

**UTKAL GOURAV MADHUSUDAN INSTITUTE OF TECHNOLOGY, RAYAGADA**  
**Academic Lesson Plan for 2nd Semester - 2024 (Summer)**

Name of the teaching faculty: Sri Pradeep Kumar Tripathy,  
 Lecturer (Mathematics)

Dept.: Department of Mathematics & Science

Semester: 2nd

Subject: Theory 3: Engg. Mathematics-II

No of Periods per week: 5 + 1(Tutorial) = 6,

End semester Exam. : 80 Marks,

Total Marks: 100 Marks

Total Periods: 75,

Class test: 20 Marks,

Week	Period	Unit / Chapter	Topics to be covered
1st	1 <sup>st</sup>	Unit-2	<b>Unit-2: Limits and Continuity</b> Introduction to Set theory and Cartesian product, Introduction to Relation
	2 <sup>nd</sup>	Unit-2	Introduction to function, Domain, Co-domain, Range, Types of function
	3 <sup>rd</sup>	Unit-2	Introduction to Limits, Left & Right hand limits, Solve related problems.
	4 <sup>th</sup>	Unit-2	Existence of limit, Solve related Problems.
	5 <sup>th</sup>	Unit-2	Method of evaluation of limits, Discuss the types of limits i.e. algebraic limits, trigonometry limits, logarithmic and exponential limits. Evaluation of algebraic limits, Methods to evaluate the algebraic limits i.e. Direct method, Factorization method, Rationalisation method, Using some standard result and evaluation of algebraic limits using $x \rightarrow \infty$ . Direct Method & related problems. Factorisation Method & solve related problems.
	6 <sup>th</sup> (T)		Doubt Clear / revision class
2nd	1 <sup>st</sup>	Unit-2	Rationalisation Method & solve related problems.
	2 <sup>nd</sup>	Unit-2	Using Standard result & solve related problems.
	3 <sup>rd</sup>	Unit-2	Evaluation of algebraic limits using $x \rightarrow \infty$ &

			Solve related problems.
	4 <sup>th</sup>	Unit-2	Evaluation of Trigonometric limits, related formula & Solve related problems.
	5 <sup>th</sup>	Unit-2	Solve more trigonometric limit problems.
	6 <sup>th</sup> (T)		Solve logarithmic and exponential limits, related formula & Solve related problems.
3 <sup>rd</sup>	1 <sup>st</sup>	Unit-2	Definition of continuity of a function at a point and Solve related problems.
	2 <sup>nd</sup>	Unit-2	Solve the problems based on continuity of a function.
	3 <sup>rd</sup>	Unit-3	<b>Unit-3: Derivatives</b> Introduction to Derivative of a function at a point, Geometrical meaning of derivative, Algebra of derivative.
	4 <sup>th</sup>	Unit-3	Derivative of standard functions
	5 <sup>th</sup>	Unit-3	Solve related problems on simple functions.
	6 <sup>th</sup> (T)		Copy checking and Test based on Limits and continuity
4 <sup>th</sup>	1 <sup>st</sup>	Unit-3	Solve related problems on simple functions.
	2 <sup>nd</sup>	Unit-3	Derivative of composite functions (Chain Rule), and solve related problems.
	3 <sup>rd</sup>	Unit-3	Solve more problems based on Chain rule.
	4 <sup>th</sup>	Unit-3	Solve more problems based on Chain rule.
	5 <sup>th</sup>	Unit-3	Derivative of Inverse trigonometric functions and solve related problems.
	6 <sup>th</sup> (T)		Doubt Clear Class
5 <sup>th</sup>	1 <sup>st</sup>	Unit-3	Derivative of inverse trigonometric functions by substitution and solve related problems.
	2 <sup>nd</sup>	Unit-3	Derivative of implicit functions and solve related problems.
	3 <sup>rd</sup>	Unit-3	Derivative of functions by using logarithmic

			and solve related problems.
	4 <sup>th</sup>	Unit-3	Derivative of parametric functions and solve related problems.
	5 <sup>th</sup>	Unit-3	Derivative of a functions w.r.t. another function and solve related problems.
	6 <sup>th</sup> (T)		Copy checking and doubt clearing class based on derivative.
6th	1 <sup>st</sup>	Unit-3	Introduction to Successive Differentiation and solve related problems (up to second order).
	2 <sup>nd</sup>	Unit-3	Solve more problems based on higher order derivatives.
	3 <sup>rd</sup>	Unit-3	Introduction and definitions to partial differentiation, Solve simple problems on partial derivatives.
	4 <sup>th</sup>	Unit-3	Solve problems based on partial derivative.
	5 <sup>th</sup>	Unit-3	Definition of homogeneous functions, Euler's theorem on homogeneous functions. Solve related problems on it (functions of two variables up to second order).
	6 <sup>th</sup> (T)		Copy Checking and Doubt clear class
7th	1 <sup>st</sup>	Unit-4	<b>Unit-4: Integration</b> Introduction to primitive or anti-derivative, Definition of indefinite integral, Fundamental of integration formula. Solve to integrate some simple functions. Algebra of integration.
	2 <sup>nd</sup>	Unit-4	Solve to integrate some simple functions.
	3 <sup>rd</sup>	Unit-4	Solve related problems.
	4 <sup>th</sup>	Unit-4	Methods of integration i.e. Integration by substitution and Integration by parts. Explain integration by substitution, Integrals of the form $\int f(ax + b) dx$ and solve related problems.

	5 <sup>th</sup>	Unit-4	Evaluate integrals of the form $\int \sin^m x dx$ and $\int \cos^m x dx$ , where $m \leq 4$ and solve related problems.
	6 <sup>th</sup> (T)		Doubt Clear Class
8 <sup>th</sup>	1 <sup>st</sup>	Unit-4	Evaluate integrals of the form $\int \sin mx \cos nx dx$ , $\int \sin mx \sin nx dx$ , $\int \cos mx \sin nx dx$ and $\int \cos mx \cos nx dx$ and solve related problems.
	2 <sup>nd</sup>	Unit-4	Evaluate integrals of the form $\int \frac{f'(x)}{f(x)} dx$ , Some standard results: Integrate $\tan x$ , $\cot x$ , $\sec x$ and $\operatorname{cosec} x$ . and solve related problems.
	3 <sup>rd</sup>	Unit-4	Solve related problems.
	4 <sup>th</sup>	Unit-4	Evaluate integrals of the form $\int \{f(x)\}^n f'(x) dx$ , and solve related problems.
	5 <sup>th</sup>	Unit-4	Evaluate integrals of the form $\int \sin^m x \cos^n x dx$ , where $m, n \in \mathbb{A}^+$ and solve related problems.
	6 <sup>th</sup> (T)		Doubt Clear Class
9 <sup>th</sup>	1 <sup>st</sup>	Unit-4	Evaluation of some special integrals of the type $\int \frac{1}{x^2+a^2} dx$ , $\int \frac{1}{x^2-a^2} dx$ , $\int \frac{1}{a^2-x^2} dx$ $\int \frac{1}{\sqrt{a^2-x^2}} dx$ , $\int \frac{1}{\sqrt{x^2+a^2}} dx$ , $\int \frac{1}{\sqrt{x^2-a^2}} dx$ and $\int \frac{1}{x\sqrt{x^2-a^2}} dx$ Solve related problems.
	2 <sup>nd</sup>	Unit-4	Evaluation of integrals of the form $\int \frac{1}{ax^2+bx+c} dx$ and $\int \frac{1}{\sqrt{ax^2+bx+c}} dx$ and solve related problems.
	3 <sup>rd</sup>	Unit-4	Evaluation of the integrals reducible to the form $\int \frac{1}{ax^2+bx+c} dx$ and $\int \frac{1}{\sqrt{ax^2+bx+c}} dx$ and solve related problems.

	4 <sup>th</sup>	Unit-4	Evaluate integrals of the form $\int \frac{px+q}{ax^2+bx+c} dx$ and solve related problems.
	5 <sup>th</sup>	Unit-4	Evaluate integrals of the form $\int \frac{P(x)}{ax^2+bx+c} dx$ , where $P(x)$ is a polynomial of degree $\geq 2$ . and solve related problems.
	6 <sup>th</sup> (T)		Doubt clear class
10 <sup>th</sup>	1 <sup>st</sup>	Unit-4	Evaluate integrals of the form $\int \frac{px+q}{\sqrt{ax^2+bx+c}} dx$ and solve related problems.
	2 <sup>nd</sup>	Unit-4	Evaluate integrals of the form $\int \frac{1}{a \sin^2 x + b \cos^2 x} dx$ , $\int \frac{1}{a + b \sin^2 x} dx$ , $\int \frac{1}{a + b \cos^2 x} dx$ , $\int \frac{1}{(a \sin x + b \cos x)^2} dx$ and $\int \frac{1}{a + b \sin^2 x + c \cos^2 x} dx$ and solve related problems.
	3 <sup>rd</sup>	Unit-4	Evaluate integrals of the form $\int \frac{1}{a \sin x + b \cos x} dx$ , $\int \frac{1}{a + b \sin x} dx$ , $\int \frac{1}{a + b \cos x} dx$ and $\int \frac{1}{a \sin x + b \cos x + c} dx$ and solve related problems.
	4 <sup>th</sup>	Unit-4	Evaluate integrals of the form $\int \frac{a \sin x + b \cos x}{c \sin x + d \cos x} dx$ and $\int \frac{a \sin x + b \cos x + c}{p \sin x + q \cos x + r} dx$ and solve related problems.
	5 <sup>th</sup>	Unit-4	Integrals by parts and solve related problems.
	6 <sup>th</sup> (T)	Unit-4	Solve related problems on it.
11 <sup>th</sup>	1 <sup>st</sup>	Unit-4	Solve related problems on it.
	2 <sup>nd</sup>	Unit-4	Evaluate integrals of the form $\int e^x \{f(x) + f'(x)\} dx$ and solve related problems. Evaluate integrals of the type $\int e^{ax} \sin(bx + c) dx$ and $\int e^{ax} \cos(bx + c) dx$ and solve related problems.
	3 <sup>rd</sup>	Unit-4	Evaluate integrals of the type

			$\int \sqrt{a^2 - x^2} dx$ , $\int \sqrt{a^2 + x^2} dx$ , $\int \sqrt{x^2 - a^2} dx$ , $\int \sqrt{ax^2 + bx + c} dx$ and solve related problems.
	4 <sup>th</sup>	Unit-4	Evaluate integrals of the form $\int (px + q) \sqrt{ax^2 + bx + c} dx$ and solve related problems.
	5 <sup>th</sup>	Unit-4	Introduction to Definite Integral, Algebra of definite integral and solve related problems.
	6 <sup>th</sup> (T)	Unit-4	Properties of definite integrals and solve related problems on it.
12 <sup>th</sup>	1 <sup>st</sup>	Unit-4	Application of integration and area enclosed by a curve and x-axis, and circle with centre at origin. Solve related problems.
	2 <sup>nd</sup>	Unit-5	<b>Unit-5: Differential Equation</b> Definition of Differential Eqn., Order and Degree, Form the differential eqn.,
	3 <sup>rd</sup>	Unit-5	Solve the differential eqn. of 1 <sup>st</sup> order and 1 <sup>st</sup> degree eqn. By using variable separation method.
	4 <sup>th</sup>	Unit-5	Definition of Linear differential eqn. and solve the problems on $\frac{dy}{dx} + Py = Q$ , where P and Q functions of x.
	5 <sup>th</sup>	Unit-5	Solve problems on differential eqns.
	6 <sup>th</sup> (T)		Copy Checking and Doubt Clear Class.
13 <sup>th</sup>	1 <sup>st</sup>	Unit-1	<b>Unit-1: Vector Algebra</b> Introduction, Types of vectors, Representation of vector, Magnitude and direction of vectors, Addition and Subtraction of vectors, Position Vectors.
	2 <sup>nd</sup>	Unit-1	Solve related problems.
	3 <sup>rd</sup>	Unit-1	Solve related problems.
	4 <sup>th</sup>	Unit-1	Definition of Scalar product of two vectors, Geometrical meaning of dot product,

			Angle between two vectors, Properties of dot/scalar product of two vectors Scalar and Vector projection of two vectors. Solve problems on it.
	5 <sup>th</sup>	Unit-1	Solve related problems on scalar product.
	6 <sup>th</sup> (T)	Unit-1	Solve related problems on scalar product.
14 <sup>th</sup>	1 <sup>st</sup>	Unit-1	Definition of Vector Product, Geometrical meaning of vector product. Properties of vector product.
	2 <sup>nd</sup>	Unit-1	Solve related problems on vector product.
	3 <sup>rd</sup>	Unit-1	Solve related problems on vector product.
	4 <sup>th</sup>	Unit-1	Copy Checking and Test on Unit-1: Vector Algebra.
	5 <sup>th</sup>		Revision on Limits and continuity.
	6 <sup>th</sup> (T)		Revision on Differentiation.
15 <sup>th</sup>	1 <sup>st</sup>		Revision on Application of Differentiation.
	2 <sup>nd</sup>		Revision on Integration (Indefinite Integral).
	3 <sup>rd</sup>		Revision on Integration (Definite Integral).
	4 <sup>th</sup>		Revision on Differential Equation.
	5 <sup>th</sup>		Revision on Vector Algebra.
	6 <sup>th</sup> (T)		Revision on Vector Algebra.

Pradeep Kumar Tripathy,  
Lecturer in Mathematics,  
Dept. of Mathematics & Science,  
UGMIT, Rayagada