DEPARTMENT OF ENERGY AND ENVIRONMENT

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	M.Tech. Energy Engineering		
Course Title	Energy Systems Modelling and Analysis		
Course Code	EN 613	No. of Credits	03 (3-0-0)
Course Code of Pre-requisite subject(s)			
Session	July 2021	Section (if, applicable)	NA
Name of Faculty	Ruben Sudhakar D	Department	Energy and Environment
Email	rubensudhakar@nitt.edu	Telephone No.	9481208902
Name of Course Coordinator(s) (if, applicable)	HoD, Dept. of Energy and Environment		
E-mail	--	Telephone No.	--
Course Type	☐ Core course	☒ Elective course	

Syllabus (approved in BoS)

Overview of technologies and conventional methods of energy conversion, Workable and optimum systems, Steps in arriving at a workable system, Creativity in concept selection Mathematical modeling, Exponential forms- Method of least squares - Counter flow heat exchanger, Evaporators and Condensers, Effectiveness, NTU, Pressure drop and pumping Power

Classes of simulation, flow diagrams, Sequential and simultaneous calculations, Newton-Raphson method- Optimization procedure, mathematical statement of the problem The Lagrange multiplier equations, Sensitivity coefficients- Single variable – Exhaustive, Dichotomous and Fibonacci, Multivariable unconstrained - Lattice, Univariable and Steepest ascent

Dynamic Programming-Geometric Programming-Linear Programming- Linear regression analysis, Internal energy and enthalpy, Pressure temperature relationship at saturated conditions

COURSE OBJECTIVES

EN613 is designed for postgraduate students of Energy and Environment. This course intends to the familiarise students with the design and effective modelling methods applicable for assessing the dynamic behaviour of energy systems, employing examples such as heat exchangers, evaporators, condensers etc.

COURSE OUTCOMES (CO)	
Course Outcomes	**Aligned Programme Outcomes (PO)**
Upon completion of EN 613, students should be able to	
1. Assess the capabilities and limitations of various modelling methods.	**POs 1,2,4,6,8, and 9**
2. Apply innovative modelling and simulation methods to solve complex multi-disciplinary energy system problems individually and in teams.	
3. Demonstrate knowledge and comprehension of theoretical principles underlying modelling programmes.	

COURSE PLAN – PART II			
COURSE OVERVIEW			
EN 613 deals with effective modelling methods applicable for assessing the dynamic behaviours of complex systems for energy supply and conversion.			
COURSE TEACHING AND LEARNING ACTIVITIES			
S.No.	**Week/Contact Hours**	**Topic**	**Mode of Delivery**
1	**1 to 2 weeks**	Overview of technologies and conventional methods of energy conversion, Workable and optimum systems, Steps in arriving at a workable system	Online Lecture/board
2	**3-6 weeks**	Creativity in concept selection Mathematical modeling, Exponential forms- Method of least squares - Counter flow heat exchanger, Evaporators and Condensers, Effectiveness, NTU, Pressure drop and pumping Power	Online Lecture/board/power point presentations
3	**7-12 weeks**	Classes of simulation, flow diagrams, Sequential and simultaneous calculations, Newton-Raphson method- Optimization procedure, mathematical statement of the problem The Lagrange multiplier equations, Sensitivity coefficients- Single variable – Exhaustive, Dichotomous and Fibonacci, Multivariable unconstrained - Lattice, Univariable and Steepest ascent	Online Lecture/board/power point presentations

4	**12-14 weeks**	Dynamic Programming-Geometric Programming-Linear Programming-Linear regression analysis	Online Lecture/board/power point presentations

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Quiz-1	7th week	50 minutes	25%
2	Quiz-II	11th week	50 minutes	25%
3	Assignments/Seminars	2nd to 13th week	Cumulative weightage of assignments	20%
CPA	Compensation Assessment* (Quiz-III)	13th week	50 minutes	25%*
4	Final Assessment *	15th Week	60-120 minutes	30%

***mandatory**

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

Feedback must be given through MIS portal, at the end of the semester. Feedback to the instructor can also be given anytime during the semester through email (rubensudhakar@nitt.edu).

COURSE POLICY (preferred mode of correspondence with students, compensation assessment policy to be specified)

MODE OF CORRESPONDENCE (email/ phone etc)

Students can meet me in my office (MN 103, DEE building) or email me at rubensudhakar@nitt.edu

COMPENSATION ASSESSMENT POLICY

Compensation Assessment will be conducted only for students who miss quiz-I or Quiz-II on valid/genuine grounds of medical or other emergencies.

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- **At least 75% attendance in each course is mandatory.**
- **A maximum of 10% shall be allowed under On Duty (OD) category.**
- Students with **less than 65% of attendance** shall be prevented from writing the final

assessment and **shall be awarded 'V' grade.**

ACADEMIC DISHONESTY & PLAGIARISM

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION

Text Books and Reference

1. *W.F. Stoecker: "Design of Thermal Systems", 3rd Ed., McGraw Hill,1989.*
2. *B.K.Hodge: "Analysis and Design of Thermal Systems", Prentice Hall Inc., 1990.*
3. *D.J. Wide: "Globally Optimal Design", Wiley- Interscience, 1978*
4. *Ian Kemp: "Pinch Analysis and Process Integration: A User Guide on Process Integration for the Efficient Use of Energy"*, Butterworth-Heinemann, 2006

FOR APPROVAL

Course Faculty _____ **CC-Chairperson** _____ **HOD** _____