DEPARTMENT OF PRODUCTION ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY,
TIRUCHIRAPPALLI - 620015

COURSE PLAN – PART I			
Course Title	ADVANCED OPERATIONS RESEARCH		
Course Code	PR 653	**No. of Credits**	3
Course Code of Pre-requisite subject(s)	-	-	-
Session	January 2021	**Section (if, applicable)**	-
Name of Faculty	Dr. A. Noorul Haq	**Department**	Production Engineering
Email	anhaq@nitt.edu; anhaq53@yahoo.com	**Telephone No.**	9443193311
Name of Course Coordinator(s) (if, applicable)	-		
E-mail	-	**Telephone No.**	-
Course Type	☑ Core course	☐ Elective course	

Syllabus (approved in BoS)

PR 653 ADVANCED OPERATIONS RESEARCH

Linear programming- Simplex method – Big M method – Two phase method –Special cases in LPP – Alternate optimal solution; Unbounded solution; Infeasible solution; Degenerate Solution - Problems in all the above methods.

Primal Dual problem, Duality analysis, Dual simplex method, Sensitivity Analysis-Changes in right-hand side constants of constraints- Changes in objective function co-efficient-adding a new constraint-adding a new variable - Problems in all the above methods.

Integer programming problem - Cutting plane method - Branch and Bound technique – Problems. Deterministic dynamic programming –Recursive nature of computations in dynamic programming - Applications of dynamic programming - Cargo loading model – Work force size model – Equipment replacement model-Investment model - Problems in all the above methods.

Network models - Shortest path model – Systematic Method; Dijkstra's Algorithm; Floyd's Algorithm – Minimum Spanning Tree Problem – PRIM Algorithm; Kruskal's Algorithm; Maximal flow problem. Crash time, Crash cost, Crashing of project network - Problems in all the above methods.

Unconstrained nonlinear problems-Constrained problems- Separable programming - Quadratic programming-Geometric programming-Stochastic programming - Problems in all the above methods.

COURSE OUTCOMES (CO)	
Course Outcomes	**Aligned Programme Outcomes (PO)**

CO1: To understand the various Linear programming methods

CO2: To know about duality analysis, sensitivity analysis and integer programming problems with examples

CO3: To understand different dynamic programming concepts and its applications

CO4: 4. To solve various network models including crashing of project networks

CO5: 5. The basics of non-linear programming techniques

COURSE OUTCOMES	Program Outcomes (PO)										
	1	2	3	4	5	6	7	8	9	10	11
CO1	√	√	√				√		√		√
CO2	√	√	√		√						
CO3	√	√	√		√				√		
CO4	√	√	√		√	√	√				√
CO5	√	√	√		√						

PROGRAMME OUTCOMES (POs)

Sl. No	Programme Outcomes (POs): On successful completion of the programme the students will be able to
1.	Acquire in-depth knowledge of industrial engineering with an ability to define, evaluate, analyse and synthesize existing and new knowledge
2.	Analyse complex real time industrial engineering problems critically, apply independent judgement for synthesizing information to make intellectual and/or creative advances for conducting research.
3.	Conceptualize and solve industrial engineering problems and evaluate potential solutions after considering economic and eco-friendly factors.
4.	Develop scientific/technological knowledge in industrial engineering domain through literature review and design and analysis of experiments.
5.	Apply tools for modelling and simulation of complex system, life cycle assessment, ergonomic assessment, supply chain assessment and data analysis.
6.	Perform collaborative-multidisciplinary industrial engineering research, through self-management and teamwork.
7.	Apply engineering and management principles to manage real time projects considering economical and financial factors.
8.	Communicate with the engineering community, and with society at large, regarding complex engineering activities confidently and effectively, such as, being able to comprehend and write effective reports and design documentation by adhering to appropriate standards, make effective presentations, and give and receive clear instructions.
9.	Recognize the need for and have the preparation and ability to engage in life-long learning independently, with a high level of enthusiasm and commitment to improve knowledge and competence continuously.
10.	Acquire professional and intellectual integrity, professional code of conduct, ethics of research and scholarship, consideration of the impact of research outcomes on professional practices and an understanding of responsibility to contribute to the community for sustainable development of society.
11.	Observe and examine critically the outcomes of one's actions and make corrective measures subsequently and learn from mistakes without depending on external feedback.

COURSE PLAN – PART II

COURSE TEACHING AND LEARNING ACTIVITIES

Sl. No	Week	Topic	Mode of Delivery
1.	Week-1 to Week-5	Linear programming- Simplex method – Big M method – Two phase method –Special cases in LPP – Alternate optimal solution; Unbounded solution; Infeasible solution; Degenerate Solution - Problems in all the above methods. Dual simplex method	Online
		Cycle Test-1	Online
2.	Week-6 to Week -11	Primal Dual problem, Duality analysis, Sensitivity analysis-Changes in right- hand side constants of constraints-Changes in objective function co-efficient-adding a new constraint-adding a new variable - Problems in all the above methods. Deterministic dynamic programming –Recursive nature of computations in dynamic programming - Applications of dynamic programming - Cargo loading model – Work force size model – Equipment replacement model-Investment model - Problems in all the above methods. Unconstrained nonlinear problems - Constrained problems - Separable programming -Quadratic programming-Geometric programming-Stochastic programming - Problems in all the above methods.	Online
		Assignment and Cycle Test-2	Online
3.	Week-12 to Week-14	Integer programming problem - Cutting plane method - Branch and Bound technique – Problems. Network models - Shortest path model – Systematic Method; Dijkstra's Algorithm; Floyd's Algorithm – Minimum Spanning Tree Problem – PRIM Algorithm; Kruskal's Algorithm; Maximal flow problem. Crash time, Crash cost, Crashing of project network - Problems in all the above methods.	Online
		Compensation Assessment	Online
4.	Week-15	**Final Assessment *(End Semester Examinations for all M.Tech.)**	Online

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

Sl.No.	Mode of assessment for theory	Week/date	Duration	Wt. %
1	Cycle Test-1	Week-5	90 Minutes	30
2	Assignment	Week-11	-	10
3	Cycle Test-2	Week-11	90 Minutes	30
4	Compensation Assessment	Week-14	90 Minutes	30
5	End Semester Examinations	Week-15	120 Minutes	30

Important Note:

1. Attending all the assessments (Assessment – 1-3 and 5) are MANDATORY for every student.
2. If any student is not able to attend any one of the Cycle Test-1 or Cycle Test-2, due to genuine reason, student is permitted to attend the Compensation Assessment with 30% weightage (30 marks).
3. In any case, Compensation Assessment will not be considered as an improvement test.
4. The portions for compensation assessment is the combined portion of Cycle Test-1 and Cycle Test-2.

MODE OF CORRESPONDENCE (email/ phone etc.)

1. All the students are advised to check their NITT WEBMAIL regularly. All the correspondence (schedule of classes schedule of assessment course material any other information regarding this course) will be done through their webmail only.
2. Queries (if required) may be emailed to me / contact me during 4.00 pm to 5.00 pm on Monday and Friday with prior intimation for any clarifications.

ATTENDANCE

Attendance will be taken by the course faculty in all the contact hours and minimum 75% of attendance is required to write the end semester examination.

ACADEMIC HONESTY & PLAGIARISM

Copying in any form during assessments is considered as academic dishonesty and will attract suitable penalty.

ADDITIONAL COURSE INFORMATION

The faculty is available for consultation at times as per the intimation given by the faculty.

Queries may also be emailed to the Course Faculty directly at 'anhaq@nitt.edu'

FOR APPROVAL

(Dr. A Noorul Haq)   (Dr J Jerald)
Course Faculty   **CC Chairperson**   **HOD**