KSV UNIVERSITY

LDRP INSTITUTE OF TECHNOLOGY & RESEARCH

MECHANICAL ENGINEERING DEPARTMENT

SYLLABUS (2017-18)

M.E. MECHANICAL-THERMAL ENGINEERING

KADI SARVA VISHWAVIDYALAYA LDRP Institute of Technology & Research Gandhinagar 382015

30/04/2018

The meeting of the Program Committee (Board of Studies) under the Faculty of Engineering & Technology, for Mechanical/Automobile is scheduled on Monday, the 30th April, 2018 at 01:00 P.M. in the Board Room of the University, with the following Agenda:

- **TEACHING AND EXAMINATION SCHEME WITH DETAIL SYLLABUS OF B.E. II YEAR (3RD AND 4TH SEMESTER) AND M.E. II YEAR (3RD AND 4TH SEMESTER - PRODUCTION/THERMAL/AUTOMOBILE ENGINEEIRNG).**
- **TEACHING AND EXAMINATION SCHEME OF B.E. III AND IV YEAR (5TH TO 8TH SEMESTER) TO B.E. IV YEAR (MECHANICAL/AUTOMOBILE ENGINEEING).**

The following Committee members were present in Program Committee (Board of Studies) under the Faculty of Engineering & Technology,

1. Dr Gargi Rajpara, Principal LDRP-ITR
2. Prof. S. K. Mantra, Registrar, KSV
3. Prof. P. K. Shah, COE, KSV
4. Prof. Anand Dhruve, VGCE - Ahmedabad
5. Prof. R J Jani, LDCE - Ahmedabad
6. Dr N M Bhatt, Director, GIT, Moti Bhoyan, Gandhinagar.
7. Prof. U V Shah, Associate Professor, GEC, Modasa.
8. Dr D H Pandya, Prof. & HOD, Mechanical 1st Shift, LDRP-ITR, Gandhinagar.
9. Dr N S Mehta, Prof. & HOD, Mechanical 2nd Shift, LDRP-ITR, Gandhinagar.
10. Dr T M Patel, Professor, Mechanical Engineering, LDRP-ITR, Gandhinagar.
11. Prof. A M MAVANI, Asst. Prof., Mechanical Engineering, LDRP-ITR, Gandhinagar.
12. Prof. Vidya Nair, Asst. Prof., Mechanical Engineering, LDRP-ITR, Gandhinagar.
13. Prof. Mrunal Pandya, Asst. Prof., Mechanical Engineering, LDRP-ITR, Gandhinagar

14. Prof. Anirudh Kyada, Asst. Prof., Mechanical Engineering, LDRP-ITR, Gandhinagar

The discussion included

U.G. – AUTOMOBILE/MECHANICAL SECOND YEAR TEACHING AND EXAMINAITN SCHEME

1. It is suggested to replace Advanced Strength of Material with Material Science and Metallurgy is semester 3 with same teaching and examination scheme (3-0-2).
2. It is suggested to transfer the topic of friction from Kinematic of Machine (semester 3) to Theory of Machine (semester 5) and add Synthesis and analysis of Mechanics in subject Kinematic of Machine in semester 3.
3. It is suggested to replace the subject of Differential Equation and Integral Transforms with Engineering Mathematics III in 3rd semester Automobile Engineering. It is also recommended to discus the syllabus of the same in the BOS of Mathematics.
4. It is suggested to correct the name of the subject Complex Analysis and Numerical Analysis in semester 4 in consultation with BOS of Mathematics.
5. Teaching and Examination scheme of subject IDMD is suggested to change from 3 – 0 – 4 to 3 – 0 – 2. It is also recommended by BOS members to give 1 (one) hour as a practice in Industrial Drafting and Machine Design and credit of the same should not counted. It is recommended to redesign the syllabus of subject as per suggestion provided by BOS members.
6. It is suggested to interchange the subject of Thermodynamics (Semester 4) with Fluid Mechanics (Semester 3) in respective semesters.
7. It is suggested to utilize 2 hours of Audit course of Semester 3 and 4 to provide as an additional teaching hours for the other subject/ subjects of the same semester without considering the credit of the same.
8. It is also recommended by the BOS members to specify the outcome of each topic of all subjects.
9. It is recommended to add more numbers of standard book in all subject.
10. Typographical error was observed by the members and it recommended to rectify the same.

11. Some discrepancy was observed in the format of syllabus of M.P. I (semester 3), it is recommended to correct it.
12. It is suggested by BOS members to rename the name of Subjects namely, M.D. I, M.D. II, M.P. I and M.P. II etc. from the student transcript point of view.
13. Add more number of Elective Subject in Semester 5 to semester 8.

TEACHING AND EXAMINATION SCHEME OF M.E. II YEAR (Production/Thermal/Automobile).

- Teaching and Examination Scheme with detail syllabus of M.E. II year **(**Production/Thermal/Automobile) is approved without any modification.

Prof. (Dr.) D.H.Pandya
HOD-Mechanical Engineering

Dr. Gargi Rajpara
Principal

Kadi Sarva Vishwavidyalaya
Scheme for Teaching and Examination
First & Second Year Master of Engineering (Semester I, II, III & IV) (Thermal Engineering)
With Effect From: Academic Year 2017 – 18 (CBCS)

SUBECT		Teaching Scheme				Total Credit	Evaluation Scheme					
		L	T	P	Total		Theory		IE	CIA	Pract.	Total
CODE	NAME	Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
Semester I												
MECC101-N	RESEARCH METHODOLOGY	2	0	-	2	2	3	70	30	20	-	120
METH102-N/MEAE107-N-A	ADVANCED THERMODYNAMICS & HEAT TRANSFER	4	0	2	6	5	3	70	30	20	30	150
METH103-N	FLUID MECHANICS & GAS DYNAMICS	4	0	2	6	5	3	70	30	20	30	150
METH104-N	INSTRUMENTATION FOR ENGINEERS	3	0	2	5	4	3	70	30	20	30	150
METH105-N	SEMINAR-1	0	0	2	2	1	-	-	-	60	100	160
	ELECTIVE – I	4	0	2	6	5	3	70	30	20	30	150
	ELECTIVE – II	3	0	0	3	3	3	70	30	20	-	120
	TOTAL	**20**	**0**	**10**	**30**	**25**	**18**	**420**	**180**	**180**	**220**	**1000**
Semester II												
MECC201-N	TECHNICAL COMMUNICATION	2	0	-	2	2	3	70	30	20	-	120
METH202-N	DESIGN OF HEAT EXCHANGE EQUIPMENTS	4	0	2	6	5	3	70	30	20	30	150
METH203-N	COMPUTATIONAL FLUID DYNAMICS	3	0	2	5	4	3	70	30	20	30	150
METH204-N	NON CONVENTIONAL ENERGY SOURCES	4	0	2	6	5	3	70	30	20	30	150
METH205-N	SEMINAR-2	0	0	2	2	1	-	-	-	60	100	160
	ELECTIVE – III	4	0	2	6	5	3	70	30	20	30	150
	ELECTIVE – IV	3	0	0	3	3	3	70	30	20	-	120
	TOTAL	**20**	**0**	**10**	**30**	**25**	**18**	**420**	**180**	**180**	**220**	**1000**
Semester III												
METH301-N	MODELING, SIMULATION & COMPUTER APPLICATION	4	0	2	6	5	3	70	30	20	30	150
METH302-N	DISSERTATION PHASE-I	-	-	-	-	15	-	-	-	50	150	200
	ELECTIVE – V	4	1	0	5	5	3	70	30	50	-	150
	TOTAL	**8**	**1**	**2**	**11**	**25**	**6**	**140**	**60**	**120**	**180**	**500**
Semester IV												
METH401-N	MID SEMESTER THESIS PROGRESS REVIEW	-	-	-	-	5	-	-	-	50	150	200
METH402-N	DISSERTATION PHASE-II	-	-	-	-	20	-	-	-	100	200	300
	TOTAL	-	-	-	-	**25**	-	-	-	**150**	**350**	**500**

	ELECTIVE – I	**ELECTIVE – II**
	METH106-N-A/ MEAE106-N-A:ADVANCED INTERNAL COMBUSTION ENGINE	METH107-N-A:BOILER TECHNOLOGY
	METH106-N-B:ADVANCED REFRIGERATION ENGINEERING	METH107-N-B:ENERGY CONSERVATION & MANAGEMENT
		METH107-N-C:FAN, BLOWERS AND COMPRESSORS
		METH107-N-D:CRYOGENIC ENGINEERING

	ELECTIVE – III	**ELECTIVE – IV**
	METH206-N-A:COMBUSTION ENGINEERING	METH207-N-A:ENVIRONMENTAL ENGINEERING AND POLLUTION CONTROL
	METH206-N-B/MEAE207-N-A:ADVANCED AIR CONDITIONING	METH207-N-B:THERMAL ENERGY SYSTEM
		METH207-N-C:FOOD PROCESSING, PRESERVATION AND TRANSPORT
		METH207-N-D:THERMAL POWER PLANT ENGINEERING

	ELECTIVE – V
	METH303-N-A: EXERGY ANALYSIS OF THERMAL SYSTEM
	METH303-N-B:ECONOMICS & MANAGEMENT OF THERMAL SYSTEM

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First Semester Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: MECC101-N	Subject Title: RESEARCH METHODOLOGY

Teaching Scheme				Total Credit	Evaluation Scheme					
L	T	P	Total		Theory		IE	CIA	Pract.	Total
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
2	0	0	2	2	3	70	30	20	00	120

LEARNING OBJECTIVES:

The educational objectives of this course are

- To learn various concepts related to research methodology

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal
- Weightage should be given to all units while conducting teaching & examination.
- Attendance is compulsory in lectures and Tutorial which carries 05 Marks.
- Viva Voce will be conducted at the end of the semester of 30 Marks.
- One internal exam of 30 marks is conducted as a part of Mid semester evaluation.

OUTLINE OF THE COURSE:

Sr. No.	Date/Week	Unit No.	Percentage Weightage.	Topic No:
1	1^{st} ,2^{nd} ,3^{rd}	Unit :1	20	1,2,3,4
2	4^{th} ,5^{th} ,6^{th}	Unit:2	20	5,6,7,8
3	7^{th} ,8^{th} ,9^{th}	Unit:3	20	9,10,11
4	19^{th} b ,11^{th} ,12^{th}	Unit:4	20	12
5	13^{th} ,14^{th} ,15^{th}	Unit:5	20	13,14

Total Hours (Theory): 30

Total Hours (Lab): 00

Total Hours: 30

DETAILED SYLLABUS

1. Introduction to the Research Methodology and research process at glance.
2. Discussion on Illustrative Research Proposals
3. Quantitative Research Design:Types of Research Designs and its applications
4. Identifying the Research Problem
5. Specifying Data and Acquisition Methods: Data types, Data source, Primary Data & Secondary Data, Comparison between various data actualization method.
6. Quantities Research design
7. Measuring and Scaling: Fundamentals and Comparative Scaling.: Commonly Used Scales in Business Research, Reliability and Validity of Scale
8. Research Paper Discussion: A Paper Contains Development and Validation of Scale
9. Questionnaire Designing: Steps in Designing Questionnaire, Pitfalls in Questionnaire Designing
10. Developing and Using Online Questionnaire
11. Sampling Design and Procedure: Sampling Method Procedure and Sample Size Decision
12. Define Research Question and Framing and Testing of Hypotheses: Developing the Hypothesis, Testing of Hypotheses: Type – I and II Errors, One Tailed and Two Tails Test of Significance. Parametric and Nonparametric Tests of Univariate and Bivariate Data(Nonparametric Tests: Kolmogorov Smirnov Test, Sign Test, Wilcoxon Matched Paris Test, Kolmogorov Smirnov Two Sample Test, Mann Whitey U Test)
13. Test of Association and Research Report writing: Regression (Introduction only), Preparing a Research Report and Communication the Research Result (Includes APA style of reporting the result referencing), Evaluation of Research Result
14. Statistical Package for Social Service(SPSS)

LESSON PLAN

Sr. No	LECTURE NO	Course Content	Hrs.	Percentage Weightage
1	1	Introduction to the Research Methodology and	1	25%
2	2	Introduction to research process at glance	1	
3	3	Discussion on Illustrative Research Proposals	1	
4	4	Quantitative Research Design	1	
5	5	Types of Research Design	1	
6	6	Research Designs and applications	1	
7	7	Identifying the Research Problem	1	
8	8	Specifying Data and Acquisition Methods:	1	
9	9	Data types, Data source,	1	
10	10	Primary Data & Secondary Data,	1	
11	11	Comparison between various data actualization method	1	
12	12	Quantities Research design	1	
13	13	Measuring and Scaling: Fundamentals and Comparative Scaling.:	1	
14	14	Commonly Used Scales in Business Research,	1	
15	15	Reliability and Validity of Scale	1	
16	16	Research Paper Discussion: A Paper Contains Development and Validation of Scale	1	25%
17	17	Questionnaire Designing: Steps in Designing Questionnaire, Pitfalls in Questionnaire Designing	1	

18	**18**	Developing and Using Online Questionnaire	**1**	
19	**19**	Sampling Design and Procedure: Sampling Method Procedure and	**1**	
20	**20**	Sample Size Decision	**1**	
21	**21**	Define Research Question and Framing and Testing of Hypotheses:	**1**	
22	**22**	Developing the Hypothesis, Testing of Hypotheses: Type – I and II Errors, One Tailed	**1**	
23	**23**	Two Tails Test of Significance. Parametric and Nonparametric Tests of Univariate and Bivariate Data(Nonparametric Tests:	**1**	
24	**24**	Kolmogorov Smirnov Test, Sign Test, Wilcoxon Matched Paris Test, Kolmogorov Smirnov Two Sample Test, Mann Whitey U Test)	**1**	
25	**25**	Test of Association	**1**	
26	**26**	Research Report writing: Regression (Introduction only),	**1**	
27	**27**	Preparing a Research Report	**1**	
28	**28**	Communication the Research Result (Includes APA style of reporting the result referencing), Evaluation of Research Result	**1**	
29	**29**	Statistical Package for Social Service(SPSS)	**1**	
		TOTAL Hrs. Required To complete Task	**30**	**100%**

STUDENTS LEARNING OUTCOME:

At the end of the course

- The students will gain an experience in defining research problem, thesis writing, applying quantitative methods,

TEXT BOOKS:

- Research Methodology: Methods & Techniques by C R Kothari, 2e, Wishwa Publication, New Delhi
- Research Methodology by D K Bhattacharyya, 1 e, Excel Books, New Delhi, 2003

REFERENCE BOOKS:

- How to Research by Loraine Blaxter, Christina Hughes and Molcolm Tight, Viva Books Pvt. Ltd., New Delhi
- Basic Communication Skills for Technology – Andrea J Rutherford (Person)
- Writing Your Thesis by Paul Oliver, Vistaar Pulication, New Delhi, 2006
- The Research Student's Guide to Success by Pat Cryer, Viva Books Pvt Ltd., New Delhi
- Technical Writing Process and Product – Shron J. Gerson (Person)
- Business Communication, Lesiker and Petit: MCGraw Hill Publications, 1995
- Business Correspondence and Report Writing – R.C. Sharma, Krishna Mohan (Tata McGraw)

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First Semester Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: METH102-N/ MEAE107-N-A	Subject Title: ADVANCED THERMODYNAMICS & HEAT TRANSFER

Teaching Scheme				Total Credit	Evaluation Scheme					
L	T	P	Total		Theory		IE	CIA	Pract.	Total
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
4	0	2	6	5	3	70	30	20	30	150

LEARNING OBJECTIVES:

The educational objectives of this course are

- To present a problem oriented in depth knowledge of Advanced Thermodynamics and heat transfer
- To address the underlying concepts and methods behind Advanced Thermodynamics and heat transfer

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation..
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
5. Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
7. The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.
8. Experiments shall be performed in the laboratory related to course contents.

OUTLINE OF THE COURSE:

Sr. No.	Date/Week	Unit No.	Percentage Weightage.	Topic No:
1	1^{st} ,2^{nd} ,3^{rd}	Unit :1	20	1

2	4^{th} ,5^{th} ,6^{th}	Unit:2	20	2
3	7^{th} ,8^{th} ,9^{th}	Unit:3	20	3
4	19^{th} b ,11^{th} ,12^{th}	Unit:4	20	4
5	13^{th} ,14^{th} ,15^{th}	Unit:5	20	5

Total Hours (Theory): 60
Total Hours (Lab): 30
Total Hours: 90

DETAILED SYLLABUS

1. Concept of Exergy and Entropy; Exergy for closed system; Entropy generation; entropy balance for closed system; behavior of gases; Equations of state.

2. Phase equilibrium; phase rule without chemical reaction; chemical potential of ideal gases; T-ds equations for simple compressible systems; Helmholtz and Gibbs functions; Maxwell relations; generalized relations for changes in enthalpy; entropy and internal energy; equations for specific heats; Clausius clapeyron equation; Joule-Thomson and Joule coefficients; applications of thermodynamic relations

3. Review of the basic laws of conduction; One dimensional steady state conduction with variable thermal conductivity and with internal distributed heat source; Extended surfaces-review and design considerations; Two dimensional steady state conduction; Unsteady state conduction; solutions using Groeber's and Heisler's charts for plates, cylinders and spheres suddenly immersed in fluids.

4. Review of convection heat transfer laws, Natural and forced convection; Heat transfer in turbulent flow; eddy heat diffusivity; Reynold's analogy between skin friction and heat transfer; von Karman; turbulent flow through circular tubes

5. Review of radiation heat transfer laws and principles; diffuse surfaces and the Lambert's Cosine law; Radiation through non-absorbing media; Hottel's method of successive reflections.

LESSON PLANNING

Sr. No	LECTURE NO	Course Content	Hrs.	Percentage Weightage
1	**1**	Concept of Exergy and Entropy	**1**	**25%**
2	**2**	Exergy for closed system;	**1**	
3	**3**	Exergy for closed system;	**1**	
4	**4**	Entropy generation	**1**	
5	**5**	Entropy generation	**1**	
6	**6**	entropy balance for close system	**1**	
7	**7**	entropy balance for close system	**1**	

8	**8**	behavior of gases	**1**	
9	**9**	Equations of state	**1**	
10	**10**	Equations of state	**1**	
11	**11**	Phase equilibrium	**1**	
12	**12**	phase rule without chemical reaction	**1**	
13	**13**	phase rule without chemical reaction	**1**	
14	**14**	phase rule without chemical reaction	**1**	
15	**15**	chemical potential of ideal gases	**1**	
16	**16**	T-ds equations for simple compressible systems	**1**	
17	**17**	T-ds equations for simple compressible systems	**1**	
18	**18**	Helmholtz and Gibbs functions	**1**	
19	**19**	Helmholtz and Gibbs functions	**1**	
20	**20**	Maxwell relations	**1**	
21	**21**	generalized relations for changes in enthalpy	**1**	
22	**22**	entropy and internal energy	**1**	**25%**
23	**23**	entropy and internal energy	**1**	
24	**24**	equations for specific heats	**1**	
25	**25**	equations for specific heats	**1**	
26	**26**	Clausius clapeyron equation;	**1**	
27	**27**	Clausius clapeyron equation;	**1**	
28	**28**	Joule-Thomson and Joule coefficients	**1**	
29	**29**	applications of thermodynamic relations	**1**	
30	**30**	applications of thermodynamic relations	**1**	
31	**31**	Review of the basic laws of conduction.	**1**	
32	**32**	One dimensional steady state conduction with variable thermal Conductivity	**1**	
33	**33**	One dimensional steady state conduction with variable thermal Conductivity	**1**	
34	**34**	One dimensional steady state conduction with internal distributed heat source	**1**	**25%**
35	**35**	One dimensional steady state conduction with internal distributed heat source	**1**	
25	**36**	Extended surfaces-review and design considerations	**1**	
37	**37**	Two dimensional steady state conduction	**1**	
38	**38**	Two dimensional steady state conduction	**1**	
39	**39**	Unsteady state conduction	**1**	
40	**40**	olutions using Groeber’s and Heisler’s charts for plates,	**1**	
41	**41**	cylinders and spheres suddenly immersed in fluids.	**1**	
42	**42**	cylinders and spheres suddenly immersed in fluids.	**1**	
43	**43**	Review of convection heat transfer laws	**1**	
44	**44**	Natural and forced convection	**1**	
45	**45**	Natural and forced convection	**1**	**25%**
46	**46**	Heat transfer in turbulent flow	**1**	
47	**47**	Eddy heat diffusivity	**1**	
48	**48**	Reynold’s analogy between skin friction and heat transfer	**1**	
49	**49**	von Karman	**1**	

50	**50**	turbulent flow through circular tubes	**1**	
51	**51**	turbulent flow through circular tubes	**1**	
52	**52**	Review of radiation heat transfer laws and principles	**1**	
53	**53**	diffuse surfaces and the Lambert's Cosine law	**1**	
54	**54**	diffuse surfaces and the Lambert's Cosine law	**1**	
55	**55**	Radiation through non-absorbing media	**1**	
56	**56**	Hottel's method of successive reflections.	**1**	
57	**57**	Case Study-1	**1**	
58	**58**	Case Study-2	**1**	
59	**59**	Case Study-3	**1**	
60	**60**	Case Study-4	**1**	
		TOTAL Hrs. Required To complete Task	**60**	**100%**

STUDENTS LEARNING OUTCOME:

On successful completion of the course

- The student can identify different areas of Thermodynamics and Heat Transfer.
- Can find the applications of all the areas in day to day life..

TEXT BOOKS:

- Fundamentals of Engineering Thermodynamics, Moran MJ & Shapiro HM, John Wiley,
- Engineering Thermodynamics work and heat Transfer, Roger Gordon & Yon Mayhew, Addison-Wesley, 2001
- Thermodynamics an Engineering Approach, Cengel Y.A. & Boles M.A., TMH.

REFERENCE BOOKS:

- Fundamentals of Classical Thermodynamics, Van Wylen GJ & S onntag RE, Wiley 2
- Thermodynamics, Wark K. Jr. & Donald E.R.,McGraw Hill (6th Edn.); 1999.
- Fundamentals of Heat Transfer, Encropera
- Heat, Mass and Momentum transfer, Rohsenow and Choi Prentice Hall
- Fundamentals of Heat Transfer, Grober, Erk and McGraw Hill Grigull
- Analysis of Heat and Mass Transfer, Eckert and Drake McGraw Hill
- Thermal Radiation, Siegel and Howell McGraw Hill.
- Engineering Thermodynamics by Jones & Dugan
- Engineering Thermodynamics by P. K. Nag
- Basic Engineering Thermodynamics by T Ray chaudhary
- Fundamentals of Engineering thermodynamics, R. Yadav.
- Advanced thermodynamics Engineering, KalyanAnnamalai&Ishwar K Puri, CRC Press.
- Heat and Mass Transfer, R.K.Rajput
- Heat and Mass Transfer, D.S.Kumar
- Handbook of Thermal Engineering, Kreith F

WEB MATERIALS:

- www.sciencedirect.com ,
- www.ocw.mit.edu,nptl.ac.in

LIST OF EXPERIMENTS:

Sr. No.	Name of the Experiments
1	Conduction heat transfer in composite wall.
2	Conduction heat transfer in metal rod.
3	Conduction heat transfer in through insulating powder.
4	Conduction heat transfer from a Pin fin.
5	Convection heat transfer in forced convection.
6	To study unsteady state heat transfer by the lumped capacitance
7	To study of heat transfer in the process of condensation.
8	To determine the value of Stefan Boltzmann constant for radiation heat transfer.
9	To measure the emissivity of test plate.
10	To study the pool boiling phenomena and measure the critical heat flux.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First Semester Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: METH103-N	**Subject Title: FLUID MECHANICS & GAS DYNAMICS**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract.**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
4	**0**	**2**	**6**	**5**	**3**	**70**	**30**	**20**	**30**	**150**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To present a problem oriented in depth knowledge of Fluid Mechanics and Gas Dynamics
- To address the underlying concepts and methods behind Fluid Mechanics and Gas Dynamic

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation..
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
5. Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
7. The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.
8. Experiments shall be performed in the laboratory related to course contents.

OUTLINE OF THE COURSE:

Sr. No.	**Date/Week**	**Unit No.**	**Percentage Weightage.**	**Topic No**:
1	1^{st} ,2^{nd} ,3^{rd}	Unit :1	20	1
2	4^{th} ,5^{th} ,6^{th}	Unit:2	20	2

3	7^{th} ,8^{th} ,9^{th}	Unit:3	20	3
4	19^{th} b ,11^{th} ,12^{th}	Unit:4	20	4
5	13^{th} ,14^{th} ,15^{th}	Unit:5	20	5

Total Hours (Theory): 60
Total Hours (Lab): 30
Total Hours: 90

DETAILED SYLLABUS

1. Review of fundamentals; types of flow; Generalized continuity equation; momentum and energy equations, Euler and Navier-Stokes equations, integration of the momentum equation; the generalized Bernoulli's equation; velocity of sound and its importance; physical difference between incompressible, subsonic and supersonic flows; three reference speeds; dimensionless velocity; concepts of static and stagnation parameters.

2. Two dimensional flow in rectangular and polar coordinates; stream function; irrotationality and the velocity potential function; vorticity and circulation; plane potential flow and the complex potential function; Sources, sinks, doublets and vortices; flow around corners; Rankine ovals; flow around circular cylinders with the without circulation; pressure distribution on the surface of these bodies

3. Aerofoil's theory; Joukowski transformation; circular arc, symmetrical aerofoil theory; Joukowski aerofoils; Joukowski hypothesis; drag, and lift forces.

4. Flow in constant area duct; friction-governing equations; choking due to friction, performance of long ducts; isothermal flow in long ducts; Flow in constant area duct with heating and cooling; Normal shocks-Introductory remarks; governing equations; Rankine- Hugonout; Prandtl and other relations; weak shocks; thickness of shocks; normal shocks in ducts; performance of convergent-divergent nozzle with shocks; moving shock waves; shocks problems in one dimensional supersonics diffuser; supersonic pilot tube.

5. Dimensional analysis and similitude: Buckingham pie theorem; Van driest theorem; dimensional analysis; model study; compressible flow of viscous fluids.

LESSON PLANNING

Sr. No	LECTURE NO	Course Content	Hrs.	Percentage Weightage
1	1	Review of fundamentals; types of flow	1	25%
2	2	Generalized continuity equation	1	
3	3	momentum and energy equations	1	
4	4	integration of the momentum equation	1	

5	**5**	the generalized Bernoulli's equation	**1**	
6	**6**	velocity of sound and its importance	**1**	
7	**7**	physical difference between incompressible	**1**	
8	**8**	three reference speeds	**1**	
9	**9**	dimensionless velocity	**1**	
10	**10**	concepts of static	**1**	
11	**11**	stagnation parameters	**1**	
12	**12**	Two dimensional flow in rectangular	**1**	
13	**13**	Two dimensional flow in polar coordinates	**1**	
14	**14**	stream function	**1**	
15	**15**	Irrotationality	**1**	
16	**16**	velocity potential function	**1**	
17	**17**	Vorticity	**1**	
18	**18**	Circulation	**1**	
19	**19**	plane potential flow	**1**	
20	**20**	the complex potential function	**1**	
21	**21**	Sources	**1**	
22	**22**	Sinks	**1**	**25%**
23	**23**	Doublets	**1**	
24	**24**	Vortices	**1**	
25	**25**	flow around corners	**1**	
26	**26**	Rankine ovals	**1**	
27	**27**	flow around circular cylinders with circulation	**1**	
28	**28**	flow around circular cylinders without	**1**	
29	**29**	pressure distribution on the surface of these bodies	**1**	
30	**30**	Aerofoils theory	**1**	
31	**31**	Joukowski transformation	**1**	
32	**32**	circular arc	**1**	
33	**33**	symmetrical aerofoil theory	**1**	
34	**34**	Joukowski aerofoils	**1**	
35	**35**	Joukowski hypothesis	**1**	**25%**
25	**36**	drag forces	**1**	
37	**37**	lift forces	**1**	
38	**38**	Flow in constant area duct	**1**	
39	**39**	friction-governing equations	**1**	
40	**40**	choking due to friction	**1**	
41	**41**	performance of long ducts	**1**	
42	**42**	isothermal flow in long ducts	**1**	
43	**43**	Flow in constant area duct with heating	**1**	
44	**44**	Flow in constant area duct with cooling	**1**	
45	**45**	Normal shocks-Introductory remarks	**1**	**25%**
46	**46**	governing equations	**1**	
47	**47**	Rankine- Hugonout	**1**	
48	**48**	Prandtl and other relations	**1**	
49	**49**	weak shocks	**1**	

50	**50**	thickness of shocks	**1**	
51	**51**	normal shocks in ducts	**1**	
52	**52**	performance of convergent-divergent nozzle with shocks	**1**	
53	**53**	moving shock waves	**1**	
54	**54**	shocks problems in one dimensional supersonics diffuser	**1**	
55	**55**	supersonic pilot tube	**1**	
56	**56**	Dimensional analysis and similitude	**1**	
57	**57**	Buckingham pie theorem	**1**	
58	**58**	Van driest theorem	**1**	
59	**59**	dimensional analysis; model study	**1**	
60	**60**	compressible flow of viscous fluids	**1**	
		TOTAL Hrs. Required To complete Task	**60**	**100%**

STUDENTS LEARNING OUTCOME:

On successful completion of the course

- The student can identify different areas of of Fluid Mechanics and Gas Dynamics.
- Can find the applications of all the areas in day to day life.

TEXT BOOKS:

- Advanced Fluid Mechanics, Raudkiri & Callander Edward Ronald
- Fundamentals of Mechanics, Currie McGraw Hill of Fluids

REFERENCE BOOKS:

- Fluid Mechanics, Landau & Lifshitz Addition Wesley
- Fluid Mechanics, Som & Biswas Tata McGraw Hyde antic Machinery
- Gas dynamics, Ali Campbell & lennings.
- Gas dynamics, Radha Krishnan , PHI
- Fundamentals of compressible flow, S.M. Yahya, New Age Pub
- The Phenomena of Fluid, Brodkey Addition Wesley Motion
- Foundation of Fluid, Yuan Prentice Hall Mechanics
- Fundamentals of Compressible Fluid Dynamics,P.Balachandran,PHI,

LIST OF EXPERIMENTS:

Sr. No.	Name of the Experiments
1	To study calibration characteristics of Rotameter.
2	Study of flow passing through Shocks.
3	Performance and testing of orifice plate, nozzle and Venturimeter.
4	To study different types of Wind tunnel.
5	To study the effect of angle of attack on Lift and Drag force.
6	To study the loss of energy in wake region behind the aerofoil in the wind tunnel.

7	To study the loss of energy in wake region behind various models (car, jeep, bus etc.) in the wind tunnel.
8	To draw profile of NASA Aerofoils.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First Semester Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: METH104-N	**Subject Title: INSTRUMENTATION FOR ENGINEERS**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract.**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
3	**0**	**2**	**5**	**4**	**3**	**70**	**30**	**20**	**30**	**150**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To present a problem oriented in depth knowledge Instrumentation For Engineers
- To address the underlying concepts and methods behind Instrumentation For Engineer

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
5. Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.

OUTLINE OF THE COURSE:

Sr. No.	**Date/Week**	**Unit No.**	**Percentage Weightage.**	**Topic No**:
1	1^{st} ,2^{nd} ,3^{rd}	Unit :1	20	1
2	4^{th} ,5^{th} ,6^{th}	Unit:2	20	2,3
3	7^{th} ,8^{th} ,9^{th}	Unit:3	20	4
4	19^{th} b ,11^{th} ,12^{th}	Unit:4	20	5
5	13^{th} ,14^{th} ,15^{th}	Unit:5	20	6,7

Total Hours (Theory): 45

Total Hours (Lab): 30
Total Hours: 75

DETAILED SYLLABUS

1. Significance of Measurement and Instrumentation: Introduction; generalized configuration and functional stages of measuring systems. The transducer and its environment; an overview; sensing process and physical laws. Types of measurement problems, Transducer classification and their modeling; Information, Energy and Incremental Models; Characteristics of instruments, design and selection of components of a measuring system.

2. Dynamic Response of Instruments: Mathematical model of a measuring system, response of general form of instruments to various test inputs; time-domain and frequency domain analysis. Elementary transfer functions and Bode plots of general transfer functions.

3. Errors in Measurement and its Analysis: Causes and types of experimental errors; systematic and random errors. Uncertainty analysis; computation of overall uncertainty; estimation for design and selection for alternative test methods.

4. Transducers and Transduction Principles: Developments in sensors, detectors and transducer technology; displacement transducers; force, torque and motion sensors; piezoelectric transducers; capacitive type transducers; Strain gage transducers; accelerometers, pressure transducers based on elastic effect of volume and connecting tubing.

5. Data acquisition and Signal Processing: Systems for data acquisition and processing; modules and computerized data system; digitization rate, time and frequency domain representation of signals, and Nyquist criterion.

6. Flow measurement: Flow visualization, shadowgraph; schlieren and interferometric techniques; Pilot static tubes; hot wire anemometers; Laser Doppler velometer; flow measurements using Coriolis Effect.

7. Temperature and Heat Flux Measurement: Thermoelectric sensor; electric resistance sensor; thermistors; radiations pyrometer; Temperature measuring problem in flowing fluids, dynamic compensation.

LESSON PLAN

Sr. No	LECTURE NO	Course Content	Hrs.	Percentage Weightage
1	1	Introduction	1	25%
2	2	generalized configuration and functional stages of measuring systems	1	
3	3	The transducer and its environment; an overview	1	
4	4	sensing process and physical laws	1	

5	**5**	Types of measurement problems	**1**	
6	**6**	Types of measurement problems	**1**	
7	**7**	Transducer classification and their modeling	**1**	
8	**8**	Information, Energy and Incremental Models	**1**	
9	**9**	Characteristics of instruments, design and selection of components of a measuring system	**1**	
10	**10**	Mathematical model of a measuring system	**1**	
11	**11**	response of general form of instruments to various test inputs;	**1**	
12	**12**	time-domain and frequency domain analysis	**1**	
13	**13**	Elementary transfer functions and Bode plots of general transfer functions	**1**	
14	**14**	Causes and types of experimental errors; systematic and random errors	**1**	
15	**15**	Uncertainty analysis	**1**	
16	**16**	computation of overall uncertainty	**1**	
17	**17**	estimation for design and selection for alternative test methods	**1**	
18	**18**	Developments in sensors, detectors and transducer technology	**1**	
19	**19**	displacement transducers	**1**	
20	**20**	torque and motion sensors	**1**	
21	**21**	capacitive type transducers	**1**	
22	**22**	piezoelectric transducers	**1**	**25%**
23	**23**	Strain gage transducers	**1**	
24	**24**	Accelerometers	**1**	
25	**25**	pressure transducers based on elastic effect of volume	**1**	
26	**26**	connecting tubing	**1**	
27	**27**	Systems for data acquisition and processing	**1**	
28	**28**	Modules	**1**	
29	**29**	computerized data system	**1**	
30	**30**	digitization rate	**1**	
31	**31**	Time	**1**	
32	**32**	frequency domain representation of signals	**1**	
33	**33**	Nyquist criterion.	**1**	
34	**34**	Flow visualization	**1**	
35	**35**	Shadowgraph	**1**	**25%**
25	**36**	schlieren	**1**	
37	**37**	interferometric techniques	**1**	
38	**38**	Pilot static tubes & hot wire anemometers	**1**	
39	**39**	Laser Doppler velometer	**1**	
40	**40**	flow measurements using Coriolis Effect.	**1**	
41	**41**	Thermoelectric sensor	**1**	
42	**42**	electric resistance sensor & thermistors	**1**	
43	**43**	radiations pyrometer	**1**	**25%**
44	**44**	Temperature measuring problem in flowing fluids	**1**	
45	**45**	Dynamic compensation.	**1**	
		TOTAL Hrs. Required To complete Task	**45**	**100%**

STUDENTS LEARNING OUTCOME:

On successful completion of the course

- The student can identify different areas of of Instrumentation for Engineers
- Can find the applications of all the areas in day to day life.

TEXT BOOKS:

- Measurement System Application and Design by Doebelin, McGraw Hill Publication.
- Experimental Methods for Engineers by Holman J.P., McGraw Hill Publication.

REFERENCE BOOKS:

- Transducers in Mechanical and Electronic Design by Harry L. Trietly, Marcel Dekker.
- Data Acquisition for Signal Analysis by Yuen, John Wiley and Sons.
- Mechanical Measurements (Fifth Edition) by Beckwith, Marangoni and Lienhard, Addision Wesely
- Measurement in Heat Transfer by Eckert and Goldstein, McGraw Hill Publication.
- Fluid Mechanics Measurement by Goldstein, Hemisphere

WEB MATERIALS:

- www.sciencedirect.com ,
- www.ocw.mit.edu
- www.nptl.ac.in

LIST OF EXPERIMENTS:

Sr. No.	Name of the Experiments
1	Study Of Displacement Transducer.
2	Pressure Transducer.
3	Ac Bridge- Schering's Bridge .
4	Ac Bridge- Maxwell's Inductance,Capacitance Bridge.
5	Dc Bridges -Wheatstone Bridge
6	Dc Bridges -Kelvins Double Bridge
7	Instrumentation Amplifier
8	A/D Converter And D/A Converter.
9	Study Of Transients
10	Calibration Of Single-Phase Energy Meter
11	Measurement Of Three-Phase Power Andpower Factor
12	Calibration Of Current Transformer
13	Measurement Of Iron Loss
14	Ultrasonic Measurement Techniques

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First Semester Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: METH105-N	Subject Title: SEMINAR-1

Teaching Scheme				Total Credit	Evaluation Scheme					
L	T	P	Total		Theory		IE	CIA	Pract.	Total
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
0	0	2	2	1	-	-	-	60	100	160

LEARNING OBJECTIVES:

The educational objectives of this course are

- To present a problem oriented in depth knowledge of Seminar
- To address the underlying concepts and methods behind Seminar

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
5. Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.

Total Hours (Theory): 00
Total Hours (Lab): 30
Total Hours: 30

DETAILED SYLLABUS

Students will do literature review and prepare a project report on relevant topic and give the presentation.

STUDENTS LEARNING OUTCOME:

On successful completion of the course

- The student can identify different areas of of Seminar
- Can find the applications of all the areas in day to day life.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Second Semester Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: MECC201-N	**Subject Title: TECHNICAL COMMUNICATION**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract.**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
2	**0**	**0**	**2**	**2**	**3**	**70**	**30**	**20**	**-**	**120**

LEARNING OBJECTIVES:

This subject intends to bring orientation towards technical communication for PG students. The PG Scholars shall acquire essential skills pertaining to technical communication which are required for various PG activities such as research, seminars, dissertation, report/paper writing, defending examination etc. The course would also help students in identifying different sources of information for literature review and data collection. It would further assist the PG scholars in understanding the drafting technical documentation including research paper/thesis/articles/reports. Further, the scholars are intended understand issues such as ethics, internet communication, gender & diversity issues etc. pertaining to technical communication.

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
5. Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.

OUTLINE OF THE COURSE:

Sr. No.	**Date/Week**	**Unit No.**	**Percentage Weightage.**	**Topic No**:
1	1^{st} ,2^{nd} ,3^{rd}	Unit :1,2	20	1
2	4^{th} ,5^{th} ,6^{th}	Unit:3	20	2

3	7^{th} ,8^{th} ,9^{th}	Unit:4	20	3
4	19^{th} b ,11^{th} ,12^{th}	Unit:5	20	4
5	13^{th} ,14^{th} ,15^{th}	Unit:6	20	5

Total Hours (Theory): 30
Total Hours (Lab): 00
Total Hours: 30

DETAILED SYLLABUS

1. Essence of Technical Communication: Analogy of Question/Answer to Problem/Solution. Steps in technical communication and practical guidelines. Hypothesis. Active-Passive voice, Direct-Indirect Speech.

2. Organization of technical report: Title, Authors, Affiliation, Abstract, Introduction, Literature survey, Methods, Result, Discussion, Figures, Tables, Conclusion, References, Acknowledgement, Communication with editor.

3. Patent Drafting and submission, preparing document for Technology Transfer, MOUs, Confidentiality agreement, SI prefixes, fundamental constants, standard Abbreviations & Scientific & Technological sign & symbols.

4. Wisdom of Internet Communication. Gender and diversity issues and stereotypes used in technical communication.

5. Ethical issues in engineering research, Avoid Plagiarism, citations methodology

6. Preparation & Presentation of research proposal for funding agencies. Poster presentations, Graphical Abstract and Highlights of Research article/proposal/Manuscript. Use of applicable simulation-platforms / open-source toolkits for scientific visualization of data.

LESSON PLANNING

Sr. No	LECTURE NO	Course Content	Hrs.	Percentage Weightage
1	1	Essence of Technical Communication	1	50%
2	2	Analogy of Question/Answer to Problem/Solution	1	
3	3	Steps in technical communication and practical guidelines	1	
4	4	Hypothesis	1	
5	5	Active-Passive voice, Direct-Indirect Speech	1	
6	6	Organization of technical report: Title, Authors,	1	
7	7	Affiliation, Abstract, Introduction, Literature survey	1	
8	8	Methods, Result, Discussion, Figures, Tables, Conclusion	1	
9	9	References, Acknowledgement	1	

10	**10**	Communication with editor	**1**	
11	**11**	Patent Drafting and submission	**1**	
12	**12**	preparing document for,	**1**	
13	**13**	Technology Transfer, MOUs	**1**	
14	**14**	Confidentiality agreement, SI prefixes	**1**	
15	**15**	fundamental constants	**1**	
16	**16**	standard Abbreviations & Scientific & Technological sign & symbols	**1**	**50%**
17	**17**	Wisdom of Internet Communication	**1**	
18	**18**	Gender and diversity issues	**1**	
19	**19**	stereotypes used in technical communication	**1**	
20	**20**	Ethical issues in engineering research	**1**	
21	**21**	Avoid Plagiarism	**1**	
22	**22**	citations methodology	**1**	
23	**23**	Preparation & Presentation of research proposal for funding agencies	**1**	
24	**24**	Poster presentations, Graphical	**1**	
25	**25**	Abstract and Highlights of Research article/proposal/Manuscript	**1**	
26	**26**	Use of applicable simulation-platforms / open-source toolkits for scientific visualization of data	**1**	
27	**27**	Case Study	**1**	
28	**28**	Case Study	**1**	
29	**29**	Case Study	**1**	
30	**30**	Case Study	**1**	
		TOTAL Hrs. Required To complete Task	**30**	

STUDENTS LEARNING OUTCOME:

At the end of this course, the student would be able

- To understand the process of research and learn the technical skills to communicate his/her research
- To learn identifying/drafting problem statement for his/her research domain
- To understand/draft different components of research papers
- To understand the significance of patenting and related drafting
- To understand notes taking, paraphrasing, elevator pitch, gender & diversity issues and ethical issues in technical communication

List of Reference Books:

- C. R. Kothari, "Research Methodology: Methods and Techniques", New Age International Publishers
- Raman, Meenakshi and Sangeeta Sharma, "Technical Communication: Principle and Practice", Oxford University Press.
- Stuart Johnson and Jon Scott, " Study and communication skills for Biosciences, Oxford University press
- Robert A. Day, "Write and Publish a scientific Paper" Oryx Press
- Jennifer Peat, "Scientific Easy when you know how", BMJ books

- Paul G. Chapin, “Research Projects and Research Proposals A Guide for Scientists seeking funding, University Press
- Sharon Gerson, Steven Geson, “Technical Writing: Process and Product”, Pearson Education.
- Sunita Mishra, C, Murlikrishna, “Communication Skills for Engineers”, Pearson Education.

List of References:

1. http://dl.acm.org/
2. http://springer.com/
3. http://sciencedirect.com/ (http://elsevier.com/)
4. http://ieeexplore.ieee.org/
5. https://scholar.google.co.in/
6. https://www.scopus.com/
7. https://iitbombayx.in/

E-Resources / Web Links:

1. http://courses.writing.ufl.edu/3254/Textbook/Lannon%20Instructor%20Manual%2012e.pdf
2. http://www.limat.org/data/research/Research%20Methodology.pdf
3. http://www.sociology.kpi.ua/wp-content/uploads/2014/06/Ranjit_Kumar-Research_Methodology_A_Step-by-Step_G.pdf
4. http://www.ndc.gov.ng/Lectures/Research-Methodology.pdf

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Second Semester Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: METH202-N	**Subject Title: DESIGN OF HEAT EXCHANGE EQUIPMENTS**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract.**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
4	**0**	**2**	**6**	**5**	**3**	**70**	**30**	**20**	**30**	**150**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To present a problem oriented in depth knowledge of Design Of Heat Exchange Equipments
- To address the underlying concepts and methods behind Design Of Heat Exchange Equipments

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation..
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
5. Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
7. The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.
8. Experiments shall be performed in the laboratory related to course contents.

OUTLINE OF THE COURSE:

Sr. No.	**Date/Week**	**Unit No.**	**Percentage Weightage.**	**Topic No:**
1	1^{st} ,2^{nd} ,3^{rd}	Unit :1	20	1
2	4^{th} ,5^{th} ,6^{th}	Unit:2	20	2

3	7^{th} ,8^{th} ,9^{th}	Unit:3	20	3
4	19^{th} b ,11^{th} ,12^{th}	Unit:4	20	4
5	13^{th} ,14^{th} ,15^{th}	Unit:5	20	5

`Total Hours (Theory): 60
Total Hours (Lab): 30
Total Hours: 90

DETAILED SYLLABUS

1. Classification of heat exchangers, basic design methods for heat exchangers,

2. Design of tube in tube and shell and tube heat exchangers, TEMA code

3. Power plant heat exchangers, heat exchangers for heat recovery at low, medium and high temperatures computerized methods for design and analysis of heat exchangers, compact heat exchangers,

4. Principles of boiler design, codes for mechanical design of heat exchangers,

5. Performance enhancement of heat exchangers, fouling of heat exchangers, testing, evaluation and maintenance of heat exchangers.

LESSON PLANNING

Sr. No	LECTURE NO	Course Content	Hrs.	Percentage Weightage
1	**1**	Classification of heat exchangers, basic design methods for heat exchangers,	**8**	**40%**
2	**9**	Design of tube in tube and shell and tube heat exchangers	**4**	
3	**13**	TEMA code	**4**	
4	**17**	Power plant heat exchangers	**4**	
5	**21**	heat exchangers for heat recovery at low	**6**	**20%**
6	**27**	medium and high temperatures computerized methods for design and analysis of heat exchangers	**4**	
7	**31**	compact heat exchanger	**4**	
8	**35**	Principles of boiler design	**8**	**30%**
9	**43**	codes for mechanical design of heat exchangers	**4**	
10	**47**	Performance enhancement of heat exchangers	**6**	
11	**53**	fouling of heat exchangers	**4**	
12	**57**	Testing	**4**	**10%**
13	**61**	evaluation of heat exchangers	**2**	
14	**63**	maintenance of heat exchangers	**2**	
		TOTAL Hrs. Required To complete Task	**60**	**100%**

STUDENTS LEARNING OUTCOME:

On successful completion of the course

- The student can identify different areas of Design Of Heat Exchange Equipments.
- Can find the applications of all the areas in day to day life..

TEXT BOOKS:

- Saunders, E.A.D., "Heat Exchangers – Selection Design and Construction", Longmann Scientific and Technical, N.Y., 2001.
- Kays, V.A. and London, A.L., "Compact Heat Exchangers" , McGraw Hill, 2002.

REFERENCE BOOKS:

- Holger Martin, "Heat Exchangers" Hemisphere Publ. Corp. , Washington, 2001.
- Kuppan, T., "Heat Exchanger Design Handbook", Macel Dekker, Inc., N.Y. , 2000
- Seikan Ishigai, "Steam Power Engineering, Thermal and Hydraulic Design Principles", Cambridge Univ. Press, 2001.

WEB MATERIALS:

- www.sciencedirect.com ,
- www.ocw.mit.edu,nptl.ac.in

LIST OF EXPERIMENTS:

Sr. No.	Name of the Experiments
1	Study of fundamentals of Fluid Flow and Heat Transfer associated with heat exchangers.
2	Design of heat exchange equipment by using method of LMTD.
3	Design of heat exchange equipment by using method – NTU.
4	Design and analysis of Parallel flow and Counter flow heat exchanger.
5	Design and analysis of Shell and tube type heat exchanger.
6	Design and analysis of Plate type heat exchanger.
7	Design of evaporator and condenser for refrigeration system.
8	Design of cooling and air conditioning circuit.
9	Design and analysis of regenerative type heat exchanger for low temperature applications.
10	Case study on design of heat exchanger for process industry.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Second Semester Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: METH203-N	**Subject Title: COMPUTATIONAL FLUID DYNAMICS**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract.**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
3	**0**	**2**	**5**	**4**	**3**	**70**	**30**	**20**	**30**	**150**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To present a problem oriented in depth knowledge of Computational Fluid Dynamics
- To address the underlying concepts and methods behind of Computational Fluid Dynamics

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation..
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
5. Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
7. The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.
8. Experiments shall be performed in the laboratory related to course contents.

OUTLINE OF THE COURSE:

Sr. No.	**Date/Week**	**Unit No.**	**Percentage Weightage.**	**Topic No**:
1	1^{st} ,2^{nd} ,3^{rd}	Unit :1	20	1
2	4^{th} ,5^{th} ,6^{th}	Unit:2	20	2
3	7^{th} ,8^{th} ,9^{th}	Unit:3	20	3
4	19^{th} b ,11^{th} ,12^{th}	Unit:4	20	4,5

5	13^{th} ,14^{th} ,15^{th}	Unit:5	20	6

Total Hours (Theory): 45
Total Hours (Lab): 30
Total Hours: 75

DETAILED SYLLABUS

1. Introduction & Basic concepts: Introduction of CFD, Types of fluids and basic equations of flow, Conservation of mass, Newton's Second law of Motion, Governing equations of fluid flow, Navier-Stokes equations, Boundary layer equations, Expanded form of N-S equations, Conservation of energy principle, Special form of N-S equations, Classification of second order partial differential equations, Initial and boundary conditions, Governing equations in generalized coordinates. Review of essentials of fluid dynamics.

2. Differential Equations & Discretization: Elementary Finite Difference Equations, Basic aspects of Finite Difference Equations, Errors and Stability Analysis, Discretization, Application to heat conduction and convection, Problems on 1-D and 2-D steady state and unsteady state conduction, Problem on Advection phenomenon, Incorporation of Advection scheme.

3. Introduction to Finite Volume Philosophy: Integral approach, discretization & higher order schemes, Application to Complex Geometry.

4. Introduction to solutions of viscous incompressible flows using MAC and simple algorithm.

5. Solutions of viscous incompressible flows by stream function, vorticity formulation. Two dimensionalin compressible viscous flow, estimation of discretization error, applications to curvilinear geometries, derivation of surface pressure & drag..

LESSON PLANNING

Sr. No	LECTURE NO	Course Content	Hrs.	Percentage Weightage
1	**1**	Introduction & Basic concepts: Introduction of CFD	1	**25%**
2	**2**	Types of fluids and basic equations of flow, Conservation of mass	1	
3	**3**	Newton's Second law of Motion	1	
4	**4**	Governing equations of fluid flow	1	
5	**5**	Stokes equations, Boundary layer equations	1	

6	**6**	Expanded form of N-S equations	1	
7	**7**	Conservation of energy principle	1	
8	**8**	Special form of N-S equations	1	
9	**9**	Classification of second order partial differential equations,	1	
10	**10**	Initial and boundary conditions	1	
11	**11**	Governing equations in generalized coordinates..	1	
12	**12**	Review of essentials of fluid dynamics	1	
13	**13**	Differential Equations & Discretization	1	
14	**14**	Elementary Finite Difference Equations,	1	
15	**15**	Basic aspects of Finite Difference Equations, Errors and Stability Analysis	1	
16	**16**	Discretization, Application to heat conduction and convection	1	
17	**17**	Problems on 1-D and 2-D steady state and unsteady state conduction	1	
18	**18**	Problem on Advection phenomenon	1	
19	**19**	Incorporation of Advection scheme	1	
20	**20**	Introduction to Finite Element Philosophy:	1	
21	**21**	Basics of finite element method	1	
22	**22**	stiffness matrix	1	
23	**23**	isoperimetric elements	1	**25%**
24	**24**	formulation of finite elements for flow	1	
25	**25**	formulation of finite elements for heat transfer problems	1	
26	**26**	Case Study	1	
27	**27**	Introduction to Finite Volume Philosophy	1	
28	**28**	Integral approach	1	
29	**29**	Discretization	1	
30	**30**	higher order schemes	1	
31	**31**	Application to Complex Geometry	1	
32	**32**	Introduction to solutions of viscous	1	
33	**33**	incompressible flows using MAC	1	**25%**
34	**34**	simple algorithm	1	

35	**35**	Examples	1	
36	**36**	Solutions of viscous incompressible	1	**25%**
37	**37**	flows by stream function	1	
38	**38**	vorticity formulation	1	
39	**39**	Two dimensionalin compressible viscous flow	1	
40	**40**	Two dimensionalin compressible viscous flow	1	
41	**41**	estimation of discretization error	1	
42	**42**	applications to curvilinear geometries	1	
43	**43**	derivation of surface pressure & drag	1	
44	**44**	Case Study	1	
45	**45**	Case Study	1	
		TOTAL Hrs. Required To complete Task	**45**	**100%**

STUDENTS LEARNING OUTCOME:

On successful completion of the course

- The student can identify different areas of of Computational Fluid Dynamics
- Can find the applications of all the areas in day to day life.

TEXT BOOKS:

- Anderson D.A., Tannehilj.c.Pletcher R.H." Computational fluid mechanics & heat transfer" Hemisphere publishing corporation,. Newyork, U.S.A2004.
- Anker S.V., "Numerical heat transfer & flow" Hemisphere corporation, 2001

REFERENCE BOOKS:

- H.K.verstag&W.Malalsekra," An introduction to computational fluid dynamics" Longman-2000
- Carnahan B, "Applied numerical method" John Wiley & Sons-2001.
- Patankar, " Numerical heat transfer & Fluid Flow", Mc.GrawHill.,2002
- Murlidhar K., Sunderrajan T., "Computational Fluid Mechanics and Heat Transfer",
- Narosa Publishing House.
- Date A. W., "Introduction to Computational Fluid Dynamics", Cambrige Uni. Press, 2005.
- Ferziger J. H., Peric M., "Computational Methods for Fluid Dynamics", Springer, 2002.

WEB MATERIALS:

- www.sciencedirect.com ,
- www.ocw.mit.edu
- www.nptl.ac.in

LIST OF EXPERIMENTS:

Sr. No.	Name of the Experiments
1	Exercise on pin-fin analysis
2	Exercise on 1-D steady state heat conduction
3	Exercise on 1-D unsteady state heat conduction
4	Exercise on 2-D steady state heat conduction
5	Exercise on 2-D unsteady state heat conduction
6	Exercise on heat transfer by convection
7	Exercise on fluid flow
8	Exercise on irregular geometry

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Second Semester Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: METH204-N	Subject Title: NON CONVENTIONAL ENERGY SOURCES

Teaching Scheme				Total Credit	Evaluation Scheme					
L	T	P	Total		Theory		IE	CIA	Pract.	Total
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
4	0	2	6	5	3	70	30	20	30	150

LEARNING OBJECTIVES:

The educational objectives of this course are

- To present a problem oriented in depth knowledge of Non-Conventional Energy Conversion Systems
- To address the underlying concepts and methods behind Non-Conventional Energy Conversion Systems

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
5. Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.

OUTLINE OF THE COURSE:

Sr. No.	Date/Week	Unit No.	Percentage Weightage.	Topic No:
1	1^{st} ,2^{nd} ,3^{rd}	Unit :1	20	1
2	4^{th} ,5^{th} ,6^{th}	Unit:2	20	2
3	7^{th} ,8^{th} ,9^{th}	Unit:3	20	3
4	19^{th} b ,11^{th} ,12^{th}	Unit:4	20	4
5	13^{th} ,14^{th} ,15^{th}	Unit:5	20	5

Total Hours (Theory): 60
Total Hours (Lab): 30
Total Hours: 90

DETAILED SYLLABUS

1. Solar Energy: solar constant, spectral distribution of extraterrestrial radiation, beam and diffuse radiation, Attenuation of beam radiation, equinox and solstice, solar angle, solar time, equation of time, solar radiation measurements, pyranometers, pyrheliometers, estimation of average solar radiations. Flat plate collectors, its components, absorber plate, reflective surfaces, their properties, cover plates, choice of material of cover plates, basic flat plate energy balance equation and collector efficiency, thermal analysis of flat plate collectors and useful design considerations of flat plate collectors. Focusing on concentrating collectors, their advantages and disadvantages over flat plate collector general characteristics, thermal performance and design considerations of focusing collectors. Photo voltaic cells, principles and circuit, properties and load, limits of cell efficiency, design consideration and construction, types and adaptation of photovoltaic, advantages, disadvantages and applications of solar cells.

2. Biogas & Biomass Energy: Biogas conversion technologies, biogas generation, factors affecting biogas generation, classification of biogas plants, advantages and disadvantages of floating drum plant, and fixed dome type plant, constructional details and design criteria of various biogas plants, selection of site, problems related to biogas plants, fuel properties of biogas, utilization of biogas, biogas development in India. Biomass as a source of energy, energy plantation, advantages, plants proposed for energy plantation, methods of obtaining energy from biomass, biomass gasification, classification of biomass gasifier, chemistry of gasification process, application, advantages and disadvantages of biological conversion of solar energy.

3. Wind Energy: Brief history, wind data, wind measurement and measuring instruments, basic principles of wind energy conversion, power in the wind, maximum power, basic components of wind energy conversion systems (WECS), classification, advantages and disadvantages of different WECS, design consideration of horizontal axis and vertical axis machines, analysis of aerodynamics forces acting on blades, performance of wind machines, schemes for electrical power generation, site selecti/on consideration, energy storage, applications, maintenance, safety, environmental aspects, economic consideration of wind machines.

4. Direct Energy Conversion Systems: Fuel cells, principle of operation and design consideration of fuel cells, their classification advantages, disadvantages, work output and EMF of fuel cells, applications of fuel cells. Magnetohydrodynamic power generation - Principle of MHD power generation, MHD systems, their design problems, advantages and disadvantages, problems associated with MHD, plant configurations, detailed analysis of MHD generation. Thermoelectric power, basic principles, thermoelectric power generator, performance analysis thermoelectric materials and their selection. Thermionic generation, thermionic emission and work

function, basic thermionic generator and its analysis. Recent trends in direct energy conversion systems.

5. Hydrogen Energy: Introduction, Hydrogen Production methods, Hydrogen storage, hydrogen transportation, utilization of hydrogen gas, hydrogen as alternative fuel for vehicles.

LESSON PLANNING

Sr. No	LECTURE NO	Course Content	Hrs.	Percentage Weightage
1	**1**	Solar Energy: solar constant, spectral distribution of extraterrestrial radiation, beam and diffuse radiation	1	**25%**
2	**2**	Attenuation of beam radiation, equinox and solstice, solar angle, solar time, equation of time, solar radiation measurements	1	
3	**3**	Pyranometers, pyrheliometers, estimation of average solar radiations. Flat plate collectors	1	
4	**4**	absorber plate, reflective surfaces, their properties	1	
5	**5**	cover plates, choice of material of cover plates	1	
6	**6**	basic flat plate energy balance equation and collector efficiency	1	
7	**7**	thermal analysis of flat plate collectors and useful design considerations of flat plate collectors	1	
8	**8**	Focusing on concentrating collectors	1	
9	**9**	their advantages and disadvantages over flat plate collector general characteristics	1	
10	**10**	thermal performance and design considerations of focusing collector	1	
11	**11**	Photo voltaic cells, principles and circuit	1	
12	**12**	properties and load, limits of cell efficiency	1	
13	**13**	design consideration and construction, type	1	
14	**14**	adaptation of photovoltaic, advantages,	1	
15	**15**	disadvantages and applications of solar cells	1	
16	**16**	Biogas & Biomass Energy: Biogas conversion technologies	1	**25%**
17	**17**	biogas generation, factors affecting biogas generation	1	
18	**18**	classification of biogas plants	1	
19	**19**	advantages and disadvantages of floating drum plant,	1	
20	**20**	advantages and disadvantages of fixed dome type plant	1	
21	**21**	constructional details and design criteria of various biogas plants	1	

22	**22**	selection of site	1	
23	**23**	problems related to biogas plants	1	
24	**24**	fuel properties of biogas	1	
25	**25**	utilization of biogas, biogas development in India	1	
26	**26**	Biomass as a source of energy, energy plantation	1	
27	**27**	advantages, plants proposed for energy plantation, methods of obtaining energy from biomass	1	
28	**28**	biomass gasification, classification of biomass gasifier	1	
29	**29**	chemistry of gasification process, application	1	
30	**30**	advantages and disadvantages of biological conversion of solar energy	1	
31	**31**	Wind Energy: Brief history, wind data	1	
32	**32**	wind measurement and measuring instruments	1	
33	**33**	basic principles of wind energy conversion	1	
34	**34**	power in the wind, maximum power	1	
35	**35**	basic components of wind energy conversion systems (WECS), classification	1	
36	**36**	advantages and disadvantages of different WECS	1	
37	**37**	design consideration of horizontal axis and vertical axis machines, analysis of aerodynamics forces acting on blades	1	
38	**38**	performance of wind machines, schemes for electrical power generation	1	**25%**
39	**39**	site selection on consideration, energy storage, applications, maintenance, safety	1	
40	**40**	environmental aspects, economic consideration of wind machines	1	
41	**41**	Direct Energy Conversion Systems: Fuel cells, principle of operation	1	
42	**42**	design consideration of fuel cells, their classification advantages	1	
43	**43**	disadvantages, work output and EMF of fuel cells	1	
44	**44**	applications of fuel cells	1	
45	**45**	Magnetohydrodynamic power generation	1	
46	**46**	Principle of MHD power generation, MHD systems, their design problems	1	
47	**47**	advantages and disadvantages,	1	**25%**
48	**48**	problems associated with MHD, plant configurations	1	
49	**49**	detailed analysis of MHD generation	1	

50	**50**	Thermoelectric power, basic principles, thermoelectric power generator	1	
51	**51**	performance analysis thermoelectric materials and their selection	1	
52	**52**	Thermionic generation	1	
53	**53**	thermionic emission and work function, basic thermionic generator and its analysis	1	
54	**54**	Case Study	1	
55	**55**	Hydrogen Energy: Introduction, Hydrogen	1	
56	**56**	Production methods	1	
57	**57**	Hydrogen storage	1	
58	**58**	hydrogen transportation	1	
59	**59**	utilization of hydrogen gas	1	
60	**60**	hydrogen as alternative fuel for vehicles	1	
		TOTAL Hrs. Required To complete Task	**60**	**100%**

STUDENTS LEARNING OUTCOME:

0On successful completion of the course

- The student can identify different areas of of Computational Fluid Dynamics
- Can find the applications of all the areas in day to day life.

TEXT BOOKS:

- Non-conventional energy sources by G.D. Rai, Khanna Publishers.
- Solar Energy: Fundamentals and Applications by H. P. Garg& Jai Prakash, TMH.

REFERENCE BOOKS:

- Solar Energy: Principles of Thermal Collection and Storage by S. P. Sukhatme, TMH.
- Alternative Energy Sources by B. L. Singhal, Tech Max Publication.
- Non Conventional Energy Resources by S.HasanSaeed and D. K. Sharma.
- Fuel Cells by Bockris and Srinivasan; McGraw Hill.
- Magneto Hydrodynamics by Kuliovsky and Lyubimov, Addison Publication.
- Solar Engineering of Thermal Processes by Duffic and Beckman, John Wiley.

WEB MATERIALS:

- www.sciencedirect.com ,
- www.ocw.mit.edu
- www.nptl.ac.in

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Second Semester Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: METH205 -N	**Subject Title: SEMINAR-2**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract.**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
0	**0**	**2**	**2**	**1**	**-**	**-**	**-**	**60**	**100**	**160**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To present a problem oriented in depth knowledge of Seminar
- To address the underlying concepts and methods behind Seminar

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
5. Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.

Total Hours (Theory): 00

Total Hours (Lab): 30

Total Hours: 30

DETAILED SYLLABUS

Students will do literature review and prepare a project report on relevant topic and give the presentation.

STUDENTS LEARNING OUTCOME:

On successful completion of the course

- The student can identify different areas of of Seminar
- Can find the applications of all the areas in day to day life.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Third Semester Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: METH301-N	**Subject Title: MODELING, SIMULATION & COMPUTER APPLICATION**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract.**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
4	**0**	**2**	**6**	**5**	**3**	**70**	**30**	**20**	**30**	**150**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To present a problem oriented in depth knowledge of Modeling, Simulation & Computer Application
- To address the underlying concepts and methods behind Modeling, Simulation & Computer Application

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation..
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
5. Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
7. The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.
8. Experiments shall be performed in the laboratory related to course contents.

OUTLINE OF THE COURSE:

Sr. No.	**Date/Week**	**Unit No.**	**Percentage Weightage.**	**Topic No:**
1	1^{st} ,2^{nd} ,3^{rd}	Unit :1	20	1

2	4^{th} ,5^{th} ,6^{th}	Unit:2	20	2
3	7^{th} ,8^{th} ,9^{th}	Unit:3	20	3
4	19^{th} b ,11^{th} ,12^{th}	Unit:4	20	4
5	13^{th} ,14^{th} ,15^{th}	Unit:5	20	5

Total Hours (Theory): 60
Total Hours (Lab): 30
Total Hours: 90

DETAILED SYLLABUS

1. Concept of system and environment; Continuous and discrete system; linear and nonlinear systems; stochastic activities; static and dynamic models; principles used in modeling; Models classifications, Mathematical models, Physical models, analog models and others, Estimation of model parameters;

2. Technique of simulation; experimental nature of simulation; numerical computation techniques; continuous system models; analog and hybrid simulation; feedback systems; Stochastic variables; discrete and continuous probability functions; random numbers; rejection method.

3. Computer technique for simulation; computer generation of Pseudo random; Application, Modeling of Civil, Electrical and Mechanical components of small hydro and Renewable Energy Projects.

4. Introduction to SCILAB/MAT lab Environment, Defining Matrices, Matrix Manipulation Data Structures, 2D Graphics,3D Graphics, Flow Control, Editor/Debugger window

5. Creating Matlab functions, Improving code performance, Error Correcting, Various Simulation tools.

LESSON PLANNING

Sr. No	LECTURE NO	Course Content	Hrs.	Percentage Weightage
1	**1**	Concept of system and environment	1	**25%**
2	**2**	Continuous and discrete system	2	
3	**4**	linear systems	1	
4	**5**	Nonlinear systems	1	
5	**6**	stochastic activities	2	
6	**8**	static and dynamic models	1	
7	**9**	principles used in modelling	2	
8	**11**	Models classifications	1	
9	**12**	Mathematical models	2	

10	**13**	Physical models	1	
11	**14**	analog models and others	1	
12	**15**	Estimation of model parameters	1	
13	**16**	Technique of simulation	2	
14	**18**	experimental nature of simulation	1	
15	**19**	numerical computation techniques	1	
16	**20**	continuous system models	1	
17	**21**	analog and hybrid simulation	2	**25%**
18	**23**	feedback systems	1	
19	**24**	Stochastic variables	1	
20	**25**	discrete probability functions	2	
21	**27**	continuous probability functions	2	
22	**29**	random numbers	1	
23	**30**	rejection method	2	
24	**32**	Computer technique for simulation	1	
25	**33**	Computer technique for simulation	1	
26	**34**	computer generation of Pseudo random	2	
27	**36**	Application Modeling of Civil	2	
28	**38**	Electrical Energy Projects	2	**25%**
29	**40**	Mechanical components of small hydro Energy Projects	1	
30	**41**	Renewable Energy Projects	2	
31	**43**	Introduction to SCILA	2	
32	**45**	MAT lab	1	
33	**46**	MAT lab Environment	1	**25%**
34	**47**	Defining Matrices	1	
35	**48**	Matrix Manipulation Data Structures	2	
36	**50**	2D Graphics	1	
37	**51**	3D Graphics	1	
38	**52**	Flow Control	2	
39	**54**	Editor/Debugger window	1	
40	**55**	Creating Matlab functions	1	
41	**56**	Improving code performance	1	
42	**57**	Error Correcting	2	
43	**59**	Various Simulation tools	1	
		TOTAL Hrs. Required To complete Task	**60**	**100%**

STUDENTS LEARNING OUTCOME:

On successful completion of the course

- The student can identify different areas of Modeling, Simulation & Computer Application
- Can find the applications of all the areas in day to day life.

TEXT BOOKS:

- System Simulation, Geoffrey Gordon Prentice-Hall
- System Simulation, The Art and Science, Robert E. Shannon Prentice – Hall

REFERENCE BOOKS:

- System Modeling and Control, J. Schwarzenbach and K. F. Gill, Edward Arnold
- Modeling and Analysis Of Dynamic Systems, Charles M. Close & Dean K. Frederick Houghton Miffin
- Simulation of Manufacturing, Allan Carrie John, Wiley & Sons
- Computational Heat Transfer, Y. Jaluria and K. E. Torrance Hemisphere Publishing
- System Simulation Dr. D. S. Hira

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Third Semester Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: METH302-N	**Subject Title: DISSERTATION PHASE-I**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract.**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
-	**-**	**-**	**-**	**15**	**-**	**-**	**-**	**50**	**150**	**200**

Course Objective:

- To present a problem oriented in depth knowledge of Dissertation Phase-I
- To address the underlying concepts and methods behind Dissertation Phase-I

Instructional Method & Pedagogy:

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weight age should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4. Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
5. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation

Students Learning Outcomes:

- The student can identify different areas of Dissertation Phase-I
- Can find the applications of all the areas in day to day life

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Fourth Semester Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: METH401-N	**Subject Title: MID SEMESTER THESIS PROGRESS REVIEW**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract.**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
-	**-**	**-**	**-**	**05**	**-**	**-**	**-**	**50**	**150**	**200**

Course Objective:

- To present a problem oriented in depth knowledge of Mid semester Thesis Progress Review
- To address the underlying concepts and methods behind Mid semester Thesis Progress Review

Instructional Method & Pedagogy:

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed

2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.

3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.

4. Assignment based on course content will be given to the student for each unit/topic and will be
evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.

5. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.

Students Learning Outcomes:

- The student can identify different areas of Mid semester Thesis Progress Review
- Can find the applications of all the areas in day to day life.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

Fourth Semester Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: METH402-N	Subject Title: DISSERTATION PHASE-II

Teaching Scheme				Total Credit	Evaluation Scheme					
L	T	P	Total		Theory		IE	CIA	Pract.	Total
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
-	-	-	-	20	-	-	-	100	200	300

Course Objective:

- To present a problem oriented in depth knowledge of Dissertation Phase-II
- To address the underlying concepts and methods behind Dissertation Phase-II

Instructional Method & Pedagogy:

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed

2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.

3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.

4. Assignment based on course content will be given to the student for each unit/topic and will be
evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.

5. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.

Students Learning Outcomes:

- The student can identify different areas of Dissertation Phase-II
- Can find the applications of all the areas in day to day life.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First/Second Year Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: METH106-N-A/ MEAE106-N-A	Subject Title: ADVANCED INTERNAL COMBUSTION ENGINE

Teaching Scheme				Total Credit	Evaluation Scheme					
L	T	P	Total		Theory		IE	CIA	Pract.	Total
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
4	0	2	6	4	3	70	30	20	30	150

LEARNING OBJECTIVES:

The educational objectives of this course are

- To present a problem oriented in depth knowledge of Advanced Internal Combustion Engine
- To address the underlying concepts and methods behind Advanced Internal Combustion Engine

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation..
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
5. Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
7. The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.
8. Experiments shall be performed in the laboratory related to course contents.

OUTLINE OF THE COURSE:

Sr. No.	Date/Week	Unit No.	Percentage Weightage.	Topic No:
1	1st ,2nd ,3rd	Unit :1	20	1,2
2	4th ,5th ,6th	Unit:2	20	3
3	7th ,8th ,9th	Unit:3	20	4
4	19th b ,11th ,12th	Unit:4	20	5
5	13th ,14th ,15th	Unit:5	20	6

Total Hours (Theory): 60
Total Hours (Lab): 30
Total Hours: 90

DETAILED SYLLABUS

1. Review of thermodynamic cycles: ideal, fuel – air and real cycles. I.C engine Processes: Suction, compression, Combustion, Expansion, Fuel injection and carburetion, Exhaust, Supercharged & turbocharged engine, cycle simulation.

2. Gas exchange processes: Flow through valves, phase of the flow, turbulence, analysis of suction and exhaust processes, manifold tuning.

3. Alternate fuels for IC engines: Fuels & their properties, future fuels like Hydrogen, Bio gas, Alcohols, producer gas, LPG, CNG- fuels rating Coal- gasification & liquefaction, Non edible vegetable oils, non edible wild oil, NH3 as substitute fuel for SI and CI engine, fuel additives. Pros and cons of alternate fuel.

4. Combustion in SI and CI engine: Combustion of SI and CI engine, Normal and abnormal combustion parameters effecting various phases of combustion, Combustion chambers, construction and design, Battery, magneto electronic- ignition system in SI engine, Volumetric efficiency.

5. Recent development in IC engine: MPFI, their advantages & limitations, circuit discussion PIV in turbulence measurement, optical methods for flame velocity measurement, new materials for engine components, alternative power plants, improved two stroke engine, hybrid, propulsion system, Fuel efficient IC engines, emission control technology emission, economics and performance for alternative fuels for IC engines.

6. Air–pollution from I.C. Engines: S.I. & C.I. Engine Emission effects of pollutants on Human health & Biological sphere. Measurement techniques used to measure pollutants. Control of emission from S.I. & C.I. engines, Noise pollution & its control. Catalytic converters, Pollution law.

LESSON PLANNING

Sr. No	LECTURE NO	Course Content	Hrs.	Percentage Weightage
1	**1**	Review of thermodynamic cycles: ideal, fuel	**1**	**25%**
2	**2**	air and real cycles	**1**	
3	**3**	I.C engine Processes	**1**	
4	**4**	Suction, compression	**1**	
5	**5**	Combustion, Expansion	**1**	
6	**6**	Fuel injection and carburetion, Exhaust	**1**	
7	**7**	Supercharged engine,	**1**	
8	**8**	Turbocharged engine,	**1**	
9	**9**	Cycle simulation.	**1**	
10	**10**	Gas exchange process	**1**	
11	**11**	Flow through valves	**1**	
12	**12**	phase of the flow	**1**	
13	**13**	turbulence,	**1**	
14	**14**	analysis of suction	**1**	
15	**15**	exhaust processes	**1**	
16	**16**	manifold tuning	**1**	**25%**
17	**17**	Case Study	**1**	
18	**18**	Alternate fuels for IC engines	**1**	
19	**19**	Fuels & their properties	**1**	
20	**20**	future fuels like Hydrogen	**1**	
21	**21**	Bio gas, Alcohols	**1**	
22	**22**	producer gas, LPG, CNG	**1**	
23	**23**	fuels rating Coal- gasification & liquefaction	**1**	
24	**24**	Non edible vegetable oils	**1**	
25	**25**	non edible wild oil	**1**	
26	**26**	NH3 as substitute fuel for SI and CI engine	**1**	
27	**27**	fuel additives	**1**	
28	**28**	Pros and cons of alternate fuel.	**1**	
29	**29**	Examples	**1**	
30	**30**	Combustion in SI and CI engine comparision	**1**	**25%**
31	**31**	Combustion of CI engine	**1**	
32	**32**	Combustion of SI engine	**1**	
33	**33**	Normal combustion parameters effecting	**1**	
34	**34**	Abnormal combustion parameters effecting	**1**	
35	**35**	various phases of combustion	**1**	
25	**36**	Combustion chambers	**1**	
37	**37**	construction and design,	**1**	
38	**38**	Battery, magneto electronic	**1**	
39	**39**	ignition system in SI engine	**1**	
40	**40**	Volumetric efficiency	**1**	
41	**41**	Recent development in IC engine: MPFI	**1**	**25%**
42	**42**	Advantages & limitations,	**1**	

43	**43**	circuit discussion PIV in turbulence measurement	**1**	
44	**44**	optical methods for flame velocity measurement	**1**	
45	**45**	new materials for engine components, alternative power plants	**1**	
46	**46**	improved two stroke engine	**1**	
47	**47**	hybrid, propulsion system	**1**	
48	**48**	Fuel efficient IC engines	**1**	
49	**49**	emission control technology emission, economics	**1**	
50	**50**	performance for alternative fuels for IC engines	**1**	
51	**51**	Air–pollution from I.C. Engines: S.I. & C.I	**1**	
52	**52**	Engine Emission	**1**	
53	**53**	effects of pollutants on Human health & Biological sphere	**1**	
54	**54**	Measurement techniques used to measure pollutants	**1**	
55	**55**	Control of emission from S.I. & C.I. engine	**1**	
56	**56**	Noise pollution & its control	**1**	
57	**57**	Catalytic converters, Pollution law	**1**	
58	**58**	Examples	**1**	
59	**59**	Case Study	**1**	
60	**60**	Case Study	**1**	
		TOTAL Hrs. Required To complete Task	**60**	**100%**

STUDENTS LEARNING OUTCOME:

On successful completion of the course

- The student can identify different areas of Advanced Internal Combustion Engine.
- Can find the applications of all the areas in day to day life..

TEXT BOOKS:

- Maleev, "I. C. Engines: Theory and Practice", McGraw -Hill-2000.
- Heywood, J. B., "Internal Combustion Engine Fundament als", McGraw Hill International Edition, 2002.

REFERENCE BOOKS:

- Richard, Stone, "Introduction to Internal Combustion Engines", 2 ndEdn. McMillan Press, 2003.
- Taylor, C. F., "Internal Combustion Engine in Theory and Practice", Vol. 1 & 2, M. I. T. Press, Cambridge, USA, 2003.
- Juvinall, R. C., and Marshek, K. M., "Fundamental of Machine Component Design", John Wiley & Sons, N.Y., 2001.

WEB MATERIALS:

- www.sciencedirect.com ,
- www.ocw.mit.edu,nptl.ac.in

LIST OF EXPERIMENTS:

Sr. No.	Name of the Experiments
1	To determine optimum injection pressure in single cylinder diesel engine by varing the injection pressure

2	Performance test of single cylinder I.C. engines as per I.S.10001
3	To Determine indicated hourse power of multi cylinder petrol engineand find out mechanical efficiency of an engine
4	Optimization of fuel injection advances in single cylinder diesel engines
5	To check operation and performance of multi cylinder fuel pump for diesel engine with the help of fuel pump test bench
6	Assignment on various cycle analysis and turbochargers

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First/Second Year Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: METH106-N-B	**Subject Title: ADVANCED REFRIGERATION ENINEERING**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract.**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
4	**0**	**2**	**6**	**4**	**3**	**70**	**30**	**20**	**30**	**150**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To present a problem oriented in depth knowledge Advanced Refrigeration
- To address the underlying concepts and methods behind Advanced Refrigeration

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
5. Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.

OUTLINE OF THE COURSE:

Sr. No.	**Date/Week**	**Unit No.**	**Percentage Weightage.**	**Topic No**:
1	1^{st} ,2^{nd} ,3^{rd}	Unit :1	20	1, 2,3
2	4^{th} ,5^{th} ,6^{th}	Unit:2	20	4,5
3	7^{th} ,8^{th} ,9^{th}	Unit:3	20	6,7
4	19^{th} b ,11^{th} ,12^{th}	Unit:4	20	8,9

5	13^{th} ,14^{th} ,15^{th}	Unit:5	20	10,11

Total Hours (Theory): 60
Total Hours (Lab): 30
Total Hours: 90

DETAILED SYLLABUS

1. Balancing of vapor compression refrigeration system
2. Dual pressure vapor compression system and its analysis.
3. Compound compression with flash cooler and flash intercooler, multiple expansions, parallel operation, sectionalizing, booster operations, various types of cascade systems analysis
4. Refrigerants: Ecofriendly refrigerants & their properties, secondary Refrigerants, mixture of refrigerants, azeotropics, salient characteristics of various refrigerants. Synthetic lubricating oil &their properties
5. Absorption refrigeration: H-x charts of LiBr-H2O and NH3-H2O solutions. analysis of vapor absorption refrigeration system on H-X charts, mass concentration &equilibrium charts , heat balance, COP comparison with vapor compression refrigeration systems, two stage vapor absorption refrigeration system, balancing of vapor absorption refrigeration systems.
6. Air cycle refrigeration, Analysis of various cycles and their applications. Calculations of COP
7. Steam jet refrigeration - cycle analysis, analysis on H-O charts performance, control and various applications.
8. Thermo-electric refrigeration: Thermo-electric effects, analysis of thermoelectric cooling, COP, FOM, thermoelectric, materials.
9. Heat pumps: Sources and sinks, refrigerant circuits, heating and cooling performance of heat pumps.
10. Preservation & processing of food by use of refrigeration

LESSON PLANNING

Sr. No	LECTURE NO	Course Content	Hrs.	Percentage Weightage
1	**1**	Balancing of vapor compression refrigeration system	**1**	**25%**
2	**2**	Balancing of vapor compression refrigeration system	**1**	
3	**3**	Balancing of vapor compression refrigeration system	**1**	
4	**4**	Dual pressure vapor compression system and its analysis	**1**	
5	**5**	Dual pressure vapor compression system and its analysis	**1**	
6	**6**	Dual pressure vapor compression system and its analysis	**1**	
7	**7**	Comparision flash cooler and flash intercooler, ,	**1**	
8	**8**	Compound compression with flash cooler	**1**	
9	**9**	Compound compression with flash intercooler	**1**	
10	**10**	multiple expansions	**1**	
11	**11**	parallel operation	**1**	
12	**12**	sectionalizing	**1**	

13	**13**	booster operations	**1**	
14	**14**	various types of cascade systems analysis	**1**	
15	**15**	Refrigerants	**1**	
16	**16**	Refrigerants	**1**	**25%**
17	**17**	Ecofriendly refrigerants	**1**	
18	**18**	Ecofriendly refrigerants properties	**1**	
19	**19**	secondary Refrigerants	**1**	
20	**20**	mixture of refrigerants	**1**	
21	**21**	azeotropics	**1**	
22	**22**	salient characteristics of various refrigerants	**1**	
23	**23**	Synthetic lubricating oil &their properties	**1**	
24	**24**	Case Study	**1**	
25	**25**	Absorption refrigeration	**1**	
26	**26**	Absorption refrigeration	**1**	
27	**27**	H-x charts of NH3-H2O solutions	**1**	
28	**28**	H-x charts of LiBr-H2O solutions	**1**	
29	**29**	Analysis of vapor absorption refrigeration system on H-X charts	**1**	
30	**30**	Mass concentration	**1**	**25%**
31	**31**	Equilibrium charts	**1**	
32	**32**	heat balance	**1**	
33	**33**	COP comparison with vapor compression refrigeration systems	**1**	
34	**34**	two stage vapor absorption refrigeration system	**1**	
35	**35**	two stage vapor absorption refrigeration system	**1**	
25	**36**	balancing of vapor absorption refrigeration systems	**1**	
37	**37**	Air cycle refrigeration	**1**	
38	**38**	Air cycle refrigeration	**1**	
39	**39**	Analysis of various cycles	**1**	
40	**40**	Analysis of applications	**1**	
41	**41**	Calculations of COP	**1**	**25%**
42	**42**	Examples	**1**	
43	**43**	Steam jet refrigeration	**1**	
44	**44**	cycle analysis	**1**	
45	**45**	analysis on H-O charts performance	**1**	
46	**46**	analysis on H-O charts performance	**1**	
47	**47**	control	**1**	
48	**48**	various applications	**1**	
49	**49**	Thermo-electric refrigeration:, ,	**1**	
50	**50**	Thermo-electric effects	**1**	
51	**51**	analysis of thermoelectric cooling	**1**	
52	**52**	COP, FOM	**1**	
53	**53**	thermoelectric	**1**	
54	**54**	materials	**1**	
55	**55**	Heat pumps: Sources and sinks, refrigerant circuits,	**1**	
56	**56**	heating and cooling performance of heat pumps	**1**	
57	**57**	Design of refrigeration systems for other application for transport refrigeration,.	**1**	

58	**58**	Design of refrigeration systems for industrial	**1**	
59	**59**	walk in coolers & cold storages for different applications	**1**	
60	**60**	Preservation & processing of food by use of refrigeration	**1**	
		TOTAL Hrs. Required To complete Task	**60**	**100%**

STUDENTS LEARNING OUTCOME:

On successful completion of the course

- The student can identify different areas of of Advanced Refrigeration
- Can find the applications of all the areas in day to day life.

TEXT BOOKS:

- Threlked, J.L., "Thermal Environmental Engineering", Prentice Hall, N. Y., 1970.
- Air conditioning principles and systems –pita

REFERENCE BOOKS:

- ASHRAE Data Book, (1) Fundamentals (2001) (2) application (1999) (3) System and
- Equipments (2000)
- Refrigeration and air conditioning, stocker
- Refrigeration and air conditioning, Jordan and Priester
- Refrigeration and air conditioning, C. P. Arora
- Industrial refrigeration handbook, stoecker,1998

WEB MATERIALS:

- www.sciencedirect.com ,
- www.ocw.mit.edu
- www.nptl.ac.in

LIST OF EXPERIMENTS:

Sr. No.	Name of the Experiments
1	Study of advanced refrigeration systems.
2	Performance and analysis of VCR system using capillary tube as a throttling device.
3	Performance and analysis of VCR system using thermostatic expansion valve as a throttling device.
4	Study and design of a steam jet refrigeration system.
5	Study and design of cascade refrigeration system.
6	Performance and analysis of VAR system in "Electrolux" refrigerator.
7	Performance and analysis on Heat Pump system with different working conditions.
8	Design and selection of different components of VCR system.
9	Study of NH3 condensing plant of a cold storage.
10	Study of freeze drying machine.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First/Second Year Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: METH107-N-A	**Subject Title: BOILER TECHNOLOGY**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract.**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
3	**0**	**0**	**3**	**3**	**3**	**70**	**30**	**20**	**-**	**120**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To learn students about different types of boilers and its application in the various industry for different purpose.
- To develop skill in students to identify the different problems in the boiler during the operation of boiler by theoretical knowledge & to resolve them by theoretical knowledge.
- To do thermal analysis and design of boiler.

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation..
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
5. Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
7. The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.
8. Experiments shall be performed in the laboratory related to course contents.

OUTLINE OF THE COURSE:

Sr. No.	Date/Week	Unit No.	Percentage Weightage.	Topic No:
1	1st ,2nd ,3rd	Unit :1	20	1
2	4th ,5th ,6th	Unit:2	20	2
3	7th ,8th ,9th	Unit:3	20	3
4	19th b ,11th ,12th	Unit:4	20	4
5	13th ,14th ,15th	Unit:5	20	5

Total Hours (Theory): 45, Total Hours (Lab): 0, Total Hours: 45

DETAILED SYLLABUS

1. INTRODUCTION:
Parameter of a Steam Generator-Thermal Calculations of a Modern steam Generator – Tube Metal Temperature Calculation and choice of Materials - Steam Purity Calculations and Water Treatment

2. HEAT BALANCE:
Heat transfer in Furnace - Furnace Heat Balance - Calculation of Heating Surfaces - Features of Firing Systems for solid -Liquid and Gaseous Fuels-Design of Burners

3. BOILER DESIGN:
Design of Boiler Drum - Steam Generator Configurations For Industrial Power and Recovery Boilers – Pressure Loss and Circulation in Boilers

4. DESIGN OF ACCESSORIES:
Design of Air Preheaters - Economizers and Superheated for high Pressure Steam Generators - Design Features of Fuel Firing Systems and Ash Removing Systems

5. BOILER CODE:
IBR and International Regulations - ISI Code's Testing and Inspection of Steam Generator – Safety Methods in Boilers - Factor of Safety in the Design of Boilers Drums and Pressure Parts - Safety of Fuel Storage and Handling - Safety Methods for Automatic Operation of Steam Boilers

LESSON PLANNING

Sr. No	LECTURE NO	Course Content	Hrs.	Percentage Weightage
1	**1**	INTRODUCTION: Parameter of a Steam Generator	**1**	**25%**
2	**2**	Thermal Calculations of a Modern steam Generator	**1**	
3	**3**	Thermal Calculations of a Modern steam Generator	**1**	

4	**4**	Tube Metal Temperature Calculation	**1**	
5	**5**	Tube Metal Temperature Calculation	**1**	
6	**6**	choice of Materials	**1**	
7	**7**	Steam Purity Calculations and Water Treatment	**1**	
8	**8**	Examples	**1**	
9	**9**	Examples	**1**	
10	**10**	HEAT BALANCE: Heat transfer in Furnace	**1**	
11	**11**	Furnace Heat Balance	**1**	
12	**12**	Calculation of Heating Surfaces	**1**	
13	**13**	Calculation of Heating Surfaces	**1**	
14	**14**	Features of Firing Systems for solid	**1**	
15	**15**	Gaseous Fuels	**1**	
16	**16**	Liquid Fuels	**1**	
17	**17**	Design of Burners	**1**	
18	**18**	BOILER DESIGN: Design of Boiler Drum	**1**	
19	**19**	Steam Generator Configurations	**1**	
20	**20**	Examples	**1**	
21	**21**	Examples	**1**	
22	**22**	Industrial Power	**1**	**25%**
23	**23**	Recovery Boilers	**1**	
24	**24**	Pressure Loss and Circulation in Boilers	**1**	
25	**25**	Case Study	**1**	
26	**26**	Case Study	**1**	
27	**27**	DESIGN OF ACCESSORIES:	**1**	
28	**28**	Air Preheaters	**1**	
29	**29**	Design of Air Preheaters	**1**	
30	**30**	Generators	**1**	
31	**31**	Economizers for high Pressure Steam	**1**	
32	**32**	Superheated for high Pressure Steam	**1**	
33	**33**	Design Features of Fuel Firing Systems	**1**	
34	**34**	Ash Removing Systems	**1**	
35	**35**	BOILER CODE: IBR and International Regulations	**1**	
25	**36**	ISI Code's Testing and Inspection of Steam Generator	**1**	**25%**
37	**37**	ISI Code's Testing and Inspection of Steam Generator	**1**	
38	**38**	Safety Methods in Boilers	**1**	
39	**39**	Factor of Safety in the Design of Boilers Drums and Pressure Parts	**1**	
40	**40**	Factor of Safety in the Design of Boilers Drums and Pressure Parts	**1**	
41	**41**	Examples	**1**	
42	**42**	Safety of Fuel Storage and Handling	**1**	
43	**43**	Safety Methods for Automatic Operation of Steam Boilers	**1**	**25%**
44	**44**	Case Study	**1**	
45	**45**	Case Study	**1**	
		TOTAL Hrs. Required To complete Task	**60**	**100%**

STUDENTS LEARNING OUTCOME:

On successful completion of the course

- The student can identify different areas of Applied Mathematics Boiler Technology.
- Can find the applications of all the areas in day to day life.

TEXT BOOKS & REFERENCE BOOKS:

- David Gunn, Robert Horton, Industrial Boilers - Longman Scientific & Technical Publication, 1986
- Carl Schields, Boilers - Type, Charecteristics and Functions, McGraw Hill Publishers, 1982
- Modern Power Station Practice(8 vol) - Central Electricity Generation Board, 1980
- Large Boiler Furnaces, Richard Dolezal Elsevier Publishing Company, 1980

WEB MATERIALS:

- http://www.volund.uk
- http://www.aee.vatech.co.at
- http://www.thermomax.com
- http://www.pages.hotbot.com

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First/Second Year Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: METH107-N-B	**Subject Title: ENERGY CONSERVATION & MANAGEMENT**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract.**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
3	**0**	**0**	**3**	**3**	**3**	**70**	**30**	**20**	**-**	**120**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To present a problem oriented in depth knowledge of Energy Conservation & Management
- To address the underlying concepts and methods behind of Energy Conservation & Management

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation..
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
5. Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
7. The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.

OUTLINE OF THE COURSE:

Sr. No.	**Date/Week**	**Unit No.**	**Percentage Weightage.**	**Topic No**:
1	1^{st} ,2^{nd} ,3^{rd}	Unit :1	20	1
2	4^{th} ,5^{th} ,6^{th}	Unit:2	20	2
3	7^{th} ,8^{th} ,9^{th}	Unit:3	20	3
4	19^{th} b ,11^{th} ,12^{th}	Unit:4	20	4
5	13^{th} ,14^{th} ,15^{th}	Unit:5	20	5

Total Hours (Theory): 45
Total Hours (Lab): 00
Total Hours: 45

DETAILED SYLLABUS

1. Energy scenario, Principles of energy Conservation, Energy consumption pattern, Resource availability.

2. Evaluation of thermal performance, calculation of heat loss – heat gain, estimation of annual heating & cooling load factors that influence thermal performance, analysis of existing buildings.

3. Organizing for energy conservation programme, the energy audit and energy information system, technology for energy conservation, co-generation of process, steam & electricity, computer controlled energy management

4. Strategies for electricity and management, setting up an energy management programme, electricity saving technique by category of end use, Electrical end use in industries, energy & power management in industry, energy management strategies for industry, demand management.

5. Importance and role of energy management, Energy economics, Payback period, Internal rate of return, life cycle costing.

LESSON PLANNING

Sr. No	LECTURE NO	Course Content	Hrs.	Percentage Weightage
1	**1**	Energy scenario	**1**	
2	**2**	Principles of energy Conservation	**1**	
3	**3**	Energy consumption pattern	**1**	
4	**4**	Energy consumption pattern	**1**	
5	**5**	Resource availability	**1**	
6	**6**	Examples	**1**	
7	**7**	Examples	**1**	
8	**8**	Case Study	**1**	**25%**
9	**9**	Evaluation of thermal performance	**1**	
10	**10**	calculation of heat gain	**1**	
11	**11**	calculation of heat loss	**1**	
12	**12**	estimation of annual heating	**1**	
13	**13**	cooling load factors that influence thermal performance	**1**	
14	**14**	cooling load factors that influence thermal performance	**1**	
15	**15**	analysis of existing buildings	**1**	
16	**16**	Examples	**1**	
17	**17**	Examples	**1**	**25%**
18	**18**	Organizing for energy conservation programme	**1**	

19	**19**	the energy audit	**1**	
20	**20**	the energy audit	**1**	
21	**21**	energy information system	**1**	
22	**22**	technology for energy conservation	**1**	
23	**23**	co-generation of process	**1**	
24	**24**	steam & electricity	**1**	
25	**25**	computer controlled energy management	**1**	
26	**26**	Strategies for electricity	**1**	
27	**27**	Strategies for management	**1**	
28	**28**	setting up an energy management programme	**1**	
29	**29**	setting up an energy management programme	**1**	
30	**30**	electricity saving technique by category of end use	**1**	
31	**31**	Electrical end use in industries	**1**	
32	**32**	energy & power management in industry	**1**	
33	**33**	energy management strategies for industry	**1**	
34	**34**	demand management	**1**	
35	**35**	Examples	**1**	**25%**
25	**36**	Case Study	**1**	
37	**37**	Importance of energy management	**1**	
38	**38**	role of energy management	**1**	
39	**39**	Energy economics	**1**	
40	**40**	Payback period	**1**	
41	**41**	Internal rate of return	**1**	
42	**42**	life cycle costing	**1**	
43	**43**	Case Study	**1**	**25%**
44	**44**	Case Study	**1**	
45	**45**	Case Study	**1**	
		TOTAL Hrs. Required To complete Task	**45**	**100%**

STUDENTS LEARNING OUTCOME:

On successful completion of the course

- The student can identify different areas of of Energy Conservation & Management.
- Can find the applications of all the areas in day to day life.

TEXT BOOKS:

- C.B.Smith, Energy Management Principles, Pergamon Press, New York, 1981.
- W.C. Turner, Energy Management, Hand Book.

REFERENCE BOOKS:

- Hamies, Energy Auditing and Conservation, Methods, Measurements, Management and Case Study, Hemisphere, Washington, 1980.
- Kreith, Economics of Solar Energy and Conservation Systems, Vol -3.
- W.F.Kenny, Energy Conservation in Process Industry.
- Trivedi, P.R, Jolka K.R., Energy Management, Commonwealth Publication, New Delhi,1997.
- Witte, Larry C, Industrial Energy Management and Utilization, Hemisphere Publishers, Washinton, 1988.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First/Second Year Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: METH107-N-C	**Subject Title: FAN, BLOWERS AND COMPRESSORS**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract.**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
3	**0**	**0**	**3**	**3**	**3**	**70**	**30**	**20**	**-**	**120**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To present a problem oriented in depth knowledge of Fans, Blowers & Compressors
- To address the underlying concepts and methods behind Fans, Blowers & Compressors

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to
   equivalent of 30 marks as a part of internal theory evaluation.
   Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
5. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
6. The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.

OUTLINE OF THE COURSE:

Sr. No.	**Date/Week**	**Unit No.**	**Percentage Weightage.**	**Topic No**:
1	1^{st} ,2^{nd} ,3^{rd}	Unit :1	20	1
2	4^{th} ,5^{th} ,6^{th}	Unit:2	20	2
3	7^{th} ,8^{th} ,9^{th}	Unit:3	20	3
4	19^{th} b ,11^{th} ,12^{th}	Unit:4	20	4

5	13^{th} ,14^{th} ,15^{th}	Unit:5	20	5

Total Hours (Theory): 45
Total Hours (Lab): 00
Total Hours: 45

DETAILED SYLLABUS

1 Principles Of Turbo Machinery Introduction to turbo machines - Transfer of energy to fluids - Performance characteristics - fan laws - Dimensionless parameters - Specific speed - selection of centrifugal, axial, and mixed flow machines.

2 Analysis Of Centrifugal Blowers And Fans Centrifugal Blowers: Theoretical characteristic curves - Eulers characteristics and Eulers velocity triangles - losses and hydraulic efficiency - flow through impeller inlet volute – diffusers - leakage disc friction mechanical losses multi-vane impellers of impulse type - cross-flow fans.

3 Analysis Of Compressor Rotor design airfoil theory - vortex theory - cascade effects - degree of reaction - blade twist stage design - surge and stall - stator and casing - mixed flow impellers.

4 Testing And Control Of Fans Fan testing - noise control - materials and components blower regulation - speed control – throttling - control at discharge and inlet.

5 Applications Of Blowers Applications of blowers - induced and forced draft fans for air conditioning plants - cooling towers - ventilation systems - booster systems.

LESSON PLANNING

Sr. No	LECTURE NO	Course Content	Hrs.	Percentage Weightage
1	**1**	Principles Of Turbo Machinery Introduction to turbo machines	**1**	**25%**
2	**2**	Principles Of Turbo Machinery Introduction to turbo machines	**1**	
3	**3**	Transfer of energy to fluids	**1**	
4	**4**	Performance characteristics	**1**	
5	**5**	fan laws	**1**	
6	**6**	Dimensionless parameters	**1**	
7	**7**	Specific speed	**1**	**25%**
8	**8**	selection of centrifugal flow machines	**1**	
9	**9**	selection of axial flow machines	**1**	
10	**10**	selection of mixed flow machines	**1**	
11	**11**	Examples	**1**	
12	**12**	Case Study	**1**	
13	**13**	Analysis Of Centrifugal Blowers And Fans Centrifugal Blowers	**1**	
14	**14**	Theoretical characteristic curves -	**1**	
15	**15**	Eulers velocity triangles	**1**	

16	**16**	Eulers characteristics	**1**	
17	**17**	losses and hydraulic efficiency - flow through impeller inlet volute	**1**	
18	**18**	Diffusers	**1**	
19	**19**	leakage disc friction mechanical losses multi-vane impellers of impulse type	**1**	
20	**20**	leakage disc friction mechanical losses multi-vane impellers of impulse type	**1**	
21	**21**	cross-flow fans	**1**	
22	**22**	Examples	**1**	
23	**23**	Case Study	**1**	
24	**24**	Analysis Of Compressor Rotor design airfoil theory	**1**	**25%**
25	**25**	vortex theory	**1**	
26	**26**	cascade effects	**1**	
27	**27**	degree of reaction	**1**	
28	**28**	blade twist stage design	**1**	
29	**29**	surge and stall	**1**	
30	**30**	stator and casing	**1**	
31	**31**	mixed flow impellers	**1**	
32	**32**	Testing And Control Of Fans Fan Testing	**1**	
33	**33**	noise control	**1**	
34	**34**	materials blower regulation	**1**	
35	**35**	components blower regulation	**1**	
36	**36**	speed control	**1**	
37	**37**	Throttling	**1**	
38	**38**	control at discharge and inlet	**1**	
39	**39**	Applications Of Blowers	**1**	**25%**
40	**40**	Applications of blowers	**1**	
41	**41**	induced draft fans for air conditioning plants	**1**	
42	**42**	forced draft fans for air conditioning plants	**1**	
43	**43**	cooling towers	**1**	
44	**44**	ventilation systems	**1**	
45	**45**	booster systems	**1**	
		TOTAL Hrs. Required To complete Task	**45**	**100%**

STUDENTS LEARNING OUTCOME:

The student can identify different areas of Fans, Blowers & Compressors .
Can find the applications of all the areas in day to day life.

TEXT BOOKS:

S.M. Yahya, " Fundamentals of Compressible Flow ", New Age International Pvt. ltd,1996
Stepanoff A.J., Turbo blowers, John Wiley & Sons, 1970

REFERENCE BOOKS:

Brunoeck, Fans, Pergamon Press, 1973

Austin H. Church, Centrifugal pumps and blowers, John Wiley and Sons, 1980
Dixon, Fluid Mechanics, Thermodynamics of turbo machinery Pergamon Press, 1984
Dixon, Worked examples in turbo machinery, Pergamon Press, 1984

WEB MATERIALS:

- http://www.petropager.com
- http://www.erichson.com
- http://www.apgate.com

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First/Second Year Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: METH107-N-D	**Subject Title: CRYOGENIC ENGINEERING**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract.**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
3	**0**	**0**	**3**	**3**	**3**	**70**	**30**	**20**	**0**	**120**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To present a problem oriented in depth knowledge of Cryogenic Engineering
- To address the underlying concepts and methods behind Cryogenic Engineering

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to
   equivalent of 30 marks as a part of internal theory evaluation.
   Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
5. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
6. The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.
7. Experiments shall be performed in the laboratory related to course contents.

OUTLINE OF THE COURSE:

Sr. No.	**Date/Week**	**Unit No.**	**Percentage Weightage.**	**Topic No**:
1	1^{st} ,2^{nd} ,3^{rd}	Unit :1	20	1
2	4^{th} ,5^{th} ,6^{th}	Unit:2	20	2
3	7^{th} ,8^{th} ,9^{th}	Unit:3	20	3

4	19^{th} b ,11^{th} ,12^{th}	Unit:4	20	4,5
5	13^{th} ,14^{th} ,15^{th}	Unit:5	20	6,7

Total Hours (Theory): 60
Total Hours (Lab): 30
Total Hours: 90

DETAILED SYLLABUS

1. Properties of engineering materials at cryogenic temperatures, mechanical properties ,thermal properties, electric & magnetic properties, super conducting materials ,thermo electric materials, composite materials, properties of cryogenic fluids, super fluidity of He 3 &He4

2. Measurement systems for low temperatures:-Temperature measurements, pressure measurements, flow measurements, liquid level measurements, fluid quality measurements.

3. Cryogenic insulation:- various types such as expanded foams, gas filled& fibrous insulation, vacuum insulation, evacuated powder& fibrous insulation ,opacified powder insulation, multi layer insulation, comparison of performance of various insulations .

4. Applications of cryogenic systems Super conductive devices such as bearings, motors, cryotrons, magnets, D.C. transformers, tunnel diodes, space technology, space simulation, cryogenics in biology and medicine, food preservation and industrial applications, nuclear propulsions ,chemical propulsions.

5. Hazards:-Physical hazards, Chemical hazards, Physiological hazards,combustion hazards, oxygen hazards, , accidents in cryogenic plants & prevention

6. Safety in handling of cryogens, care for storage of gaseous cylinders, familiarization with regulations of department of explosives.

LESSON PLANNING

Sr. No	LECTURE NO	Course Content	Hrs.	Percentage Weightage
1	1	Properties of engineering materials at cryogenic temperatures	1	25%
2	2	Properties of engineering materials at cryogenic temperatures	1	
3	3	mechanical properties	1	
4	4	thermal properties	1	

5	**5**	electric & magnetic propertie	**1**	
6	**6**	super conducting materials	**1**	
7	**7**	thermo electric materials	**1**	
8	**8**	composite materials	**1**	
9	**9**	properties of cryogenic fluids, super fluidity of He 3 &He4	**1**	
10	**10**	Examples	**1**	
11	**11**	Case Study	**1**	
12	**12**	Measurement systems for low temperatures	**1**	
13	**13**	Temperature measurements	**1**	
14	**14**	pressure measurements	**1**	
15	**15**	flow measurements	**1**	
16	**16**	liquid level measurements	**1**	
17	**17**	fluid quality measurements	**1**	
18	**18**	Examples	**1**	
19	**19**	Case Study	**1**	
20	**20**	Case Study	**1**	
21	**21**	Cryogenic insulation:- various types	**1**	
22	**22**	expanded foams	**1**	**25%**
23	**23**	gas filled& fibrous insulation	**1**	
24	**24**	vacuum insulation	**1**	
25	**25**	evacuated powder insulation	**1**	
26	**26**	fibrous insulation	**1**	
27	**27**	opacified powder insulation,	**1**	
28	**28**	multi layer insulation	**1**	
29	**29**	Examples	**1**	
30	**30**	comparison of performance of various insulations	**1**	
31	**31**	Applications of cryogenic systems	**1**	
32	**32**	Super conductive, motors	**1**	
33	**33**	Super conductive motors	**1**	
34	**34**	Cryotron	**1**	
35	**35**	Magnets	**1**	**25%**
25	**36**	Examples	**1**	
37	**37**	D.C. transformers	**1**	
38	**38**	tunnel diodes,	**1**	
39	**39**	space technology	**1**	
40	**40**	space simulation	**1**	
41	**41**	cryogenics in biology and medicine	**1**	
42	**42**	food preservation and industrial applications	**1**	
43	**43**	food preservation and industrial applications	**1**	
44	**44**	nuclear propulsions	**1**	
45	**45**	chemical propulsion	**1**	**25%**
46	**46**	Hazards:-Physical hazards	**1**	
47	**47**	Chemical hazards	**1**	
48	**48**	Case Study	**1**	

49	**49**	Examples	**1**	
50	**50**	Physiological hazards	**1**	
51	**51**	combustion hazards	**1**	
52	**52**	oxygen hazards	**1**	
53	**53**	accidents in cryogenic plants	**1**	
54	**54**	Cryogenic plants prevention	**1**	
55	**55**	Examples	**1**	
56	**56**	Safety in handling of cryogens, ,	**1**	
57	**57**	care for storage of gaseous cylinders	**1**	
58	**58**	familiarization with regulations of department of explosives	**1**	
59	**59**	Case Study	**1**	
60	**60**	Case Study	**1**	
		TOTAL Hrs. Required To complete Task	**60**	**100%**

STUDENTS LEARNING OUTCOME:

- The student can identify different areas of Cryogenic Engineering
- Can find the applications of all the areas in day to day life.

TEXT BOOKS:

- Cryogenic systems-Baron, McGraw-Hill book
- Cryogenic fundamentals-Haselden, Academic press New York

REFERENCE BOOKS:

- Cryogenic technology –Vance
- Advance cryogenic –bailey, plenum press
- Cryogenic engineering –Scott

LIST OF EXPERIMENTS:

Sr. No.	Name of the Experiments
1	Study of cryogenic properties of hydrogen and helium.
2	Study of low temperature measurement instrument.
3	Study of flow measurement and quality measurement instrument.
4	Study of liquid level measurement.
5	Study of insulation used in cryogenic equipment.
6	Study of cryogenic application (superconductivity)
7	Study of cryogenic application in space technology.
8	Study of safety while handling fluid.
9	To find the thermal conductivity of powder insulation by boil off calorimeter method.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First/Second Year Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: METH206-N-A	**Subject Title: COMBUSTION ENGINEERING**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract.**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
4	**0**	**2**	**6**	**4**	**3**	**70**	**30**	**20**	**30**	**150**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To present a problem oriented in depth knowledge of Combustion Engineering
- To address the underlying concepts and methods behind Combustion Engineering

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation..
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
5. Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
7. The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.
8. Experiments shall be performed in the laboratory related to course contents.

OUTLINE OF THE COURSE:

Sr. No.	**Date/Week**	**Unit No.**	**Percentage Weightage.**	**Topic No**:
1	1^{st} ,2^{nd} ,3^{rd}	Unit :1	20	1
2	4^{th} ,5^{th} ,6^{th}	Unit:2	20	2
3	7^{th} ,8^{th} ,9^{th}	Unit:3	20	3

4	19^{th} b ,11^{th} ,12^{th}	Unit:4	20	4
5	13^{th} ,14^{th} ,15^{th}	Unit:5	20	5

Total Hours (Theory): 60
Total Hours (Lab): 30
Total Hours: 90

DETAILED SYLLABUS

1. Combustion thermodynamics; Stoichiometry; first and second laws of thermodynamics applied to combustion;

2. Ignition and combustion in SI engine; Flame travel; turbelent flame propagation; flame stabilization; vaporization; Review of detonation and Diesel knock; effect of various factors; Combustion chambers for SI engines; Combustion in CI engine; Ignition delay and diesel knock; Excess air supply and air motion; Combustion chamber for CI engines- Construction and Performance aspects; M-combustion chamber; latest combustion chamber and technology.

3. Fundamentals of combustion kinetics' Combustion products in equilibrium; rate of reactions; chain reactions; opposing reactions; consecutive reactions, competitive reactions; Conservation equation for multi component reacting systems.

4. Combustion of liquid fuel droplet; fuel atomization; types of injectors; spray formation and charactristics; Oil – fired furnace combustion; gas turbine spray combustion; direct injection engine combustion; detonation of liquid gaseous mixture.

5. Combustion of solid fuels; Coal combustion; combustion of pulverized coal; combustion of coal on bed in a fluidised bed and in a cyclone burners; stabilization of pulverized coal combustion; design consideration of coal burners; combustion generated pollution.

LESSON PLANNING

Sr. No	LECTURE NO	Course Content	Hrs.	Percentage Weightage
1	**1**	Combustion thermodynamics;	**1**	**25%**
2	**2**	Stoichiometry	**1**	
3	**3**	First of thermodynamics	**1**	
4	**4**	Second laws of thermodynamics	**1**	
5	**5**	applied to combustion	**1**	
6	**6**	Ignition and combustion in SI engine	**1**	
7	**7**	Flame travel	**1**	
8	**8**	turbelent flame propagation	**1**	
9	**9**	flame stabilization	**1**	

10	**10**	vaporization	**1**	
11	**11**	Review of detonation and Diesel knock	**1**	
12	**12**	effect of various factors	**1**	
13	**13**	Combustion chambers for SI engines	**1**	
14	**14**	Combustion in CI engine	**1**	
15	**15**	Combustion in CI engine	**1**	
16	**16**	Ignition delay and diesel knock	**1**	**25%**
17	**17**	Excess air supply and air motion	**1**	
18	**18**	Combustion chamber for CI engines- Construction	**1**	
19	**19**	Performance aspects; M-combustion chamber	**1**	
20	**20**	Performance aspects; M-combustion chamber	**1**	
21	**21**	latest combustion chamber and technology	**1**	
22	**22**	Examples	**1**	
23	**23**	Fundamentals of combustion kinetics	**1**	
24	**24**	Combustion products in equilibrium	**1**	
25	**25**	rate of reactions	**1**	
26	**26**	chain reactions	**1**	
27	**27**	opposing reactions	**1**	
28	**28**	consecutive reactions	**1**	
29	**29**	competitive reactions	**1**	
30	**30**	Conservation equation for multi component reacting systems	**1**	**25%**
31	**31**	Conservation equation for multi component reacting systems	**1**	
32	**32**	Case Study	**1**	
33	**33**	Examples	**1**	
34	**34**	Combustion of liquid fuel droplet	**1**	
35	**35**	fuel atomization	**1**	
25	**36**	types of injectors	**1**	
37	**37**	spray formation and charactristics	**1**	
38	**38**	Oil – fired furnace combustion	**1**	
39	**39**	gas turbine spray combustion	**1**	
40	**40**	gas turbine spray combustion	**1**	
41	**41**	direct injection engine combustion	**1**	**25%**
42	**42**	direct injection engine combustion	**1**	
43	**43**	detonation of liquid gaseous mixture	**1**	
44	**44**	Examples	**1**	
45	**45**	Case Study	**1**	
46	**46**	Combustion of solid fuels	**1**	
47	**47**	Combustion of solid fuels	**1**	
48	**48**	Coal combustion	**1**	
49	**49**	combustion of pulverized coal	**1**	
50	**50**	combustion of coal in a cyclone burners	**1**	
51	**51**	combustion of coal on bed in a fluidised bed	**1**	
52	**52**	combustion of coal on bed in a fluidised bed	**1**	
53	**53**	stabilization of pulverized coal combustion	**1**	
54	**54**	design consideration of coal burners	**1**	
55	**55**	combustion generated pollution	**1**	

56	**56**	Examples	**1**	
57	**57**	Examples	**1**	
58	**58**	Case Study	**1**	
59	**59**	Case Study	**1**	
60	**60**	Case Study	**1**	
		TOTAL Hrs. Required To complete Task	**60**	**100%**

STUDENTS LEARNING OUTCOME:
On successful completion of the course

- The student can identify different areas of of Combustion Engineering.
- Can find the applications of all the areas in day to day life.

TEXT BOOKS:

- Combustion Engineering – Gary L. Borman, Kenneth W. Ragland, McGraw Hill
- Principles of Combustion – Kenneth K. Kuo, John Wiley & Sons

REFERENCE BOOKS:

- Fuels & Combustion – S. P. Sharma &Chander Mohan, Tata McGraw Hill
- Fuels & Combustion - Sarkar
- Introduction to combustion phenomenon, Kanurymurty, Mc-Ggraw hill
- Combustion, fundamentals, strehlow, Mc-Ggraw hill

LIST OF EXPERIMENTS:

Sr. No.	Name of the Experiments
1	With the help of orsat apparatus determine volumetric analysis of product of combustion.
2	Bomb calorimeter determination of highest and lowest calorific value of solid fuel.
3	Combustion of fuel in diesel engine with help of P.V.Diagram..
4	Combustion of fuel in petrol engine with the help of P.V.Diagram.
5	Flue gas analysis by gas analyser.
6	Various combustion methods used for burning pulverized fuel.
7	Fluidised bed combustion.
8	Conversion of Volumetric analysis in to graviometric analysis.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First/Second Year Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: METH206-N-B/ MEAE207-N-A	**Subject Title: ADVANCED AIR CONDITIONING**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract.**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
4	**0**	**2**	**6**	**5**	**3**	**70**	**30**	**20**	**30**	**150**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To present a problem oriented in depth knowledge of Advanced Air Conditioning
- To address the underlying concepts and methods behind Advanced Air Conditioning

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to
   equivalent of 30 marks as a part of internal theory evaluation.
   Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
5. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
6. The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.

19. Experiments shall be performed in the laboratory related to course contents.

OUTLINE OF THE COURSE:

Sr. No.	**Date/Week**	**Unit No.**	**Percentage Weightage.**	**Topic No**:
1	1^{st} ,2^{nd} ,3^{rd}	Unit :1	20	1,2
2	4^{th} ,5^{th} ,6^{th}	Unit:2	20	3,4

3	7^{th} ,8^{th} ,9^{th}	Unit:3	20	5,6
4	19^{th} b ,11^{th} ,12^{th}	Unit:4	20	7,8
5	13^{th} ,14^{th} ,15^{th}	Unit:5	20	9,10

Total Hours (Theory): 60
Total Hours (Lab): 30
Total Hours: 90

DETAILED SYLLABUS

1. Psychometric charts : ASHRE and CARRIER charts ,their differences ,application of corrections of different charts Applied Psychrometry : Combinations of different processes and their representation on psychrometric charts, psychrometric calculations for cooling and dehumidification .High latent heat load ,dehumidified air quantities based on total and effective room loads ,GSHF and ESHF ,effect of fan and duct heat gain or dehumidified air quantity ,effective surface temperature ,effect of bypass factor on GSHF, analysis for using all outside air ,psychrometric of partial load control
2. Cooling tower: Different types, construction working performance, testing different types of desert coolers, testing of desert coolers as per BIS, Air washer, different types, construction performance.
3. Heat gain calculations: choices of supply conditions. Solar heat gain: Terminology calculation different solar angles ,relation between different angles ,calculation of the intensity of direct ,diffused and ground radiation solar air temperature ,empirical methods to evaluate heat transfer through walls, and roofs, TETD and its determination by calculation and tables ,Heat gain through glass ,Solar heat gain factor, use of equations and tables ,shading of glass ,solar chart and its use .shading of glass ,solar chart and its use, shading devices and itsselection ,load due to other sources, stack effect ,different methods of calculating cooling load as per ASHREsomebrief idea(other than TETD methods)
4. Duct Design : Types of ducts ,duct construction ,factors affecting duct construction, friction charts and othercorrection factors ,losses ,design velocity and its selection, duct heat gain or loss ,duct insulation ,duct layouts,duct sizing methods, equal friction static regains and T-method design simple idea .Noise and their isolation, ductmaterials and their accessories
5. Air Distribution: Terminology, outlet performance, types of outlets, location of outlets,factors affecting grill performance, selection of outlets using nomographs, tables and line charts ,room air diffusions, performance index (ADPI) and its use in outlet selection ,use of different equations.
6. Air conditioning systems: Factors affecting the selection of the systems, classification, systems, design procedure, system features, psychrometric analysis, controls of all air, air water, all water, DX ,VAV and dual duct systems basic idea of cold air distributions systems and dessicant cooling systems
7. Thermal effects :-Human thermo regulation, different equations governing thermal exchanges, factors affecting comforts, environmental indices, AQ and its importance – Human comfort and health.

8. Air conditioning controls : Characteristics of HVAC noise ,Acoustical rating systems and criteria ,RC ,NC, and NR criteria for noise rating ,noise control methods for VAV units ,cooling towers, air devices roof top units ,chillers ,pumps, AHU rooms, compressors.
9. Air handling systems: Fans, types ,construction performance characteristics ,fan laws ,testing as per BS ,IS and AMCA standards, fan selection with the help of tables charts and curves, fan drive arrangements and discharge from fans, duct design fan selection etc.
10. Advances in Air Conditioning, Clean Room Concept, Filtration of suspended particles, PPM Control and methods, Types of Filters, Mechanical , UV filters etc.

LESSON PLANNING

Sr. No	LECTURE NO	Course Content	Hrs.	Percentage Weightage
1	**1**	Psychometric charts : ASHRE and CARRIER charts ,their differences	**1**	
2	**2**	application of corrections of different charts Applied Psychrometry	**1**	
3	**3**	Combinations of different processes and their representation on psychrometric charts	**1**	
4	**4**	psychrometric calculations for cooling and dehumidification	**1**	
5	**5**	High latent heat load ,dehumidified air quantities based on total and effective room loads , GSHF and ESHF	**1**	
6	**6**	effect of fan and duct heat gain or dehumidified air quantity	**1**	
7	**7**	effective surface temperature ,effect of bypass factor on GSHF, analysis for using all outside air ,psychrometric of partial load control	**1**	**25%**
8	**8**	Cooling tower: Different types	**1**	
9	**9**	construction working performance	**1**	
10	**10**	testing different types of desert coolers	**1**	
11	**11**	testing of desert coolers as per BIS, Air washer	**1**	
12	**12**	different types, construction performance	**1**	
13	**13**	Heat gain calculations: choices of supply conditions	**1**	
14	**14**	Solar heat gain	**1**	
15	**15**	Terminology calculation different solar angles ,relation between different angles	**1**	
16	**16**	calculation of the intensity of direct ,diffused and ground radiation solar air temperature	**1**	
17	**17**	empirical methods to evaluate heat transfer through walls, and roofs, TETD and its determination by calculation and tables	**1**	
18	**18**	Heat gain through glass ,Solar heat gain factor, use of equations and tables	**1**	**25%**
19	**19**	shading of glass ,solar chart and its use .shading of glass ,solar chart and its use, shading devices and itsselection	**1**	
20	**20**	load due to other sources, stack effect ,different methods of calculating cooling load as per ASHRE some brief idea(other than	**1**	

		TETD methods)		
21	**21**	Duct Design : Types of ducts ,duct construction	**1**	
22	**22**	factors affecting duct construction, friction charts	**1**	
23	**23**	Other correction factors ,losses ,design velocity and its selection	**1**	
24	**24**	duct heat gain or loss ,duct insulation ,duct layouts,duct sizing methods,.	**1**	
25	**25**	equal friction static regains and T-method design simple idea	**1**	
26	**26**	Noise and their isolation, duct materials and their accessories	**1**	
27	**27**	Air Distribution: Terminology	**1**	
28	**28**	Air Distribution: Terminology	**1**	
29	**29**	outlet performance	**1**	
30	**30**	types of outlets	**1**	
31	**31**	location of outlets	**1**	
32	**32**	factors affecting grill performance	**1**	
33	**33**	selection of outlets using nomographs,	**1**	
34	**34**	tables and line charts	**1**	
35	**35**	room air diffusions	**1**	**25%**
25	**36**	performance index (ADPI	**1**	
37	**37**	its use in outlet selection ,use of different equations	**1**	
38	**38**	Air conditioning systems	**1**	
39	**39**	Factors affecting the selection of the systems	**1**	
40	**40**	classification, systems	**1**	
41	**41**	design procedure, system features, psychrometric analysis	**1**	
42	**42**	controls of all air, air water, all water, DX ,VA	**1**	
43	**43**	dual duct systems basic idea of cold air distributions systems and	**1**	
44	**44**	dessicant cooling systems	**1**	
45	**45**	Thermal effects, Human thermo regulation	**1**	
46	**46**	different equations governing thermal exchanges, factors affecting comforts	**1**	
47	**47**	environmental indices, AQ and its importance, Human comfort and health.	**1**	
48	**48**	Air conditioning controls	**1**	
49	**49**	Characteristics of HVAC noise	**1**	
50	**50**	Acoustical rating systems and criteria ,RC ,NC	**1**	
51	**51**	NR criteria for noise rating ,	**1**	**25%**
52	**52**	noise control methods for VAV units	**1**	
53	**53**	Cooling towers, air devices roof top units ,chillers ,pumps, AHU rooms, compressors.	**1**	
54	**54**	Air handling systems: Fans, types ,construction performance characteristics ,	**1**	
55	**55**	fan laws testing as per BS ,IS and AMCA standards, fan selection with the help of tables charts and curves	**1**	
56	**56**	fan drive arrangements and discharge from fans, duct design fan selection etc	**1**	
57	**57**	Advances in Air Conditioning, Clean Room Concept	**1**	
58	**58**	Filtration of suspended particles	**1**	
59	**59**	PPM Control and methods	**1**	

60	**60**	Types of Filters, Mechanical , UV filters etc	**1**	
		TOTAL Hrs. Required To complete Task	**60**	**100%**

STUDENTS LEARNING OUTCOME:

- The student can identify different areas of Advanced Air Conditioning.
- Can find the applications of all the areas in day to day life.

TEXT BOOKS:

- Air Conditioning Engineering -By Jones 5th 2001
- Thermal Environmental Engineering, Threlkeld

REFERENCE BOOKS:

- Thermal Environmental Engineering, Threlkeld
- Hand book of air conditioning systems design :carrier corporation 1965
- Air conditioning principles and systems –pita
- HVAC testing adjusting and balancing manual :Gladstone 3 rd 1997
- Ashrae Data Book, (1) Fundamentals (2001) (2) application (1999) (3) System and equipments (2000)
- Hand book of air conditioning and refrigeration : wang 2 (1993
- Air conditioning application and design by jones 2nd1997
- Air conditioning system design manual : lorach1993
- Fan handbook : bleier 1998

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First/Second Year Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: METH207-N-A	**Subject Title: ENVIRONMENTAL ENGINEERING AND POLLUTION CONTROL**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract.**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
3	**0**	**0**	**3**	**3**	**3**	**70**	**30**	**20**	**-**	**120**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To present a problem oriented in depth knowledge of Environmental Engineering And Pollution Control
- To address the underlying concepts and methods behind Environmental Engineering And Pollution Control

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to
   equivalent of 30 marks as a part of internal theory evaluation.
   Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
5. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
6. The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.

OUTLINE OF THE COURSE:

Sr. No.	Date/Week	Unit No.	Percentage Weightage.	Topic No:
1	1st ,2nd ,3rd	Unit :1	20	1,2
2	4th ,5th ,6th	Unit:2	20	3,4
3	7th ,8th ,9th	Unit:3	20	5,6
4	19th b ,11th ,12th	Unit:4	20	7,8
5	13th ,14th ,15th	Unit:5	20	9,10

Total Hours (Theory): 45
Total Hours (Lab): 00
Total Hours: 45

DETAILED SYLLABUS

1. INTRODUCTION
Global atmospheric change – Green house effect –Ozone Depletion - Natural Cycles - Mass and
Energy Transfer – Material balance – Environmental chemistry and biology – Impacts – Environmental legislations.
2. AIR POLLUTION
Pollutants - Sources and Effect – Air Pollution meteorology – Atmospheric dispersion –Indoor air quality - Control Methods and Equipments - Issues in Air Pollution control – Air sampling and measurement
3. WATER POLLUTION
Water resources - Water Pollutants - Characteristics – Quality - Water Treatment systems – Wastewater treatment - Treatment, Utilization and Disposal of Sludge - Monitoring compliance
with Standards
4. WASTE MANAGEMENT
Sources and Classification – Solid waste – Hazardous waste - Characteristics – Collection and Transportation - Disposal – Processing and Energy Recovery – Waste minimization
5. OTHER TYPES OF POLLUTION FROM INDUSTRIES
Noise Pollution and its impact - Oil Pollution - Pesticides - Instrumentation for EIA test - Water
Pollution from Tanneries and other Industries and their control – Environment Impact assessment for various projects – Case studies

LESSON PLANNING

Sr. No	LECTURE NO	Course Content	Hrs.	Percentage Weightage
1	**1**	INTRODUCTION Global atmospheric change	**1**	**25%**
2	**2**	Green house effect	**1**	
3	**3**	Ozone Depletion	**1**	
4	**4**	Natural Cycles	**1**	

5	**5**	Mass and Energy Transfer	**1**	
6	**6**	Material balance	**1**	
7	**7**	Environmental chemistry and biology – Impact	**1**	
8	**8**	Environmental chemistry and biology – Impact	**1**	
9	**9**	Environmental legislations.	**1**	
10	**10**	Examples	**1**	
11	**11**	AIR POLLUTION Pollutants	**1**	
12	**12**	Sources and Effect	**1**	
13	**13**	Air Pollution meteorology	**1**	
14	**14**	Atmospheric dispersion	**1**	
15	**15**	Indoor air quality -	**1**	
16	**16**	Control Methods and Equipments	**1**	
17	**17**	Issues in Air Pollution control	**1**	
18	**18**	Air sampling and measurement	**1**	
19	**19**	Case Study	**1**	
20	**20**	Case Study	**1**	
21	**21**	WATER POLLUTION	**1**	
22	**22**	Water resources	**1**	**25%**
23	**23**	Water resources	**1**	
24	**24**	Water Pollutants	**1**	
25	**25**	Characteristics	**1**	
26	**26**	Quality	**1**	
27	**27**	Water Treatment systems	**1**	
28	**28**	Wastewater treatment	**1**	
29	**29**	Treatment, Utilization and Disposal of Sludge	**1**	
30	**30**	Monitoring compliance with Standards	**1**	
31	**31**	Case Study	**1**	
32	**32**	Examples	**1**	
33	**33**	WASTE MANAGEMENT Sources and Classification Solid waste	**1**	
34	**34**	Hazardous waste	**1**	
35	**35**	Characteristics	**1**	**25%**
25	**36**	Collection and Transportation	**1**	
37	**37**	Disposal	**1**	
38	**38**	Processing and Energy Recovery	**1**	
39	**39**	Waste minimization	**1**	
40	**40**	OTHER TYPES OF POLLUTION FROM INDUSTRIES	**1**	
41	**41**	Noise Pollution and its impact	**1**	
42	**42**	Oil Pollution - Pesticides	**1**	
43	**43**	Instrumentation for EIA test	**1**	**25%**
44	**44**	Water Pollution from Tanneries and other Industries	**1**	
45	**45**	their control – Environment Impact assessment for various projects – Case studies	**1**	
		TOTAL Hrs. Required To complete Task	**45**	**100%**

STUDENTS LEARNING OUTCOME:

- The student can identify different areas of Environmental Engineering And Pollution
- Control Can find the applications of all the areas in day to day life.

TEXT BOOKS:

- G.Masters, "Introduction to Environmental Engineering and Science", Prentice Hall of India Pvt. Ltd, New Delhi, 2003
- H.S.Peavy, D.R..Rowe, G.Tchobanoglous, "Environmental Engineering", McGraw-Hill
  Book Company, New York, 1985

REFERENCE BOOKS:

- H.Ludwig, W.Evans, "Manual of Environmental Technology in Developing Countries",
- International Book Company, Absecon Highlands, N.J, 1991
- Arcadio P Sincero and G. A. Sincero, "Environmental Engineering – A Design Approach", Prentice Hall of India Pvt. Ltd, New Delhi

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First/Second Year Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: METH207-N-B	**Subject Title: THERMAL ENERGY SYSTEM**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract.**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
3	**0**	**0**	**3**	**3**	**3**	**70**	**30**	**20**	**-**	**120**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To develop in students mathematical modeling skill for analysis and design purpose of different thermal system and different components of the thermal system.
- To develop ideas for engineering thermal system & expose those ideas in real world for optimization of the technology.
- To know the importance of thermal system in engineering application-use of mathematical modeling-optimization technique for increasing the productivity of thermal system.

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to
   equivalent of 30 marks as a part of internal theory evaluation.
   Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
5. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
6. The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.

OUTLINE OF THE COURSE:

Sr. No.	Date/Week	Unit No.	Percentage Weightage.	Topic No:
1	1st ,2nd ,3rd	Unit :1	20	1
2	4th ,5th ,6th	Unit:2	20	2
3	7th ,8th ,9th	Unit:3	20	3
4	19th b ,11th ,12th	Unit:4	20	4
5	13th ,14th ,15th	Unit:5	20	5

Total Hours (Theory): 45
Total Hours (Lab): 00
Total Hours: 45

DETAILED SYLLABUS

1. Design of Thermal Systems
Design Principles, Workable systems, Optimal systems, Matching of system components, Economic analysis, Depreciation, Gradient present worth factor

2. Mathematical Modeling
Equation fitting, Nomography, Empirical equation, Regression analysis, Different modes of mathematical models, Selection, computer programs for models

3. Modeling Thermal Equipments
Modeling heat exchangers, evaporators, condensers, absorption and rectification columns, compressor, pumps, simulation studies, information flow diagram, solution procedures

4. System Optimization
Objective function formulation, Constraint equations, Mathematical formulation,
Calculus method, Dynamic programming, Geometric programming, Linear programming methods, solution procedures.

5. Dynamic Behavior of Thermal System
Steady state simulation, Laplace transformation, Feedback control loops, Stability analysis, Non-linearties.

LESSON PLANNING

Sr. No	LECTURE NO	Course Content	Hrs.	Percentage Weightage
1	**1**	Design of Thermal Systems Design Principles	**1**	**25%**
2	**2**	Workable systems	**1**	
3	**3**	Optimal systems	**1**	
4	**4**	Matching of system components	**1**	
5	**5**	Economic analysis	**1**	
6	**6**	Depreciation	**1**	

7	**7**	Gradient present worth factor	**1**	
8	**8**	Mathematical Modeling Equation fitting	**1**	
9	**9**	Nomography	**1**	
10	**10**	Examples	**1**	
11	**11**	Empirical equation	**1**	**25%**
12	**12**	Regression analysis	**1**	
13	**13**	Different modes of mathematical models	**1**	
14	**14**	Selection	**1**	
15	**15**	computer programs for models	**1**	
16	**16**	Modeling Thermal Equipments Modeling heat exchangers	**1**	
17	**17**	Modeling Thermal Equipments Modeling heat exchangers	**1**	
18	**18**	Evaporators	**1**	
19	**19**	Condensers	**1**	
20	**20**	absorption and rectification columns,	**1**	
21	**21**	Compressor	**1**	
22	**22**	Pumps	**1**	
23	**23**	simulation studies	**1**	
24	**24**	information flow diagram	**1**	
25	**25**	solution procedures	**1**	**25%**
26	**26**	System Optimization Objective function formulation	**1**	
27	**27**	Constraint equations	**1**	
28	**28**	Mathematical formulation	**1**	
29	**29**	Mathematical formulation	**1**	
30	**30**	Calculus method	**1**	
31	**31**	Dynamic programming	**1**	
32	**32**	Geometric programming	**1**	
33	**33**	Linear programming methods	**1**	
34	**34**	solution procedures	**1**	
35	**35**	Dynamic Behavior of Thermal System	**1**	
36	**36**	Dynamic Behavior of Thermal System	**1**	
37	**37**	Examples	**1**	
38	**38**	Steady state simulation	**1**	
39	**39**	Laplace transformation	**1**	**25%**
40	**40**	Feedback control loops	**1**	
41	**41**	Stability analysis	**1**	
42	**42**	Non-linearties	**1**	
43	**43**	Case Study	**1**	
44	**44**	Examples	**1**	
45	**45**	Examples	**1**	
		TOTAL Hrs. Required To complete Task	**45**	**100%**

STUDENTS LEARNING OUTCOME:

- The student can identify different areas of Thermal Energy Systems.
- Can find the applications of all the areas in day to day life.

TEXT BOOKS:

- J.N.Kapur, Mathematical Modelling, Wiley Eastern Ltd., New York, 1989.
- W.F. Stoecker, Design of Thermal Systems, McGraw Hill, 1980.

REFERENCE BOOKS:

- W.F. Stoecker, Refrigeration and Airconditioning, TMH, 1985.
- Fanger P.O., Thermal Comport, McGraw Hill, USA 1972.
- McQuiston FC & Parker TD, Heating, Ventilating and Air conditioning, Analysis and Design, John Wiley & Sons, USA 1988.

WEB MATERIALS:

- http;//www.engr.usak.ca/dept/mee/research/thermal_fluid.html
- http://at.yorku.ca/cgi-bin/amca/cadl-26
- http://www.gre.ac.uk/research/cms/centre
- http://naca.larc.nasa.gov

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First/Second Year Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: METH207-N-C	**Subject Title: FOOD PROCESSING, PRESERVATION AND TRANSPORT**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract.**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
3	**0**	**0**	**3**	**3**	**3**	**70**	**30**	**20**	**-**	**120**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To present a problem oriented in depth knowledge of Food Processing, Preservation And Transport
- To address the underlying concepts and methods behind Food Processing, Preservation And Transport

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to
   equivalent of 30 marks as a part of internal theory evaluation.
   Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
5. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
6. The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.

OUTLINE OF THE COURSE:

Sr. No.	**Date/Week**	**Unit No.**	**Percentage Weightage.**	**Topic No**:
1	1^{st} ,2^{nd} ,3^{rd}	Unit :1	20	1
2	4^{th} ,5^{th} ,6^{th}	Unit:2	20	2

3	7th ,8th ,9th	Unit:3	20	3
4	19th b ,11th ,12th	Unit:4	20	4
5	13th ,14th ,15th	Unit:5	20	5,6

Total Hours (Theory): 45

Total Hours (Lab): 00

Total Hours: 45

DETAILED SYLLABUS

1 INTRODUCTION

Microbiology of Food Products – Mechanism of food spoilage critical microbial growth requirements – Design for control of micro organisms – The role of HACCP – Sanitation – Regulation and standards

2 PROCESSING & PRESERVATION

Thermodynamic properties and Transfer properties – Water content – Initial freezing temperature – Ice fraction – Transpiration of fresh fruits & vegetables – Food processing techniques for Dairy products, Poultry, Meat, Fruits & Vegetables

3 FREEZING & DRYING

Pre-cooling – Freeze drying principles – Cold storage & freezers – Freezing drying limitations – Irradiation techniques – Cryofreezing – Numerical and analytical methods in estimating Freezing, Thawing times, Energy conservation in food industry.

4 COLD STORAGE DESIGN & INSTRUMENTATION

Initial building consideration – Building design – Specialized storage facility – Construction methods – Refrigeration systems – Insulation techniques – Control & instrumentation – Fire protection – Inspection & maintenance

5 TRANSPORT

Refrigerated transportation – Refrigerated containers & trucks – Design features – Piping & Role of cryogenics in freezing & transport

LESSON PLANNING

Sr. No	LECTURE NO	Course Content	Hrs.	Percentage Weightage
1	**1**	INTRODUCTION Microbiology of Food Products	**1**	
2	**2**	Mechanism of food spoilage critical microbial growth requirements	**1**	
3	**3**	Mechanism of food spoilage critical microbial growth requirements	**1**	
4	**4**	Design for control of micro organisms	**1**	
5	**5**	Design for control of micro organisms	**1**	**25%**
6	**6**	The role of HACCP	**1**	
7	**7**	Sanitation	**1**	
8	**8**	Regulation and standards	**1**	
9	**9**	Examples	**1**	
10	**10**	PROCESSING & PRESERVATION Thermodynamic properties	**1**	

11	**11**	Transfer properties	**1**	
12	**12**	Water content	**1**	
13	**13**	Initial freezing temperature	**1**	
14	**14**	Ice fraction	**1**	
15	**15**	Transpiration of fresh fruits & vegetables	**1**	
16	**16**	Food processing techniques for Dairy products	**1**	
17	**17**	Food processing techniques for Poultry	**1**	
18	**18**	Food processing techniques for Meat	**1**	
19	**19**	Food processing techniques for Fruits & Vegetables	**1**	
20	**20**	FREEZING & DRYING Pre-cooling	**1**	
21	**21**	Freeze drying principles	**1**	
22	**22**	Cold storage & freezers	**1**	**25%**
23	**23**	Freezing drying limitations	**1**	
24	**24**	Irradiation techniques	**1**	
25	**25**	Cryofreezing	**1**	
26	**26**	Numerical methods in estimating Freezing,	**1**	
27	**27**	Analytical methods in estimating Freezing,	**1**	
28	**28**	Thawing times	**1**	
29	**29**	Energy conservation in food industry	**1**	
30	**30**	COLD STORAGE DESIGN & INSTRUMENTATION Initial building consideration	**1**	
31	**31**	Building design	**1**	
32	**32**	Specialized storage facility	**1**	
33	**33**	Construction methods	**1**	
34	**34**	Refrigeration systems	**1**	
35	**35**	Insulation technique	**1**	**25%**
25	**36**	Control & instrumentation	**1**	
37	**37**	Fire protection	**1**	
38	**38**	Inspection & maintenance	**1**	
39	**39**	TRANSPORT Refrigerated transportation	**1**	
40	**40**	Refrigerated containers	**1**	
41	**41**	Refrigerated trucks	**1**	
42	**42**	Design features	**1**	
43	**43**	Piping	**1**	**25%**
44	**44**	Role of cryogenics in freezing & transport	**1**	
45	**45**	Examples	**1**	
		TOTAL Hrs. Required To complete Task	**45**	**100%**

STUDENTS LEARNING OUTCOME:

- The student can identify different areas of Food Processing, Preservation And Transport Can find the applications of all the areas in day to day life.

TEXT BOOKS:

- Alan Rodes, “Principles of Industrial Microbiology”, Pregmon International Pub., 1989

- IbrahamDincer, “Heat Transfer in Food Cooling Applications”, Tailor & Francis Pub., 1997

REFERENCE BOOKS:

- 3Stanley E. Charm, “Fundamentals of Food Engineering’, III Ed. AVI Pub. Company Inc., 1989
- Clive V.I. Dellino, “Cold and Chilled Storage Technology”, Van Nostrand Reinhold Pub., New York, 1991
- Arora C.P., “Refrigeration and Air conditioning”, Second Edition. McGraw-Hill, Pub., 2000
- ASHRAE Handbook, Refrigeration, American Society of Heating, Refrigerating and Air- Conditioning Engineers, Inc. Atlanta, 1988

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First/Second Year Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: METH207-N-D	**Subject Title: THERMAL POWER PLANT ENGINEERING**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract.**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
3	**0**	**0**	**3**	**3**	**3**	**70**	**30**	**20**	**0**	**120**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To present a problem oriented in depth knowledge of Thermal Power Plant Engineering
- To address the underlying concepts and methods behind Thermal Power Plant Engineering

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to
   equivalent of 30 marks as a part of internal theory evaluation.
   Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
5. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
6. The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.
7. Experiments shall be performed in the laboratory related to course contents.

OUTLINE OF THE COURSE:

Sr. No.	**Date/Week**	**Unit No.**	**Percentage Weightage.**	**Topic No**:
1	1^{st} ,2^{nd} ,3^{rd}	Unit :1	20	1,2
2	4^{th} ,5^{th} ,6^{th}	Unit:2	20	3,4

3	7^{th} ,8^{th} ,9^{th}	Unit:3	20	5,6
4	19^{th} b ,11^{th} ,12^{th}	Unit:4	20	7,8
5	13^{th} ,14^{th} ,15^{th}	Unit:5	20	9,10

Total Hours (Theory): 60
Total Hours (Lab): 30
Total Hours: 90

DETAILED SYLLABUS

1. Recent trends in Steam Power Plants, design of combustion chambers, Fluidized bed combustion chambers, burners and selection criteria, combustion calculations, design and selection for economizers, air-preheater, superheater, desuperheaters, and reheaters. Performance testing and maintenance.
2. Design of Advanced boiler and steam system, heat balance sheet, co-generation and combined cycle, boiler efficiency, thermodynamics and power plant cycle analysis. Power plant layout and selection, Arrangement of units. Advancement in high pressure boilers and miniature boilers.
3. Classification and comparison of different types of gas turbine power plants, Thermodynamic cycles, Analysis of closed cycle and open cycle gas turbine plants, Methods of improving the thermal efficiency and power output of gas turbine plants.
4. Different components of gas turbine plants and different arrangements of gas turbine components. Types of combustion chambers used, fuels and fuel handling equipments, Governing of gas turbines. Combined steam and gas turbine plants. Recent developments of gas turbine power plants.
5. Modern nuclear power plants and their arrangement, types of nuclear furnaces and moderator, heat exchangers, turbines for nuclear power plants. Nuclear waste disposal, Gas disposal system.
6. Advances in diesel electric power plant, types of engines used, analysis of thermodynamic cycles, supercharging of diesel engine, performance and analysis of diesel power plant, present development in diesel power plant.
7. Economics Analysis of Power Plant. Cost electric energy, selection of type of generation and generating equipment, performance and operating characteristic, load division and tariff method.
8. Fluctuating Loads on Power Plants: Introduction, load curves, Different terms and definitions, Effect of variable load on power plant design and operation, Method to meet variable loads.
9. Peak Load Plants: Requirements, Pump storage power plants, Economical justification of pump storage plant, Their advantages and disadvantages compressed air storage plants, Their advantages and limitation.
10. Energy conservation and management, distribution of energy consumption, load sharing, need of energy conservation, methods of energy conservation, energy management techniques.

LESSON PLANNING

Sr. No	LECTURE NO	Course Content	Hrs.	Percentage Weightage
1	**1**	Recent trends in Steam Power Plants	**1**	**25%**
2	**2**	design of combustion chambers	**1**	
3	**3**	Fluidized bed combustion chambers	**1**	
4	**4**	burners and selection criteria, combustion calculations, ,	**1**	
5	**5**	design and selection for economizers	**1**	
6	**6**	air-preheater, superheater	**1**	
7	**7**	desuperheaters, and reheaters.	**1**	
8	**8**	Performance testing and maintenance	**1**	
9	**9**	Design of Advanced boiler	**1**	
10	**10**	steam system, heat balance sheet	**1**	
11	**11**	co-generation and combined cycle	**1**	
12	**12**	boiler efficiency	**1**	
13	**13**	thermodynamics and power plant cycle analysis	**1**	
14	**14**	Power plant layout and selection	**1**	
15	**15**	Arrangement of units. Advancement in high pressure boilers and miniature boilers	**1**	
16	**16**	Classification and comparison of different types of gas turbine power plants	**1**	**25%**
17	**17**	Thermodynamic cycles,	**1**	
18	**18**	Analysis of closed cycle and open cycle gas turbine plants	**1**	
19	**19**	Methods of improving the	**1**	
20	**20**	thermal efficiency and power output of gas turbine plants	**1**	
21	**21**	Different components of gas turbine plants	**1**	
22	**22**	different arrangements of gas turbine component	**1**	
23	**23**	Types of combustion chambers used	**1**	
24	**24**	fuels and fuel handling equipments	**1**	
25	**25**	Governing of gas turbines. Combined steam and gas turbine plants	**1**	
26	**26**	Recent developments of gas turbine power plants	**1**	
27	**27**	Modern nuclear power plants and their arrangement	**1**	
28	**28**	types of nuclear furnaces and moderator,	**1**	
29	**29**	heat exchangers	**1**	
30	**30**	turbines for nuclear power plants	**1**	**25%**
31	**31**	Nuclear waste disposal,	**1**	
32	**32**	Gas disposal system	**1**	
33	**33**	Advances in diesel electric power plant	**1**	
34	**34**	types of engines used,	**1**	
35	**35**	analysis of thermodynamic cycles	**1**	
25	**36**	supercharging of diesel engine	**1**	
37	**37**	performance and analysis of diesel power plant	**1**	
38	**38**	present development in diesel power plant	**1**	
39	**39**	Advances in diesel electric power plant, , s, , ,.	**1**	
40	**40**	types of engines used	**1**	
41	**41**	analysis of thermodynamic cycle	**1**	**25%**
42	**42**	supercharging of diesel engine	**1**	

43	**43**	performance and analysis of diesel power plant	**1**	
44	**44**	present development in diesel power plant	**1**	
45	**45**	Economics Analysis of Power Plant	**1**	
46	**46**	Cost electric energy	**1**	
47	**47**	selection of type of generation and generating equipment	**1**	
48	**48**	performance and operating characteristic	**1**	
49	**49**	load division and tariff method	**1**	
50	**50**	Fluctuating Loads on Power Plants: Introduction	**1**	
51	**51**	load curves, Different terms and definitions	**1**	
52	**52**	Effect of variable load on power plant design and operation	**1**	
53	**53**	Method to meet variable loads	**1**	
54	**54**	Peak Load Plants: Requirements, Pump storage power plants	**1**	
55	**55**	Economical justification of pump storage plant,	**1**	
56	**56**	Their advantages and disadvantages compressed air storage plants, Their advantages and limitation	**1**	
57	**57**	Energy conservation and management	**1**	
58	**58**	distribution of energy consumption	**1**	
59	**59**	load sharing, need of energy conservation	**1**	
60	**60**	methods of energy conservation, energy management techniques	**1**	
		TOTAL Hrs. Required To complete Task	**60**	**100%**

STUDENTS LEARNING OUTCOME:

- The student can identify different areas of Thermal Power Plant Engineering
- Can find the applications of all the areas in day to day life

TEXT BOOKS:

- Black and Vetach, "Power Plant Engineering", Chapman and Hall, International Thomson Publishing Co., 2001.
- El, Wakil, "Power Plant Technology", McGraw-Hill, 2003.York

REFERENCE BOOKS:

- Gebhartt, G. F., "Steam Power Plant Engineering", John Wiley & Sons, 2002.
- Kearton, "Steam Turbine Theory and Practice", ELBS, 2001.
- Burger R., "Cooling Tower Technology", Chemical Publishing Company
- Shields, C. D., "Boilers", McGraw Hill, New York, 2001
- Babcock-Wilcox manual "Steam"
- Vandagriff, R.L "Practical guide to boiler systems", Marcel Dekker, 2000
- Oliver, K.G "Industrial boiler management, an operations guide, Industrial Press, NewYork. 2002

LIST OF EXPERIMENTS:

Sr. No.	Name of the Experiments
1	Case study on selection of size of different elements of steam power plant
2	.Performance and operation methods of Power Plant

3	Experimental performance test on steam power plant: To study boiler operation and calculate boiler capacity, efficiency and all other necessary parameters
4	Experimental performance test on steam power plant: To study steam turbine operation and calculate steam turbine efficiency, fuel consumption, steam quality, flow rate, condenser effectiveness and all other necessary parameters
5	Experimental performance test on steam power plant: To calculate dryness fraction of steam, heat balance and energy utilization
6	Industrial visit of Steam Power Plant, and prepare detail study report
7	Study of Fluidized bed combustion system and its design.
8	Study of Nuclear Power Plants, properties and reaction of nuclear fuel
9	Study of co-generation and combine cycle
10	Industrial visit of Nuclear Power Plant, and prepare detail study report.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First/Second Year Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: METH303-N-A	**Subject Title: EXERGY ANALYSIS OF THERMAL SYSTEM**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract.**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
4	**1**	**-**	**5**	**5**	**3**	**70**	**30**	**50**	**-**	**150**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To present a problem oriented in depth knowledge of Exergy Analysis Of Thermal Systems
- To address the underlying concepts and methods behind Exergy Analysis Of Thermal Systems.

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
5. Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.

OUTLINE OF THE COURSE:

Sr. No.	**Date/Week**	**Unit No.**	**Percentage Weightage.**	**Topic No**:
1	1^{st} ,2^{nd} ,3^{rd}	Unit :1	20	1, 2,3
2	4^{th} ,5^{th} ,6^{th}	Unit:2	20	4,5
3	7^{th} ,8^{th} ,9^{th}	Unit:3	20	6,7

4	19^{th} b ,11^{th} ,12^{th}	Unit:4	20	8,9
5	13^{th} ,14^{th} ,15^{th}	Unit:5	20	10,11

Total Hours (Theory): 45

Total Hours (Lab): 30

Total Hours: 75

DETAILED SYLLABUS

1. Basic exergy concepts: classification of forms of exergy, concepts of exergy, exergy concepts for control volume, physical exergy, exergy concepts for closed systems analysis, non flow analysis

2. Elements of Plant Analysis: Control volume analysis, criterion for performance, pictorial
representation of exergy balance, exergy based property diagram.

3. Exergy Analysis in Process: Expansion process, compression process, heat transfer process, mixing process, separation process, and combustion processes.

4. Energy and Exergy Analysis of gas turbine, steam power plant, captive power plant, combined cycle power plant, refrigeration plant, heat exchanger.

5. Tutorials: This shall consists of solution of examples based on above topics

LESSON PLANNING

Sr. No	LECTURE NO	Course Content	Hrs.	Percentage Weightage
1	**1**	Basic exergy concepts:, ,	**1**	
2	**2**	classification of forms of exergy	**1**	
3	**3**	concepts of exergy	**2**	
4	**4**	exergy concepts for control volume	**1**	
5	**5**	physical exergy	**2**	
6	**6**	exergy concepts for closed systems analysis	**2**	
7	**7**	non flow analysis	**1**	
8	**8**	Elements of Plant Analysis:, ,	**1**	**25%**
9	**9**	Control volume analysis	**2**	
10	**10**	criterion for performance	**2**	
11	**11**	pictorial representation of exergy balance	**2**	
12	**12**	exergy based property diagram	**2**	
13	**13**	Exergy Analysis in Process:, ,	**1**	
14	**14**	Expansion process	**2**	
15	**15**	compression process	**1**	
16	**16**	heat transfer process	**2**	
17	**17**	mixing process	**1**	**25%**
18	**18**	separation process	**1**	
19	**19**	combustion processes	**2**	

20	**20**	Energy and Exergy	**1**	
21	**21**	Analysis of gas turbine	**1**	
22	**22**	steam power plant	**1**	
23	**23**	captive power plant	**1**	
24	**24**	combined cycle power plant	**2**	
25	**25**	refrigeration plant	**1**	
26	**26**	heat exchanger	**2**	
27	**27**	Tutorials	**2**	
28	**28**	Tutorials	**2**	
29	**29**	Tutorials	**1**	
30	**30**	Tutorials	**1**	**25%**
		TOTAL Hrs. Required To complete Task	**45**	**100%**

STUDENTS LEARNING OUTCOME:

On successful completion of the course

- The student can identify different areas of Exergy Analysis Of Thermal Systems
- Can find the applications of all the areas in day to day life.

TEXT BOOKS:

- Advanced Engineering Thermodynamics by Adrian Bejan, John Wiley & Sons, Inc
- The Exergy Method of Thermal Plant Analysis by T J Kotas, Krieger Publishing Company

REFERENCE BOOKS:

- Thermal Design and Optimization by Adrian Bejan, George Tsatsaronis, Michael Moran, John Wiley & Sons, Inc.
- Advance Thermodynamics for Engineers by Winterbore D E, Arnold Publication
- Advanced Thermodynamics for Engineers by Kenneth Wark, McGraw Hill Publishing Co. Ltd
- Fundamentals of Engineering Thermodynamics by Michel J Moran, Howard N Shapiro, Daisie D Boettner, Margaret B Bailey, John Wiley & Sons, Inc.

Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First/Second Year Master of Engineering (Mechanical Engineering)

In Effect from Academic Year 2017-18

Subject Code: METH303-N-B	**Subject Title: ECONOMICS & MANAGEMENT OF THERMAL SYSTEM**

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**IE**	**CIA**	**Pract.**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
4	**1**	**-**	**5**	**5**	**3**	**70**	**30**	**50**	**-**	**150**

LEARNING OBJECTIVES:

The educational objectives of this course are

- To present a problem oriented in depth knowledge of Economics & Management of Thermal System
- To address the underlying concepts and methods behind Economics & Management of Thermal System

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to
   equivalent of 30 marks as a part of internal theory evaluation.
   Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
5. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
6. The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.

OUTLINE OF THE COURSE:

Sr. No.	**Date/Week**	**Unit No.**	**Percentage Weightage.**	**Topic No**:
1	1^{st} ,2^{nd} ,3^{rd}	Unit :1	20	1
2	4^{th} ,5^{th} ,6^{th}	Unit:2	20	2

3	7^{th} ,8^{th} ,9^{th}	Unit:3	20	3
4	19^{th} b ,11^{th} ,12^{th}	Unit:4	20	4
5	13^{th} ,14^{th} ,15^{th}	Unit:5	20	5,6

Total Hours (Theory): 45
Total Hours (Lab): 30
Total Hours: 75

DETAILED SYLLABUS

1. Role of Power in the Development of a Society with Emphasis on Indian Scene: Both rural and urban as well as agriculture and Industrial development, General economic considerations leading to the choice of a power plant.
2. Fluctuating Loads on Power Plants: Introduction, load curves, Different terms and definitions, Effect of variable load on power plant design and operation, Method to meet variable loads.
3. Peak Load Plants: Requirements, Pump storage power plants, Economical justification of pump storage plant, Their advantages and disadvantages compressed air storage plants, Their advantages and limitation.
4. Economic Analysis of Power Plants: The cost of electrical energy, Selection of the type of generation, Selection of generating equipment, Performance and operating characteristics of power plants, Load division among generators, Tariff methods for electrical energy, Economics of various types of power plants.
5. Combined Operation of Power Plant: Their advantages, Load division between power stations storage type hydro electric plant on combination with steam power plant, Run-off river plant in combination with steam power plant, Coordination hydroelectric and gas turbine plants, Coordination of hydroelectric and nuclear power plants.
6. Role of fuels in power plant economics.

LESSON PLANNING

Sr. No	LECTURE NO	Course Content	Hrs.	Percentage Weightage
1	**1**	Role of Power in the Development of a Society with Emphasis on Indian Scene:,	**1**	**60%**
2	**2**	Both rural and urban as well as agriculture and Industrial development	**2**	
3	**4**	General economic considerations leading to the choice of a power plant	**1**	
4	**5**	Fluctuating Loads on Power Plants: Introduction	**2**	
5	**7**	load curves	**1**	
6	**8**	Different terms and definitions	**1**	
7	**9**	Effect of variable load on power	**2**	
8	**11**	plant design and operation	**2**	
9	**13**	Method to meet variable loads	**2**	

10	**15**	Peak Load Plants: Requirements	**2**	
11	**17**	Pump storage power plants	**1**	
12	**18**	Economical justification of pump storage plant	**2**	
13	**20**	Their advantages and disadvantages compressed air storage plants	**2**	
14	**22**	Their advantages and limitation	**2**	
15	**24**	Economic Analysis of Power Plants: The cost of electrical energy	**1**	
16	**25**	Selection of the type of generation	**2**	
17	**27**	Selection of generating equipment	**2**	
18	**20**	Performance and operating characteristics of power plants,	**2**	
19	**22**	Load division among generators	**2**	
20	**21**	Tariff methods for electrical energy	**1**	
21	**23**	Economics of various types of power plants	**2**	
22	**25**	Combined Operation of Power Plant: Their advantages	**2**	**40%**
23	**26**	Load division between power stations storage type hydro electric plant on combination with steam power plant	**1**	
24	**28**	Run-off river plant in combination with steam power plant	**2**	
25	**30**	Coordination hydroelectric and gas turbine plants	**2**	
26	**32**	Coordination of hydroelectric and nuclear power plants	**1**	
27	**35**	Role of fuels in power plant economics	**3**	
		TOTAL Hrs. Required To complete Task	**45**	**100%**

STUDENTS LEARNING OUTCOME:

- The student can identify different areas of Economics & Management of Thermal System
- Can find the applications of all the areas in day to day life.

TEXT BOOKS:

- Energy management handbook, by Wayne C. Turner, Culinary and Hospitality Industry Publications Services.
- Handbook of Energy Audits, by Thumann& Younger, Fairmont Press

REFERENCE BOOKS:

- Renewable Energy: Technology, Economics, and Environment by Kaltschmitt, M.
- Engineering Economics & Costing, by Agasty, SciTech publication (India) pvt.ltd
- Industrial organization & engineering Economics, by Banga& Sharma, SciTech publication (India) pvt.ltd