RK.UNIVERSITY

SYLLABUS

SCHOOL OF ENGINEERING

SYLLABUS

FOR

PROGRAM: B.TECH.
[MECHANICAL ENGINEERING]

ACADEMIC YEAR: 2017 – 18
(BATCH: 2014-2018)

SEMESTER: VIII

DIRECTOR
SCHOOL OF ENGINEERING
RK UNIVERSITY
RAJKOT

TEACHING SCHEME

PROGRAM: **SEMESTER**

B.TECH. [MECHANICAL ENGINEERING] VIII

ACADEMIC YEAR: 2017-18
[2014-18 BATCH]

Sem - VIII

Course Code	Course Name	Teaching Scheme (Hours)			Credits
		Theory	Tutorial	Practical	
ME806	OPERATION RESEARCH	3	0	0	3
ME807	MACHINE DESIGN - II	3	2	2	5
ME808	THERMAL ENGINEERING	3	0	0	3
ME809	CAPSTONE DESIGN - II	0	0	**(2)**	5
ME8XX	ELECTIVE - II	3	0	2	4
	Total	**12**	**2**	**4**	**20**
	Total Hours	**18**			

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Course Title	OPERATION RESEARCH
Course Code	ME806
Course Credit	Theory : 03
	Practical : 00
	Tutorial : 00
	Credits : 03

Course Learning Outcomes:

After Successful completion of the above course, students will be able to:

- **Describe** features of different decision making situations and **apply** suitable decision making approaches to the real world problems.
- **Apply** fundamental knowledge about principles of Operation Research.
- **Analyze** various practical problems of Queuing and Inventory control and simplify them to **apply** the existing models in order to achieve optimum solutions.
- **Evaluate** the knowledge related to linear programming, transportation problems and finding out optimum solution.
- **Estimate** critical activities of a project and **compare** feasibility of crashing various activities in order to minimize project duration.

Detailed Syllabus

Sr. No.	Name of chapter & details	Hours Allotted
	SECTION-I	
1.	**Introduction to Operation Research :** Definition, objectives, phases, applications and limitations of OR.	01
2.	**Linear Programming :** Graphical method, Simplex method, Dual Simplex method, revised simplex method, the decomposition method, Degeneracy, Big-M method, Two phase method, duality, and post-optimality analysis, parametric linear programming, goal programming, linear fractional programming, integer programming.	08
3.	**Transportation Model :** Formulation, North-West Corner rule, Least-cost method, Vogel's Approximation Method, Degeneracy in transportation problem, stepping stone method, modified distribution method, profit maximization problem, prohibited transportation routes, sensitivity analysis in transportation problems, transshipment problems.	08

4.	**Assignment Model :** Hungarian method for solution, non-square matrix, branch and bound technique, restriction on Assignments, Maximization problem, travelling salesman problem.	**04**
	Total	**21**
	SECTION-II	
5.	**Probability Theory and Queuing Models:** Definitions and terminology of probability theory, Laws of probability, Modified addition law, law of condition probability and Bayes' law. Elements of a Queuing system, Kendall's notation, Single server unlimited queue model (M/M/1)/FCFS), Single server finite queue model (M/M/1)N/FCFS), Multi-channel queuing model (M/M/C)/FCFS)	**09**
6.	**Inventory Models:** Necessity for inventory management, inventory classification and inventory costs, EOQ, Forecasting of demands and inventory models with deterministic and probabilistic demand, ABC analysis.	**06**
7.	**Network Analysis:** Terms used in network analysis, Network logic, Fulkerson's rule, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Cost analysis and Crashing of network.	**06**
	Total	**21**

Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory. Minimum two internal exams will be conducted and average of two will be considered as a part of overall evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
- Surprise tests/Quizzes/Seminar/Tutorials will be conducted.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures. Minimum eight experiments shall be there in the laboratory related to course contents.
- Minimum six tutorials which includes solution of minimum five numerical under each head.

Reference Books:

1. Kapoor V. K., “Operation Research”, Sultan Chand & Sons, New Delhi.
2. Gupta P.K. & HiraD.S,“Operation Research”S.Chand& Company Ltd, New Delhi
3. TahaHamdy A., “Operation Research An introduction”, Pearson publications, Delhi.
4. SharmaJ K, “Operation Research Theory and Practice”, Macmillan Press.
5. Panneerselvam R., “Operation Research”, Prentice-Hall of India Private Limited, New Delhi.
6. VohraN.D., “Quantitative Techniques in Management”,Tata McGraw Hill,New Delhi.
7. Askhedkar&Kulkarni,“Operation Research”,Dhanpatrai& Sons

Course Title	MACHINE DESIGN - II
Course Code	ME807
Course Credit	Theory :03
	Practical :01
	Tutorial :01
	Credits :05

Course Learning Outcomes:

After Successful completion of the above course, students will be able to:

- **Select** an optimum category of gears and material handling equipment to identify, formulate, and solve engineering problems.
- **Demonstrate** the design procedure of Gears, Gearbox, IC engine components and material handling systems.
- **Apply** knowledge of mathematics, science and engineering to design various mechanical systems.
- **Use** the techniques, skills and modern engineering tools necessary for design engineering practice.
- **Evaluate** mechanical component failure, fundamental laws, failure theories, properties of materials etc.
- **Design** Gearbox, IC Engine Components and Material handling equipment.

Detailed Syllabus

Sr. No.	Name of chapter & details	Hours Allotted
	SECTION-I	
1.	**Spur Gears :** Introduction, Classification, Gear terminology, Selection criterion, Interference and undercutting, Tooth correction factor, Relation between speed ratio and number of teeth, Force and stress analysis, Dynamic effects, Fatigue strength, Factor of safety, Gear materials, Module and face width power rating calculations based on beam strength and wear considerations, Support reactions.	**8**
2.	**Helical Gears :** Introduction, Gear terminology, Pressure angle in the normal and transverse plane, helix angle, Equivalent number of teeth, Forces and stress analysis, Estimating the size of the helical gears, Support reactions.	**6**

3.	**Bevel Gears:** Straight and spiral bevel gear, Introduction, Gear terminology, Forces and stress analysis, Equivalent number of teeth. Support reactions.	**4**
4.	**Worm Gears:** Introduction, Terminology, Materials, Forces and stress analysis, Efficiency, estimating the size of the worm gear pair, Support reaction.	**3**
5.	**Design Of Gear Boxes:** Introduction, Geometric progression, Standard step ratio, Ray diagram, Kinematics layout. Design of sliding mesh gear box, Constant mesh gear box, Design of multi speed gear box.	**6***
	Total	**21**
	SECTION-II	
6.	**Design Of IC Engine Components:** Introduction, Selection, type, general design consideration, design of cylinder, cylinder liner, cylinder head, pistons, piston ring, gudgeon pin, connecting rod, crank shaft, valves gears mechanism and flywheel.	**12***
7.	**Material Handling Equipment:** Introduction, Handling equipment, classification and their selection. Concept of material handling system design.	**8**
8.	**Design Of Lifting Equipment:** Introduction, Classification and selection and design of hooks, sheaves, drums. Classification of cranes, construction working of different types of conveyors, feeders and elevators.	**8**
9.	**Design Of Conveying equipment:** Introduction, Classification construction and working of different types of conveyors, feeders and elevators. Design of belt conveyors and screw conveyors.	**5**
	Total	**21**

Instructional method and Pedagogy:

- At the commencement of the course, the course delivery pattern, course goal, prerequisite of the course etc. will be discussed.
- Lectures/Laboratories will be conducted with the aid of multi-media projector, black board, activity kit, design and analysis software etc.
- Assignments, based on course content, will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
- Edmodo will be used to evaluate performance, to discuss subjects and to share ideas, notes, reading materials etc.
- Research Gate and LinkedIn would be used to promote research.
- Surprise Tests/Quizzes/Seminar/Tutorials will be conducted.
- Attendance is compulsory in lectures and laboratory. Minimum two internal exams will be conducted and average of two will be considered as a part of overall evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures. Minimum four experiments/projects shall be there in the laboratory related to course contents.
- *Design of IC Engine Components and Design of Gear Boxes will be covered during laboratories hours.
- PSG Design Data book is permitted in examinations.

Reference Books:

1. Shigley J. E and Mischke C. R., “Mechanical Engineering Design”, McGraw-Hill
2. Bhandari V.B., “Design of Machine Elements”, Tata McGraw-Hill
3. Sharma P. C.and Agrawal D.K., “Machine Design”, S.K.Kataria & Sons
4. Sadhu Singh, “Machine Design”, Khanna Publication
5. Alexandrov M. P., “Material handling equipments”, MIR publishers
6. Rudenko N., “Material handling equipments”, MIR publishers
7. Maitra G.M., Prasad L.V., “Hand book of Mechanical Design”, Tata McGraw-Hill
8. Spivakovskii, “Conveyors and related equipments”. MIR publishers.
9. Apple J. M., “Plant Layout and Material Handling”, John Wiley & sons
10. Norton R.L, “Design of Machinery”, McGraw-Hill Book co
11. Farazdak Haideri, “Transmission system Design”, Nirali Prakashan
12. Farazdak Haideri, “Mechanical system Design”, Nirali Prakashan
13. Sreenath L., “Concepts in Reliability”, Affiliated East West Press

Additional Resources

- http://nptel.ac.in/courses/107103002/
- http://ocw.mit.edu/courses/mechanical-engineering/2-72-elements-of-mechanical-design-spring-2009/readings/
- http://nptel.ac.in/downloads/112105125/
- http://nptel.ac.in/courses/112101096/
- http://ocw.mit.edu/courses/mechanical-engineering/2-000-how-and-why-machines-work-spring-2002/
- http://ocw.mit.edu/courses/mechanical-engineering/2-007-design-and-manufacturing-i-spring-2009/
- http://ocw.mit.edu/courses/mechanical-engineering/2-008-design-and-manufacturing-ii-spring-2004/
- http://ocw.mit.edu/courses/mechanical-engineering/2-008-design-and-manufacturing-ii-spring-2003/
- http://ocw.mit.edu/courses/special-programs/sp-722j-d-lab-ii-design-spring-2010/
- http://www.machinedesignonline.com/
- http://machinedesign.com/

Course Title	THERMAL ENGINEERING
Course Code	ME808
Course Credit	Theory :03
	Practical :00
	Tutorial :00
	Credits :03

Course Learning Outcomes:

After Successful completion of the above course, students will be able to:

- **Apply** the fundamentals of mathematics & geometry for solution of steam nozzle and steam turbine problems.
- **Demonstrate** the velocity diagrams for **understanding** operation of steam turbines.
- **Apply** fundamentals of Jet propulsion for understanding the working of rockets.
- **Analyze** the performance of gas turbine cycle and evaluate the methods of improving the efficiency.

Detailed Syllabus

Sr. No.	Name of chapter & details	Hours Allotted
	SECTION-I	
1.	**Steam Nozzles:** Types of nozzles, velocity of steam, discharge through nozzle, critical pressure ratio and condition for maximum discharge, physical significance of critical pressure ratio, effect of friction and nozzle efficiency, general relationship between area, velocity and pressure in nozzle flow, supersaturated flow.	**09**
2.	**Steam Turbine:** Principle of operation, types of steam turbines, compounding of steam turbines, impulse turbine- velocity diagram, calculation of work, power and efficiency, condition for maximum efficiency, Reaction turbines – velocity diagram , degree of reaction, Parson turbine, work, power, efficiencies, blade height, condition for maximum blade efficiency for Parson turbine, reheat factor, governing of steam turbine- throttle, nozzle and bypass governing, regenerative feed heating, reheating of steam, binary vapour cycle,	**12**
	Total	**21**

	SECTION-II	
3.	**Gas Turbine:** Classification, open and closed cycle, gas turbine fuels, actual brayton cycle, optimum pressure ratio for maximum thermal efficiency, work ratio, air rate, effect of operating variables on the thermal efficiency and work ratio, and air rate means of improving efficiency and specific output of simple cycle- open cycle turbine with regeneration, reheating and Intercooling, combined steam and gas turbine plant, requirements of combustion chamber, types of combustion chambers.	**10**
4.	**Jet Propulsion:** Turbojet Engine, thrust, thrust power, propulsive efficiency, thermal efficiency, turboprop, ramjet and pulsejet engines, rocket engines.	**6**
5.	Methods of attachment of blades to turbine rotor; Labyrinth packing. Losses in steam turbine, special types of steam turbine- back pressure, pass out and mixed pressure turbine.	**5**
	Total	**21**

Instructional Method and Pedagogy

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory. Minimum two internal exams will be conducted and average of two will be considered as a part of overall evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
- Surprise tests/Quizzes/Seminar/Tutorials will be conducted.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures. Minimum eight experiments shall be there in the laboratory related to course contents.
- Use of Steam Table in the course and Exam.

Reference Books:

1. R.K. Rajput, “Thermal Engineering” - Laxmi Publication, Delhi
2. R. Yadav, “Steam & Gas turbines”- Central publishing House, Allahabad.
3. J. Selwin Rajadurai, “Thermodynamics & Thermal Engineering” –New Age Publishers, Delhi.
4. S. Domkundwar, “Thermal Engineering” –Dhanpatrai & Co. Delhi.
5. Mahesh Rathore, “Thermal Engineering”- TataMcGraw Hill, Delhi.
6. K. Suman, “Thermal Engineering” –PrenticeHall, New Delhi.
7. K.K. Ramalingam, “Thermal Engineering” –Scitech Publication, Chennai.
8. Khurmi & Gupta, “Thermal Engineering” –S. Chand & Company, Delhi
9. S. K. Kulshrestha, “Thermal Engineering” –Vikas Publishing House Pvt. Ltd, New Delhi.
10. P.L. Ballaney, “Thermal Engineering” –Khanna Publishers, New Delhi
11. B. K. Sarkar, “Thermal Engineering” –Tata Mcgraw Hill, New Delhi
12. Dr. Khajuria & Dubey ,”Gas Turbines & Propulsive Systems” –Dhanpatrai Pub

Additional Resources

- http://nptel.ac.in/courses/112105171/
- http://web.mit.edu/hml/ncfmf.html
- http://www.learnerstv.com/Free-engineering-Video-lectures-ltv078-Page1.htm

Course Title	CAPSTONE DESIGN - II
Course Code	ME809
Course Credit	Lecture : 00
	Practical : 00
	Tutorial : 00
	Total : 05

Course Learning Outcomes

At the end of course, students will be able to:

- **Identify, formulate** and **analyse** an engineering problem.
- **Acquire** the knowledge of the techniques, skills, and modern engineering tools necessary for engineering practice.
- **Design** the solution of identified problem and Implement the same.
- **Analyze** the outcomes of implemented solution.
- **Present** features of the developed project to the targeted group through written and oral communication.
- **Contribute** in a team in development of technical project.

Project Definition

Project work shall be based on any of the following or other:

- abrication of product/ testing setup of an experimentation unit/ apparatus/ small equipment, in a group.
- xperimental verification of principles used in Mechanical Engineering Applications.
- roduct design and development.
- esign and development of laboratory equipments/test rigs.
- eveloping computer programs/software.
- ndustry based project.
- ndustry need based basic survey or Testing or Analysis etc.

Instructional Method and Pedagogy

- our project work may be carried out in two semester known as project Phase -1 and project Phase-2 in consecutive last two semesters.
- reliminary work of project should be completed within project work like Finalisation of topic, literature study, methodology etc.
- ach student should maintain log book for the progress of project work. In this book you will keep a log of your weekly work. You must get this signed (and dated) by your supervisor every week. It will be handed in with your final report, and should cover the following headings:
  - Progress (from previous week)
  - Problems & Queries,
  - Objectives (for next week)
  - Date of Meeting
  - Sign of Supervisor
- Each student has to prepare and submit the Report with CD-R which will consists of .doc & .pdf format of report and .ppt format of presentation at the time of final presentation of project Phase -1 and project Phase -2.
- One copy of the report should be submitted to Institute/ Department, One copy to Guide and one copy should remain with each student of the project group.
- The project term work shall be evaluated on the basis of reviews.
- Two reviews are to be taken in Project Phase -1 and Project Phase -2.
- Oral examination shall be conducted along with final presentation of the project.

Report Layout

1. Cover Page & Title Page
2. Declaration
3. Certificate
4. Project work Approval
5. Acknowledgement
6. Table of Contents
7. Abstract
8. List of Table
9. List of Figures
10. List of Symbols, Abbreviations and Nomenclature
11. Chapters
12. Appendices
13. References

Project Report Preparation Guideline

- Paper must be White Royal Executive Bond, not less than 85 gsm Paper of A4 size.
- Font size type and margins

Details	Font Type	Font size	Spacing
Facing page (cover and first page) - see sample page for details	Times New Roman	14pt bold capitals	Centered (Adjustable spacing)
Chapter headings with chapter number on top	Times New Roman	14pt bold capitals	Centered
Section headings	Times New Roman	12pt bold capitals	Left adjusted
Subsection headings	Times New Roman	12pt. sentence case	Left adjusted
Paragraph headings	Times New Roman	12pt.bold sentence case	Left adjusted
Body of Project report	Times New Roman	12 pt	Justified and with 1.5 spacing for text and equations
Margins	Left Margin	1.5 inch	To accommodate binding area
	Right Margin	1.25 inch	
	Top	2.0inch	On pages on which chapter begins
		1.25 inch	Other pages
	Bottom	1.25 inch	

- References can be given as per format given in IEEE journals.
- Bibliography contains materials that were useful for the preparation of the Project report in a general way and is not directly referred to in the Project report.

Additional Resources

-
-journal available at library portal.