	2	2	-	-	-	-	-	-	2	-	-	-	-	-
		<b>AVg</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>-</b>	<b>1</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
			<b>8</b>	<b>3</b>	<b>6</b>			<b>5</b>	<b>8</b>					<b>5</b>							
21155E56 A	Water Quality and	Know about the principles of water quality modelling	3	2	2	1	-	1	1	-	-	-	-	1	-	-	-	-	-		

	Management	Understand the pollutant transport phenomena in surface and groundwater.	2	-	-	1	-	2	2	-	-	-	-	-	-		
		Apply the knowledge of surface water quality modelling to predict the water quality of rivers, lakes and estuary.	3	1	-	-	-	-	-	-	-	-	-	-	-	-	
		Predict the groundwater contamination transport	3	1	1	-	-	1	2	-	-	-	-	-	-	-	
		Predict water quality of surface and sub surface water using numerical solution.	3	1	2	1	-	2	2	-	-	-	-	-	2	-	
		<b>AVg</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>-</b>	<b>1</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1</b>	<b>-</b>	
		<b>·</b>	<b>·</b>	<b>·</b>		<b>·</b>	<b>·</b>						<b>·</b>	<b>·</b>			
		<b>8</b>	<b>3</b>	<b>6</b>		<b>5</b>	<b>8</b>						<b>5</b>				
21155E56 B	Prefabricate d Structures	Understand concepts about principles of prefabrication, production, transportation, erection	3	3	1	1	0	0	0	0	2	0	2	3	-		
		Acquire knowledge about panel systems, slabs, beams, shear walls and columns used in precast construction.	3	3	1	1	0	0	0	0	2	0	2	3	-		
		Acquire knowledge about design of cross section, joint flexibility.	3	3	1	1	0	0	0	0	2	0	2	3	-		
		Acquire knowledge about joints and connection in precast construction.	3	3	1	1	0	0	0	0	2	0	2	3	-		
		Acquire knowledge about structural stability.	3	3	1	1	0	0	0	0	2	0	2	3	-		
		<b>AVg</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>3</b>	<b>-</b>		
	21155E56 C	Total Station and GPS Surveying	Learn about the fundamental concept of Total station.	3	2	2	1	-	1	1	-	-	-	-	1	-	
			Provide knowledge about electromagnetic waves and its usage in Total station and GNSS.	2	-	-	1	-	2	2	-	-	-	-	-	-	-
			Gain Knowledge on basic concepts of GNSS	3	1	-	-	-	-	-	-	-	-	-	-	-	-
			Understand the measuring and working principle of electro optical and Microwave Total station and GPS	3	1	1	-	-	1	2	-	-	-	-	-	-	-
			Gain knowledge about Total station and GNSS data processing and Mapping.	3	1	2	1	-	2	2	-	-	-	-	-	2	-
			<b>AVg</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>-</b>	<b>1</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1</b>	<b>-</b>
		<b>·</b>	<b>·</b>	<b>·</b>		<b>·</b>	<b>·</b>						<b>·</b>	<b>·</b>			
		<b>8</b>	<b>3</b>	<b>6</b>		<b>5</b>	<b>8</b>						<b>5</b>				
21147MC 51A	Introduction to Women and Gender Studies	Gender and Representation in Alternative Media.	3	3	1	1	0	0	0	0	2	0	2	3	-		
		Gender and social media.	3	3	1	1	0	0	0	0	2	0	2	3	-		
21147MC 51B	Elements of Literature	Students will be able to understand the relevance of literature in human life and appreciate its aspects in developing finer sensibilities.	3	3	1	1	0	0	0	0	2	0	2	3	-		

		the students will be introduced broadly to the development of film as an art and entertainment form.	3	3	1	1	0	0	0	0	2	0	2	3	-
		<b>AVg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-
21147MC 51C	Film Appreciation	the students will be introduced broadly to the development of film as an art and entertainment form.	3	3	1	1	0	0	0	0	2	0	2	3	-
		The students will be taught as to how to read a film and appreciate the various nuances of a film as a text	3	3	1	1	0	0	0	0	2	0	2	3	-
		The students will be guided to study film joyfully.	3	3	1	1	0	0	0	0	2	0	2	3	-
		<b>AVg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-
21147MC 51D	Disaster Management	To impart knowledge on the concepts of Disaster, Vulnerability and Disaster Risk reduction (DRR)	3	3	1	1	0	0	0	0	2	0	2	3	-
		To enhance understanding on Hazards, Vulnerability and Disaster Risk Assessment prevention and risk reduction.	3	3	1	1	0	0	0	0	2	0	2	3	-
		To develop disaster response skills by adopting relevant tools and technology.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Enhance awareness of institutional processes for Disaster response in the country.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Develop rudimentary ability to respond to their surroundings with potential Disaster response in areas where they live, with due sensitivity	3	3	1	1	0	0	0	0	2	0	2	3	-
		<b>AVg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-
21155L58	Highway Engineering Laboratory	Characterize Pavement Aggregate through relevant test.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Ascertain the Quality of Bitumen.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Determine the Optimum Binder Content Using Marshall Method.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Evaluate the Consistency and Properties of Bitumen.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Determine the Bitumen Content in the Bituminous Mixes	3	3	1	1	0	0	0	0	2	0	2	3	-
		<b>AVg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-
21155L59	Survey Camp	Interpret the contours.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Work in a teamwork.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Mark a road alignment of (L-section, Cross-section) a given gradient connecting any two stations on the map	3	3	1	1	0	0	0	0	2	0	2	3	-
		Calculate the earth work	3	3	1	1	0	0	0	0	2	0	2	3	-
		Prepare a topographical plan of a given area	3	3	1	1	0	0	0	0	2	0	2	3	-
		<b>AVg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-

SEM 6	211500E 61A	IoT Concepts and Applications (CSE)	Explain the concept of IoT.	3	3	1	1	0	0	0	0	2	0	2	3	-
			Understand the communication models and various protocols for IoT.	3	3	1	1	0	0	0	0	2	0	2	3	-
			Design portable IoT using Arduino/Raspberry Pi /open platform	3	3	1	1	0	0	0	0	2	0	2	3	-
			Apply data analytics and use cloud offerings related to IoT.	3	3	1	1	0	0	0	0	2	0	2	3	-
			Analyze applications of IoT in real time scenario.	3	3	1	1	0	0	0	0	2	0	2	3	-
			<b>AVg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-
	211500E 61B	Augmented and Virtual Reality (CSE)	Understand the basic concepts of AR and VR	3	2	2	1	-	1	1	-	-	-	-	1	-
			Understand the tools and technologies related to AR/VR	2	-	-	1	-	2	2	-	-	-	-	-	-
			Know the working principle of AR/VR related Sensor devices	3	1	-	-	-	-	-	-	-	-	-	-	-
			Design of various models using modeling techniques	3	1	1	-	-	1	2	-	-	-	-	-	-
			Develop AR/VR applications in different domains	3	1	2	1	-	2	2	-	-	-	-	2	-
			<b>AVg</b>	<b>2</b> <b>.</b> <b>8</b>	<b>1</b> <b>.</b> <b>3</b>	<b>1</b> <b>.</b> <b>6</b>	<b>1</b>	<b>-</b>	<b>1</b> <b>.</b> <b>5</b>	<b>1</b> <b>.</b> <b>8</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1</b> <b>.</b> <b>5</b>	<b>-</b>
	21155C62	Design of Steel Structural Elements	Understand the concepts of various design philosophies	3	3	1	1	0	0	0	0	2	0	2	3	-
			Design common bolted and welded connections for steel structures	3	3	1	1	0	0	0	0	2	0	2	3	-
			Design tension members and understand the effect of shear lag.	3	3	1	1	0	0	0	0	2	0	2	3	-
			Understand the design concept of axially loaded columns and column base connections.	3	3	1	1	0	0	0	0	2	0	2	3	-
			Understand specific problems related to the design of laterally restrained and unrestrained steel beams.	3	3	1	1	0	0	0	0	2	0	2	3	-
			<b>AVg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-
	21155C63	Structural Analysis II	Draw influence lines for statically determinate structures and calculate critical stress resultants.	3	3	2	1	1	1	-	-	-	-	-	-	
			Understand Muller Breslau principle and draw the influence lines for statically indeterminate beams.	3	3	2	1	2	1	-	-	-	-	-	-	
			Analyse of three hinged, two hinged and fixed arches.	3	3	2	2	2	1	-	-	-	-	-	1	-
Analyse the suspension bridges with stiffening girders			3	3	1	1	2	1	-	-	-	-	-	-	-	
Understand the concept of Plastic analysis and the method of analyzing beams and rigid frames			3	3	1	1	2	1	-	-	-	-	-	-	-	

			3	3	1	1	1	1	-	-	-	-	-	1	-
		<b>AVg</b>			.6	.2	.8								
21155C64	Hydrology and Water Resource Engineering	Define the hydrological processes and their integrated behaviour in catchments	3	3	1	1	0	0	0	0	2	0	2	3	-
		Apply the knowledge of hydrological processes to address basin characteristics, runoff and hydrograph	3	3	1	1	0	0	0	0	2	0	2	3	-
		Explain the concept of hydrological extremes and its management strategies	3	3	1	1	0	0	0	0	2	0	2	3	-
		Describe the principles of storage reservoirs	3	3	1	1	0	0	0	0	2	0	2	3	-
		Understand and apply the concepts of groundwater management	3	3	1	1	0	0	0	0	2	0	2	3	-
		<b>AVg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-
21155E65 A	Prestressed Concrete Structures	Design a prestressed concrete beam accounting for losses.	3	3	2	1	1	1	-	-	-	-	-	-	-
		Design for flexure and shear	3	3	2	1	2	1	-	-	-	-	-	-	-
		Design the anchorage zone for post-tensioned members and estimate the deflection in beams.	3	3	2	2	2	1	-	-	-	-	-	1	-
		• Design composite members and continuous beams.	3	3	1	1	2	1	-	-	-	-	-	-	-
		Design water tanks, pipes, poles and sleepers.	3	3	1	1	2	1	-	-	-	-	-	-	-
		<b>AVg</b>	3	3	.6	.2	.8								
21155E65 B	Water Resources Systems Engineering	Define the economic aspects and analysis of water resources systems for comprehensive and integrated planning of a water resources project.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Apply the concept of linear programming for optimisation of water resources problems.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Explain the concept of dynamic programming and apply in water resource system.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Develop the simulation model based on deterministic and stochastic simulation for reservoir operating policy	3	3	1	1	0	0	0	0	2	0	2	3	-
		Apply advance optimisation techniques like goal programming, heuristic algorithm in the field of water resources planning and management.	3	3	1	1	0	0	0	0	2	0	2	3	-
		<b>AVg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-
21155E65 C	Remote Sensing Concepts	Understand the concepts and laws related to remote sensing	3	3	2	1	1	1	-	-	-	-	-	-	



		Understand the interaction of electromagnetic radiation with atmosphere and earth material	3	3	2	1	2	1	-	-	-	-	-	-	-
		Acquire knowledge about satellite orbits and different types of satellites	3	3	2	2	2	1	-	-	-	-	-	1	-
		Understand the different types of remote sensors	3	3	1	1	2	1	-	-	-	-	-	-	-
		Gain knowledge about the concepts of interpretation of satellite imagery	3	3	1	1	2	1	-	-	-	-	-	-	-
		<b>AVg</b>	3	3	1.6	1.2	1.8	1	-	-	-	-	-	1	-
21155E66 A	Pile Foundation	Apart from vertically loaded piles, the structures are exposed to the peculiar pile subjected to lateral and uplift load with reference to codal provision and case studies.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Understand the design of pile and pile caps, considering the wind and seismic loads.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Explain the importance of caisson foundation and checking the stability of caissons based on codal provisions.	3	3	1	1	0	0	0	0	2	0	2	3	-
		<b>AVg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-
21155E66 B	Urban Planning and Development	Understand the basic issues and meaning of terminologies in urban planning	3	3	1	1	0	0	0	0	2	0	2	3	-
		Understand the different types of theories of urban planning and city development.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Understand the different types of plan, their strategies and their preparation process.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Comprehend the planning standards, evaluate the constraints and the financial mechanism	3	3	1	1	0	0	0	0	2	0	2	3	-
		Knowledge on various town and country planning acts and their functions.	3	3	1	1	0	0	0	0	2	0	2	3	-
		<b>AVg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-
21155E66 C	Construction Equipment and Machinery	Develop knowledge on planning of equipment and selection of equipment	3	3	2	1	1	1	-	-	-	-	-	-	-
		Explain the knowledge on fundamentals of earth work operations, earth moving operations and types of earth work equipment	3	3	2	1	2	1	-	-	-	-	-	-	-
		Develop the knowledge on special construction equipment	3	3	2	2	2	1	-	-	-	-	-	1	-
		Apply the knowledge on asphalt and concrete plants	3	3	1	1	2	1	-	-	-	-	-	-	-
		Apply the knowledge and select the proper materials handling equipment	3	3	1	1	2	1	-	-	-	-	-	-	-



21147MC 61A	Well Being with Traditional Practices	Learn the importance of different components of health	3	3	1	1	0	0	0	0	2	0	2	3	-
		Gain confidence to lead a healthy life	3	3	1	1	0	0	0	0	2	0	2	3	-
		Learn new techniques to prevent lifestyle health disorders	3	3	1	1	0	0	0	0	2	0	2	3	-
		Understand the importance of diet and workouts in maintaining health	3	3	1	1	0	0	0	0	2	0	2	3	-
		<b>AVg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-
21147MC 61B	History of Science and Technology in India	The students will learn about history of science and technology in india.	3	3	1	1	0	0	0	0	2	0	2	3	-
21147MC 61C	Political and Economic Thought for a Humane Society	The students will get an understanding of how societies are shaped by philosophy, political and economic system, how they relate to fulfilling human goals & desires with some case studies of how different attempts have been made in the past and how they have fared.	3	3	1	1	0	0	0	0	2	0	2	3	-
21147MC 61D	State, Nation Building And Politics in India	It is expected that this course will make students aware of the theoretical aspect of the state, its organs, its operationalization aspect, the background and philosophy behind the founding of the present political system, broad streams and challenges of national integration and nation-building in India.	3	3	1	1	0	0	0	0	2	0	2	3	-
21147MC 61E	Safety In Engineering Industries	Understand the basic concept of safety.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Obtain knowledge of Statutory Regulations and standards.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Know about the safety Activities of the Working Place.	3	3	2	2	2	1	-	-	-	-	-	1	-
		Analyze on the impact of Occupational Exposures and their Remedies	3	3	1	1	2	1	-	-	-	-	-	-	-
		Obtain knowledge of Risk Assessment Techniques.	3	3	1	1	2	1	-	-	-	-	-	-	-
		<b>AVg</b>	3	3	1	1	1	1	-	-	-	-	-	1	-
21155L69	Building Drawing and Detailing Laboratory	Draft the plan, elevation and sectional view of the load bearing and framed buildings	3	3	2	1	1	1	-	-	-	-	-	-	
		Draw the structural detailing of RCC elements	3	3	2	1	2	1	-	-	-	-	-	-	
		Draw the structural detailing of RCC water tanks, footings and retaining walls	3	3	2	2	2	1	-	-	-	-	-	1	-
		Draw the structural detailing of steel structures	3	3	1	1	2	1	-	-	-	-	-	-	-
		Draft the structural detailing of Industrial structures	3	3	1	1	2	1	-	-	-	-	-	-	-

				3	3	1	1	1	1	-	-	-	-	-	1	-	
			<b>AVg</b>			.6	.2	.8									
<b>SEM 7</b>	21147S71	Human Values and Ethics	Identify the importance of democratic, secular and scientific values in harmonious functioning of social life	3	3	2	1	1	1	-	-	-	-	-	-	-	
			Practice democratic and scientific values in both their personal and professional life.	3	3	2	1	2	1	-	-	-	-	-	-	-	-
			Find rational solutions to social problems.	3	3	2	2	2	1	-	-	-	-	-	-	1	-
			Behave in an ethical manner in society	3	3	1	1	2	1	-	-	-	-	-	-	-	-
			Practice critical thinking and the pursuit of truth.	3	3	1	1	2	1	-	-	-	-	-	-	-	-
			<b>AVg</b>	3	3	1.6	1.2	1.8	1	-	-	-	-	-	-	1	-
	21150OE 72A	Data Science Fundamentals (CSE)	Gain knowledge on data science process	3	3	2	1	1	1	-	-	-	-	-	-	-	
			Perform data manipulation functions using Numpy and Pandas.	3	3	2	1	2	1	-	-	-	-	-	-	-	
			Understand different types of machine learning approaches.	3	3	2	2	2	1	-	-	-	-	-	1	-	
			Perform data visualization using tools	3	3	1	1	2	1	-	-	-	-	-	-	-	
			Handle large volumes of data in practical scenarios.	3	3	1	1	2	1	-	-	-	-	-	-	-	
			<b>AVg</b>	3	3	1.6	1.2	1.8	1	-	-	-	-	-	-	1	-
	21150OE 72B	Artificial Intelligence and Machine Learning Fundamentals	Understand the basic concepts of AR and VR	3	3	1	1	0	0	0	0	2	0	2	3	-	
			Understand the tools and technologies related to AR/VR	3	3	1	1	0	0	0	0	2	0	2	3	-	
			Know the working principle of AR/VR related Sensor devices	3	3	1	1	0	0	0	0	2	0	2	3	-	
			Design of various models using modeling techniques	3	3	1	1	0	0	0	0	2	0	2	3	-	
			Develop AR/VR applications in different domains	3	3	1	1	0	0	0	0	2	0	2	3	-	
			<b>AVg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-	
	21147OE 73A	English for Competitive Examinations	expand their vocabulary and gain practical techniques to read and comprehend a wide range of texts with the emphasis required	3	3	1	1	0	0	0	0	2	0	2	3	-	
			identify errors with precision and write with clarity and coherence	3	3	1	1	0	0	0	0	2	0	2	3	-	
			understand the importance of task fulfilment and the usage of task-appropriate vocabulary	3	3	1	1	0	0	0	0	2	0	2	3	-	



			3	3	1	1	1	1	-	-	-	-	-	1	-
		<b>Avg</b>			6	2	8								
21154OE 73B	Industrial Management	Understand the basic concepts of industrial management	3	3	1	1	0	0	0	0	2	0	2	3	-
		Identify the group conflicts and its causes.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Perform swot analysis	3	3	1	1	0	0	0	0	2	0	2	3	-
		Analyze the learning curves	3	3	1	1	0	0	0	0	2	0	2	3	-
		Understand the placement and performance appraisal	3	3	1	1	0	0	0	0	2	0	2	3	-
		<b>Avg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-
21152OE 73A	Biomedical Instrumentation	Students will learn about various kinds of biomolecules and their physiological role.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Students will gain knowledge about various metabolic disorders and will help them to know the importance of various biomolecules in terms of disease correlation.	3	3	1	1	0	0	0	0	2	0	2	3	-
21152OE 73B	Fundamentals of Electronic Devices and Circuits	Explain the structure and working operation of basic electronic devices.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Design and analyze amplifiers.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Analyze frequency response of BJT and MOSFET amplifiers	3	3	1	1	0	0	0	0	2	0	2	3	-
		Design and analyze feedback amplifiers and oscillator principles.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Design and analyze power amplifiers and supply circuits	3	3	1	1	0	0	0	0	2	0	2	3	-
		<b>Avg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-
21154OE 74A	Additive Manufacturing	Recognize the development of AM technology and how AM technology propagated into various businesses and developing opportunities.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Acquire knowledge on process vat polymerization and material extrusion processes and its applications.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Elaborate the process and applications of powder bed fusion and binder jetting.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Evaluate the advantages, limitations, applications of material jetting and directed energy deposition processes.	3	3	1	1	0	0	0	0	2	0	2	3	-
		Acquire knowledge on sheet lamination and direct write technology.	3	3	1	1	0	0	0	0	2	0	2	3	-
		<b>Avg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-
21154OE 74B	Industrial safety	Describe, with example, the common work-related diseases and accidents in occupational setting	3	3	1	1	0	0	0	0	2	0	2	3	-

		Name essential members of the Occupational Health team	3	3	1	1	0	0	0	0	2	0	2	3	-	
		What roles can a community health practitioners play in an Occupational setting to ensure the protection, promotion and maintenance of the health of the employee	3	3	1	1	0	0	0	0	2	0	2	3	-	
		<b>AVg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-	
21153OE 74A	Sensors	Understand various sensor effects, sensor characteristics, signal types, calibration methods and obtain transfer function and empirical relation of sensors. They can also analyze the sensor response.	3	3	1	1	0	0	0	0	2	0	2	3	-	
		Analyze and select suitable sensor for displacement, proximity and range measurement.	3	3	2	1	2	1	-	-	-	-	-	-	-	-
		Analyze and select suitable sensor for force, magnetic field, speed, position and direction measurement.	3	3	2	2	2	1	-	-	-	-	-	-	1	-
		Analyze and Select suitable sensor for light detection, pressure and temperature measurement and also familiar with other miniaturized smart sensors.	3	3	1	1	2	1	-	-	-	-	-	-	-	-
		Select and design suitable signal conditioning circuit with proper compensation and linearizing element based on sensor output signal.	3	3	1	1	2	1	-	-	-	-	-	-	-	-
		<b>AVg</b>	3	3	1 . 6	1 . 2	1 . 8	1	-	-	-	-	-	-	1	-
21153OE 74B	Electrical, Electronic and Magnetic materials	Understand various types of dielectric materials, their properties in various conditions.	3	3	2	1	1	1	-	-	-	-	-	-	-	
		Evaluate magnetic materials and their behavior	3	3	2	1	2	1	-	-	-	-	-	-	-	
		Evaluate semiconductor materials and technologies.	3	3	2	2	2	1	-	-	-	-	-	-	1	-
		Select suitable materials for electrical engineering applications.	3	3	1	1	2	1	-	-	-	-	-	-	-	-
		Identify right material for optical and optoelectronic applications	3	3	1	1	2	1	-	-	-	-	-	-	-	-
		<b>AVg</b>	3	3	1 . 6	1 . 2	1 . 8	1	-	-	-	-	-	-	1	-
21152OE 77B	Medical Informatics	Explain the structure and functional capabilities of Hospital Information System.	3	3	1	1	0	0	0	0	2	0	2	3	-	
		Describe the need of computers in medical imaging and automated clinical laboratory.	3	3	1	1	0	0	0	0	2	0	2	3	-	

			Articulate the functioning of information storage and retrieval in computerized patient record system.	3	3	1	1	0	0	0	0	2	0	2	3	-
			Apply the suitable decision support system for automated clinical diagnosis.	3	3	1	1	0	0	0	0	2	0	2	3	-
			Discuss the application of virtual reality and telehealth technology in medical industry.	3	3	1	1	0	0	0	0	2	0	2	3	-
			<b>AVg</b>													
	21155C75	Estimation , Costing & Valuation Engineering	Estimate the quantities for buildings,	3	3	2	1	1	1	-	-	-	-	-	-	-
			Rate Analysis for all Building works, canals, and Roads and Cost Estimate.	3	3	2	1	2	1	-	-	-	-	-	-	-
			Understand types of specifications, principles for report preparation, tender notices types.	3	3	2	2	2	1	-	-	-	-	-	1	-
			Gain knowledge on types of contracts	3	3	1	1	2	1	-	-	-	-	-	-	-
			Evaluate valuation for building and land.	3	3	1	1	2	1	-	-	-	-	-	-	-
			<b>AVg</b>	3	3	1.6	1.2	1.8	1	-	-	-	-	-	1	-
	21149S46	Environmental Sciences and Sustainability	carry out scoping and screening of developmental projects for environmental and social assessments	3	3	1	1	0	0	0	0	2	0	2	3	-
			explain different methodologies for environmental impact prediction and assessment	3	3	1	1	0	0	0	0	2	0	2	3	-
			plan environmental impact assessments and environmental management plans	3	3	1	1	0	0	0	0	2	0	2	3	-
			evaluate environmental impact assessment reports	3	3	1	1	0	0	0	0	2	0	2	3	-
			<b>AVg</b>	3	3	1	1	0	0	0	0	2	0	2	3	-
	21160S77	Total quality management	The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.	3	3	1	1	0	0	0	0	2	0	2	3	-
			Development of critical thinking and synergistic research approach.	3	3	1	1	0	0	0	0	2	0	2	3	-
<b>SEM 8</b>	21155PW 81	Project Work	On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.	3	3	1	1	0	0	0	0	2	0	2	3	-









	19155H25P	Soil Mechanics	Classify the soil and assess the engineering properties, based on index properties.	✓	✓					✓	✓	✓	✓	
			Understand the stress concepts in soils							✓	✓			
			Understand and identify the settlement in soils.	✓	✓							✓		
			Determine the shear strength of soil										✓	
			Analyze both finite and infinite slopes.			✓					✓			
	19155H32P	Design of reinforced concrete structures-I	The student shall be in a position to design the basic elements of reinforced concrete structures.	✓	✓					✓	✓			
	19155H33P	Structural Analysis I	Students will be able to analysis trusses, frames and arches	✓	✓	✓	✓	✓				✓	✓	
Students will be able to analyse structures for moving loads and				✓	✓	✓	✓							
Students will be able to will be conversant with classical methods of analysis.			✓	✓	✓	✓					✓	✓		
19155H34P	Construction Materials and Practices	Compare the properties of most common and advanced building materials.	✓			✓		✓				✓		
		understand the typical and potential applications of lime, cement and aggregates				✓		✓				✓		
		Know the production of concrete and also the method of placing and making of concrete elements.	✓	✓										
		understand the applications of timbers and other materials	✓			✓								
		Understand the importance of modern material for construction.				✓			✓					
19155L35P	Soil Mechanics Lab	Students are able to conduct tests to determine both the index and engineering properties of soils and to characterize the soil based on their properties.			✓		✓	✓						
IV	19155H41P	Design of reinforced concrete structures-II	The student shall have a comprehensive design knowledge related to various structural systems.	✓		✓		✓			✓			
	19155H42P	Structural Analysis II	The student will have the knowledge on advanced methods of analysis of structures including space and cable structures.		✓	✓	✓	✓						
	19155H43P	Environmental Engineering	an insight into the structure of drinking water supply systems, including water transport, treatment and distribution			✓	✓	✓	✓				✓	
			the knowledge in various unit operations and processes in water					✓						



		Understand specific problems related to the design of laterally restrained and unrestrained steel beams.	✓									
19155H52P	Foundation Engineering	Understand the site investigation, methods and sampling.		✓		✓			✓		✓	✓
		Get knowledge on bearing capacity and testing methods.									✓	
		Design shallow footings.		✓					✓			
		Determine the load carrying capacity, settlement of pile foundation.				✓						
		Determine the earth pressure on retaining walls and analysis for stability.							✓			✓
19155H53P	Industrial Waste Management	understanding of the nature and characteristics of municipal solid wastes and the regulatory requirements regarding municipal solid waste management.	✓			✓			✓			
		Reduction, reuse and recycling of waste.										
		ability to plan and design systems for storage, collection, transport, processing and disposal of municipal solid waste.								✓		✓
		knowledge on the issues on solid waste management from an integrated and holistic perspective, as well as in the local and international context.				✓			✓			
		Design and operation of sanitary landfill.					✓			✓		
19155H54AP	Computer Aided Analysis And Design	At the end of the course the student acquires hands on experience in design and preparation of structural drawings for concrete / steel structures normally encountered in Civil Engineering practice.	✓			✓			✓			
19155E54BP	Transportation Engineering	Design flexible and rigid pavements.		✓				✓				
		Understand the concept of pavement management system, evaluation of distress and maintenance of pavements.				✓			✓			
		Analyze and design the elements for orientation of runways and passenger facility systems.				✓			✓		✓	
		Understand the various features in Harbours and Ports, their construction, coastal protection works and coastal Regulations to be adopted.					✓			✓		✓
19155E54CP	Geology	Will be able to understand the importance of geological knowledge such as earth, earthquake, volcanism and the action of various geological agencies.				✓			✓			✓
		Will get basics knowledge on properties of minerals.	✓				✓					✓



	19155H63P	Construction Project Management	The student should be able to plan construction projects, schedule the activities using network diagrams, determine the cost of the project, control the cost of the project by creating cash flows and budgeting and to use the project information as decision making tool.	✓	✓	✓	✓							✓	✓	
	19155E64AP	Remote Sensing And GIS	Principles of Remote Sensing and GIS	✓	✓										✓	
			Analysis of RS and GIS data and interpreting the data for modeling applications	✓	✓	✓	✓								✓	
	19155E64BP	Railway Engineering	Understand the methods of route alignment and design elements in Railway Planning and Constructions.	✓	✓	✓		✓	✓	✓	✓	✓	✓			
			Understand the Construction techniques and Maintenance of Track laying and Railway stations.				✓									✓
	19155E64CP	Airport & Harbours	Gain an insight on the planning and site selection of Airport Planning and design.	✓	✓										✓	
			Analyze and design the elements for orientation of runways and passenger facility systems.	✓	✓	✓	✓								✓	
			Understand the various features in Harbours and Ports, their construction, coastal protection works and coastal Regulations to be adopted.	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		
	19155E64DP	Electronic Surveying	Understand the advantages of electronic surveying over conventional surveying methods	✓	✓										✓	
			Understand the working principle of GPS, its components, signal structure, and error sources	✓	✓	✓	✓								✓	
			Understand various GPS surveying methods and processing techniques used in GPS	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		
	19155L65P	Concrete & Transportation Engineering Laboratory	Student knows the techniques to characterize various pavement materials through relevant tests.	✓	✓	✓	✓								✓	
VII	19160S71P	Total Quality Management	The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.	✓				✓	✓					✓	✓	
	19155C72P	Housing, Planning & Management	The students should have a comprehensive knowledge of planning, design, evaluation, construction and financing of housing projects.		✓			✓	✓					✓	✓	



19155C73P	Repair And Rehabilitation of Structures	Students must gained knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.	✓			✓	✓			✓	✓		
19155E74AP	Air Pollution Management	an understanding of the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management	✓			✓	✓			✓		✓	
		ability to identify, formulate and solve air and noise pollution problems		✓			✓	✓				✓	✓
		ability to design stacks and particulate air pollution control devices to meet applicable standards.	✓			✓	✓			✓	✓		
19155E74BP	Pre Fabricated Structures	The student shall be able to design some of the prefabricated elements and also have the knowledge of the construction methods in using these elements.	✓			✓	✓			✓		✓	
19155E74CP	Bridge Structures	To develop an understanding of an appreciation for basic concepts in proportioning and design of bridges in terms of aesthetics, geographical location and functionality.	✓			✓	✓			✓	✓		
		To help the student develop an intuitive feeling about the sizing of bridge elements,ie., develop a clear understanding of conceptual design	✓			✓	✓			✓		✓	
		To understand the load flow mechanism and identify loads on bridges.		✓			✓	✓				✓	✓
		To carry out a design of bridge starting from conceptual design, selecting suitable bridge,geometry to sizing of its elements.			✓			✓	✓				✓
19155E74DP	Prestressed Concrete Structures	Student shall have a knowledge on methods of prestressing and able to design various prestressed concrete structural elements.		✓			✓	✓			✓	✓	
19155P75P	Project Work	On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.	✓			✓	✓			✓	✓		



**DEPARTMENT OF CIVIL ENGINEERING**  
**1.1.1 -CO-PO-PSO MAPPING**

**M.TECH STRUCTURAL ENGINEERING (P.T)- 2019R**

Sem	Course Code	Title of the Course	COs	POS												
				PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10			
I	19248S11EP	Advanced Engineering Mathematics	The course aim to develop the skills of the students in the areas of boundary value problems and transform techniques. The course will also serve as a prerequisite for post Graduate and specialized studies and research.							✓				✓		
			Be capable of mathematically formulating certain practical problems in terms of partial differential equations, solve them and physically interpret the results.	✓									✓		✓	
			Have learnt the basics of Z – transform in its applicability to discretely varying functions, gained the skill to formulate certain problems in terms of differences equations.					✓		✓			✓			
	19255H12P	Quality Control & Assurance in Construction	To understand the elements of quality planning and the implication			✓			✓							
			To become aware of objectives and advantage of quality assurance						✓		✓			✓		
			To be exposed to means of quality control				✓		✓							
	19255H13P	Theory of Plasticity and Elasticity	To study the relationship between quality control and assurance	✓					✓		✓			✓		
	19255L14P	Core Practical (Computer Programming Lab)	To learn design and preparation of structural drawing of concrete and steel structures (STADD-PRO).			✓					✓		✓			

	19255CRSP	Research Led Seminar	To impart knowledge to analyze solve, design and Civil Engineering drawings using AutoCAD.						✓			✓			✓			
			Exposure to various research domains									✓	✓		✓			
			Acquaintance with languages of research									✓						
II																		
	19255H21P	Management Information System	Development of research aptitude				✓				✓			✓				
			To bring about an exposure to information systems in a formal manner				✓				✓			✓				
			To study the development of information systems						✓					✓		✓		
			To study the means of applying information systems models to project management				✓				✓			✓				
	19255H22P	Finite Element Analysis	To introduce system audit and to study its features				✓					✓			✓			
	19255E23AP	Failure Analysis of Structures	Ability to design structure to prevent failure from the internal defect that unit within the structure									✓			✓			✓
			Ability to design structure to prevent fatigue and creep				✓						✓			✓		
			Ability to define different deformation and related theories						✓									
	19255E23BP	Advanced Concrete Technology	To impart knowledge about the performance of concrete as structural material and the behavior, elastic and inelastic, of reinforced – concrete members and structures, designing structures safely, economically and efficiently.									✓						
	19255E23CP	Steel,Concrete Composite Structures	To learn the Performance of concrete as structural material and advanced technologies used in construction by using concrete.				✓								✓			
19255L24P	Core practical(Software Lab – Finite Element Analysis- ANSYS)	This course covers the theory and applications related to Earthquake Engineering. The broad subjects discussed in this course include earthquake response of linearly elastic and inelastic buildings, structural dynamics in building codes.								✓				✓		✓		
192TECW RP	Technical writing / Seminars	To impart knowledge to analyze solve, design and Civil Engineering drawings using FEA - ANSYS									✓	✓		✓				



IV	19255H41P	Advanced Concrete Structural Design	The finite element method is the most powerful structural analysis tool for the Civil Engineers. The basic formulation and programming technique are introduced. According to the same procedures, the different elements such as truss, beam, plate and shell are easily formulated.	✓						✓		✓		
	19255H42P	Advanced Steel Structures	Familiarity with cutting edge research trends		✓						✓		✓	
	19255E43AP	Optimization in Structural Design	This course emphasize about steel & concrete composite member, design concepts of composite box girder bridges and case studies.	✓	✓									
	19255E43BP	Design of industrial structures	At the end of this course the student shall be able to design someof the strctures used in industries.			✓	✓			✓		✓		
	19255E43CP	Elements of earthquake Engineering	Students will be trained to identify, formulate and solve complicated problem.	✓	✓									
			Students will be able to understand the role of natural calamity in the damage of structures.			✓	✓							
			Students will be able to develop the skill to analyse data and to apply the same in the practical problems.		✓	✓				✓		✓		
			Students will be able to apply the developed methodologies for the safe and stable design of structures.				✓	✓						
	19255P44P	Project Work Phase-I	This course introduces the properties of materials, strength and elastic behavior of composite lamina and design of composite structures.		✓									
			Sensitization of social needs for innovation		✓				✓					
Team work towards interdisciplinary synchronous research strategy										✓				
V	19255E51AP	Experimental Stress Analysis	Introduction to steel structure, tensioned member, compressed member, beam, design of beam and column, bolt jointing, welding jointing and other joint design.	✓										
	19255E51BP	Soil Structure Interaction	At the end of the semester students can learn about the strain gauges, strain rosetters, model analysis, calibration of photo elastic materials.	✓			✓							
	19255E51CP	Aseismic Design of structures							✓		✓			

	19255E52AP	Prefabricated Structures	This course explains about design principles of Prefabricated Structures, components, application of prefabricated structures. Students can learn the usage of prefabricated structures in wall panels, industrial buildings and shell roofs.						✓					
	19255E52BP	Disaster Resistant Structures	This course explains about design principles of Prefabricated Structures, components, application of prefabricated structures. Students can learn the usage of prefabricated structures in wall panels, industrial buildings and shell roofs.			✓			✓		✓			
	19255E52CP	Non Linear Analysis of Structures	This course deals the philosophy of the design of disaster resistant structures such as dams , bridges and emphasize about the rehabilitation , retrofitting and damage assessment of structures.	✓			✓			✓		✓		
	19255E53AP	Offshore Structures	This course deals about the non –linearities, non-linear equations and non linear static analysis of plates, columns, trusses and frames						✓					
	19255E53BP	Stability of Structures	This course includes the details of wave theories, forces in offshore structures and design and analysis of offshore structures .	✓										
	19255E53CP	Mechanics of Composite Materials	This course deals with the concept and characteristics of stability problems and behavior of torsional buckling and lateral buckling in beams and columns.			✓				✓		✓		
VI	19255P61P	Project Work Phase-II	On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.	✓		✓				✓	✓		✓	



**DEPARTMENT OF CIVIL ENGINEERING**  
**1.1.1 -CO-PO-PSO MAPPING**

**M.TECH STRUCTURAL ENGINEERING(F.T)- 2019R**

Sem	Course Code	Title of the Course	COs	POS												
				PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10			
I	19248S11E	Advanced Engineering Mathematics	The course aim to develop the skills of the students in the areas of boundary value problems and transform techniques. The course will also serve as a prerequisite for post Graduate and specialized studies and research.								✓	✓				
			Be capable of mathematically formulating certain practical problems in terms of partial differential equations, solve them and physically interpret the results.	✓												
			Have learnt the basics of Z – transform in its applicability to discretely varying functions, gained the skill to formulate certain problems in terms of differences equations.					✓		✓					✓	
	19255H12	Quality Control & Assurance in Construction	To understand the elements of quality planning and the implication			✓			✓							
			To become aware of objectives and advantage of quality assurance			✓			✓		✓					
			To be exposed to means of quality control													
			To study the relationship between quality control and assurance				✓		✓		✓					
	19255H13	Theory of Plasticity and Elasticity	Emphasis is placed on static problems with linear material and small deformation. Many basic 2-D problems (such as plane strain and plane stress) and 3-D problems.	✓							✓			✓		
	19255H14	Structural Dynamics	This course covers the methods for analyzing the stresses and deflections developed in any given type of structures when it is subjected to an arbitrary dynamic loading.					✓		✓				✓		

	19255H15	Maintenance and Rehabilitation of Structures	Introduction to the governmental quality assurance regulations for public works. Application of quality control concepts, statistical experimental design principles to the construction process to minimize project costs and improve quality.							✓		✓			
	19255E1A	Prestressed Concrete Structures	This course introduces students to the fundamental principles of pre-stressed concrete behavior and design, So that they can act effectively to optimize existing forms of construction and apply fundamental concepts with confidence in unusual and challenging situations.		✓				✓		✓			✓	
	19255E16B	High Rise Structures	This course covers the design criteria and loading pattern on high rise structures, behavior of structural systems and stability, design and analysis of tall buildings.	✓						✓			✓		
	19255E16C	Computer Aided Structural Design	To learn design and preparation of structural drawing of concrete and steel structures (STADD-PRO).	✓						✓	✓			✓	
	19255L19	Core Practical (Computer Programming Lab)	To impart knowledge to analyze solve, design and Civil Engineering drawings using AutoCAD.			✓					✓			✓	
	19255CRS	Research Led Seminar	Exposure to various research domains			✓					✓			✓	
Acquaintance with languages of research									✓						
Development of research aptitude									✓				✓		
<b>II</b>	19255H21	Management Information System	To bring about an exposure to information systems in a formal manner			✓						✓			
			To study the development of information systems				✓								
			To study the means of applying information systems models to project management					✓				✓			
			To introduce system audit and to study its features			✓						✓			✓
	19255H22	Finite Element Analysis	The finite element method is the most powerful structural analysis tool for the Civil Engineers. The basic formulation and programming technique are introduced. According to the same procedures, the different elements such as truss, beam, plate and shell are easily formulated.				✓					✓			
19255H23	Advanced Concrete Structural Design	To impart knowledge about the performance of concrete as structural material and the behavior, elastic and inelastic, of reinforced – concrete members and structures, designing	✓							✓			✓		





		strain rosetters, model analysis, calibration of photo elastic materials.												
	19255E32B	Soil Structure Interaction	This course deals with the soil-foundation interaction, analysis of beams and finite plates, elastic analysis of pile, load deflection for laterally loaded pile.	✓			✓			✓				✓
	19255E33 A	Prefabricated Structures	This course explains about design principles of Prefabricated Structures, components, application of prefabricated structures. Students can learn the usage of prefabricated structures in wall panels, industrial buildings and shell roofs.						✓	✓			✓	
	19255E33B	Disaster Resistant Structures	This course deals the philosophy of the design of disaster resistant structures such as dams , bridges and emphasize about the rehabilitation , retrofitting and damage assessment of structures.				✓					✓		
	19255E33C	Non Linear Analysis of Structures	This course deals about the non – linearities, non-linear equations and non linear static analysis of plates, columns, trusses and frames	✓			✓							
	19255E34 A	Offshore Structures	This course includes the details of wave theories, forces in offshore structures and design and analysis of offshore structures .							✓				
	19255E34B	Stability of Structures	This course deals with the concept and characteristics of stability problems and behavior of torsional buckling and lateral buckling in beams and columns.	✓								✓		✓
	19255E34C	Mechanics of Composite Materials	This course introduces the properties of materials, strength and elastic behavior of composite lamina and design of composite structures.				✓							
	19255P35	Project Work Phase-I	Sensitization of social needs for innovation		✓				✓		✓			✓
			Team work towards interdisciplinary synchronous research strategy								✓			
	19255CSR	Design / Socio - Technical Project	Development of critical thinking and synergistic research approach.	✓						✓	✓			✓
<b>IV</b>	19255P41	Project Work Phase-II	On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.	✓			✓			✓	✓			✓