



National Institute of Technology Meghalaya
An Institute of National Importance

CURRICULUM

Programme	Bachelor of Technology in Mechanical Engineering	Year of Regulation	2018
Department	Mechanical Engineering	Semester	IV

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
ME 226	Numerical Methods in Engineering	3	0	0	3	50	50	100	200
Course Objectives	To introduce numerical approximation methods.	Course Outcomes	CO1	Able to choose and apply different iterative methods to find solution of algebraic equations and compare in terms of error analysis and convergence. (Applying and Analyzing)					
	To develop an ability to choose and apply different numerical schemes to obtain solution of algebraic equations, numerical differentiation and integrations, ordinary and partial differential equations and obtain empirical correlations		CO2	Able to appraise empirical correlations using curve fitting methods (Analyzing)					
	To develop an ability to analyze numerical schemes in terms of error analysis, stability analysis and convergence.		CO3	Able to solve differentiation and integration using different numerical schemes. (Applying)					
	To develop an ability to create computer program for mathematical models that solves real-life applications using the knowledge of numerical methods.		CO4	Able to choose and apply different numerical methods to find solution of ordinary and partial differential equations and compare in terms of accuracy, stability and convergence.(Applying and Analyzing)					
			CO5	Develop a computer code to solve prototypical mathematical problems which will have real-life applications and deliver presentation on outcome of the project . (Create)					

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	CO1	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
2	CO2	3	3	2	-	2	-	-	-	-	-	-	-	-	-	-
3	CO3	3	3	3	3	2	-	-	-	-	-	-	-	-	-	-
4	CO4	3	3	3	-	2	-	-	-	-	-	-	-	-	-	-
5	CO5	3	3	3	-	2	-	-	-	-	-	-	-	-	-	-
6	CO6	3	3	3	3	3	-	-	-	3	3	-	3	-	-	-

SYLLABUS

No.	Content	Hours	COs
I	Solution of Simultaneous Algebraic Equations Direct methods of solution, Pitfalls of elimination methods, Norm and condition number, Iterative methods for solution, Comparison and convergence of iterative methods, Ill conditioned equations	6	CO1
II	Empirical Correlations and Curve-Fitting Graphical method, Laws reducible to the linear law, Method of group averages, Method of least squares, Method of moments, Linear and non-linear regression analysis	6	CO2
III	Numerical Differentiation and Integration Numerical derivatives using forward, backward and central difference schemes, Maxima and minima, Numerical integration, Quadrature formulae, Errors in quadrature formulae	8	CO3
IV	Numerical Solution of Ordinary Differential Equations Taylor's series method, Euler's method, Runge-Kutta method, Adam's Bashforth method, Error analysis, Stability analysis, Convergence of a method	8	CO4
V	Numerical Solution of Partial Differential Equations Classification of partial differential equations, Solution of elliptic, parabolic and hyperbolic equations	8	CO4
VI	Term Project Write computer programs/codes for prototypical mathematical problems which will have real-life applications in the area of computational mechanics. Deliver short presentation on the project undertaken.		CO5
Total Hours		36	

Essential Readings

- J. D. Hoffman, "Numerical Methods for Engineers and Scientists", Second Edition, CRC Press.
- B. S. Grewal, "Numerical Methods in Engineering & Science with Programs in C, C++ & MATLAB" Eleventh Edition, Khanna Publishers

Supplementary Readings

- E. Kreyszig, "Advanced Engineering Mathematics", Tenth Edition, Wiley.
- S. Conte and C. Deboor "Elementary Numerical Analysis: An Algorithmic approach", Third Edition, McGrawhill Education
- R. W. Hamming, "Numerical Methods for Scientists and Engineers", Second Edition, Dover
- K. E. Atkinson. An Introduction to Numerical Analysis, Second Edition, Wiley