M3 - MICRO LESSON PLAN

Subject : **MATHEMATICS-III**		
Year : I B-Tech	Semester : II	Branch :EEE
Faculty : **S P V N D SUMALATHA**	Reg : R20	Academic Year : **2021-2022**

COURSE OBJECTIVES:

In this course the students can Perform calculations and algebraic manipulations, particularly differentiation and integration, quickly and accurately. StudentsUse the language of mathematics to communicate mathematical ideas, using symbols and notations correctly, and presenting solutions in a clear and organized way. Use concepts of calculus to the model real-world problems. : Make connections between different mathematical concepts, such as geometric, analytic and numerical interpretations of functions, derivatives and integrals. : Develop ability to understand and create rigorous formal mathematical arguments. Apply basic mathematical logic.

COURSE OUTCOMES:

1	**Factual**	Interpret the physical meaning of different operators such as gradient, curl and divergence Estimate the work done against a field, circulation and flux using vector calculus
2	**Conceptual**	Apply the Laplace transform for solving differential equations
3	**Procedural**	Find or compute the Fourier series of periodic signals
4	**Applied**	Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms Identify solution methods for partial differential equations that model physical processes

TEXT BOOKS/ REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
T	**B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.**
T	B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
R	Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
R	**Dean. G. Duffy**, Advanced Engineering Mathematics with MATLAB, 3rd Edition, CRC Press.
R	**Peter O' Neil**, Advanced Engineering Mathematics, Cengage.
R	**Srimantha Pal, S C Bhunia,** Engineering Mathematics, Oxford University Press.

UNIT – 1: Vector calculus [Total Classes : 11]

Activity:

1	**Factual**	Compute dot product, cross product, length of vectors. Estimate a derivative, integral or quantity defined by a vector field, given the graph of a function or vector field.
2	**Conceptual**	Can Compute partial derivatives, derivatives of vector-valued functions, gradient functions.
3	**Procedural**	Optimize a function of two or more variables, organizing work into main steps, carefully justifying determination of critical points
4	**Applied**	Use concepts of calculus to the model real-world problems. : Make connections between different mathematical concepts, such as geometric, analytic and numerical interpretations of functions, derivatives and integrals.

Activity / Schedule of UNIT-1 :

Pre-Class : Videos, E-books, Web links etc…
In-Class : Explanation on concept, discussion, Poll, doubts clarification, Demo etc..
Post-Class : Discussion Forum, Review on topic, Assessment, Quiz, Notes etc….

CLASS SL NO	CONCEPT	OBJECTIVES	PRE-CLASS	IN-CLASS	POST-CLASS
1.	Introduction to vector calculus	To introduce Basic concepts of dot product and cross product	VIDEO LINK: https://www.slideshare.net/AshrafulTauhid/dot-cross-product-of-vectors	Discussion on pre-requisites (5 Min) PPT presentation (30 Min) Discussion or **Poll activity** (5 min) Summary (5min) Doubts clari-fication (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic
2.	Vector Differentiation: Gradient	To Understand the concept of differentiation of vectors in scalar field.	VIDEO LINK: https://www.youtube.com/watch?v=NomUbVmmyro	Discussion on pre-requisites (5 Min) PPT presentation (30 Min) Discussion or **Poll activity** (5 min) Summary (5min) Doubts clari-fication (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic
3.	Directional derivatives	To Understand the concept of derivatives in vector field	Video Link : https://www.slideserve.com/rhian/directional-derivatives-and-the-gradient-vector	Discussion on pre-requisites (5 Min) PPT presentation (30 Min) Discussion or **Poll activity** (5 min) Summary (5min) Doubts clari-fication (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic
4.	Divergence	To Understand the concept of	Video Link : https://en.wikipedia.org/wiki/Divergence	Discussion on pre-requisites (5 Min) PPT presentation	Discussion Forum on the topic in the group

		Divergence of fluid in vector field		(30 Min) Discussion or **Poll activity** (5 min) Summary (5min) Doubts clari-fication (10 min)	Review on the topic Share material on the topic
5.	Curl:scalar potential;	To Understand the concept of curl ,curl and irrotational	Video Link : https://mathinsight.org/curl_idea	Discussion on pre-requisites (5 Min) PPT presentation (30 Min) Discussion or **Poll activity** (5 min) Summary (5min) Doubts clari-fication (10 min)	. Discussion Forum on the topic in the group Review on the topic Share material on the topic
6.	Line integral	To Understand the concept of work done by force by curve integral	Video Link : https://mathinsight.org/line_integral_vector_field_introduction	Discussion on pre-requisites (5 Min) PPT presentation (30 Min) Discussion or **Poll activity** (5 min) Summary (5min) Doubts clari-fication (10 min)	. Discussion Forum on the topic in the group Review on the topic Share material on the topic Exercises to solve
7.	Surface integral	To Understand the concept of finding surface areas.	Video Link : https://mathinsight.org/surface_integral_vector_field_introduction Web Link : https://nptel.ac.in/courses/122/104/122104017/	Discussion on pre-requisites (5 Min) PPT presentation (30 Min) Discussion or **Poll activity** (5 min) Summary (5min) Doubts clari-fication (10 min)	. Discussion Forum on the topic in the group Review on the topic Share material on the topic Exercises to solve

8.	Volume integrals	Able to find volumes of surfaces	Video Link : https://www.youtube.com/watch?v=_GRF5WaPBFU	Discussion on pre-requisites (5 Min) PPT presentation (30 Min) Discussion or **Poll activity** (5 min) Summary (5min) Doubts clari-fication (10 min)	. Discussion Forum on the topic in the group Review on the topic Share material on the topic Exercises to solve
9.	Gauss divergence theorem	To Understand the concept of converting line to volume integrals	Video Link : https://www.slideserve.com/bjorn/divergence-theorem	Discussion on pre-requisites (5 Min) PPT presentation (30 Min) Discussion or **Poll activity** (5 min) Summary (5min) Doubts clari-fication (10 min)	. Discussion Forum on the topic in the group Review on the topic Share material on the topic Quiz
10.	Greens theorem	To Understand the concept of curve integration to surface in xy plane	Video Link : https://www.youtube.com/watch?v=a_zdFvYXX_c ppt link: https://www.slideshare.net/samiul11/application-of-gsg	Discussion on pre-requisites (5 Min) PPT presentation (30 Min) Discussion or **Poll activity** (5 min) Summary (5min) Doubts clari-fication (10 min)	. Discussion Forum on the topic in the group Review on the topic Share material on the topic
11.	Stokes theorem	To Understand the concept of changing curve to surface integration.	Video Link : https://www.math24.net/stokes-theorem/	Discussion on pre-requisites (5 Min) PPT presentation (30 Min) Discussion or **Poll activity** (5 min) Summary (5min) Doubts clari-fication (10 min)	. Discussion Forum on the topic in the group Review on the topic Share material on the topic Quiz

UNIT – 2 : Laplace Transforms **[Total Classes :9] Activity:**

1	**Factual**	Solve an initial value problem for an n th order ordinary differential equation using the Laplace transform.
2	**Conceptual**	. Analyze and solve engineering problems using Laplace Series.Video Lectures related to laplace transforms
3	**Procedural**	To understand the concept of transforms,and apply its properties to solve the problems.
4	**Applied**	Problems Solving and Applications solving by practice sessions and Assignments Quiz etc…

Activity / Schedule of UNIT-2 :

Pre-Class: Videos, E-books, Web links etc…
In-Class: Explanation on concept, discussion, Poll, doubts clarification, Demo etc..
Post-Class: Discussion Forum, Review on topic, Assessment, Quiz, Notes etc….

CLASS SL NO	CONCEPT	OBJECTIVES	PRE-CLASS	IN-CLASS	POST-CLASS
1.	Introduction on laplace transforms.	To introduce The concept of transformation	Video Link : https://tutorial.math.lamar.edu/classes/de/LaplaceIntro.aspx	Discussion on pre-requisites (5 Min) PPT presentation (30 Min) Discussion (5 min) Summary (5min) Doubts clari-fication (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic
2.	Laplace transforms of certain functions	To apply definition of LT on functions	Video Link : https://www.youtube.com/watch?v=cHe_ya566bA ppt: https://www.academia.edu/10952057/Laplace_Transformation	Revise previous class – (5 Mins) Asking Questions on previous class randomly (5 Mins) PPT presentation/ class (30 min) Doubts clarification (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic
3.	Shifting theorems	To understand the concept of shifting theorems	Video Link : https://www.youtube.com/watch?v=_CvlSs0T8ok	Revise previous class – (5 mins) Asking Questions on previous class randomely (5 Mins) PPT presentation/class (30 min) Doubts clarification	Discussion Forum on the topic in the group Review on the topic Share material on the topic

				(10 min)	
4.	Transforms of derivatives and integrals	To understand the concept of finding LT of derivatives and integrals	Video Link : https://www.youtube.com/watch?v=lEwfeY_yxEA	Revise previous class – (5 mins) Asking Questions on previous class randomely (5 Mins) PPT presentation/ class (30 min) Doubts clarification (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic
5.	Unit step function	To understand the concept of Unit step function	Video Link : https://www.youtube.com/watch?v=JewW5ukzwlc	Revise previous class – (5 mins) Asking Questions on previous class randomely (5 Mins) PPT presentation/class (30 min) Doubts clarification (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic

6.	Dirac Delta function	To understand the concept of Dirac Delta function	**Video Link :** **https://www.youtube.com/watch?v=J-oyM1GyyDk**	Revise previous class – (5 mins) Asking Questions on previous class randomely (5 Mins) PPT presentation/class (30 min) Doubts clarification (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic

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7.	Inverse laplace transforms	To understand how to apply inverse laplace transforms	Video Link : https://www.youtube.com/watch?v=Y8GXpS31CGI	Revise previous class – (5 mins) Asking Questions on previous class randomely (5 Mins) PPT presentation/class (30 min) Doubts clarification (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic
8.	Convolution theorem	To understand the concept of Convolution theorem	Video Link : https://mathworld.wolfram.com/ConvolutionTheorem.html	Revise previous class – (5 mins) Asking Questions on previous class randomely (5 Mins) PPT presentation/class (30 min) Doubts clarification (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic
9.	Solving ordinary differential equations using Laplace transforms	To understand the concept of applying LTs to solvd ODE	Video Link : https://www.youtube.com/watch?v=0jHn2I2y6Mw	Revise previous class – (5 mins) Asking Questions on previous class randomely (5 Mins) PPT presentation/class (30 min) Doubts clarification (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic

UNIT – 3: Fourier series and Fourier Transforms **[Total Classes: 12]**

Activity:

1	**Factual**	Introduce the Fourier series and its application to the solution of partial differential equations.
2	**Conceptual**	Find the solution of the wave, diffusion and Laplace equations using the Fourier series.
3	**Procedural**	Refer to text book content of Fourier series and Fourier Transforms in Understanding the concept with examples(simple to complex)
4	**Applied**	Problems Solving and Applications solving by practice sessions and Assignments Quiz etc…

Activity / Schedule of UNIT-3:

Pre-Class: Videos, E-books, Web links etc…
In-Class: Explanation on concept, discussion, doubts clarification etc..
Post-Class: Discussion Forum, Review on topic, Assessment, Quiz, Notes etc….

CLASS SL NO	CONCEPT	OBJECTIVES	PRE-CLASS	IN-CLASS	POST-CLASS
1.	Fourier Series: Introduction	To introduce The concept of Fourier series	Video Link : https://slideplayer.com/slide/4213412/ https://www.youtube.com/watch?v=L7Yy0IMshbE 8/	Discussion on pre-requisites (5 Min) PPT presentation (30 Min) Discussion (5 min) Summary (5min) Doubts clari-fication (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic
2.	Periodic functions	To introduce The concept	Video Link :	Revise previous class – (5 mins)	Discussion Forum on the topic in the

		of Periodic functions	https://en.wikipedia.org/wiki/Mean-periodic_function	Asking Questions on previous class randomely (5 Mins) PPT presentation & demo (30 min) Doubts clarification (10 min)	group Review on the topic Share material on the topic
3.	Fourier series of periodic function	To introduce The concept of fourier series periodic function	VIDEO LINK: https://en.wikipedia.org/wiki/Mean-periodic_function	Revise previous class – (5 mins) Asking Questions on previous class randomely (5 Mins) PPT presentation & demo (30 min) Doubts clarification (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic
4.	Dirichlet's conditions s	To introduce the concept of Dirichlet's conditions	Video Link : https://www.youtube.com/watch?v=blS_OImUJ-c	Revise previous class – (5 mins) Asking Questions on previous class randomely (5 Mins) PPT presentation & demo (30 min) Doubts clarification (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic

5.	Even and odd functions	To introduce the concept	Video Link :	Revise previous class – (5 mins)	Discussion Forum on the topic in the

		of Even and odd functions	https://www.purplemath.com/modules/fcnnot3.htm	Asking Questions on previous class randomely (5 Mins) PPT presentation & demo (30 min) Doubts clarification (10 min)	group Review on the topic Share material on the topic
6.	Change of interval	To demonstrate Change of interval	Video Link : https://www.youtube.com/watch?v=2_i1fz38QSw PDF: https://math.mit.edu/~gs/cse/websections/cse41.pdf	Revise previous class – (5 mins) Asking Questions on previous class randomely (5 Mins) PPT presentation & demo (30 min) Doubts clarification (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic
7.	Half-range sine and cosine series	To introduce the concept of Half-range sine and cosine series	Video Link : https://www.youtube.com/watch?v=Sq2FhCxcyI8 Ppt: https://www.slideshare.net/hardik6034off/half-range-sine-cosine-fourier-series	Revise previous class – (5 mins) Asking Questions on previous class randomely (5 Mins) PPT presentation & demo (30 min) Doubts clarification (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic

8.	Fourier Transforms: Fourier integral theorem	To introduce Fourier Transforms	Video Link : https://www.youtube.com/watch?v=4VlyGap4Tpg	Revise previous class – (5 mins) Asking Questions on previous class randomely (5	Discussion Forum on the topic in the group Review on the topic

				Mins) PPT presentation & demo (30 min) Doubts clarification (10 min)	Share material on the topic
9.	Fourier sine and cosine integrals	To demonstrate Method of Fourier sine and cosine integrals	Video Link : https://www.youtube.com/watch?v=OWFm2sZ2Rxg	Revise previous class – (5 mins) Asking Questions on previous class randomely (5 Mins) PPT presentation & demo (30 min) Doubts clarification (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic
10.	Sine and cosine transforms	*To Introduce the concept of* Sine and cosine transforms	Video Link : https://www.youtube.com/watch?v=zkkqTpXMeVo	Revise previous class – (5 mins) Asking Questions on previous class randomely (5 Mins) PPT presentation & demo (30 min) Doubts clarification (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic
11.	Properties	To explain the properties of Fourier Transforms	Video Link : https://www.youtube.com/watch?v=0USI-48ovJI	Revise previous class – (5 mins) Asking Questions on previous class randomely (5 Mins) PPT presentation & demo (30 min) Doubts clarification (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic

12.	Finite Fourier transforms.	To explain the concept of Finite Fourier transforms	**https://www.math.usm.edu/lambers/mat417/lecture18.pdf**	Revising the concepts discussed so far Any topic to Repeat asked by students.	Assignment-3 Quiz-3

UNIT 4PDE of first order **[Total Classes: 10]**

Activity:

1	**Factual**	To Analyse, synthesise, organise and plan projects in the field of study. Reading Prerequisite concepts- partial differentiation Videos Referring the content on the Internet
2	**Conceptual**	Video Lectures On partial differentiation NPTEL Videos Links from the Internet Solved Examples from Internet
3	**Procedural**	Refer to text book content and Examples, Understanding the partial differentiation with examples(simple to complex)
4	**Applied**	Problems Solving and Applications solving by practice sessions and Assignments Quiz etc…

Activity / Schedule of UNIT-4 :

Pre-Class: Videos, E-books, Web links etc…
In-Class: Explanation on concept, discussion, Poll, doubts clarification etc..
Post-Class: Discussion Forum, Review on topic, Assessment, Quiz, Notes etc….

CLASS SL NO	CONCEPT	OBJECTIVES	PRE-CLASS	IN-CLASS	POST-CLASS
1.	Formation of partial differential equation by eliminating arbitrary constants	To introduce The concept of forming the partial differential equation	**Vedio link:** **https://www.youtube.com/watch?v=3c71y8N9qj0** **PPT:** **https://www.slideshare.net/sidpatel143/pde-41689592** **NPTEL:** **https://www.slideshare.net/sidpatel143/pde-41689592**	Discussion on pre-requisites (5 Min) PPT presentation (30 Min) Discussion (5 min) Summary (5min) Doubts clari-fication (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic
2.	Formation of partial differential equation by eliminating arbitrary functions	To Introduce the concept of Taylors theorem for functions of several variables	Video Link : https://www.youtube.com/watch?v=33vJ1wz3rfU Ppt: https://nitkkr.ac.in/docs/11-%20Partial%20Differential%20Equations.pdf	Revise previous class – (5 mins) Asking Questions on previous class randomely (5 Mins) PPT presentation & demo (30 min) Doubts clarification (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic

3.	Solutions of first order linear (Lagrange) equation	To Introduce the concept of Mc Lauren's theorem	Video Link : https://www.youtube.com/watch?v=Qpudxz275eo	Revise previous class – (5 mins) Asking Questions on previous class randomely (5 Mins) PPT presentation & demo (30 min) Doubts clarification (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic
4.	Solutions of first order nonlinear (standard types) equations.	To Introduce the concept of Jacobian, functional dependent and independent	Video Link : https://en.wikipedia.org/wiki/Nonlinear_partial_differential_equation	Revise previous class – (5 mins) Asking Questions on previous class randomely (5 Mins) PPT presentation & demo (30 min) Doubts clarification (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic

UNIT – 5: Second order PDE and Applications **[Total Classes : 8]**

Activity:

1	**Factual**	Create and analyze mathematical models using higher order differential equations to solve application problems such as harmonic oscillator and circuits.
2	**Conceptual**	Student will have a working knowledge of basic application problems described by second order linear differential equations with constant coefficients. Video Lectures l Videos and NPTEL Videos Links from the Internet Solved Problems, Examples from Internet

3	**Procedural**	Refer to text book content and Examples, Understanding the multiple integrals with examples(simple to complex)
4	**Applied**	Problems Solving and Applications solving by practice sessions and Assignments Quiz etc…

Activity / Schedule of UNIT- 5:

Pre-Class: Videos, E-books, Web links etc…
In-Class: Explanation on concept, discussion, Poll, doubts clarification etc..
Post-Class: Discussion Forum, Review on topic, Assessment, Quiz, Notes etc….

CLASS SL NO	CONCEPT	OBJECTIVES	PRE-CLASS	IN-CLASS	POST-CLASS
1.	Solutions of linear partial differential equations with constant coefficients	To introduce The concept of linear partial differential equations with constant coefficients	Video Link : http://www.fen.bilkent.edu.tr/~gurses/constantcoefficientpdes.pdf	Discussion on pre-requisites (10 Min) PPT presentation/Class/demo (35 Min) Summary (5min) Doubts clarification (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic
2.	Solutions of linear partial differential equations with constant coefficients RHS term of the type $e^{ax + by}$	To find the particular integral of pde RHS term of the type $e^{ax + by}$	Video Link : https://www.youtube.com/watch?v=7sJvNWsSqus	Discussion on pre-requisites (10 Min) PPT presentation/Class/demo (35 Min) Summary (5min) Doubts clarification (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic
3.	Solutions of linear partial differential equations with constant coefficients RHS term of the type ,sin(ax + by), cos(ax + by),	To find the particular integral of pde RHS term of the type sin(ax + by), cos(ax + by),	Video Link : https://www.youtube.com/watch?v=7sJvNWsSqus	Discussion on pre-requisites (10 Min) PPT presentation/Class/demo (35 Min) Summary (5min) Doubts clarification (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic

4.	Solutions of linear partial differential equations with constant coefficients RHS term of the type $x^m y^n$	To find the particular integral of pde RHS term of the type $x^m y^n$	Vedio link: https://www.slideshare.net/prathab1983/chapter-1-maths-3	Discussion on pre-requisites (10 Min) PPT presentation/Class/demo (35 Min) Summary (5min) Doubts clari-fication (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic
5.	Applications of PDE: Method of separation of Variables	To explain Applications of PDE: Method of separation of Variables http://www2.gcc.edu/dept/math/faculty/BancroftED/teaching/handouts/sep_of_var_examples.pdf	Video Link : http://www2.gcc.edu/dept/math/faculty/BancroftED/teaching/handouts/sep_of_var_examples.pdf	Discussion on pre-requisites (10 Min) PPT presentation/Class/demo (35 Min) Summary (5min) Doubts clari-fication (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic

6.	Solution of One dimensional Wave equation	To introduce The concept of Evaluating Wave equation	Video Link : https://www.youtube.com/watch?v=IAut5Y-Ns7g https://www.youtube.com/watch?v=IAut5Y-Ns7g	Discussion on pre-requisites (10 Min) PPT presentation/Class/demo (35 Min) Summary (5min) Doubts clari-fication (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic
7.	Solution of One dimensional Heat equation	To introduce The concept of Evaluating Solution of One dimensional Heat equation	Video Link : https://www.youtube.com/watch?v=PbucCMGDuao	Discussion on pre-requisites (10 Min) PPT presentation/Class/demo (35 Min) Summary (5min) Doubts clari-fication (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic
8.	Solution of two-dimensional Laplace equation.	To introduce The concept of Checking Solution of two-dimensional Laplace equation.	Video Link : https://www.youtube.com/watch?v=DNo0FmsGZKg	Discussion on pre-requisites (10 Min) PPT presentation/Class/demo (35 Min) Summary (5min) Doubts clari-fication (10 min)	Discussion Forum on the topic in the group Review on the topic Share material on the topic

prepared by
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