Syllabus for B.Tech – Energy Engineering

Course Number & Title: EN309 Numerical Methods	
L-T-P-C: 3-0-0-6	
Offered in (Odd/ Even / Any): Semester VI	
Pre-Requisite: Nil	

Preamble / Objectives (Optional): To increase the student's ability to use computational and numerical techniques for the mathematical modeling of energy systems. Furthermore, to demonstrate a knowledge of modeling, error analysis, solving linear, non-linear equations, and ordinary differential equations by numerical methods related to energy problems

Course Content/ Syllabus: Introduction: mathematical modeling; error analysis: truncation and round-off errors; root finding methods: bracketing and open methods; linear systems: algebraic equations, matrices, gauss elimination, Lu factorization; Iterative methods: non-linear systems; curve fitting: linear and non-linear regression, Fourier analysis, interpolation; numerical integration: trapezoidal, Simpson's rules, Newton-Cotes formula, Romberg integration, and gauss quadrature; numerical differentiation: high accuracy methods and Richardson extrapolation; ordinary differential equations: initial and boundary value problems; case studies for energy applications: heat transfer, fluid mechanics, electrical, and optical circuits.

Books (In case UG compulsory courses, please give it as "Text books" and "Reference books".
Otherwise give it as "References".

Text Books: (Format: Authors, *Book Title in Italics font,* Volume/Series, Edition Number, Publisher, Year.)

1.	S C Chapra, *Applied Numerical Methods with MATLAB for Engineers and Scientists*, 3rd Edition, McGraw Hill, 2017.
2.	R Pratap, *Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers*, 7th Edition, Oxford University Press, 2019.

Reference Books: (Format: Authors, *Book Title in Italics font,* Volume/Series, Edition Number, Publisher, Year.)

1.	N M Tabatabaei, N Bizon (Eds), *Numerical Methods for Energy Applications*, Springer, 2021.
2.	S K Gupta, *Numerical Methods for Engineers,* New Age International Publishers, 2003.