

COURSE HANDOUT

Part-A

PROGRAM : B.Tech, V-Sem A Section, MECHANICAL

ACADEMIC YEAR : 2018-19

COURSE NAME & CODE : IC Engines and Gas-Turbines & S267

L-T-P STRUCTURE : 3-1-0

COURSE CREDITS : 3

COURSE INSTRUCTOR : Dr.P.Vijay Kumar

COURSE COORDINATOR : A.Naresh Kumar

PRE-REQUISITES : Thermodynamics

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objectives of this course are

To provide students an insight of the principles and operation of internal combustion engines, its (sub component systems) fuel supply, cooling, lubrication, ignition systems, fuel-air cycles, combustion phenomenon in SI and CI engines also the performance testing of IC engines, operation of gas turbines, rocket and jet propulsion systems.

COURSE OUTCOMES (COs): At the end of the course, the student will be able to

CO1: Comprehend the operation of IC engines, its sub systems, rocket and jet propulsion systems.

CO2: Analyze fuel-air cycles using the concepts of heat power cycles.

CO3: Apply combustion phenomenon concepts for giving the right choice for SI and CI engine combustion chambers

CO4: Compute the performance parameters of IC engines for different set of conditions.

CO5: Evaluate the performance parameters of gas turbines and also under inter cooling, reheating and regeneration conditions.

COURSE ARTICULATION MATRIX (Correlation between Cos & POs, PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	1	2	-	1	3	-	-	-	-	2	3	1	2
CO2	3	-	-	3	1	2	-	-	-	-	-	3	3	1	2
CO3	-	-	-	-	1	1	3	-	2	-	-	2	3	1	2
CO4	-	-	3	1	2	1	-	-	-	-	-	2	3	1	2
CO5	3	3	2	-	-	1	3	1	-	-	-	1	3	1	2

Note: Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put '-'
1- Slight (Low), **2** – Moderate (Medium), **3** - Substantial (High).

BOS APPROVED TEXT BOOKS:

T1. V.Ganesan, Internal Combustion Engines – Tata McGraw-Hill, 3rd Edition 2008 Edition.

T2. V.Ganesan, Gas Turbines – Tata McGraw-Hill, 2007 Edition.

T3. M.L.Mathur&R.P.Sharma, A Course in I.C. Engines, DhanpatRai New Delhi, 7th Edition 2000.

BOS APPROVED REFERENCE BOOKS:**R1.** John B. Heywood, Internal Combustion Engine Fundamentals, Tata McGraw- Hill, 2012.**R2.** Cohen, Rogers and Sarvanamuttu, Gas Turbine Theory, Longman Group limited, England, 4th Edition 1996.**R3.** Vasandhani & Kumar, Treatise on Heat Engineering - Metropolitan Book Company, Delhi, 4th Edition 2001.**R4.** Pulkrabek, Engineering Fundamentals of I.C. Engines – PHI 2nd Edition 2004.**Part-B****COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: INTRODUCTION AND ENGINE SYSTEMS**

Sl. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	CO's and Introduction to IC Engines	1	12-06-18		TLM1	CO1	T1/T3	
2.	Classification of IC engines and basic Engine components	1	13-06-18		TLM2	CO1	T1/T3	
3.	Engine Nomenclature and working principles of Four stroke SI engines	1	14-06-18		TLM1/TLM4	CO1	T1	
4.	Working principles of Four stroke CI Engines	1	19-06-18		TLM1/TLM4	CO1	T1/T3	
5.	Working principles of Two stroke SI and CI Engines	1	20-06-18		TLM1/TLM4	CO1	T1/T3	
6.	Tutorial-I	1	21-06-18		TLM3	CO1	T1	
7.	Valve Timing diagrams for Four stroke Engines	1	23-06-18		TLM1/TLM4	CO1	T1/T3	
8.	Port timing diagrams for Two stroke engines & Applications of IC Engines	1	26-06-18		TLM1/TLM4	CO1	T1/T3	
9.	Layout of Fuel supply system for SI Engine and Simple Carburetor	1	27-06-18		TLM1	CO1	T1/T3	
10.	Fuel supply system for CI Engine-Solid Injection-Individual pump type-Common rail type only	1	28-06-18		TLM1	CO1	T1/T3	
11.	Tutorial-II and Quiz-I	1	30-06-18		TLM3	CO1	T1/T3	
No. of classes required to complete UNIT-I		11	No. of classes taken:					

UNIT-II: Engine systems, Air-Standard, Fuel/Air and Actual cycles

Sl. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
12.	Air-standard cycles: Carnot cycle	1	03-07-18		TLM1	CO2	T1	

13.	Otto cycle & its analysis	1	04-07-18		TLM1	CO2	T1	
14.	Diesel ,Dual cycle & its analysis	1	05-07-18		TLM1	CO2	T1/T3	
15.	Atkinson , Stirling , Ericson Cycles	1	07-07-18		TLM1	CO2	T1	
16.	Brayton cycle and its analysis	1	10-07-18		TLM1	CO2	T1/T3	
17.	Problems on Otto, Diesel and Dual cycles	1	11-07-18		TLM1	CO2	T1	
18.	Problems on Brayton cycle	1	12-07-18		TLM1	CO2	T1	
19.	Tutorial-III	1	14-07-18		TLM3	CO2	T1/T3	
20.	Fuel-air cycles and their significance, composition of cylinder gases	1	17-07-18		TLM1	CO2	T3	
21.	Dissociation, comparison of air-standard and fuel-air cycles.	1	18-07-18		TLM1	CO2	T3	
22.	Comparison of air-standard and actual cycles, time loss factor	1	19-07-18		TLM1	CO2	T3	
23.	Heat loss factor, exhaust blow down, loss due to rubbing Friction, actual and fuel-air cycles of engines.	1	21-07-18		TLM1	CO2	T3	
24.	Cooling systems, Air cooling, Water cooling, Comparison, Radiators and cooling fans	1	24-07-18		TLM1/TLM2	CO2	T1/T3	
25.	Lubricating systems, Mist lubrication, Wet sump lubrication, and Dry sump lubrication system	1	25-07-18		TLM1/TLM2	CO2	T1/T3	
26.	Ignition systems , Battery, Magneto Ignition systems	1	26-07-18		TLM1/TLM2	CO2	T1	
27.	Electronic Ignition system	1	28-07-18		TLM2	CO2	T3	
28.	Tutorial-IV and Quiz-II	1	07-08-18		TLM3	CO2	T1/T3	
No. of classes required to complete UNIT-II		17			No. of classes taken:			

UNIT-III: Combustion in SI and CI Engines

Sl. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
29.	Introduction, Homogeneous and Heterogeneous mixture, stages of combustion in SI engines	1	08-08-18		TLM1	CO3	T1/T3	
30.	Flame front propagation, factors influencing the flame speed	1	09-08-18		TLM1	CO3	T1	
31.	Abnormal combustion, phenomenon of knock in SI engines	1	11-08-18		TLM1/TLM2	CO3	T1/T3	
32.	Effect of engine variables on knock	1	14-08-18		TLM1/TLM2	CO3	T1	
33.	Combustion chambers for SI engines-Fuel requirement and fuel rating	1	16-08-18		TLM1/TLM2	CO3	T1/T3	
34.	Tutorial-V	1	18-08-18		TLM3	CO3	T1/T3	
35.	Stages of combustion in CI engines, factors affecting the delay period	1	21-08-18		TLM1/TLM2	CO3	T1/T3	
36.	Phenomenon of knock in CI engines, comparison of knock in SI and CI engines	1	23-08-18		TLM1/TLM2	CO3	T1/T3	
37.	Combustion Chambers for CI engines-I	1	25-08-18		TLM1/TLM2	CO3	T1/T3	
38.	Combustion Chambers for CI engines-II	1	28-08-18		TLM1/TLM2	CO3	T1/T3	
39.	Fuel requirement, fuel rating	1	29-08-18		TLM1	CO3	T1/T3	
40.	Tutorial-VI and Quiz-III	1	30-08-18		TLM3	CO3	T1/T3	
No. of classes required to complete UNIT-III		12			No. of classes taken:			

UNIT-IV : Engine Testing and Performance

Sl. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
41.	Introduction, Parameters of performance- Measurement of Fuel consumption, Air intake	1	01-09-18		TLM1	CO4	T1/T3	
42.	Measurement of Brake power, Determination of Frictional power and Indicated power	1	04-09-18		TLM1	CO4	T1/T3	
43.	Performance tests &	1	05-09-18		TLM1	CO4	T1/T3	

	Performance Characteristic Curves							
44.	Heat Balance sheet and Tutorial-VII	1	06-09-18		TLM1	CO4	T1/T3	
45.	Problems on Engine performance-I	1	08-03-18		TLM1	CO4	T1/T3	
46.	Tutorial-VII	1	11-09-18		TLM3	CO4	T1/T3	
47.	Problems on Engine performance-II	1	12-09-18		TLM1	CO4	T1/T3	
48.	Problems on Morse Test	1	15-09-18		TLM1	CO4	T1/T3	
49.	Problems on Heat Balance sheet-I	1	18-09-18		TLM1	CO4	T1/T3	
50.	Problems on Heat Balance sheet-II	1	19-09-18		TLM1	CO4	T1/T3	
51.	Tutorial-VIII and Quiz-IV	1	20-09-18		TLM3	CO4	T1/T3	
No. of classes required to complete UNIT-IV		11			No. of classes taken:			

UNIT-V: Gas-Turbines and Jet-Propulsion systems

Sl. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
52.	Gas turbine plant and Its Components, Classification	1	22-09-18		TLM1/TLM2	CO5	T2	
53.	Analysis of Closed and Open cycle Gas Turbine plants	1	25-09-18		TLM1/TLM2	CO5	T2	
54.	Methods of improving performance- Intercooler	1	26-09-18		TLM1	CO5	T2	
55.	Regeneration and Reheating	1	27-09-18		TLM1/TLM2	CO5	T2	
56.	Tutorial-IX	1	29-09-18		TLM3	CO5	T2	
57.	Applications of Gas-Turbine plant	1	03-10-18		TLM1	CO5	T2	
58.	Introduction of Jet Propulsion- Qualitative treatment of Turbojet, Turbo Fan	1	04-10-18		TLM1/TLM2	CO5	T2	
59.	Turboprop, Ramjet, applications, Tutorial-X and Quiz-V	1	06-10-18		TLM1/TLM2/TLM3	CO5	T2	
No. of classes required to complete UNIT-V		08			No. of classes taken:			

Contents beyond the Syllabus

Sl. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign
60.	Contents beyond syllabus-Emissions	1	04-10-2018		TLM2	CO3	R1/R4	
61.	Contents beyond syllabus-Supercharger & Turbocharger	1	05-10-2018		TLM2	CO1	R1/R4	

Teaching Learning Methods			
TLM1	Chalk and Talk	TLM4	Demonstration (Lab/Field Visit)
TLM2	PPT	TLM5	ICT (NPTEL/Swayam Prabha/MOOCs)
TLM3	Tutorial	TLM6	Group Discussion/Project

Part - C

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment/Quiz – 1	1	A1=5
Assignment/Quiz – 2	2	A2=5
I-Mid Examination	1,2	B1=20
Assignment/Quiz – 3	3	A3=5
Assignment/Quiz – 4	4	A4=5
Assignment/Quiz – 5	5	A5=5
II-Mid Examination	3,4,5	B2=20
Evaluation of Assignment/Quiz Marks: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=5
Evaluation of Mid Marks: $B=75\% \text{ of Max}(B1,B2)+25\% \text{ of Min}(B1,B2)$	1,2,3,4,5	B=20
Cumulative Internal Examination : A+B	1,2,3,4,5	A+B=25
Semester End Examinations	1,2,3,4,5	C=75
Total Marks: A+B+C	1,2,3,4,5	100

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

Graduates of Mechanical Engineering programme will be:

PEO1: To build a professional career and pursue higher studies with sound knowledge in Mathematics, Science and Mechanical Engineering.

PEO2: To inculcate strong ethical values and leadership qualities for graduates to become successful in multidisciplinary activities.

PEO3: To develop inquisitiveness towards good communication and lifelong learning.

PROGRAMME OUTCOMES (POs):

Engineering Graduates will be able to:

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PSOs:

Graduate of the Mechanical Engineering will have the ability to

1. To apply the principles of thermal sciences to design and develop various thermal systems.
2. To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.
3. To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Course Instructor	Course Coordinator	Module Coordinator	HoD
Dr.P.Vijay Kumar	A.Naresh Kumar	Dr. P. Vijay Kumar	Dr. S. Pichi Reddy

COURSE HANDOUT

PROGRAM : B.Tech. V-Sem., ME
ACADEMIC YEAR : 2018-19
COURSE NAME & CODE : IC ENGINES AND GAS TURBINES - S 267
L-T-P STRUCTURE : 3-1-0
COURSE CREDITS : 3
COURSE INSTRUCTOR : S RAMI REDDY
COURSE COORDINATOR : DR P.VIJAY KUMAR
PRE-REQUISITE: THERMODYNAMICS

COURSE OBJECTIVE:

To provide students an insight of the principles and operation of internal combustion engines, its (sub component systems) fuel supply, cooling, lubrication, ignition systems, fuel-air cycles, combustion phenomenon in SI and CI engines also the performance testing of IC engines, operation of gas turbines, rocket and jet propulsion systems.

COURSE OUTCOMES (CO):

CO1: Comprehend the operation of IC engines, its sub systems, rocket and jet propulsion systems.

CO2: Analyze fuel-air cycles using the concepts of heat power cycles.

CO3: Apply combustion phenomenon concepts for giving the right choice for SI and CI engine combustion chambers

CO4: Compute the performance parameters of IC engines for different set of conditions.

CO5: Evaluate the performance parameters of gas turbines and also under inter cooling, reheating and regeneration conditions.

COURSE ARTICULATION MATRIX (Correlation between COs&POs,PSOs):

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1		1	2		1	3					2	3	1	2
CO2	3			3	1	2						3	3	1	2
CO3					1	1	3		2			2	3	1	2
CO4			3	1	2	1						2	3	1	2
CO5	3	3	2			1	3	1				1	3	1	2

Note: Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put '-'
1- Slight(Low), **2** - Moderate(Medium), **3** - Substantial (High).

BOS APPROVED TEXT BOOKS:**T1** V.Ganesan,Internal Combustion Engines-Tata McGraw-Hill,3rd Edition2008**T2** V.Ganesan,Gas Turbines--Tata McGraw-Hill, 2007 Edition**BOS APPROVED REFERENCE BOOKS:****R1** John B.Heywood,Internal Combustion Engine Fundamentals, Tata McGraw-Hill, 2012**R2** M.L.Mathur&R.P.Sharma,A Course in I.C.Engines,Dhanapatrai New Delhi,7th Edition 2000**COURSE DELIVERY PLAN (LESSON PLAN): Section-B****UNIT-I: INTRODUCTION AND ENGINE SYSTEMS**

S.N o.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to IC Engines & classification of IC Engines	01	11/06/18		TLM1	CO1	V GANESAN	
2.	Basic Engine components and Nomenclature	01	12/06/18		TLM1	CO1	V GANESAN	
3.	Working principles of Four stroke SI and CI Engines	02	14/06/18		TLM1, TLM2	CO1	V GANESAN	
4.	Working principles of Two stroke SI and CI Engines & Valve Timing diagrams for Four stroke Engines	01	18/06/18		TLM1, TLM2	CO1	V GANESAN	
5.	Tutorial-I	01	19/06/18		TLM3	CO1	V GANESAN	
6.	Port timing diagrams for Two stroke engines & Applications of IC Engines	01	21/06/18		TLM1	CO1	V GANESAN	
7.	Layout of Fuel supply system for SI Engine-Simple Carburettor	01	23/06/18		TLM8, TLM4	CO1	V GANESAN	
8.	Fuel supply system for CI Engine-Solid Injection-	01	25/06/18		TLM1	CO1	V GANESAN	

	Individual pump type-Common rail type only						AN	
9.	Tutorial-II	01	26/06/18		TLM3	CO1	V GANES AN	
10.	Assignment /Quiz-1	01	28/06/18		TLM6	CO1	V GANES AN	
No. of classes required to complete UNIT-I		11			No. of classes taken:			

UNIT-II: ENGINE SYSTEMS, AIR-STANDARD CYCLES ,FUEL-AIR CYCLES AND ACTUAL CYCLES THEIR ANALYSIS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
11.	Air-standard cycles: Carnot cycle	01	30/06/18		TLM1	CO2	V GANES AN	
12.	Otto cycle & its analysis	01	02/07/18		TLM1	CO2	V GANES AN	
13.	Diesel ,Dual cycle & its analysis	01	03/07/18		TLM1	CO2	V GANES AN	
14.	Atkinson , Stirling , Ericson Cycles	01	05/07/18		TLM1	CO2	V GANES AN	
15.	Brayton cycle and its analysis	01	07/07/18		TLM1	CO2	V GANES AN	
16.	Problems on Otto, Diesel and Dual cycles	01	09/07/18		TLM4	CO2	J.B.HE YWOOD	
17.	Tutorial-III	01	10/07/18		TLM3	CO2	J.B.HE YWOOD	
18.	Fuel-air cycles and their significance, composition of cylinder gases	01	12/07/18		TLM1	CO2	J.B.HE YWOOD	

19.	Dissociation, comparison of air-standard and fuel-air cycles.	01	16/07/18		TLM3	CO2	J.B.HEYWOOD	
20.	Comparison of air-standard and actual cycles, time loss factor	02	17/07/18		TLM1, TLM2	CO2	J.B.HEYWOOD	
21.	Heat loss factor, exhaust blow down, loss due to rubbing Friction, actual and fuel-air cycles of engines.	02	19/07/18		TLM1	CO2	J.B.HEYWOOD	
22.	Cooling systems, Air cooling, Water cooling, Comparison, Radiators and cooling fans	02	21/07/18		TLM1	CO2	J.B.HEYWOOD	
23.	Lubricating systems, Mist lubrication, Wet sump lubrication, and Dry sump lubrication system	01	23/07/18		TLM1	CO2	V.GANESAN	
24.	Ignition systems- Battery, Magneto Ignition systems	01	24/07/18		TLM1	CO2	M.L.MATHUR	
25.	Electronic Ignition system	01	26/07/18		TLM1	CO2	M.L.MATHUR	
26.	Tutorial-IV	01	28/07/18		TLM3	CO2	M.L.MATHUR	
27.	Assignment/ Quiz-2	01	30/07/18		TLM6	CO2	M.L.MATHUR	
No. of classes required to complete UNIT-II		17			No. of classes taken:			

UNIT-III: COMBUSTION IN SI AND CI ENGINES

S.N o.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
28.	Introduction, Homogeneous and Heterogeneous mixture, stages of combustion in SI engines	02	31/07/18		TLM1	CO3	V.GAN ESAN	
29.	Flame front propagation, factors influencing the flame speed	01	06/08/18		TLM1	CO3	V.GAN ESAN	
30.	Abnormal combustion, phenomenon of knock in SI engines	01	07/08/18		TLM3	CO3	V.GAN ESAN	
31.	Effect of engine variables on knock	01	09/08/18		TLM1	CO3	V.GAN ESAN	
32.	Combustion chambers for SI engines- Fuel requirement and fuel rating	01	13/08/18		TLM1, TLM2	CO3	V.GAN ESAN	
33.	Tutorial-V	01	14/08/18		TLM3	CO3	M.L.MA THUR	
34.	Stages of combustion in CI engines, factors affecting the delay period	01	16/08/18		TLM1	CO3	M.L.MA THUR	
35.	Phenomenon of knock in CI engines, comparison of knock in SI and CI engines	01	18/08/18		TLM1	CO3	M.L.MA THUR	
36.	Combustion Chambers for CI engines-I	01	20/08/18		TLM1	CO3	V.GAN ESAN	
37.	Combustion Chambers for CI engines-II and Fuel requirement, fuel rating	01	21/08/18		TLM3	CO3	M.L.MA THUR	
38.	Tutorial-VI	01	23/08/18		TLM3	CO3	J.B.HE YWO	

							D	
39.	Assignment /Quiz-3	01	25/08/18		TLM6	CO3	J.B.HE YWOOD	D
No. of classes required to complete UNIT-III		12			No. of classes taken:			

UNIT-IV: ENGINE TESTING AND PERFORMANCE

S.N o.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
40.	Introduction, Parameters of performance- Measurement of Fuel consumption, Air intake	01	27/08/18		TLM1	CO4	V.GANESAN	
41.	Measurement of Brake power, Determination of Frictional power and Indicated power	02	28/08/18		TLM1	CO4	J.B.HE YWOOD	
42.	Performance tests & Performance Characteristic Curves	01	30/08/18		TLM1	CO4	V.GANESAN	
43.	Heat Balance sheet and Problems on Engine performance-I	01	01/09/18		TLM4	CO4	M.L.MATHUR	
44.	Tutorial-VII	01	04/09/18		TLM3	CO4	V GANESAN	
45.	Problems on Engine performance-II	03	06/09/18		TLM4	CO4	J.B.HE YWOOD	
46.	Problems on Morse Test	01	10/09/18		TLM4	CO4	V GANESAN	
47.	Problems on Heat Balance sheet-I	01	11/09/18		TLM4	CO4	V GANESAN	
48.	Problems on Heat Balance sheet-II	02	15/09/18		TLM4	CO4	V GANESAN	
49.	Tutorial-VIII	01	17/09/18		TLM3	CO4	J.B.HE Y	

							WOOD	
50.	Assignment/ Quiz-4	01	18/09/18		TLM6	CO4	V GANESAN	
No. of classes required to complete UNIT-IV		11			No. of classes taken:			

UNIT-V: GAS TURBINES AND ROCKET PROPULSION SYSTEMS

S.N o.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
51.	Gas turbine plant and Its Components, Classification	01	20/09/18		TLM1	CO5	V GANESAN	
52.	Analysis of Closed and Open cycle Gas Turbine plants	02	22/09/18		TLM1	CO5	V GANESAN	
53.	Methods of improving performance- Intercooler, Regeneration and Reheating	01	24/09/18		TLM1, TLM2	CO5	J B HEYWOOD	
54.	Tutorial-IX	01	25/10/18		TLM3	CO5	J B HEYWOOD	
55.	Introduction of Jet Propulsion- Qualitative treatment of Turbojet, Turbo Fan etc	01	27/09/18		TLM1	CO5	J B HEYWOOD	
56.	Tutorial-X	01	29/09/18		TLM3	CO5	V GANESAN	
57.	Assignment /Quiz-5	01	01/10/18		TLM6	CO5	V GANESAN	
No. of classes required to complete UNIT-V		7			No. of classes taken:			

Contents beyond the Syllabus

S.N o.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
58.	Startified charged engines	01	02/10/18		TLM1	-		

59.	Modern developments in IC Engines	01	04/10/18		TLM1	-	V GANES AN
60.	Alternate fuels for IC Engines	01	06/10/18		TLM1	-	

Teaching Learning Methods					
TLM1	Chalk and Talk	TLM4	Problem Solving	TLM7	Seminars or GD
TLM2	PPT	TLM5	Programming	TLM8	Lab Demo
TLM3	Tutorial	TLM6	Assignment or Quiz	TLM9	Case Study

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	11-06-2018	28-07-2018	7
I Mid Examinations	30-07-2018	04-08-2018	1
II Phase of Instructions	06-08-2018	06-10-2018	9
II Mid Examinations	08-10-2018	13-10-2018	1
Preparation and Practicals	15-10-2018	27-10-2018	2
Semester End Examinations	29-10-2018	10-11-2018	2

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment/Quiz – 1	1	A1=5
Assignment/Quiz – 2	2	A2=5
I-Mid Examination	1,2	B1=20
Assignment/Quiz – 3	3	A3=5
Assignment/Quiz – 4	4	A4=5
Assignment/Quiz – 5	5	A5=5
II-Mid Examination	3,4,5	B2=20
Evaluation of Assignment/Quiz Marks: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=5
Evaluation of Mid Marks: $B=75\% \text{ of Max}(B1,B2)+25\% \text{ of Min}(B1,B2)$	1,2,3,4,5	B=20
Cumulative Internal Examination : A+B	1,2,3,4,5	A+B=25
Semester End Examinations	1,2,3,4,5	C=75
Total Marks: A+B+C	1,2,3,4,5	100

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To build a professional career and pursue higher studies with sound knowledge in Mathematics, Science and Mechanical Engineering.

PEO2: To inculcate strong ethical values and leadership qualities for graduates to become successful in multidisciplinary activities.

PEO3: To develop inquisitiveness towards good communication and lifelong learning.

PROGRAMME OUTCOMES (POs)

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PSOs

1. To apply the principles of thermal sciences to design and develop various thermal systems.
2. To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.
3. To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Course Instructor	Course Coordinator	Module Coordinator	HOD

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING
(Autonomous & Affiliated to JNTUK, Kakinada & Approved by AICTE, New Delhi,
NAAC Accredited with 'A' grade, Accredited by NBA, Certified by ISO 9001:2015)
L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

COURSE HANDOUT

Part-A

PROGRAM : B.Tech, V-Sem C Section, MECHANICAL
ACADEMIC YEAR : 2018-19
COURSE NAME & CODE : IC Engines and Gas-Turbines & S267
L-T-P STRUCTURE : 3-1-0
COURSE CREDITS : 3
COURSE INSTRUCTOR : A.Naresh Kumar
COURSE COORDINATOR : A.Naresh Kumar
PRE-REQUISITES : Thermodynamics

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objectives of this course are

To provide students an insight of the principles and operation of internal combustion engines, its (sub component systems) fuel supply, cooling, lubrication, ignition systems, fuel-air cycles, combustion phenomenon in SI and CI engines also the performance testing of IC engines, operation of gas turbines, rocket and jet propulsion systems.

COURSE OUTCOMES (COs): At the end of the course, the student will be able to

CO1: Comprehend the operation of IC engines, its sub systems, rocket and jet propulsion systems.

CO2: Analyze fuel-air cycles using the concepts of heat power cycles.

CO3: Apply combustion phenomenon concepts for giving the right choice for SI and CI engine combustion chambers

CO4: Compute the performance parameters of IC engines for different set of conditions.

CO5: Evaluate the performance parameters of gas turbines and also under inter cooling, reheating and regeneration conditions.

COURSE ARTICULATION MATRIX (Correlation between Cos & POs, PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	1	2	-	1	3	-	-	-	-	2	3	1	2
CO2	3	-	-	3	1	2	-	-	-	-	-	3	3	1	2
CO3	-	-	-	-	1	1	3	-	2	-	-	2	3	1	2
CO4	-	-	3	1	2	1	-	-	-	-	-	2	3	1	2
CO5	3	3	2	-	-	1	3	1	-	-	-	1	3	1	2

Note: Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put '-'

1- Slight (Low), **2** – Moderate (Medium), **3** - Substantial (High).

BOS APPROVED TEXT BOOKS:

T1. V.Ganesan, Internal Combustion Engines – Tata McGraw-Hill, 3rd Edition 2008 Edition.

T2. V.Ganesan, Gas Turbines – Tata McGraw-Hill, 2007 Edition.

T3. M.L.Mathur&R.P.Sharma, A Course in I.C. Engines, DhanpatRai New Delhi, 7th Edition 2000.

BOS APPROVED REFERENCE BOOKS:**R1.** John B. Heywood, Internal Combustion Engine Fundamentals, Tata McGraw- Hill, 2012.**R2.** Cohen, Rogers and Sarvanamuttu, Gas Turbine Theory, Longman Group limited, England, 4th Edition 1996.**R3.** Vasandhani & Kumar, Treatise on Heat Engineering - Metropolitan Book Company, Delhi, 4th Edition 2001.**R4.** Pulkrabek, Engineering Fundamentals of I.C. Engines – PHI 2nd Edition 2004.**Part-B****COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: INTRODUCTION AND ENGINE SYSTEMS**

Sl. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	CO's and Introduction to IC Engines	1	11-06-2018		TLM1	CO1	T1/T3	
2.	Classification of IC engines and basic Engine components	1	12-06-2018		TLM2	CO1	T1/T3	
3.	Engine Nomenclature and working principles of Four stroke SI engines	1	14-06-2018		TLM1/TLM4	CO1	T1	
4.	Working principles of Four stroke CI Engines	1	15-06-2018		TLM1/TLM4	CO1	T1/T3	
5.	Working principles of Two stroke SI and CI Engines	1	18-06-2018		TLM1/TLM4	CO1	T1/T3	
6.	Tutorial-I	1	19-06-2018		TLM3	CO1	T1	
7.	Valve Timing diagrams for Four stroke Engines	1	21-06-2018		TLM1/TLM4	CO1	T1/T3	
8.	Port timing diagrams for Two stroke engines & Applications of IC Engines	1	22-06-2018		TLM1/TLM4	CO1	T1/T3	
9.	Layout of Fuel supply system for SI Engine and Simple Carburetor	1	25-06-2018		TLM1	CO1	T1/T3	
10.	Fuel supply system for CI Engine-Solid Injection-Individual pump type-Common rail type only	1	26-06-2018		TLM1	CO1	T1/T3	
11.	Tutorial-II and Quiz-I	1	28-06-2018		TLM3	CO1	T1/T3	
No. of classes required to complete UNIT-I		11	No. of classes taken:					

UNIT-II: Engine systems, Air-Standard, Fuel/Air and Actual cycles

Sl. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
12.	Air-standard cycles: Carnot cycle	1	29-06-2018		TLM1	CO2	T1	
13.	Otto cycle & its analysis	1	02-07-2018		TLM1	CO2	T1	
14.	Diesel ,Dual cycle & its analysis	1	03-07-2018		TLM1	CO2	T1/T3	
15.	Atkinson , Stirling , Ericson Cycles	1	05-07-2018		TLM1	CO2	T1	
16.	Brayton cycle and its analysis	1	06-07-2018		TLM1	CO2	T1/T3	
17.	Problems on Otto, Diesel and Dual cycles	1	09-07-2018		TLM1	CO2	T1	
18.	Problems on Brayton cycle	1	10-07-2018		TLM1	CO2	T1	
19.	Tutorial-III	1	12-07-2018		TLM3	CO2	T1/T3	
20.	Fuel-air cycles and their significance, composition of cylinder gases	1	13-07-2018		TLM1	CO2	T3	
21.	Dissociation, comparison of air-standard and fuel-air cycles.	1	16-07-2018		TLM1	CO2	T3	
22.	Comparison of air-standard and actual cycles, time loss factor	1	17-07-2018		TLM1	CO2	T3	
23.	Heat loss factor, exhaust blow down, loss due to rubbing Friction, actual and fuel-air cycles of engines.	1	19-07-2018		TLM1	CO2	T3	
24.	Cooling systems, Air cooling, Water cooling, Comparison, Radiators and cooling fans	1	20-07-2018		TLM1/TLM2	CO2	T1/T3	
25.	Lubricating systems, Mist lubrication, Wet sump lubrication, and Dry sump lubrication system	1	23-07-2018		TLM1/TLM2	CO2	T1/T3	
26.	Ignition systems , Battery, Magneto Ignition systems	1	24-07-2018		TLM1/TLM2	CO2	T1	
27.	Electronic Ignition system	1	26-07-2018		TLM2	CO2	T3	

28.	Tutorial-IV and Quiz-II	1	27-07-2018		TLM3	CO2	T1/T3		
No. of classes required to complete UNIT-II		17			No. of classes taken:				

UNIT-III: Combustion in SI and CI Engines

Sl. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly	
29.	Introduction, Homogeneous and Heterogeneous mixture, stages of combustion in SI engines	1	06-08-2018		TLM1	CO3	T1/T3		
30.	Flame front propagation, factors influencing the flame speed	1	07-08-2018		TLM1	CO3	T1		
31.	Abnormal combustion, phenomenon of knock in SI engines	1	09-08-2018		TLM1/TLM2	CO3	T1/T3		
32.	Effect of engine variables on knock	1	10-08-2018		TLM1/TLM2	CO3	T1		
33.	Combustion chambers for SI engines-Fuel requirement and fuel rating	1	13-08-2018		TLM1/TLM2	CO3	T1/T3		
34.	Tutorial-V	1	14-08-2018		TLM3	CO3	T1/T3		
35.	Stages of combustion in CI engines, factors affecting the delay period	1	16-08-2018		TLM1/TLM2	CO3	T1/T3		
36.	Phenomenon of knock in CI engines, comparison of knock in SI and CI engines	1	17-08-2018		TLM1/TLM2	CO3	T1/T3		
37.	Combustion Chambers for CI engines-I	1	20-08-2018		TLM1/TLM2	CO3	T1/T3		
38.	Combustion Chambers for CI engines-II	1	21-08-2018		TLM1/TLM2	CO3	T1/T3		
39.	Fuel requirement, fuel rating	1	23-08-2018		TLM1	CO3	T1/T3		
40.	Tutorial-VI and Quiz-III	1	24-08-2018		TLM3	CO3	T1/T3		
No. of classes required to complete UNIT-III		12			No. of classes taken:				

UNIT-IV: Engine Testing and Performance

Sl. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
41.	Introduction, Parameters of performance- Measurement of Fuel	1	27-08-2018		TLM1	CO4	T1/T3	

	consumption, Air intake							
42.	Measurement of Brake power, Determination of Frictional power and Indicated power	1	28-08-2018		TLM1	CO4	T1/T3	
43.	Performance tests & Performance Characteristic Curves	1	30-08-2018		TLM1	CO4	T1/T3	
44.	Heat Balance sheet and Tutorial-VII	1	31-08-2018		TLM1	CO4	T1/T3	
45.	Problems on Engine performance-I	1	03-09-2018		TLM1	CO4	T1/T3	
46.	Tutorial-VII	1	04-09-2018		TLM3	CO4	T1/T3	
47.	Problems on Engine performance-II	1	06-09-2018		TLM1	CO4	T1/T3	
48.	Problems on Morse Test	1	07-09-2018		TLM1	CO4	T1/T3	
49.	Problems on Heat Balance sheet-I	1	10-09-2018		TLM1	CO4	T1/T3	
50.	Problems on Heat Balance sheet-II	1	11-09-2018		TLM1	CO4	T1/T3	
51.	Tutorial-VIII and Quiz-IV	1	14-09-2018		TLM3	CO4	T1/T3	
No. of classes required to complete UNIT-IV		11			No. of classes taken:			

UNIT-V: Gas-Turbines and Jet-Propulsion systems

Sl. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
52.	Gas turbine plant and Its Components, Classification	1	17-09-2018		TLM1/TLM2	CO5	T2	
53.	Analysis of Closed and Open cycle Gas Turbine plants	1	18-09-2018		TLM1/TLM2	CO5	T2	
54.	Methods of improving performance- Intercooler	1	20-09-2018		TLM1	CO5	T2	
55.	Regeneration and Reheating	1	21-09-2018		TLM1/TLM2	CO5	T2	
56.	Tutorial-IX	1	24-09-2018		TLM3	CO5	T2	
57.	Applications of Gas-Turbine plant	1	25-09-2018		TLM1	CO5	T2	
58.	Introduction of Jet Propulsion-Qualitative treatment of Turbojet, Turbo Fan	1	27-09-2018		TLM1/TLM2	CO5	T2	
59.	Turboprop, Ramjet, applications	1	28-09-2018		TLM1/TLM2	CO5	T2	

60.	Tutorial-X and Quiz-V	1	01-10-2018		TLM3	CO5	T2	
No. of classes required to complete UNIT-V		09			No. of classes taken:			

Contents beyond the Syllabus

Sl. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign
61.	Revision	1	02-10-2018		TLM1	Revision of all units	T1/T2/T3	
62.	Contents beyond syllabus- Emissions	1	04-10-2018		TLM2	CO3	R1/R4	
63.	Contents beyond syllabus- Supercharger & Turbocharger	1	05-10-2018		TLM2	CO1	R1/R4	

Teaching Learning Methods			
TLM1	Chalk and Talk	TLM4	Demonstration (Lab/Field Visit)
TLM2	PPT	TLM5	ICT (NPTEL/Swayam Prabha/MOOCs)
TLM3	Tutorial	TLM6	Group Discussion/Project

Part - C

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment/Quiz – 1	1	A1=5
Assignment/Quiz – 2	2	A2=5
I-Mid Examination	1,2	B1=20
Assignment/Quiz – 3	3	A3=5
Assignment/Quiz – 4	4	A4=5
Assignment/Quiz – 5	5	A5=5
II-Mid Examination	3,4,5	B2=20
Evaluation of Assignment/Quiz Marks: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=5
Evaluation of Mid Marks: $B=75\% \text{ of Max}(B1,B2)+25\% \text{ of Min}(B1,B2)$	1,2,3,4,5	B=20
Cumulative Internal Examination : A+B	1,2,3,4,5	A+B=25
Semester End Examinations	1,2,3,4,5	C=75
Total Marks: A+B+C	1,2,3,4,5	100

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

Graduates of Mechanical Engineering programme will be:

PEO1: To build a professional career and pursue higher studies with sound knowledge in Mathematics, Science and Mechanical Engineering.

PEO2: To inculcate strong ethical values and leadership qualities for graduates to become successful in multidisciplinary activities.

PEO3: To develop inquisitiveness towards good communication and lifelong learning.

PROGRAMME OUTCOMES (POs):

Engineering Graduates will be able to:

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PSOs:

Graduate of the Mechanical Engineering will have the ability to

1. To apply the principles of thermal sciences to design and develop various thermal systems.
2. To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.
3. To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Course Instructor	Course Coordinator	Module Coordinator	HoD
A.Naresh Kumar	A.Naresh Kumar	Dr. P. Vijay Kumar	Dr. S. Pichi Reddy

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DEPARTMENT OF MECHANICAL ENGINEERING
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L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

COURSE HANDOUT

PROGRAM : B.Tech. V-Sem., ME
ACADEMIC YEAR : 2018-19
COURSE NAME & CODE : **Machine Design-I ,S291**
L-T-P STRUCTURE : 3-1-0
COURSE CREDITS : 3
COURSE INSTRUCTOR : G.Kartheek
COURSE COORDINATOR : T.Venkateswara Rao
PRE-REQUISITE: Mechanics of Materials, Engineering Mechanics

COURSE OBJECTIVE:

The main objective of this course is to familiarize the steps involved in the design process of various machine elements.

COURSE OUTCOMES (CO)

CO 1	Formulate and analyze stresses and strains in machine elements and structures subjected to different loads.
CO 2	Evaluate the stress distribution and analyze the failure criterion of mechanical parts under fatigue loads.
CO 3	Comprehend the design of welded assemblies and riveted joints under axial and eccentric loads.
CO 4	Analyze the bolts and nuts subjected to axial and eccentric loads and design of various machine elements
CO 5	Analyze and design shafts and shaft couplings for various engineering applications.

COURSE ARTICULATION MATRIX (Correlation between COs&POs,PSOs):

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	1		2							1			3
CO2	2	2	1									1			3
CO3	2	1	3									1			3
CO4	3	2	3									1			3
CO5	3	2	3									1			3

Note: Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put '-'
1- Slight(Low), **2** - Moderate(Medium), **3** - Substantial (High).

BOS APPROVED TEXT BOOKS:

T1	Bhandari V.B, Design of Machine Elements, 3rdEdition, 2ndReprint, Tata McGraw-Hill 2010
T2	Shigley J.E and Mischke C. R., Mechanical Engineering Design, 6thEdition, Tata McGraw-Hill, 2003.

BOS APPROVED REFERENCE BOOKS:

R1	Norton R.L, “Design of Machinery”, ,2 nd Edition,Tata McGraw-Hill Book Co, 2001.
R2	Orthwein W, “Machine Component Design”, 1st Edition, Jaico Publishing Co, 1999.
R3	Ugural A.C, “Mechanical Design – An Integral Approach, McGraw-Hill Book Co,2004.

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I: INTRODUCTION AND DESIGN FOR STATIC STRENGTH

S.N o.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
62.	Pre requisites, course outcomes and course objective, syllabus	1	12-06-2018		TLM1	CO1	T1	
63.	Machine Design- Introduction-Basic Procedure	1	13-06-2018		TLM1	CO1	T1	
64.	Design of machine elements, procedure, design analysis and design synthesis	1	15-06-2018		TLM1	CO1	T1	
65.	Introduction to Indian standards- Selection of Preferred sizes	1	19-06-2018		TLM1	CO1	T1	
66.	Tutorial-1	1	20-06-2018		TLM3	CO1		
67.	Modes of failure-factor of safety-stress strain relationship	1	22-06-2018		TLM1	CO1	T1	
68.	Stresses due to bending moment-stresses due to turning moment-	1	23-06-2018		TLM1, TLM4	CO1	T1	

	eccentric axial loading							
69.	Introduction to theories of failure, maximum principle stress maximum shear stress theories	1	26-06-2018		TLM1	CO1	T1	
70.	Maximum shear stress theory, Distortion energy theory, Derivation	1	27-06-2018		TLM1	CO1	T1	
71.	Distortion energy theory, Derivation & Comparison of Theories of failures	1	29-06-2018		TLM1, TLM4	CO1	T1	
72.	Tutorial-2	1	30-08-2018		TLM3	CO1		
	Assignment-1/quiz-1				TLM6	CO1		
No. of classes required to complete UNIT-I		11			No. of classes taken:			

UNIT-II: DESIGN FOR FATIGUE STRENGTH

S.N o.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
73.	Stress concentration, factors causing stress concentration	1	03-07-2018		TLM1	CO2	T1, T2	
74.	Theoretical stress concentration factor, Methods of reducing	1	04-07-2018		TLM1, TLM4	CO2	T1, T2	

	stress concentration-						
75.	Fluctuating stresses, repeated stresses reversed stresses	1	06-07-2018		TLM1	CO2	T1,T2
76.	Fatigue failure -endurance limit-S-N curve	1	07-07-2018		TLM1,	CO2	T1,T2
77.	Low cycle and high cycle fatigue-Notch sensitivity-fatigue stress concentration factor	1	10-07-2018		TLM1, TLM4	CO2	T1
78.	Endurance limit_ approximation method- Derating factors	1	11-07-2018		TLM1	CO2	T1
79.	Endurance limit_ approximation method- Derating factors	1	13-07-2018		TLM1, TLM4	CO2	T1
80.	Tutorial-3	1	17-07-2018		TLM3	CO2	
81.	Soderberg and Good man line- explanation	1	18-07-2018		TLM1	CO2	T1
82.	Good man line- explanation- Problems	1	20-07-2018		TLM1	CO2	T1,T2
83.	Modified Goodman line; Gerber curve	1	21-07-2018		TLM1, TLM4	CO2	T1,T2
84.	Tutorial-4	1	24-07-2018		TLM3	CO2	
	Assignment-2/Quiz-2				TLM6	CO2	
No. of classes required to		12			No. of classes taken:		

complete UNIT-II				
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UNIT-III: RIVENETD JOINTS AND WELDED JOINTS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
85.	Riveted joints-types-design for strength	1	25-07-2018		TLM1	CO3	T1	
86.	Design for strength-efficiency of joint	1	27-07-2018		TLM1, TLM4	CO3	T1	
87.	Eccentrically loaded riveted joints.	1	28-07-2018		TLM1	CO3	T1	
88.	Eccentrically loaded riveted joints	1	30-07-2018		TLM1, TLM4	CO3	T1	
89.	Tutorial-5	1	07-08-2018		TLM3	CO3		
90.	Introduction to welded joints-fillet welds and butt welds-Strength of butt weld	1	08-08-2018		TLM1	CO3	T1	
91.	Strength of parallel fillet weld-transverse fillet weld	1	10-08-2018		TLM1	CO3	T1	
92.	Maximum shear stress in a parallel fillet weld - Maximum shear stress in a transverse fillet weld	1	11-08-2018		TLM1	CO3	T1	
93.	Maximum shear stress in a	1	14-08-2018		TLM1	CO3	T1	

	transverse fillet -Axially loaded unsymmetrical Welded joints							
94.	Axially loaded unsymmetrical welded joints;	1	17-08-2018		TLM1	CO3	T1	
95.	Welded joints subjected to bending moment	1	18-08-2018		TLM1, TLM4	CO3	T1	
96.	Tutorial-6	1	21-08-2018		TLM3	CO3		
	Assignment-3/Quiz-3				TLM6	CO3		
No. of classes required to complete UNIT-III		12			No. of classes taken:			

UNIT-IV:THREADED JOINTS AND KEYS ,COTTER AND KNUCKLE JOINTS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
97.	Threaded joints; Terminology-bolts of uniform strength	1	24-08-2018		TLM1	CO4	T1	
98.	Eccentrically loaded bolted joints in shear	1	25-08-2018		TLM1	CO4	T1	
99.	Eccentrically loaded bolted joints in shear	1	28-08-2018		TLM1	CO4	T1	
100	Eccentric load perpendicular to axis of bolt	1	29-08-2018		TLM1, TLM4	CO4	T1	
101	Problems	1	31-08-2018		TLM4	CO4		
102	Tutorial-7	1	01-09-2018		TLM3	CO4		
103	Design of square and flat keys-types	1	04-09-2018		TLM1, TLM2	CO4	T1	

104	Design of Cotter joints	1	05-09-2018		TLM1, TLM2	CO4	T1	
105	Design of Socket and Spigot cotter joint	1	07-09-2018		TLM1, TLM2	CO4	T1	
106	Design of Socket and Spigot cotter joint	1	08-09-2018		TLM1, TLM2	CO4	T1	
107	Design of Knuckle joint-Failures	1	11-09-2018		TLM1, TLM2	CO4	T1	
108	Tutorial-8	1	12-09-2018		TLM3	CO4		
	Assignment-4/Quiz-4				TLM6	CO4		
No. of classes required to complete UNIT-IV		12			No. of classes taken:			

UNIT-V: SHAFTS AND SHAFT COUPLINGS

S.N o.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
109	Transmission shafts-introduction-design of shaft on strength basis	1	14-09-2018		TLM1	CO5	T1,T2	
110	Design of shaft on strength basis- rigidity basis	1	15-09-2018		TLM1,	CO5	T1,T2	
111	ASME code of shaft design	1	18-09-2018		TLM1,	CO5	T1,T2	
112	ASME code of shaft design	1	19-09-2018		TLM1, TLM4	CO5	T1,T2	
113	Tutorial-9	1	22-09-2018		TLM3	CO5		
114	Muff coupling	1	25-09-2018		TLM1, TLM2	CO5	T1	
115	Clamp coupling	1	26-09-2018		TLM1, TLM2	CO5	T1	
116	Flange coupling	1	28-09-2018		TLM1, TLM2	CO5	T1	
117	Bushed pin flexible coupling	1	29-09-2018		TLM1, TLM2	CO5	T1	

118	Tutorial-10	1	03-10-2018		TLM3	CO5		
	Assignment-5 / Quiz-5				TLM6			
No. of classes required to complete UNIT-V		10			No. of classes taken:			

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
119.	Topic 1: Theories of Fatigue Failure	1	05-10-2018		TLM2	-	T2	
120.	Topic 2: Brief Introduction to Fracture Mechanics	1	06-10-2018		TLM2	-	T2	

Teaching Learning Methods					
TLM1	Chalk and Talk	TLM4	Problem Solving	TLM7	Seminars or GD
TLM2	PPT	TLM5	Programming	TLM8	Lab Demo
TLM3	Tutorial	TLM6	Assignment or Quiz	TLM9	Case Study

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	11/06/2018	28/07/2018	7
I Mid Examinations	30/07/2018	04/08/2018	1
II Phase of Instructions	06/08/2018	06/10/2018	9
II Mid Examinations	08/10/2018	13/10/2018	1
Preparation and Practicals	15/10/2018	27/10/2018	2
Semester End Examinations	29/10/2018	10/11/2018	2

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment/Quiz – 1	1	A1=5
Assignment/Quiz – 2	2	A2=5
I-Mid Examination	1,2	B1=20

Assignment/Quiz – 3	3	A3=5
Assignment/Quiz – 4	4	A4=5
Assignment/Quiz – 5	5	A5=5
II-Mid Examination	3,4,5	B2=20
Evaluation of Assignment/Quiz Marks: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=5
Evaluation of Mid Marks: $B=75\%$ of $\text{Max}(B1,B2)+25\%$ of $\text{Min}(B1,B2)$	1,2,3,4,5	B=20
Cumulative Internal Examination : A+B	1,2,3,4,5	A+B=25
Semester End Examinations	1,2,3,4,5	C=75
Total Marks: A+B+C	1,2,3,4,5	100

PROGRAMME EDUCATIONAL OBJECTIVES:

PEO1: To build a professional career and pursue higher studies with sound knowledge in Mathematics, Science and Mechanical Engineering.

PEO2: To inculcate strong ethical values and leadership qualities for graduates to become successful in multidisciplinary activities.

PEO3: To develop inquisitiveness towards good communication and lifelong learning.

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

1. To apply the principles of thermal sciences to design and develop various thermal systems.
2. To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.
3. To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Course Instructor	Course Coordinator	Module Coordinator	HOD
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LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING
(Autonomous & Affiliated to JNTUK, Kakinada & Approved by AICTE, New Delhi,
NAAC Accredited with 'A' grade, Accredited by NBA, Certified by ISO 9001:2015)
L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

COURSE HANDOUT

Part-A

PROGRAM : B.Tech., V-Sem.B. SEC- ME
ACADEMIC YEAR : 2018-19
COURSE NAME & CODE : **Machine Design-I & S291**
L-T-P STRUCTURE : 3-1-0
COURSE CREDITS : 3
COURSE INSTRUCTOR : T.Venkateswara Rao
COURSE COORDINATOR : T.Venkateswara Rao
PRE-REQUISITES : Engineering Mechanics, Mechanics of Materials

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The main objective of this course is to familiarize the steps involved in the design process of various machine elements.

COURSE OUTCOMES (COs): At the end of the course, the student will be able to

CO 1	Formulate and analyze stresses and strains in machine elements and structures subjected to different loads.
CO 2	Evaluate the stress distribution and analyze the failure criterion of mechanical parts under fatigue loads.
CO 3	Comprehend the design of welded assemblies and riveted joints under axial and eccentric loads.
CO 4	Analyze the bolts and nuts subjected to axial and eccentric loads and design of various machine elements
CO 5	Analyze and design shafts and shaft couplings for various engineering applications.

COURSE ARTICULATION MATRIX (Correlation between Cos & POs, PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	-	2	-	-	-	-	-	-	1	-	-	3
CO2	2	2	1	-	-	-	-	-	-	-	-	1	-	-	3
CO3	2	1	3	-	-	-	-	-	-	-	-	1	-	-	3
CO4	3	2	3	-	-	-	-	-	-	-	-	1	-	-	3
CO5	3	2	3	-	-	-	-	-	-	-	-	1	-	-	3

Note: Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put '-'
1- Slight (Low), **2** – Moderate (Medium), **3** - Substantial (High).

BOS APPROVED TEXT BOOKS:

T1. Bhandari V.B, Design of Machine Elements, 3rdEdition, 2ndReprint, Tata McGraw-Hill 2010.

T2. Shigley J.E and Mischke C. R., Mechanical Engineering Design, 6thEdition, Tata McGraw-Hill, 2003.

BOS APPROVED REFERENCE BOOKS:

R1. Norton R.L, “Design of Machinery”, ,2ndedition,Tata McGraw-Hill Book Co, 2001.

R2. Orthwein W, “Machine Component Design”, 1st edition, Jaico Publishing Co, 1999.

R3. Ugural A.C, “Mechanical Design – An Integral Approach, McGraw-Hill Book Co, 2004.

R4. Spotts M.F., Shoup T.E “Design and Machine Elements” Pearson Education, 2004.

R5. Juvinall R. C., Marshek K.M., “Fundamentals of Machine component Design”, – John Wiley & Sons 3rdEdition, 2002.

Part-B**COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: INTRODUCTION**

Sl. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Design - Introduction	1	11.06.2018		TLM1	CO1	T1/T2	
2.	Machine Design- Introduction& Basic Procedure for Machine Design	1	14.06.2018		TLM1	CO1	T1/T2	
3.	Basic requirements of machine elements and Design of Machine Elements	1	15.06.2018		TLM1	CO1	T1/T2	
4.	Design analysis- Design synthesis Introduction to Indian standards	1	16.06.2018		TLM1	CO1	T1/T2	
5.	Selection of Preferred sizes & Modes of failure – Factor of safety	1	18.06.2018		TLM1	CO1	T1	
6.	Stress-strain relationship, Shear stress and shear strain, Stresses due to bending moment	1	21.06.2018		TLM1	CO1	T1/T2	
7.	Stresses due to torsional moment Eccentric axial loading	1	22.06.2018		TLM1	CO1	T1/T2	
8.	Tutorial-I	1	23.06.2018		TLM3	CO1	T1/T2	
9.	Theories of elastic failure –Introduction and principal stresses	1	25.06.2018		TLM1	CO1	T1/T2	
10.	Maximum principal	1	28.06.2018		TLM2			

	stress theory					CO1	T1/T2	
11.	Maximum Shear stress theory	1	29.06.2018		TLM1	CO1	T1/T2	
12.	Distortion energy theory	1	30.06.2018		TLM1	CO1	T1/T2	
13.	Tutorial-II & Quiz-I	1	02.07.2018		TLM3	CO1	T1/T2	
No. of classes required to complete UNIT-I		13			No. of classes taken:			

UNIT-II: DESIGN FOR FATIGUE STRENGTH

Sl. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
14.	Stress concentration - Stress concentration factors	1	05.07.2018		TLM1	CO2	T1/T2	
15.	Reduction of stress concentration Fluctuating stresses - Fatigue failure	1	06.07.2018		TLM2	CO2	T1/T2	
16.	Endurance limit Low cycle and high cycle fatigue-Notch sensitivity	1	07.07.2018		TLM2	CO2	T1/T2	
17.	Endurance limit - Approximate estimation & Introduction to reversed stresses	1	09.07.2018		TLM1	CO2	T2	
18.	Reversed stresses and Design for infinite life	1	12.07.2018		TLM1	CO2	T1/T2	
19.	Tutorial-III	1	13.07.2018		TLM3	CO2	T1/T2	
20.	Soderberg and Goodman lines-Modified Goodman line	1	14.07.2018		TLM1	CO2	T1	
21.	Infinite Life Problems under fluctuating loads	1	16.07.2018		TLM1	CO2	T1/T2	
22.	Infinite Life Problems under fluctuating loads	1	19.07.2018		TLM1	CO2	T1/T2	
23.	Gerber equation and Fatigue design under combined stresses	1	20.07.2018		TLM1	CO2	T1/T2	

24.	Fatigue design under combined stresses	1	21.07.2018		TLM1	CO2	T1/T2	
25.	Tutorial-IV & Quiz-II	1	23.07.2018		TLM3	CO2	T1/T2	
No. of classes required to complete UNIT-II		12			No. of classes taken:			

UNIT-III: RIVETED JOINTS & WELDED JOINTS

Sl. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
26.	Types of riveted joint-Types of failures	1	26.07.2018		TLM1	CO3	T1/T2	
27.	Strength equation, Efficiency of riveted joint	1	27.07.2018		TLM1	CO3	T1/T2	
28.	Eccentrically loaded riveted joints	1	28.07.2018		TLM1	CO3	T1/R2	
29.	Eccentrically loaded riveted joints-Problems	1	06.08.2018		TLM1	CO3	T1/R2	
30.	Tutorial-V	1	09.08.2018		TLM3	CO3	T1/T2	
31.	Introduction to welding joints Butt joints-Fillet joints	1	10.08.2018		TLM2	CO3	T2	
32.	Strength of butt welds- Strength of parallel fillet welds	1	11.08.2018		TLM1	CO3	T1/T2	
33.	Strength of transverse fillet welds Maximum shear stress in parallel fillet welds	1	13.08.2018		TLM1	CO3	T1/T2	
34.	Maximum shear stress in transverse fillet welds	1	16.08.2018		TLM2	CO3	T1/T2	
35.	Axially loaded unsymmetrical Welded joints	1	17.08.2018		TLM1	CO3	T1/T2	
36.	Welded joint subjected to bending moment	1	18.08.2018		TLM1	CO3	T2	
37.	Tutorial-VI & Quiz-III	1	20.08.2018		TLM3	CO3	T1/T2	
No. of classes required to complete UNIT-III		12			No. of classes taken:			

UNIT-IV : THREADED JOINTS, KEYS, COTTER AND KNUCKLE JOINTS

Sl. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly	
38.	Threaded joints - Terminology of screw threads and Bolted joints	1	23.08.2018		TLM1	CO4	T1/T2		
39.	Eccentrically loaded bolted joints in shear	1	24.08.2018		TLM2	CO4	T1		
40.	Eccentrically loaded bolted joints in shear	1	25.08.2018		TLM1	CO4	T1/T2		
41.	Eccentric load perpendicular to axis of bolt	1	27.08.2018		TLM2	CO4	T1/T2		
42.	Bolts of uniform strength	1	30.08.2018		TLM1	CO4	T1/T2		
43.	Tutorial-VII	1	31.09.2018		TLM3	CO4	T1/T2		
44.	Design of square and flat keys-types, Design of Socket and Spigot cotter joint	1	01.09.2018		TLM1	CO4	T2		
45.	Design of Cotter joints	1	03.09.2018		TLM3	CO4	T1/T2		
46.	Design of Knuckle joint-Failures	1	06.09.2018		TLM2	CO4	T1/T2		
47.	Quiz-IV	1	07.09.2018		TLM2	CO4	T1/T2		
48.	Tutorial-VIII	1	08.09.2018		TLM3	CO4	T1/T2		
No. of classes required to complete UNIT-IV		11			No. of classes taken:				

UNIT-V: SHAFTS & SHAFT COUPLINGS

Sl. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
49.	Introduction to transmission shafts Shaft design on strength basis	1	10.09.2018		TLM1	CO5	T1/T2	
50.	Shaft design on strength basis	1	14.09.2018		TLM3	CO5	T1/T2	
51.	Shaft design on torsional rigidity basis	1	15.09.2018		TLM1	CO5	T1/T2	
52.	ASME code for shaft design	1	17.09.2018		TLM1	CO5	T1/T2	

53.	Design of hollow shaft on strength and torsional rigidity basis	1	20.09.2018		TLM1	CO5	T2	
54.	Design of hollow shaft on strength and torsional rigidity basis	1	21.09.2018		TLM1	CO5	T1/T2	
55.	Tutorial-IX	1	22.09.2018		TLM3	CO5	T1/T2	
56.	Flange coupling- Muff coupling	1	24.09.2018		TLM1	CO5	T1/R2	
57.	Clamp coupling	1	27.09.2018		TLM1	CO5	T1	
58.	Bushed pin flexible coupling	1	28.09.2018		TLM1	CO5	T1/T2	
59.	Quiz-V	1	29.09.2018		TLM2	CO5	T1/T2	
60.	Tutorial-X	1	01.10.2018		TLM3	CO5	T1/T2	
No. of classes required to complete UNIT-V		12			No. of classes taken:			

Contents beyond the Syllabus

Sl. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign
61.	Introduction to product design and Development	1	04.10.2018		TLM6	CO1	R2/R3	
62.	Design for Manufacturing and Assembly	1	05.10.2018		TLM6	CO4	R2/R3	
63.	Introduction to Fracture Mechanics	1	06.10.2018		TLM2	CO1	R2/R3	

Teaching Learning Methods			
TLM1	Chalk and Talk	TLM4	Demonstration (Lab/Field Visit)
TLM2	PPT	TLM5	ICT (NPTEL/Swayam Prabha/MOOCs)
TLM3	Tutorial	TLM6	Group Discussion/Project

Part - C

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment/Quiz – 1	1	A1=5
Assignment/Quiz – 2	2	A2=5
I-Mid Examination	1,2	B1=20
Assignment/Quiz – 3	3	A3=5
Assignment/Quiz – 4	4	A4=5

Assignment/Quiz – 5	5	A5=5
II-Mid Examination	3,4,5	B2=20
Evaluation of Assignment/Quiz Marks: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=5
Evaluation of Mid Marks: $B=75\% \text{ of Max}(B1,B2)+25\% \text{ of Min}(B1,B2)$	1,2,3,4,5	B=20
Cumulative Internal Examination : A+B	1,2,3,4,5	A+B=25
Semester End Examinations	1,2,3,4,5	C=75
Total Marks: A+B+C	1,2,3,4,5	100

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

Graduates of Mechanical Engineering programme will be:

PEO1: To build a professional career and pursue higher studies with sound knowledge in Mathematics, Science and Mechanical Engineering.

PEO2: To inculcate strong ethical values and leadership qualities for graduates to become successful in multidisciplinary activities.

PEO3: To develop inquisitiveness towards good communication and lifelong learning.

PROGRAMME OUTCOMES (POs):

Engineering Graduates will be able to:

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PSOs:

Graduate of the Mechanical Engineering will have the ability to

1. To apply the principles of thermal sciences to design and develop various thermal systems.
2. To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.
3. To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Course Instructor	Course Coordinator	Module Coordinator	HoD
T.Venkateswara Rao	T.VenkateswaraRao	Dr. Y. Appala Naidu	Dr. S. Pichi Reddy

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING
(Autonomous & Affiliated to JNTUK, Kakinada & Approved by AICTE, New Delhi,
NAAC Accredited with 'A' grade, Accredited by NBA, Certified by ISO 9001:2015)
L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

COURSE HANDOUT

Part-A

PROGRAM : B.Tech., V-Sem C Sec., ME
ACADEMIC YEAR : 2018-19
COURSE NAME & CODE : Machine Design-I & S291
L-T-P STRUCTURE : 3-1-0
COURSE CREDITS : 3
COURSE INSTRUCTOR : V. Sankararao
COURSE COORDINATOR : T. Venkateswararao
PRE-REQUISITES : Engineering Mechanics, Mechanics of Materials

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The main objective of this course is to familiarize the steps involved in the design process of various machine elements

COURSE OUTCOMES (COs): At the end of the course, the student will be able to

- CO1** : Formulate and analyze stresses and strains in machine elements and structures subjected to different loads.
CO2 : Evaluate the stress distribution and analyze the failure criterion of mechanical parts under fatigue loads.
CO3 : Comprehend the design of welded assemblies and riveted joints under axial and eccentric loads.
CO4 : Analyze the bolts and nuts subjected to axial and eccentric loads and design of various machine elements
CO5 : Analyze and design shafts and shaft couplings for various engineering applications.

COURSE ARTICULATION MATRIX (Correlation between Cos & POs, PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	-	2	-	-	-	-	-	-	1	-	-	3
CO2	2	2	1	-	-	-	-	-	-	-	-	1	-	-	3
CO3	2	1	3	-	-	-	-	-	-	-	-	1	-	-	3
CO4	3	2	3	-	-	-	-	-	-	-	-	1	-	-	3
CO5	3	2	3	-	-	-	-	-	-	-	-	1	-	-	3

Note: Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put '-'
1- Slight (Low), **2** – Moderate (Medium), **3** - Substantial (High).

BOS APPROVED TEXT BOOKS:

- T1.** Bhandari V.B, Design of Machine Elements, 3rdEdition, 2ndReprint, Tata McGraw-Hill 2010.
T2. Shigley J.E and Mischke C. R., Mechanical Engineering Design, 6thEdition,

Tata McGraw-Hill, 2003.

BOS APPROVED REFERENCE BOOKS:

R1. Norton R.L, “Design of Machinery”, ,2ndedition,Tata McGraw-Hill Book Co, 2001.

R2. Orthwein W, “Machine Component Design”, 1st edition, Jaico Publishing Co, 1999.

R3. Ugural A.C, “Mechanical Design – An Integral Approach, McGraw-Hill Book Co, 2004.

R4. Spotts M.F., Shoup T.E “Design and Machine Elements” Pearson Education, 2004.

R5. Juvinall R. C., Marshek K.M., “Fundamentals of Machine component Design”, – John Wiley & Sons 3rdEdition, 2002.

Part-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: INTRODUCTION

Sl. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Design - Introduction	1	12.06.2018		TLM1	CO1	T1/T2	
2.	Machine Design- Introduction& Basic Procedure	1	13.06.2018		TLM1	CO1	T1/T2	
3.	Basic requirements of machine elements and Design of Machine Elements	1	14.06.2018		TLM1	CO1	T1/T2	
4.	Design analysis- Design synthesis Introduction to Indian standards	1	16.06.2018		TLM1	CO1	T1/T2	
5.	Selection of Preferred sizes & Modes of failure – Factor of safety	1	19.06.2018		TLM1	CO1	T1	
6.	Stress-strain relationship, Shear stress and shear strain, Stresses due to bending moment	1	20.06.2018		TLM1	CO1	T1/T2	
7.	Stresses due to torsional moment Eccentric axial loading	1	21.06.2018		TLM1	CO1	T1/T2	
8.	Tutorial-I	1	23.06.2018		TLM3	CO1	T1/T2	
9.	Theories of elastic failure –Introduction and principal stresses	1	26.06.2018		TLM1	CO1	T1/T2	
10.	Maximum principal stress theory	1	27.06.2018		TLM2	CO1	T1/T2	
11.	Maximum Shear stress theory	1	28.06.2018		TLM1	CO1	T1/T2	
12.	Distortion energy theory	1	30.06.2018		TLM1	CO1	T1/T2	
13.	Tutorial-II &	1	03.07.2018		TLM3			

	Quiz-I					CO1	T1/T2	
No. of classes required to complete UNIT-I		13			No. of classes taken:			

UNIT-II: DESIGN FOR FATIGUE STRENGTH

Sl. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
14.	Stress concentration - Stress concentration factors	1	04.07.2018		TLM1	CO2	T1/T2	
15.	Reduction of stress concentration Fluctuating stresses - Fatigue failure	1	05.07.2018		TLM2	CO2	T1/T2	
16.	Endurance limit Low cycle and high cycle fatigue-Notch sensitivity	1	07.07.2018		TLM2	CO2	T1/T2	
17.	Endurance limit - Approximate estimation & Introduction to reversed stresses	1	10.07.2018		TLM1	CO2	T2	
18.	Reversed stresses and Design for infinite life	1	11.07.2018		TLM1	CO2	T1/T2	
19.	Tutorial-III	1	12.07.2018		TLM3	CO2	T1/T2	
20.	Soderberg and Goodman lines-Modified Goodman line	1	14.07.2018		TLM1	CO2	T1	
21.	Infinite Life Problems under fluctuating loads	1	17.07.2018		TLM1	CO2	T1/T2	
22.	Infinite Life Problems under fluctuating loads	1	18.07.2018		TLM1	CO2	T1/T2	
23.	Gerber equation and Fatigue design under combined stresses	1	19.07.2018		TLM1	CO2	T1/T2	
24.	Fatigue design under combined stresses	1	21.07.2018		TLM1	CO2	T1/T2	
25.	Tutorial-IV & Quiz-II	1	24.07.2018		TLM3	CO2	T1/T2	
No. of classes required to complete UNIT-II		12			No. of classes taken:			

UNIT-III: RIVETED JOINTS & WELDED JOINTS

Sl. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
26.	Types of riveted joint-Types of failures	1	25.07.2018		TLM1	CO3	T1/T2	
27.	Strength equation, Efficiency of riveted joint	1	26.07.2018		TLM1	CO3	T1/T2	
28.	Eccentrically loaded riveted joints	1	28.07.2018		TLM1	CO3	T1/R2	
29.	Eccentrically loaded riveted joints-Problems	1	07.08.2018		TLM1	CO3	T1/R2	
30.	Tutorial-V	1	08.08.2018		TLM3	CO3	T1/T2	
31.	Introduction to welding joints Butt joints-Fillet joints	1	09.08.2018		TLM2	CO3	T2	
32.	Strength of butt welds- Strength of parallel fillet welds	1	11.08.2018		TLM1	CO3	T1/T2	
33.	Strength of transverse fillet welds Maximum shear stress in parallel fillet welds	1	14.08.2018		TLM1	CO3	T1/T2	
34.	Maximum shear stress in transverse fillet welds	1	16.08.2018		TLM2	CO3	T1/T2	
35.	Axially loaded unsymmetrical Welded joints	1	18.08.2018		TLM1	CO3	T1/T2	
36.	Welded joint subjected to bending moment	1	21.08.2018		TLM1	CO3	T2	
37.	Tutorial-VI & Quiz-III	1	22.08.2018		TLM3	CO3	T1/T2	
No. of classes required to complete UNIT-III		12			No. of classes taken:			

UNIT-IV : THREADED JOINTS, KEYS, COTTER AND KNUCKLE JOINTS

Sl. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
38.	Threaded	1	23.08.2018		TLM1			

	joins - Terminology of screw threads and Bolted joints					CO4	T1/T2	
39.	Eccentrically loaded bolted joints in shear	1	25.08.2018		TLM2	CO4	T1	
40.	Eccentrically loaded bolted joints in shear	1	28.08.2018		TLM1	CO4	T1/T2	
41.	Eccentric load perpendicular to axis of bolt	1	29.08.2018		TLM2	CO4	T1/T2	
42.	Bolts of uniform strength	1	30.08.2018		TLM1	CO4	T1/T2	
43.	Tutorial-VII	1	01.09.2018		TLM3	CO4	T1/T2	
44.	Design of square and flat keys-types, Design of Socket and Spigot cotter joint	1	04.09.2018		TLM1	CO4	T2	
45.	Design of Cotter joints	1	05.09.2018		TLM3	CO4	T1/T2	
46.	Design of Knuckle joint-Failures	1	06.09.2018		TLM2	CO4	T1/T2	
47.	Quiz-IV	1	08.09.2018		TLM2	CO4	T1/T2	
48.	Tutorial-VIII	1	11.09.2018		TLM3	CO4	T1/T2	
No. of classes required to complete UNIT-IV		11			No. of classes taken:			

UNIT-V: SHAFTS & SHAFT COUPLINGS

Sl. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
49.	Introduction to transmission shafts Shaft design on strength basis	1	12.09.2018		TLM1	CO5	T1/T2	
50.	Shaft design on strength basis	1	13.09.2018		TLM3	CO5	T1/T2	
51.	Shaft design on torsional rigidity basis	1	15.09.2018		TLM1	CO5	T1/T2	
52.	ASME code for shaft design	1	18.09.2018		TLM1	CO5	T1/T2	
53.	Design of hollow shaft on strength and torsional rigidity basis	1	19.09.2018		TLM1	CO5	T2	

54.	Design of hollow shaft on strength and torsional rigidity basis	1	20.09.2018		TLM1	CO5	T1/T2	
55.	Tutorial-IX	1	22.09.2018		TLM3	CO5	T1/T2	
56.	Flange coupling- Muff coupling	1	25.09.2018		TLM1	CO5	T1/R2	
57.	Clamp coupling	1	26.09.2018		TLM1	CO5	T1	
58.	Bushed pin flexible coupling	1	27.09.2018		TLM1	CO5	T1/T2	
59.	Quiz-V	1	29.09.2018		TLM2	CO5	T1/T2	
60.	Tutorial-X	1	03.10.2018		TLM3	CO5	T1/T2	
No. of classes required to complete UNIT-V		12			No. of classes taken:			

Contents beyond the Syllabus

Sl. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign
61.	Introduction to product design and Development	1	04.10.2018		TLM6	CO1	R2/R3	
62.	Design for Manufacturing and Assembly	1	06.10.2018		TLM6	CO4	R2/R3	

Teaching Learning Methods

TLM1	Chalk and Talk	TLM4	Demonstration (Lab/Field Visit)
TLM2	PPT	TLM5	ICT (NPTEL/Swayam Prabha/MOOCs)
TLM3	Tutorial	TLM6	Group Discussion/Project

Part - C

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment/Quiz – 1	1	A1=5
Assignment/Quiz – 2	2	A2=5
I-Mid Examination	1,2	B1=20
Assignment/Quiz – 3	3	A3=5
Assignment/Quiz – 4	4	A4=5
Assignment/Quiz – 5	5	A5=5
II-Mid Examination	3,4,5	B2=20
Evaluation of Assignment/Quiz Marks: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=5
Evaluation of Mid Marks: $B=75\% \text{ of Max}(B1,B2)+25\% \text{ of Min}(B1,B2)$	1,2,3,4,5	B=20
Cumulative Internal Examination : A+B	1,2,3,4,5	A+B=25

Semester End Examinations	1,2,3,4,5	C=75
Total Marks: A+B+C	1,2,3,4,5	100

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

Graduates of Mechanical Engineering programme will be:

PEO1: To build a professional career and pursue higher studies with sound knowledge in Mathematics, Science and Mechanical Engineering.

PEO2: To inculcate strong ethical values and leadership qualities for graduates to become successful in multidisciplinary activities.

PEO3: To develop inquisitiveness towards good communication and lifelong learning.

PROGRAMME OUTCOMES (POs):

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PSOs:

Graduate of the Mechanical Engineering will have the ability to

1. To apply the principles of thermal sciences to design and develop various thermal systems.
2. To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.
3. To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Course Instructor	Course Coordinator	Module Coordinator	HoD
V. Sankararao	T. Venkateswararao	Dr. Y. Appala Naidu	Dr. S. Pichi Reddy

LAKKIREDDY BALI REDDY COLLEGE OF ENGINEERING
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L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

COURSE HANDOUT

PROGRAM : B.Tech., V-Sem., ME [**Section – A**]
ACADEMIC YEAR : 2018-19
COURSE NAME & CODE : DYNAMICS OF MACHINES & S203
L-T-P STRUCTURE : 4-0-0
COURSE CREDITS : 3
COURSE INSTRUCTOR : CH. SIVA SANKARA BABU
COURSE COORDINATOR : Dr. Y. APPALANAIDU
PRE-REQUISITE: ENGINEERING MECHANICS, KINAMATICS OF MACHINES

COURSE OBJECTIVE: To understand the force motion relationship in components subjected to external forces and analysis of standard mechanisms used for speed control and stability control & the effect of dynamics of undesirable vibrations and unbalance.

COURSE OUTCOMES (CO): After completion this course, student will be able to

- CO1 Solve the practical problems on clutches and brakes by applying the concept contact forces due to friction and observe the gyroscopic effect due to precession of rotating bodies.
- CO2 Analyze the energy storage in the flywheels and cyclic energy of equalization process.
- CO3 Analyze the speed regulations in centrifugal governors under varying loads.
- CO4 Analyze the balancing process of the moving parts (rotating& reciprocating) statically and dynamically.
- CO5 Analyze the basic concepts of vibrations and take measures to minimize vibration and noise.

COURSE ARTICULATION MATRIX (Correlation between Cos &POs, PSOs):

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	3				2								3
CO2	3	2	3				2								3
CO3	3	2	3				2								3
CO4	3	2	3	2			2					2			3
CO5	3	3	3	2	2		2					2			3

Note: Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put '-'
1- Slight(Low), **2** - Moderate(Medium), **3** - Substantial (High).

BOS APPROVED TEXT BOOKS:

- T1** Rattan S.S, "Theory of Machines", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2007
- T2** Shigley J.E. and Uicker J.J., "Theory of Machines and Mechanisms", McGraw-Hill, Inc., 1995

BOS APPROVED REFERENCE BOOKS:

- R1** Rao J.S and Dukkipati R.V, "Mechanism and Machine Theory", New Age International, NewDelhi, 2007.
- R3** Sadhu Singh "Theory of Machines", Pearson Education, 2002.
- R4** Ballaney.P.L "Theory of Machines", Khanna Publishers,1990
- R5** Ghosh A. and Mallick A.K., "Theory of Mechanisms and Machines", Affiliated EastWest Press Pvt. Ltd., New Delhi, 1988

COURSE DELIVERY PLAN (LESSON PLAN):**UNIT-I : CLUTCHES, BRAKES AND DYNAMOMETERS & PRECESSION**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to Dynamics of machines -Course Educational Objectives (CEO's) and Course Outcomes (CO's).	1	12-06-2018		TLM1	CO1	--	
2.	Introduction to clutches- Single plate clutch and Multi plate clutch –construction and working	1	13-06-2018		TLM1,2		T1	
3.	Derivation for frictional torque in single & multi plate clutch by Uniform pressure and Uniform wear conditions- Problems	1	14-06-2018		TLM1,4		T1	
4.	Cone clutch and Centrifugal clutch – working and derivation and Problems	1	15-06-2018		TLM1,2 TLM4		T1	
5.	Tutorial-1	1	19-06-2018		TLM3		T1	
6.	Brakes: Simple block brakes & problems	1	20-06-2018		TLM1,4		T1	
7.	Band brake & Band and block brakes – problems	1	21-06-2018		TLM1,4		T1	
8.	Internal expansion shoe brakes-derivation	1	22-06-2018		TLM1,2		T1	
9.	Absorption type dynamometers- working	1	26-06-2018		TLM1,2		T1	
10.	Transmission type dynamometers –working	1	27-06-2018		TLM1,2		T1	
11.	Tutorial-2	1	28-06-2018		TLM3		T1	
12.	Precession: Gyroscopes and introduction	1	29-06-2018		TLM1,2		T1,R1	
13.	Effect of precession on Aero planes & ships	1	03-07-2018		TLM1,2		T1,R1	
14.	Effect of precession on the stability of motor car (four wheeler)	1	04-07-2018		TLM1,2		T1,R1	
15.	Effect of precession on the stability of motor cycle (two wheeler)	1	05-07-2018		TLM1,2		T1,R1	
16.	Assignment-1/Quiz -1	1	06-07-2018		TLM6		T1,R1	
No. of classes required to complete UNIT-I		16			No. of classes taken:			

UNIT-II : TURNING MOMENT DIAGRAMS AND FLY WHEELS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction about Turning moment	1	10-07-2018		TLM1 TLM2		T1,R1	
2.	Angular velocity and acceleration of piston,	1	11-07-2018		TLM1,2		T1,R1	

	connecting rod					CO2		
3.	Engine force analysis-piston and crank effort & Inertia torque of connecting rod	1	12-07-2018		TLM1			T1,R1
4.	Introduction to turning moment diagrams-single and multi-cylinder engines	1	13-07-2018		TLM1			T1,R1
5.	Tutorial-3	1	17-07-2018		TLM3			T1,R1
6.	Problems on single cylinder engines	1	18-07-2018		TLM1,4			T1,R1
7.	Problems on multi cylinder engines		19-07-2018		TLM1,4			T1,R1
8.	Fluctuation of energy-Problems	1	20-07-2018		TLM1,4			T1,R1
9.	Fly wheels and their design	1	24-07-2018		TLM1,4			T1,R1
10.	Problems on Fly wheel design		25-07-2018		TLM4			T1,R1
11.	Tutorial-4	1	26-07-2018		TLM3			T1,R1
12.	Assignment-2/Quiz -2	1	27-07-2018		TLM6			T1,R1
No. of classes required to complete UNIT-II		12					No. of classes taken:	

UNIT-III : GOVERNORS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Governor - introduction, Watt governors working & Derivation for speed of governor	1	07-08-2018		TLM1,2	CO3	T1	
2.	Porter governor working & derivation	1	08-08-2018		TLM2		T1,R1	
3.	Porter governor Problems	1	09-08-2018		TLM1,4		T1,R1	
4.	Tutorial-5	1	10-08-2018		TLM3		T1,R1	
5.	Proell governor working & derivation	1	14-08-2018		TLM1,2		T1	
6.	Hartnell governor working & derivation	1	16-08-2018		TLM1,2		T1,R1	
7.	Hartnell governor Problems	1	17-08-2018		TLM1,4		T1,R1	
8.	Tutorial-6	1	20-08-2018		TLM3		T1,R1	
9.	Sensitiveness, Isochronism and hunting	1	21-08-2018		TLM1		T1,R1	
10.	Assignment-3/Quiz -3	1	23-08-2018		TLM6		T1,R1	
No. of classes required to complete UNIT-III		10				No. of classes taken:		

UNIT-IV : BALANCING

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to Balancing - Balancing of rotating masses in single plane	1	28-08-2018		TLM1,2	CO4	T1,R1	
2.	Balancing of several masses rotating in different planes	1	29-08-2018		TLM1,2		T1,R1	
3.	Analytical and graphical methods	1	30-08-2018		TLM1		T1,R1	
4.	Tutorial-7	1	31-08-2018		TLM3		T1,R1	
5.	Primary, secondary balancing of reciprocating masses.	1	04-09-2018		TLM1,2		T1,R1	
6.	Analytical and graphical methods	1	05-09-2018		TLM1,4		T1,R1	
7.	Unbalanced forces and couples	1	06-09-2018		TLM1		T1,R1	
8.	Tutorial-8	1	07-09-2018		TLM3		T1,R1	

9.	Examination of 'V' multi cylinder in line and radial engines for primary and secondary balancing	1	11-09-2018		TLM1,2		T1,R1	
10.	Locomotive balancing - Hammer blow, swaying couple and tractive efforts	1	12-09-2018		TLM1,2		T1,R1	
11.	Assignment-4/Quiz -4	1	14-09-2018		TLM6		T1,R1	
No. of classes required to complete UNIT-IV		11			No. of classes taken:			

UNIT-V : VIBRATIONS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction & Types of Vibrations	1	18-09-2018		TLM1,2	CO5	T1,R1	
2.	Free longitudinal vibrations- Displacement, velocity & acceleration of body due to inertia force	1	19-09-2018		TLM1		T1, G.K. Grover	
3.	Inertia effect of the mass of spring-problems	1	20-09-2018		TLM1		T1, G.K. Grover	
4.	Derivations & problems	1	25-09-2018		TLM1,2		T1	
5.	Tutorial-9	1	26-09-2018		TLM3		T1	
6.	Damped vibrations-types-explanation	1	27-09-2018		TLM1,2		T1	
7.	Forced vibrations & Forced damped vibrations	1	28-09-2018		TLM1,2		T1, G.K. Grover	
8.	Vibration isolation and transmissibility & Whirling speed of shafts	1	03-10-2018		TLM1,2		T1, G.K. Grover	
9.	Assignment-5/Quiz -5	1	04-10-2018		TLM6		T1	
No. of classes required to complete UNIT-V		09			No. of classes taken:			

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1	Dynamics of advanced governors	1	24-08-2018		TLM1 TLM2	CO3	T1	
2	Vibration measuring instruments & transverse vibrations	1	05-10-2018		TLM1 TLM2	CO5	G.K. Grover	

Teaching Learning Methods

TLM1	Chalk and Talk	TLM4	Problem Solving	TLM7	Seminars or GD
TLM2	PPT	TLM5	Programming	TLM8	Lab Demo
TLM3	Tutorial	TLM6	Assignment or Quiz	TLM9	Case Study

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	11-06-2018	28-07-2018	7 W

I Mid Examinations	30-07-2018	04-08-2018	1 W
II Phase of Instructions	06-08-2018	06-10-2018	9 W
II Mid Examinations	08-10-2018	13-10-2018	1 W
Preparation and Practicals	15-10-2018	27-10-2018	2 W
Semester End Examinations	29-10-2018	10-11-2018	2 W

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment/Quiz – 1	1	A1=5
Assignment/Quiz – 2	2	A2=5
I-Mid Examination	1,2	B1=20
Assignment/Quiz – 3	3	A3=5
Assignment/Quiz – 4	4	A4=5
Assignment/Quiz – 5	5	A5=5
II-Mid Examination	3,4,5	B2=20
Evaluation of Assignment/Quiz Marks: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=5
Evaluation of Mid Marks: $B=75\% \text{ of Max}(B1,B2)+25\% \text{ of Min}(B1,B2)$	1,2,3,4,5	B=20
Cumulative Internal Examination : A+B	1,2,3,4,5	A+B=25
Semester End Examinations	1,2,3,4,5	C=75
Total Marks: A+B+C	1,2,3,4,5	100

	Course Instructor	Course coordinator	Module coordinator	HOD
Signature				
NAME	CH. SIVA SANKARA BABU	Dr. Y. APPALANAIDU	B. SUDHEER KUMAR	Dr. S. PICHI REDDY

LAKKIREDDY BALI REDDY COLLEGE OF ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING
(Autonomous & Affiliated to JNTUK, Kakinada & Approved by AICTE, New Delhi,
NAAC Accredited with 'A' grade, Accredited by NBA, Certified by ISO 9001:2015)
L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

COURSE HANDOUT

PROGRAM : B.Tech., V-Sem., ME
ACADEMIC YEAR : 2018-19
COURSE NAME & CODE : DYNAMICS OF MACHINES & S203
L-T-P STRUCTURE : 4-0-0
COURSE CREDITS : 3
COURSE INSTRUCTOR : Dr. Y. APPALA NAIDU
COURSE COORDINATOR : Dr. Y. APPALA NAIDU
PRE-REQUISITE: ENGINEERING MECHANICS, KINAMATICS OF MACHINES

COURSE OBJECTIVE: To understand the force motion relationship in components subjected to external forces and analysis of standard mechanisms used for speed control and stability control & the effect of dynamics of undesirable vibrations and unbalance.

- CO1 Solve the practical problems on clutches and brakes by applying the concept contact forces due to friction and observe the gyroscopic effect due to precession of rotating bodies.
- CO2 Analyze the energy storage in the flywheels and cyclic energy of equalization process.
- CO3 Analyze the speed regulations in centrifugal governors under varying loads.
- CO4 Analyze the balancing process of the moving parts (rotating& reciprocating) statically and dynamically.
- CO5 Analyze the basic concepts of vibrations and take measures to minimize vibration and noise.

COURSE OUTCOMES(CO): After completion this course, student will be able to

COURSE ARTICULATION MATRIX (Correlation between Cos &POs, PSOs):

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	3				2								3
CO2	3	2	3				2								3
CO3	3	2	3				2								3
CO4	3	2	3	2			2					2			3
CO5	3	3	3	2	2		2					2			3

Note: Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put '-'
1- Slight(Low), **2** - Moderate(Medium), **3** - Substantial (High).

BOS APPROVED TEXT BOOKS:

- T1** Rattan S.S, "Theory of Machines", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2007
- T2** Shigley J.E. and Uicker J.J., "Theory of Machines and Mechanisms", McGraw-Hill, Inc., 1995

BOS APPROVED REFERENCE BOOKS:

- R1** Rao J.S and Dukkipati R.V, "Mechanism and Machine Theory", New Age International, NewDelhi, 2007.
- R3** Sadhu Singh "Theory of Machines", Pearson Education, 2002.
- R4** Ballaney.P.L "Theory of Machines", Khanna Publishers,1990
- R5** Ghosh A. and Mallick A.K., "Theory of Mechanisms and Machines", Affiliated EastWest Press Pvt. Ltd., New Delhi, 1988

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I :

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
1	Introduction to Dynamics of machines -Course Educational Objectives (CEO's) and Course Outcomes (CO's).	1	11-06-2018		TLM1	CO1	T1
2	Introduction to clutches- Single plate clutch and Multi plate clutch –construction and working	1	12-06-2018		TLM1 TLM2		T1
3	Derivation for frictional torque in single & multi plate clutch by Uniform pressure and Uniform wear conditions- Problems	1	14-06-2018		TLM1 TLM2		T1
4	Cone clutch and Centrifugal clutch – working and derivation and Problems	1	15-06-2018		TLM1		T1
5	Tutorial-1	1	18-06-2018		TLM4		T1
6	Brakes: Simple block brakes & problems	1	19-06-2018		TLM4		T1
7	Band brake & Band and block brakes – problems	1	21-06-2018		TLM3		T1
8	Internal expansion shoe brakes-derivation	1	22-06-2018		TLM1 TLM2		T1
9	Absorption type dynamometers- working	1	25-06-2018		TLM1		T1
10	Transmission type dynamometers –working	1	26-06-2018		TLM4		T1
11	Tutorial-2	1	28-06-2018		TLM4		T1
12	Precession: Gyroscopes and introduction	1	29-06-2018		TLM3		T1,R1
13	Effect of precession on Aero planes & ships	1	02-07-2018		TLM4		T1,R1
14	Effect of precession on the stability of motor car (four wheeler)	1	03-07-2018		TLM6		T1,R1
15	Effect of precession on the stability of motor cycle (two wheeler)	1	05-07-2018		TLM4		T1,R1
16	Assignment/Quiz -1	1	06-07-2018				

No. of classes required to complete UNIT-I	16		No. of classes taken
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UNIT-II :

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1	Introduction about Turning moment	1	09-07-2018		TLM1 TLM2	CO2	T1,R1	
2	Angular velocity and acceleration of piston, connecting rod	1	10-07-2018		TLM4		T1,R1	
3	Engine force analysis-piston and crank effort & Inertia torque of connecting rod	1	12-07-2018		TLM1 TLM2		T1,R1	
4	Introduction to turning moment diagrams-single and multi-cylinder engines	1	13-07-2018		TLM3		T1,R1	
5	Tutorial-3	1	16-07-2018		TLM1 TLM2		T1,R1 T1,R1	
6	Problems on single cylinder engines	1	17-07-2018		TLM4		T1,R1	
7	Problems on multi cylinder engines		19-07-2018				T1,R1	
7	Fluctuation of energy- Problems	1	20-07-2018		TLM1 TLM2		T1,R1	
8	Fly wheels and their design	1	23-07-2018		TLM4		T1,R1	
9	Problems on Fly wheel design		24-07-2018				T1,R1	
10	Tutorial-4	1	26-07-2018		TLM3			
11	Assignment/Quiz -2	1	27-07-2018		TLM6			
No. of classes required to complete UNIT-II		10			No. of classes taken:			

UNIT-III :

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1	Governor - introduction, Watt governors working & Derivation for speed of governor	1	06-08-2018		TLM1 TLM2	CO3		
2	Porter governor working & derivation	1	07-08-2018		TLM1			
3	Porter governor Problems	1	09-08-2018		TLM1 TLM2			
4	Tutorial-5	1	10-08-2018		TLM1			
5	Proell governor working & derivation	1	13-08-2018		TLM4			

6	Hartnell governor working & derivation	1	14-08-2018		TLM3			
7	Hartnell governor Problems	1	16-08-2018		TLM1 TLM2			
8	Tutorial-6	1	17-08-2018		TLM1			
9	Sensitiveness, Isochronism and hunting	1	20-08-2018		TLM4			
10	Assignment3/Quiz -3	1	21-08-2018		TLM3			
No. of classes required to complete UNIT-III		10				No. of classes taken:		

UNIT-IV :

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1	Introduction to Balancing - Balancing of rotating masses in single plane	1	23-08-2018		TLM1 TLM2	CO4	T1,T2,R1	
2	Balancing of several masses rotating in different planes	1	24-08-2018		TLM1 TLM2			
3	Analytical and graphical methods	1	27-08-2018		TLM4			
4	Tutorial-7	1	28-08-2018		TLM1			
5	Primary, secondary balancing of reciprocating masses.	1	30-08-2018		TLM3			
6	Analytical and graphical methods	1	31-08-2018		TLM1			
7	Unbalanced forces and couples	1	04-09-2018		TLM1			
8	Tutorial-8	1	06-09-2018		TLM1			
9	Examination of 'V' multi cylinder in line and radial engines for primary and secondary balancing	1	07-09-2018		TLM1			
10	Locomotive balancing -Hammer blow, swaying couple and tractive efforts	1	10-09-2018		TLM4			
11	Assignment/Quiz -4	1	11-09-2018		TLM4			
No. of classes required to complete UNIT-IV		11				No. of classes taken:		

UNIT-V :

S.No.	Topics to be covered	No. of Classes	Tentative Date of	Actual Date of	Teaching Learning	Learning Outcome	Text Book	HOD Sign
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		Required	Completion	Completion	Methods	COs	followed	Weekly
1	Introduction & Types of Vibrations	Introduction & Types of Vibrations	17-09-2018		TLM1 TLM2	CO5	G.K. Grover	
2	Free longitudinal vibrations- Displacement, velocity & acceleration of body due to inertia force	Free longitudinal vibrations- Displacement, velocity & acceleration of body due to inertia force	18-09-2018		TLM1 TLM2			
3	Inertia effect of the mass of spring-problems	Inertia effect of the mass of spring-problems	20-09-2018		TLM1 TLM2			
4	Derivations & problems	Derivations & problems	24-09-2018		TLM4			
5	Tutorial-9	Tutorial-9	25-09-2018		TLM1			
6	Damped vibrations	Damped vibrations	27-09-2018		TLM3			
7	Forced vibrations & Forced damped vibrations	Forced vibrations & Forced damped vibrations	28-09-2018		TLM1			
8	Vibration isolation and transmissibility & Whirling speed of shafts	Vibration isolation and transmissibility & Whirling speed of shafts	01-10-2018		TLM1			
9	Assignment/Quiz -5	Assignment/Quiz -5	02-10-2018		TLM4			
10	Revision	Practice imp problems	04-10-2018					
No. of classes required to complete UNIT-V		09			No. of classes taken:			

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1	Dynamics of advanced governors	1	14-09-2018		TLM1 TLM2		T1,R1	
2	Vibration measuring instruments & transverse vibrations	1	05-10-2018		TLM1 TLM2			

Teaching Learning Methods

TLM1	Chalk and Talk	TLM4	Problem Solving	TLM7	Seminars or GD
TLM2	PPT	TLM5	Programming	TLM8	Lab Demo
TLM3	Tutorial	TLM6	Assignment or Quiz	TLM9	Case Study

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	11-06-2018	28-07-2018	7 W
I Mid Examinations	30-07-2018	04-08-2018	1 W
II Phase of Instructions	06-08-2018	06-10-2018	9 W
II Mid Examinations	08-10-2018	13-10-2018	1 W
Preparation and Practicals	15-10-2018	27-10-2018	2 W
Semester End Examinations	29-10-2018	10-11-2018	2 W

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment/Quiz – 1	1	A1=5
Assignment/Quiz – 2	2	A2=5
I-Mid Examination	1,2	B1=20
Assignment/Quiz – 3	3	A3=5
Assignment/Quiz – 4	4	A4=5
Assignment/Quiz – 5	5	A5=5
II-Mid Examination	3,4,5	B2=20
Evaluation of Assignment/Quiz Marks: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=5
Evaluation of Mid Marks: $B=75\%$ of Max(B1,B2)+25% of Min(B1,B2)	1,2,3,4,5	B=20
Cumulative Internal Examination : A+B	1,2,3,4,5	A+B=25
Semester End Examinations	1,2,3,4,5	C=75
Total Marks: A+B+C	1,2,3,4,5	100

	Course Instructor	Course coordinator	Module coordinator	HOD
Signature				
NAME	Dr. Y. APPALANAIDU			Dr. S. PICHI REDDY

LAKKIREDDY BALI REDDY COLLEGE OF ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING
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L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

COURSE HANDOUT

PROGRAM : B.Tech., V-Sem., ME [**Section – C**]
ACADEMIC YEAR : 2018-19
COURSE NAME & CODE : DYNAMICS OF MACHINES & S203
L-T-P STRUCTURE : 4-0-0
COURSE CREDITS : 3
COURSE INSTRUCTOR : CH. SIVA SANKARA BABU
COURSE COORDINATOR : Dr. Y. APPALANAIDU
PRE-REQUISITE: ENGINEERING MECHANICS, KINAMATICS OF MACHINES

COURSE OBJECTIVE: To understand the force motion relationship in components subjected to external forces and analysis of standard mechanisms used for speed control and stability control & the effect of dynamics of undesirable vibrations and unbalance.

COURSE OUTCOMES (CO): After completion this course, student will be able to

- CO1 Solve the practical problems on clutches and brakes by applying the concept contact forces due to friction and observe the gyroscopic effect due to precession of rotating bodies.
- CO2 Analyze the energy storage in the flywheels and cyclic energy of equalization process.
- CO3 Analyze the speed regulations in centrifugal governors under varying loads.
- CO4 Analyze the balancing process of the moving parts (rotating& reciprocating) statically and dynamically.
- CO5 Analyze the basic concepts of vibrations and take measures to minimize vibration and noise.

COURSE ARTICULATION MATRIX (Correlation between Cos &POs, PSOs):

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	3				2								3
CO2	3	2	3				2								3
CO3	3	2	3				2								3
CO4	3	2	3	2			2					2			3
CO5	3	3	3	2	2		2					2			3

Note: Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put '-'
1- Slight(Low), **2** - Moderate(Medium), **3** - Substantial (High).

BOS APPROVED TEXT BOOKS:

- T1** Rattan S.S, "Theory of Machines", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2007
- T2** Shigley J.E. and Uicker J.J., "Theory of Machines and Mechanisms", McGraw-Hill, Inc., 1995

BOS APPROVED REFERENCE BOOKS:

- R1** Rao J.S and Dukkipati R.V, "Mechanism and Machine Theory", New Age International, NewDelhi, 2007.
- R3** Sadhu Singh "Theory of Machines", Pearson Education, 2002.
- R4** Ballaney.P.L "Theory of Machines", Khanna Publishers,1990
- R5** Ghosh A. and Mallick A.K., "Theory of Mechanisms and Machines", Affiliated EastWest Press Pvt. Ltd., New Delhi, 1988

COURSE DELIVERY PLAN (LESSON PLAN):**UNIT-I : CLUTCHES, BRAKES AND DYNAMOMETERS & PRECESSION**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
17.	Introduction to Dynamics of machines -Course Educational Objectives (CEO's) and Course Outcomes (CO's).	1	11-06-2018		TLM1	CO1	--	
18.	Introduction to clutches- Single plate clutch and Multi plate clutch –construction and working	1	13-06-2018		TLM1,2		T1	
19.	Derivation for frictional torque in single & multi plate clutch by Uniform pressure and Uniform wear conditions- Problems	1	14-06-2018		TLM1,4		T1	
20.	Cone clutch and Centrifugal clutch – working and derivation and Problems	1	18-06-2018		TLM1,2 TLM4		T1	
21.	Tutorial-1	1	20-06-2018		TLM3		T1	
22.	Brakes: Simple block brakes & problems	1	21-06-2018		TLM1,4		T1	
23.	Band brake & Band and block brakes – problems	1	23-06-2018		TLM1,4		T1	
24.	Internal expansion shoe brakes-derivation	1	25-06-2018		TLM1,2		T1	
25.	Absorption type dynamometers- working	1	27-06-2018		TLM1,2		T1	
26.	Transmission type dynamometers –working	1	28-06-2018		TLM1,2		T1	
27.	Tutorial-2	1	30-06-2018		TLM3		T1	
28.	Precession: Gyroscopes and introduction	1	02-07-2018		TLM1,2		T1,R1	
29.	Effect of precession on Aero planes & ships	1	04-07-2018		TLM1,2		T1,R1	
30.	Effect of precession on the stability of motor car (four wheeler)	1	05-07-2018		TLM1,2		T1,R1	
31.	Effect of precession on the stability of motor cycle (two wheeler)	1	07-07-2018		TLM1,2		T1,R1	
32.	Assignment-1/Quiz -1	1	09-07-2018		TLM6		T1,R1	
No. of classes required to complete UNIT-I		16			No. of classes taken:			

UNIT-II : TURNING MOMENT DIAGRAMS AND FLY WHEELS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
13.	Introduction about Turning moment	1	11-07-2018		TLM1 TLM2		T1,R1	
14.	Angular velocity and acceleration of piston,	1	12-07-2018		TLM1,2		T1,R1	

	connecting rod					CO2		
15.	Engine force analysis-piston and crank effort & Inertia torque of connecting rod	1	16-07-2018		TLM1		T1,R1	
16.	Introduction to turning moment diagrams-single and multi-cylinder engines	1	18-07-2018		TLM1		T1,R1	
17.	Tutorial-3	1	19-07-2018		TLM3		T1,R1	
18.	Problems on single cylinder engines & multi cylinder engines	1	21-07-2018		TLM1,4		T1,R1	
19.	Fluctuation of energy-Problems	1	23-07-2018		TLM1,4		T1,R1	
20.	Fly wheels and their design-Problems	1	25-07-2018		TLM1,4		T1,R1	
21.	Tutorial-4	1	26-07-2018		TLM3		T1,R1	
22.	Assignment-2/Quiz -2	1	28-07-2018		TLM6		T1,R1	
No. of classes required to complete UNIT-II		10					No. of classes taken:	

UNIT-III : GOVERNORS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
11.	Governor - introduction, Watt governors working & Derivation for speed of governor	1	06-08-2018		TLM1,2	CO3	T1	
12.	Porter governor working & derivation	1	08-08-2018		TLM2		T1,R1	
13.	Porter governor Problems	1	09-08-2018		TLM1,4		T1,R1	
14.	Tutorial-5	1	13-08-2018		TLM3		T1,R1	
15.	Proell governor working & derivation	1	16-08-2018		TLM1,2		T1	
16.	Hartnell governor working & derivation- problems	1	18-08-2018		TLM1,2, TLM 4		T1,R1	
17.	Tutorial-6	1	20-08-2018		TLM3		T1,R1	
18.	Sensitiveness, Isochronism and hunting	1	23-08-2018		TLM1		T1,R1	
19.	Assignment-3/Quiz -3	1	25-08-2018		TLM6		T1,R1	
No. of classes required to complete UNIT-III		9					No. of classes taken:	

UNIT-IV : BALANCING

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
12.	Introduction to Balancing - Balancing of rotating masses in single plane	1	29-08-2018		TLM1,2	CO4	T1,R1	
13.	Balancing of several masses rotating in different planes	1	30-08-2018		TLM1,2		T1,R1	
14.	Analytical and graphical methods	1	01-09-2018		TLM1		T1,R1	
15.	Tutorial-7	1	03-09-2018		TLM3		T1,R1	
16.	Primary, secondary balancing of reciprocating masses.	1	05-09-2018		TLM1,2		T1,R1	
17.	Analytical and graphical methods	1	06-09-2018		TLM1,4		T1,R1	
18.	Unbalanced forces and couples	1	10-09-2018		TLM1		T1,R1	
19.	Tutorial-8	1	12-09-2018		TLM3		T1,R1	
20.	Examination of 'V' multi cylinder in line and radial	1	15-09-2018		TLM1,2		T1,R1	

	engines for primary and secondary balancing							
21.	Locomotive balancing - Hammer blow, swaying couple and tractive efforts	1	17-09-2018		TLM1,2		T1,R1	
22.	Assignment-4/Quiz -4	1	19-09-2018		TLM6		T1,R1	
No. of classes required to complete UNIT-IV		11				No. of classes taken:		

UNIT-V : VIBRATIONS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
10.	Introduction & Types of Vibrations	1	20-09-2018		TLM1,2	CO5	T1,R1	
11.	Free longitudinal vibrations- Displacement, velocity & acceleration of body due to inertia force	1	22-09-2018		TLM1		T1, G.K. Grover	
12.	Inertia effect of the mass of spring-problems	1	24-09-2018		TLM1		T1, G.K. Grover	
13.	Derivations & problems	1	26-09-2018		TLM1,2		T1	
14.	Tutorial-9	1	27-09-2018		TLM3		T1	
15.	Damped vibrations-types-explanation	1	29-09-2018		TLM1,2		T1	
16.	Forced vibrations & Forced damped vibrations	1	01-10-2018		TLM1,2		T1, G.K. Grover	
17.	Vibration isolation and transmissibility & Whirling speed of shafts	1	03-10-2018		TLM1,2		T1, G.K. Grover	
18.	Assignment-5/Quiz -5	1	04-10-2018		TLM6		T1	
No. of classes required to complete UNIT-V		09				No. of classes taken:		

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1	Dynamics of advanced governors	1	27-08-2018		TLM1 TLM2	CO3	T1	
2	Vibration measuring instruments & transverse vibrations	1	06-10-2018		TLM1 TLM2	CO5	G.K. Grover	

Teaching Learning Methods					
TLM1	Chalk and Talk	TLM4	Problem Solving	TLM7	Seminars or GD
TLM2	PPT	TLM5	Programming	TLM8	Lab Demo
TLM3	Tutorial	TLM6	Assignment or Quiz	TLM9	Case Study

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	11-06-2018	28-07-2018	7 W

I Mid Examinations	30-07-2018	04-08-2018	1 W
II Phase of Instructions	06-08-2018	06-10-2018	9 W
II Mid Examinations	08-10-2018	13-10-2018	1 W
Preparation and Practicals	15-10-2018	27-10-2018	2 W
Semester End Examinations	29-10-2018	10-11-2018	2 W

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment/Quiz – 1	1	A1=5
Assignment/Quiz – 2	2	A2=5
I-Mid Examination	1,2	B1=20
Assignment/Quiz – 3	3	A3=5
Assignment/Quiz – 4	4	A4=5
Assignment/Quiz – 5	5	A5=5
II-Mid Examination	3,4,5	B2=20
Evaluation of Assignment/Quiz Marks: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=5
Evaluation of Mid Marks: $B=75\% \text{ of Max}(B1,B2)+25\% \text{ of Min}(B1,B2)$	1,2,3,4,5	B=20
Cumulative Internal Examination : A+B	1,2,3,4,5	A+B=25
Semester End Examinations	1,2,3,4,5	C=75
Total Marks: A+B+C	1,2,3,4,5	100

	Course Instructor	Course coordinator	Module coordinator	HOD
Signature				
NAME	CH. SIVA SANKARA BABU	Dr. Y. APPALANAIDU	B. SUDHEER KUMAR	Dr. S. PICHI REDDY

LAKKIREDDY BALI REDDY COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
(Autonomous & Affiliated to JNTUK, Kakinada & Approved by AICTE, New Delhi,
NAAC Accredited with 'A' grade, Accredited by NBA, Certified by ISO 9001:2015)
L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

COURSE HANDOUT

Part-A

PROGRAM : B.Tech. V-Sem., ME-SEC- A
ACADEMIC YEAR : 2018-19
COURSE NAME & CODE : **Industrial Management –S270**
L-T-P STRUCTURE : 4-0-0
COURSE CREDITS : 3
COURSE INSTRUCTOR : **S SRINIVASA REDDY**
COURSE COORDINATOR : **B.CHAITANYA**
PRE-REQUISITE:

COURSE EDUCATIONAL OBJECTIVES (CEOs):

In this Course student will learn about-The fundamental concepts and contributions of management, human resource practices, quality control and project management which plays a vital role in the organisation, study techniques for increased productivity, human resource practices and various network techniques.

COURSE OUTCOMES (COs)

After completion of the course, the student will be able to

CO1: Apply the fundamental knowledge of management and organization in work environment.

CO2: Analyze different types of plant location and plant layouts.

CO3: Examine the statistical quality control and material management as a process.

CO4: Apply the concepts of HRM and functions of HRM to achieve goals.

CO5: Make use of program evaluation review techniques (PERT) and critical path method for real time project estimation.

COURSE ARTICULATION MATRIX (Correlation between Cos &POs, PSOs):

Course Code	COs	Programme Outcomes												PSOs			
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
S269	CO1	3	1			2		1		3	1	2	1			3	
	CO2	1	1			1				2			2			1	
	CO3		1			2		2	2	3	2		1			3	
	CO4	2		1		1	1	1	3	1		1	1				
	CO5	3	1			1			1			1	1				1
		1 = Slight (Low)			2 = Moderate (Medium)			3-Substantial(High)									

Note: Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put ‘-’
1- Slight(Low), **2** - Moderate(Medium), **3** - Substantial (High).

BOS APPROVED TEXT BOOKS:

T1 Dr.A.R.Aryasri, Management Science, TMH, 4thEdition, 2009

BOS APPROVED REFERENCE BOOKS:

1. Koontz & wehrich – Essentials of management, TMH, 8thEdition, 2010
2. Stoner, Freeman, Gilbert, Management, 6th edition Pearson education, New Delhi,2004
3. O.P. Khana, Industrial engineering and Management L.S.Srinath, PERT & CPM

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I :

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
121.	Introduction to Management: Definition, Nature of management	1	11-06-2018		TLM2	1	T1	
122.	Importance and Functions of Management	1	12-06-2018		TLM1	1	T1	
123.	Taylor’s Scientific Management Theory	1	13-06-2018		TLM1	1	T1	
124.	Fayol’s Principles of Management	1	15-06-2018		TLM1	1	T1	
125.	Fayol’s Principles of Management cntd.	1	18-06-2018		TLM1	1	T1	
126.	Contribution of Elton Mayo, Maslow	1	19-06-2018		TLM1	1	T1	
127.	Herzberg, Douglas Mc Gregor, Assignment test-1	1	20-06-2018		TLM1	1	T1	
128.	Basic concepts of Organization, Authority, Responsibility, Delegation of Authority	1	22-06-2018		TLM1	1	T1	
129.	Span of Control, Departmentation and Decentralization	1	25-06-2018		TLM1	1	T1	
130.	Organization Structures: Line organization, functional organization	1	26-06-2018		TLM1	1	T1	
131.	Line and staff organization, Committee organization	1	27-06-2018		TLM1	1	T1	
132.	Matrix organization, review of organization structure	1	29-06-2018		TLM2	1	T1	
133.	unit-1 revision, Assignment test-2	1	02-07-2018		TLM3	1	T1	
No. of classes required to complete UNIT-I		13			No. of classes taken:			

UNIT-II :

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
134.	Introduction To Operations Management	1	03-07-2018		TLM2	2	T1	
135.	Plant Location, Factors influencing location	1	04-07-2018		TLM1	2	T1	
136.	Principles of Plant Layouts	1	07-07-2018		TLM1	2	T1	
137.	Types of Plant Layouts	1	09-07-2018		TLM1	2	T1	
138.	Types of Plant Layouts cntd..	1	10-07-2018		TLM1	2	T1	
139.	Methods of production: batch and Mass Production	1	11-07-2018		TLM1	2	T1	
140.	Methods of production: Job Production	1	14-07-2018		TLM1	2	T1	
141.	Work Study	1	16-07-2018		TLM1	2	T1	
142.	Work Study cntd..	1	17-07-2018		TLM1	2	T1	
143.	Work Study	1	18-07-2018		TLM1	2	T1	
144.	Basic procedure involved in Method Study	1	21-07-2018		TLM1	2	T1	
145.	Work Measurement	1	23-07-2018		TLM1	2	T1	
146.	Revision, Problems	1	24-07-2018		TLM2	2	T1	
147.	Problems, Assignment test-3	1	25-07-2018		TLM3	2	T1	
No. of classes required to complete UNIT-II		14			No. of classes taken:			

UNIT-III :

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
148.	Introduction to Quality Management	1	06-08-2018		TLM2	3	T1	
149.	Statistical Quality Control-Meaning, Basics variables and attributes	1	07-08-2018		TLM1	3	T1	
150.	Control charts: X chart, R chart,	1	08-08-2018		TLM1	3	T1	
151.	Control charts: C chart, P chart	1	11-08-2018		TLM1	3	T1	
152.	Acceptance Sampling and Sampling plans	1	13-08-2018		TLM1	3	T1	
153.	Deming's contribution to quality	1	14-08-2018		TLM1	3	T1	
154.	Introduction to Materials Management-Objectives	1	18-08-2018		TLM1	3	T1	
155.	Need for Inventory control, Purchase Procedure	1	20-08-2018		TLM1	3	T1	
156.	Store records and its types EOQ	1	21-08-2018		TLM1	3	T1	

157.	ABC Analysis	1	25-08-2018		TLM1	3	T1	
158.	problems, Assignment test-4	1	27-08-2018		TLM3	3	T1	
159.	stock levels	1	28-08-2018		TLM2	3	T1	
No. of classes required to complete UNIT-III		12			No. of classes taken:			

UNIT-IV :

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
160.	Introduction to Human Resource Management	1	29-08-2018		TLM2	4	T1	
161.	Concepts of HRM, Basic functions of HR Manager	1	01-09-2018		TLM1	4	T1	
162.	Manpower planning	1	04-09-2018		TLM1	4	T1	
163.	Recruitment, Selection	1	05-09-2018		TLM1	4	T1	
164.	Training and Development, Placement	1	08-09-2018		TLM1	4	T1	
165.	Wage and Salary Administration	1	10-09-2018		TLM1	4	T1	
166.	Promotion, Transfer, Separation	1	11-09-2018		TLM1	4	T1	
167.	Performance Appraisal	1	12-09-2018		TLM1	4	T1	
168.	Job Evaluation and Merit Rating	1	15-09-2018		TLM2	4	T1	
169.	Revision, Problems, assignmenttest-5	1	17-09-2018		TLM3	4	T1	
No. of classes required to complete UNIT-IV		10			No. of classes taken:			

UNIT-V :

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
170.	Introduction to Project management	1	18-09-2018		TLM2	5	T1	
171.	Early techniques in Project Management	1	19-09-2018		TLM1	5	T1	
172.	Rules to draw network diagram and types of activities	1	22-09-2018		TLM1	5	T1	
173.	problems	1	24-09-2018		TLM1	5	T1	
174.	Critical Path Method (CPM):identifying critical path	1	25-09-2018		TLM1	5	T1	
175.	problems	1	26-09-2018		TLM1	5	T1	
176.	Project Evaluation and Review Technique (PERT)	1	29-09-2018		TLM1	5	T1	
177.	Probability of Completing the project within given time	1	01-10-2018		TLM1	5	T1	
178.	Problems, assignment test-6	1	03-10-2018		TLM3	5	T1	

179.	Project Cost Analysis, Project Crashing, Problems	1	06-10-2018		TLM2	5	T1	
No. of classes required to complete UNIT-V		10			No. of classes taken:			

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
180.	REVIEW				TLM2			
181.	REVIEW				TLM2			
182.	REVIEW				TLM2			

Teaching Learning Methods

TLM1	Chalk and Talk	TLM4	Problem Solving	TLM7	Seminars or GD
TLM2	PPT	TLM5	Programming	TLM8	Lab Demo
TLM3	Tutorial	TLM6	Assignment or Quiz	TLM9	Case Study

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	11-06-2018	28-07-2018	7W
I Mid Examinations	30-07-2018	04-08-2018	1W
II Phase of Instructions	06-08-2018	06-10-2018	9W
II Mid Examinations	08-10-2018	13-10-2018	1W
Preparation and Practicals	09-04-2018	21-04-2018	2W
Semester End Examinations	23-04-2018	05-05-2018	2W

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment/Quiz – 1	1	A1=5
Assignment/Quiz – 2	2	A2=5
I-Mid Examination	1,2	B1=20
Assignment/Quiz – 3	3	A3=5
Assignment/Quiz – 4	4	A4=5
Assignment/Quiz – 5	5	A5=5
II-Mid Examination	3,4,5	B2=20
Evaluation of Assignment/Quiz Marks: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=5
Evaluation of Mid Marks: $B=75\% \text{ of Max}(B1,B2)+25\% \text{ of Min}(B1,B2)$	1,2,3,4,5	B=20
Cumulative Internal Examination : A+B	1,2,3,4,5	A+B=25
Semester End Examinations	1,2,3,4,5	C=75
Total Marks: A+B+C	1,2,3,4,5	100

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

Graduates of Mechanical Engineering programme will be:

PEO1: To build a professional career and pursue higher studies with sound knowledge in Mathematics, Science and Mechanical Engineering.

PEO2: To inculcate strong ethical values and leadership qualities for graduates to become successful in multidisciplinary activities.

PEO3: To develop inquisitiveness towards good communication and lifelong learning.

PROGRAMME OUTCOMES (POs):

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PSOs:

Graduate of the Mechanical Engineering will have the ability to

1. To apply the principles of thermal sciences to design and develop various thermal systems.

2. To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.

3. To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

S SRINIVASA REDDY	B.CHAITANYA	J SUBBA REDDY	S.PICHI REDDY
Course Instructor	Course Coordinator	Module Coordinator	HOD

LAKKIREDDY BALI REDDY COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
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L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

COURSE HANDOUT

Part-A

PROGRAM : B.Tech. V-Sem., ME- SEC-B
ACADEMIC YEAR : 2018-19
COURSE NAME & CODE : **Industrial Management –S270**
L-T-P STRUCTURE : 4-0-0
COURSE CREDITS : 3
COURSE INSTRUCTOR : **S SRINIVASA REDDY**
COURSE COORDINATOR : **B.CHAITANYA**
PRE-REQUISITE:

COURSE EDUCATIONAL OBJECTIVES (CEOs):

In this Course student will learn about-The fundamental concepts and contributions of management, human resource practices, quality control and project management which plays a vital role in the organisation, study techniques for increased productivity, human resource practices and various network techniques.

COURSE OUTCOMES (COs)

After completion of the course, the student will be able to

CO1: Apply the fundamental knowledge of management and organization in work environment.

CO2: Analyze different types of plant location and plant layouts.

CO3: Examine the statistical quality control and material management as a process.

CO4: Apply the concepts of HRM and functions of HRM to achieve goals.

CO5: Make use of program evaluation review techniques (PERT) and critical path method for real time project estimation.

COURSE ARTICULATION MATRIX (Correlation between Cos &POs, PSOs):

Course Code	COs	Programme Outcomes												PSOs			
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
S269	CO1	3	1			2		1		3	1	2	1			3	
	CO2	1	1			1				2			2			1	
	CO3		1			2		2	2	3	2		1			3	
	CO4	2		1		1	1	1	3	1		1	1				
	CO5	3	1			1			1			1	1				1
		1 = Slight (Low)			2 = Moderate (Medium)			3-Substantial(High)									

Note: Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put ‘-’
1- Slight(Low), **2** - Moderate(Medium), **3** - Substantial (High).

BOS APPROVED TEXT BOOKS:

T1 Dr.A.R.Aryasri, Management Science, TMH, 4thEdition, 2009

BOS APPROVED REFERENCE BOOKS:

4. Koontz & wehrich – Essentials of management, TMH, 8thEdition, 2010
5. Stoner, Freeman, Gilbert, Management, 6th edition Pearson education, New Delhi,2004
6. O.P. Khana, Industrial engineering and Management L.S.Srinath, PERT & CPM

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-B

UNIT-I :

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
183.	Introduction to Management: Definition, Nature of management	1	11-06-2018		TLM2	1	T1	
184.	Importance and Functions of Management	1	13-06-2018		TLM1	1	T1	
185.	Taylor’s Scientific Management Theory	1	15-06-2018		TLM1	1	T1	
186.	Fayol’s Principles of Management	1	18-06-2018		TLM1	1	T1	
187.	Fayol’s Principles of Management cntd.	1	20-06-2018		TLM1	1	T1	
188.	Contribution of Elton Mayo, Maslow	1	22-06-2018		TLM1	1	T1	
189.	Herzberg, Douglas Mc Gregor, Assignment test-1	1	23-06-2018		TLM1	1	T1	
190.	Basic concepts of Organization, Authority, Responsibility, Delegation of Authority	1	25-06-2018		TLM1	1	T1	
191.	Span of Control, Departmentation and Decentralization	1	27-06-2018		TLM1	1	T1	
192.	Organization Structures: Line organization, functional organization	1	29-06-2018		TLM1	1	T1	
193.	Line and staff organization, Committee organization	1	30-06-2018		TLM1	1	T1	
194.	Matrix organization, review of organization structure	1	02-06-2018		TLM1	1	T1	
195.	unit-1 revision, Assignment test-2	1	04-07-2018		TLM3	1	T1	
No. of classes required to complete UNIT-I		13			No. of classes taken:			

UNIT-II :

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
196.	Introduction To Operations Management	1	06-07-2018		TLM2	2	T1	
197.	Plant Location, Factors influencing location	1	07-07-2018		TLM1	2	T1	
198.	Principles of Plant Layouts	1	09-07-2018		TLM1	2	T1	
199.	Types of Plant Layouts	1	11-07-2018		TLM1	2	T1	
200.	Types of Plant Layouts cntd..	1	13-07-2018		TLM1	2	T1	
201.	Methods of production: batch and Mass Production	1	14-07-2018		TLM1	2	T1	
202.	Methods of production: Job Production	1	16-07-2018		TLM1	2	T1	
203.	Work Study	1	18-07-2018		TLM1	2	T1	
204.	Work Study cntd..	1	20-07-2018		TLM1	2	T1	
205.	Work Study	1	21-07-2018		TLM1	2	T1	
206.	Basic procedure involved in Method Study	1	23-07-2018		TLM1	2	T1	
207.	Work Measurement	1	25-07-2018		TLM1	2	T1	
208.	Revision, Problems	1	27-07-2018		TLM1	2	T1	
209.	Problems, Assignment test-3	1	28-07-2018		TLM3	2	T1	
No. of classes required to complete UNIT-II		14			No. of classes taken:			

UNIT-III :

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
210.	Introduction to Quality Management	1	06-08-2018		TLM2	3	T1	
211.	Statistical Quality Control-Meaning, Basics variables and attributes	1	08-08-2018		TLM1	3	T1	
212.	Control charts: X chart, R chart,	1	10-08-2018		TLM1	3	T1	
213.	Control charts: C chart, P chart	1	11-08-2018		TLM1	3	T1	
214.	Acceptance Sampling and Sampling plans	1	13-08-2018		TLM1	3	T1	
215.	Deming's contribution to quality	1	17-08-2018		TLM1	3	T1	
216.	Introduction to Materials Management-Objectives	1	18-08-2018		TLM1	3	T1	
217.	Need for Inventory control, Purchase Procedure	1	20-08-2018		TLM1	3	T1	
218.	Store records and its types EOQ	1	24-08-2018		TLM1	3	T1	

219.	ABC Analysis	1	25-08-2018		TLM1	3	T1	
220.	problems, Assignment test-4	1	27-08-2018		TLM3	3	T1	
221.	stock levels	1	29-08-2018		TLM1	3	T1	
No. of classes required to complete UNIT-III		12			No. of classes taken:			

UNIT-IV :

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
222.	Introduction to Human Resource Management	1	31-08-2018		TLM2	4	T1	
223.	Concepts of HRM, Basic functions of HR Manager	1	01-09-2018		TLM1	4	T1	
224.	Manpower planning	1	05-09-2018		TLM1	4	T1	
225.	Recruitment, Selection	1	07-09-2018		TLM1	4	T1	
226.	Training and Development, Placement	1	08-09-2018		TLM1	4	T1	
227.	Wage and Salary Administration	1	10-09-2018		TLM1	4	T1	
228.	Promotion, Transfer, Separation	1	12-09-2018		TLM1	4	T1	
229.	Performance Appraisal	1	14-09-2018		TLM1	4	T1	
230.	Job Evaluation and Merit Rating	1	15-09-2018		TLM1	4	T1	
231.	Revision, Problems, assignmenttest-5	1	17-09-2018		TLM1	4	T1	
No. of classes required to complete UNIT-IV		10			No. of classes taken:			

UNIT-V :

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
232.	Introduction to Project management	1	19-09-2018		TLM2	5	T1	
233.	Early techniques in Project Management	1	22-09-2018		TLM1	5	T1	
234.	Rules to draw network diagram and types of activities	1	24-09-2018		TLM1	5	T1	
235.	problems	1	26-09-2018		TLM1	5	T1	
236.	Critical Path Method (CPM):identifying critical path	1	28-09-2018		TLM1	5	T1	
237.	problems	1	29-09-2018		TLM1	5	T1	
238.	Project Evaluation and Review Technique (PERT)	1	01-10-2018		TLM1	5	T1	
239.	Probability of Completing the project within given time	1	03-10-2018		TLM1	5	T1	
240.	Problems, assignment test-6	1	05-10-2018		TLM3	5	T1	

241.	Project Cost Analysis, Project Crashing, Problems	1	06-10-2018		TLM1	5	T1	
No. of classes required to complete UNIT-V		10			No. of classes taken:			

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
242.	REVIEW				TLM2			
243.	REVIEW				TLM2			
244.	REVIEW				TLM2			

Teaching Learning Methods					
TLM1	Chalk and Talk	TLM4	Problem Solving	TLM7	Seminars or GD
TLM2	PPT	TLM5	Programming	TLM8	Lab Demo
TLM3	Tutorial	TLM6	Assignment or Quiz	TLM9	Case Study

PART C

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	11-06-2018	28-07-2018	7W
I Mid Examinations	30-07-2018	04-08-2018	1W
II Phase of Instructions	06-08-2018	06-10-2018	9W
II Mid Examinations	08-10-2018	13-10-2018	1W
Preparation and Practicals	09-04-2018	21-04-2018	2W
Semester End Examinations	23-04-2018	05-05-2018	2W

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment/Quiz – 1	1	A1=5
Assignment/Quiz – 2	2	A2=5
I-Mid Examination	1,2	B1=20
Assignment/Quiz – 3	3	A3=5
Assignment/Quiz – 4	4	A4=5
Assignment/Quiz – 5	5	A5=5
II-Mid Examination	3,4,5	B2=20
Evaluation of Assignment/Quiz Marks: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=5
Evaluation of Mid Marks: $B=75\% \text{ of Max}(B1,B2)+25\% \text{ of Min}(B1,B2)$	1,2,3,4,5	B=20
Cumulative Internal Examination : A+B	1,2,3,4,5	A+B=25
Semester End Examinations	1,2,3,4,5	C=75
Total Marks: A+B+C	1,2,3,4,5	100

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

Graduates of Mechanical Engineering programme will be:

PEO1: To build a professional career and pursue higher studies with sound knowledge in Mathematics, Science and Mechanical Engineering.

PEO2: To inculcate strong ethical values and leadership qualities for graduates to become successful in multidisciplinary activities.

PEO3: To develop inquisitiveness towards good communication and lifelong learning.

PROGRAMME OUTCOMES (POs):

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PSOs:

Graduate of the Mechanical Engineering will have the ability to

1. To apply the principles of thermal sciences to design and develop various thermal systems.

2. To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.

3. To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

S SRINIVASA REDDY	B.CHAITANYA	J SUBBA REDDY	S.PICHI REDDY
Course Instructor	Course Coordinator	Module Coordinator	HOD

COURSE HANDOUT

Part-A

PROGRAM : B.Tech., V-Sem.Sec-C, ME
ACADEMIC YEAR : 2018-19
COURSE NAME & CODE : **INDUSTRIAL MANAGEMENT –S270**
L-T-P STRUCTURE : 4-0-0
COURSE CREDITS : 3
COURSE INSTRUCTOR : **K.N.D.MALLESWARA RAO**
COURSE COORDINATOR : **B.CHAITANYA**
PRE-REQUISITE:

COURSE EDUCATIONAL OBJECTIVES (CEOs):

In this Course student will learn about-The fundamental concepts and contributions of management, human resource practices, quality control and project management which plays a vital role in the organisation, study techniques for increased productivity, human resource practices and various network techniques.

COURSE OUTCOMES (COs)

After completion of the course, the student will be able to

CO1: Apply the fundamental knowledge of management and organization in work environment.

CO2: Analyze different types of plant location and plant layouts.

CO3: Examine the statistical quality control and material management as a process.

CO4: Apply the concepts of HRM and functions of HRM to achieve goals.

CO5: Make use of program evaluation review techniques (PERT) and critical path method for real time project estimation.

COURSE ARTICULATION MATRIX (Correlation between COs&POs,PSOs):

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1		2	3			1		2			3			2	
CO2	2	2				2	3				3			2	
CO3	2	1	2								3			2	
CO4								3			3			2	
CO5	2	3	3								3			2	

Note: Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put '-'
1- Slight(Low), **2** - Moderate(Medium), **3** - Substantial (High).

BOS APPROVED TEXT BOOKS:**T1** Dr.A.R.Aryasri, Management Science, TMH, 4thEdition, 2009**BOS APPROVED REFERENCE BOOKS:****R1** Koontz &weihrich – Essentials of management, TMH, 8thEdition, 2010**R2** Stoner, Freeman, Gilbert, Management, 6th edition Pearson education, New Delhi, 2004**R3** O.P. Khana, Industrial engineering and ManagementL.S.Srinath, PERT & CPM**Part-B****COURSE DELIVERY PLAN (LESSON PLAN): Section-A****UNIT-I : Introduction**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to Management: Definition, Nature of management	1	11/06/2018		TLM1	1	T1	
2.	Importance and Functions of Management	1	12/06/2018		TLM2	1	T1	
3.	Taylor's Scientific Management Theory	1	13/06/2018		TLM1	1	T1	
4.	Fayol's Principles of Management	1	15/06/2018		TLM1	1	T1	
5.	Contribution of Elton Mayo, Maslow	1	18/06/2018		TLM1	1	T1	
6.	Herzberg, Douglas Mc Gregor,	1	19/06/2018		TLM1	1	T1	
7.	Assignment test-1	1	20/06/2018			1	T1	
8.	Basic concepts of Organization, Authority, Responsibility, Delegation of Authority	1	22/06/2018		TLM1	1	T1	
9.	Span of Control, Departmentation and Decentralization	1	25/06/2018		TLM2	1	T1	
10.	Organization Structures: Line organization,functional organization	1	26/06/2018		TLM1	1	T1	
11.	Line and staff organization, Committee organization	1	27/06/2018		TLM2	1	T1	
12.	Matrix organization, review of oraganisation structure	1	29/06/2018		TLM2	1	T1	
13.	Assignment test-2	1	02/07/2018			1	T1	
No. of classes required to complete UNIT-I		13			No. of classes taken:			

UNIT-II : Operations management

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
14.	Introduction To Operations Management	1	21/12/2018		TLM1	2	T1	
15.	Plant Location, Factors influencing location	1	03/07/2018		TLM1	2	T1	

16.	Principles of Plant Layouts	1	04/07/2018		TLM1	2	T1
17.	Types of Plant Layouts	1	06/07/2018		TLM2	2	T1
18.	Types of Plant Layouts cntd..	1	09/07/2018		TLM2	2	T1
19.	Methods of production: batch and Mass Production, Job Production	1	10/07/2018		TLM2	2	T1
20.	Assignment test-3	1	11/07/2018			2	T1
21.	Work Study	1	13/07/2018		TLM1	2	T1
22.	Work Study cntd..	1	16/07/2018		TLM1	2	T1
23.	problems	1	17/07/2018		TLM1		
24.	Basic procedure involved in Method Study	1	18/07/2018		TLM2	2	T1
25.	Method Study cntd..	1	20/07/2018		TLM1	2	T1
26.	Work Measurement	1	23/07/2018		TLM1	2	T1
27.	Problems	1	24/07/2018		TLM1	2	T1
28.	Problems	1	25/07/2018		TLM1	2	T1
29.	Assignment test-4	1	27/07/2018			2	T1
No. of classes required to complete UNIT-II		13			No. of classes taken:		

UNIT-III : Quality and materials management

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
30.	Introduction to Quality Management	1	06/08/2018		TLM1	3	T1	
31.	Statistical Quality Control-Meaning, Basics variables and attributes	1	07/08/2018		TLM2	3	T1	
32.	Control charts: X chart, R chart, problems	1	08/08/2018		TLM1	3	T1	
33.	Control charts: C chart, P chart, problems	1	10/08/2018		TLM2	3	T1	
34.	Problems on control charts cntd..	1	13/08/2018		TLM1	3	T1	
35.	Assignment test-5	1	14/08/2018			3	T1	
36.	Acceptance Sampling and Sampling plans	1	17/08/2018		TLM1	3	T1	
37.	Deming's contribution to quality	1	20/08/2018		TLM1	3	T1	
38.	Introduction to Materials Management-Objectives	1	21/08/2018		TLM1	3	T1	
39.	Need for Inventory control, Purchase Procedure	1	22/08/2018		TLM1	3	T1	
40.	Store records and its types EOQ	1	24/08/2018		TLM1	3	T1	
41.	ABC Analysis	1	27/08/2018		TLM1	3	T1	
42.	stock levels, problems	1	28/08/2018		TLM1	3	T1	
43.	Assignment test-6	1	29/08/2018			3	T1	

Teaching Learning Methods			
TLM1	Chalk and Talk	TLM4	Demonstration (Lab/Field Visit)
TLM2	PPT	TLM5	ICT (NPTEL/Swayam Prabha/MOOCs)
TLM3	Tutorial	TLM6	Group Discussion/Project

Part - C

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment/Quiz – 1	1	A1=5
Assignment/Quiz – 2	2	A2=5
I-Mid Examination	1,2	B1=20
Assignment/Quiz – 3	3	A3=5
Assignment/Quiz – 4	4	A4=5
Assignment/Quiz – 5	5	A5=5
II-Mid Examination	3,4,5	B2=20
Evaluation of Assignment/Quiz Marks: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=5
Evaluation of Mid Marks: $B=75\% \text{ of Max}(B1,B2)+25\% \text{ of Min}(B1,B2)$	1,2,3,4,5	B=20
Cumulative Internal Examination : A+B	1,2,3,4,5	A+B=25
Semester End Examinations	1,2,3,4,5	C=75
Total Marks: A+B+C	1,2,3,4,5	100

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3. To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

K.N.D.MALLESWARA RAO	B.CHAITANYA	J.SUBBA REDDY	S.PICHI REDDY
Course Instructor	Course Coordinator	Module Coordinator	HOD

LAKKIREDDY BALI REDDY COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
(Autonomous & Affiliated to JNTUK, Kakinada & Approved by AICTE, New Delhi,
NAAC Accredited with 'A' grade, Accredited by NBA, Certified by ISO 9001:2015)
L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

COURSE HANDOUT

PROGRAM : B.Tech, V-Sem.,A Sec, MECH
ACADEMIC YEAR : 2018-19
COURSE NAME & CODE : Metal Cutting and Machine Tools- S 308
L-T-P STRUCTURE : 4-1-0
COURSE CREDITS : 3
COURSE INSTRUCTOR : Dr.K.MURAHARI
COURSE COORDINATOR : Dr.K.MURAHARI

PRE-REQUISITE: Basic concepts of Engineering Drawing, Production Technology, Materials and Metallurgy.

COURSE OBJECTIVE: To enable the learners to gain knowledge about metal cutting operation, tool nomenclature, tool geometry and the various operations performed on machine tools for manufacturing of engineering objects to produce the desired shape, size, accuracy; finish etc. and also students able to understand the basic concepts of Jigs and fixtures designs.

COURSE OUTCOMES (CO): At the end of the course, the student will be able to:
CO1: Comprehend the basic principles of metal cutting and analyze the forces in machining.
CO2: Understand detailed working and applications of lathe
CO3: Comprehend the detailed working principle and applications on shaper, slotter, planar, drilling and boring machines
CO4: Relate the knowledge of milling and grinding operations with manufacturing industry
CO5: Identify various kinds of finishing processes and different kinds of holding and guiding mechanisms.

COURSE ARTICULATION MATRIX (Correlation between COs&POs, PSOs):

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	2			2						2	2	3	2
CO2	3	1				2	2					2		3	
CO3	3	2				2	2					2		3	
CO4	3	2					3					2		3	
CO5	3	2	3	2	1							3		3	

Note: Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put '-'
1- Slight (Low), **2** - Moderate (Medium), **3** - Substantial (High).

BOS APPROVED TEXT BOOKS:

T1 R.K. Jain and S.C. Gupta, Production Technology, Khanna publication, 17th Edition, 2012.

T2 H.M.T. (Hindustan Machine Tools), Production Technology, Tata McGraw Hill, 2009.

BOS APPROVED REFERENCE BOOKS:

R1 B.S.RaghuVamshi ,Workshop Technology, DhanpatRai & Co, 10th edition, 2009

R2 Gosh and Malik , Manufacturing Science, East west press Pv.t Ltd., 2ndEdition, 2011.

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I: ELEMENTARY TREATMENT OF METAL CUTTING THEORY

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
245.	Metal cutting and Machine tools, COs and POs PEOs	1	11-06-18		TML1/TML2	CO1	T1/T2	
246.	Introduction, Classification of Machine tools	1	13-06-18		TML1/TML2	CO1	T1/T2	
247.	Basic elements of Metal cutting, Methods of Metal Cutting	1	14-06-18		TML1/TML2	CO1	T1/T2	
248.	Classification of Cutting Tools	1	15-06-18		TML1/TML2	CO1	T1/T2	
249.	Cutting tool materials	1	18-06-18		TML1/TML2	CO1	T1/T2	
250.	Geometry of Single Point Cutting Tool	1	20-06-18		TML1/TML2	CO1	T1/T2	
251.	Mechanism of Metal cutting	1	21-06-18		TML1/TML2	CO1	T1/T2	
252.	Types of chips and Chip breakers	1	22-06-18		TML1/TML2	CO1	T1/T2	
253.	measurement of chip thickness ratio, shear angle	1	25-06-18		TML1/TML2	CO1	T1/T2	
254.	Tutorial - I	1	27-06-18		TML3/TML6	CO1	T1/T2	
255.	measurement of cutting forces, velocity diagrams	1	28-06-18		TML1/TML2	CO1	T1/T2	
256.	Merchant's Force diagram	1	29-06-18		TML1/TML2	CO1	T1/T2	
257.	Numericals	1	02-07-18		TML1/TML2	CO1	T1/T2	
258.	Machining parameters - Tool Life, related problems	1	04-07-18		TML1/TML2	CO1	T1/T2	
259.	Work done in cutting. Metal cutting theories	1	05-07-18		TML1/TML2	CO1	T1/T2	
260.	Tool Failure	1	06-07-18		TML1/TML2	CO1	T1/T2	
261.	Cutting fluids	1	09-07-18		TML1/TML2	CO1	T1/T2	
262.	Tutorial – II, Quiz – I, Assignment - I	1	11-07-18		TML3/TML6	CO1	T1/T2	
No. of classes required to complete UNIT-I		18			No. of classes taken:			

UNIT-II: ENGINE LATHE, TURRET AND CAPSTAN LATHES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
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263.	Introduction, Principle of working	1	12-07-18		TML1/TML2	CO2	T1/T2
264.	Specification of lathe, classification of Lathes	1	13-07-18		TML1/TML2	CO2	T1/T2
265.	Lathe accessories, Tool holding,	1	16-07-18		TML1/TML2	CO2	T1/T2
266.	Work holding and Special attachments	1	18-07-18		TML1/TML2	CO2	T1/T2
267.	Lathe Operations, Tutorial – III	1	19-07-18		TML1/TML2/TML6	CO2	T1/T2
268.	Taper turning methods, Thread turning methodology	1	20-07-18		TML1/TML2	CO2	T1/T2
269.	Turret and Capstan Lathes: Introduction	1	23-07-18		TML1/TML2	CO2	T1/T2
270.	Principle of working - Collet chucks	1	25-07-18		TML1/TML2	CO2	T1/T2
271.	Other work and tool holding devices	1	26-07-18		TML1/TML2	CO2	T1/T2
272.	Box and tool layout, Assignment – II, Quiz-II	1	27-07-18		TML1/TML2/TML6	CO2	T1/T2
No. of classes required to complete UNIT-II		10			No. of classes taken:		

UNIT-III: SHAPING, SLOTTING, PLANING, DRILLING AND BORING MACHINES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
273.	Introduction to reciprocating machines, Planning	1	06-08-18		TML1/TML2	CO3	T1/T2	
274.	Principles of working – Principal parts, Specification	1	08-08-18		TML1/TML2	CO3	T1/T2	
275.	classification	1	09-08-18		TML1/TML2	CO3	T1/T2	
276.	Operations performed, Machining time calculations	1	10-08-18		TML1/TML2	CO3	T1/T2	
277.	Numericals	1	13-08-18		TML1/TML2	CO3	T1/T2	
278.	Tutorial - IV	1	16-08-18		TML3/TML6	CO3	T1/T2	
279.	Drilling and Boring Machines : Introduction	1	17-08-18		TML1/TML2	CO3	T1/T2	
280.	Principles of working – Principal parts, Specification	1	20-08-18		TML1/TML2	CO3	T1/T2	
281.	Types of drilling machines, boring machines	1	22-08-18		TML1/TML2	CO3	T1/T2	
282.	operations performed	1	23-08-18		TML3/TML6	CO3	T1/T2	
283.	Tool holding devices, Twist drill	1	24-08-18		TML1/TML2	CO3	T1/T2	
284.	Boring machines, Fine boring machines	1	27-08-18		TML1/TML2	CO3	T1/T2	
285.	Deep hole drilling machine	1	29-08-18		TML1/TML2	CO3	T1/T2	
286.	Tutorial – V, Assignment – III, Quiz-III	1	30-08-18		TML3/TML6	CO3	T1/T2	
No. of classes required to complete UNIT-III		14			No. of classes taken:			

UNIT-IV: MILLING AND GRINDING MACHINES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
287.	Principle of working – Specifications	1	31-09-18		TML1/TML2	CO4	T1/T2	
288.	Classifications of milling machines, Principal features of horizontal, vertical and universal milling machines	1	03-09-18		TML1/TML2	CO4	T1/T2	
289.	Methods of operations, various types of operations	1	05-03-18		TML1/TML2	CO4	T1/T2	
290.	Geometry of milling cutters	1	06-09-18		TML1/TML2	CO4	T1/T2	
291.	Types of Milling cutters	1	07-09-18		TML1/TML2	CO4	T1/T2	
292.	Methods of indexing – Accessories to milling machines	1	10-09-18		TML1/TML2	CO4	T1/T2	
293.	Tutorial – VI, Assignment – IV, Grinding Machines: Introduction,	1	12-09-18		TML1/TML2/ TML3/TML6	CO4	T1/T2	
294.	Fundamentals – Theory of grinding, Classification of grinding machine	1	13-09-18		TML1/TML2	CO4	T1/T2	
295.	Grinding wheel description, Types of Abrasive materials and signatures	1	14-09-18		TML1/TML2	CO4	T1/T2	
296.	Cylindrical and surface grinding machine	1	17-09-18		TML1/TML2	CO4	T1/T2	
297.	Tool and cutter grinding machine	1	19-09-18		TML1/TML2	CO4	T1/T2	
298.	special types of grinding machines, Quiz-IV	1	20-09-18		TML1/TML2/TML6	CO4	T1/T2	
No. of classes required to complete UNIT-IV		12			No. of classes taken:			

UNIT-V: LAPPING, HONING AND BROACHING MACHINES, JIGS AND FIXTURES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
299.	Introduction to super finishing processes, Types	1	21-09-18		TML1/TML2	CO5	T1/T2	
300.	Working Principle, Comparison to grinding – lapping and honing	1	24-09-18		TML1/TML2	CO5	T1/T2	
301.	Constructional features, Speed, Feed, DC and M/C	1	26-09-18		TML1/TML2	CO5	T1/T2	
302.	Tutorial - VII and Assignment – V	1	27-09-18		TML3/TML6	CO5	T1/T2	
303.	Definitions of Jig and Fixture, comparisons and classifications, Principles of design of Jigs and fixtures	1	28-09-18		TML1/TML2	CO5	T1/T2	
304.	Types of clamping & work holding devices. Typical examples of jigs and fixtures, Tutorial - VIII , Quiz – V,	1	01-10-18		TML1/TML2	CO5	T1/T2	

	Assignment - VI						
No. of classes required to complete UNIT-V	6			No. of classes taken:			

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
305.	Various types of forces, measurement techniques, Machinability case study	1	03-10-18		TML2\ TML 9	CO1	Journal paper, NPTL	
306.	Kinematic Diagrams of Shaper, planner, Drilling machines	1	04-10-18		TML 2	CO2	R1	
307.	Milling machine applications like FSP, FSW	1	05-10-18		TML 9	CO4	Journal paper	

Teaching Learning Methods					
TLM1	Chalk and Talk	TLM4	Problem Solving	TLM7	Seminars or GD
TLM2	PPT	TLM5	Programming	TLM8	Lab Demo
TLM3	Tutorial	TLM6	Assignment or Quiz	TLM9	Case Study

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	11/06/2018	28/07/2018	7W
I Mid Examinations	30/07/2018	04/08/2018	1W
II Phase of Instructions	06/08/2018	06/10/2018	9W
II Mid Examinations	08/10/2018	13/10/2018	1W
Preparation and Practical's	15/10/2018	27/10/2018	2W
Semester End Examinations	29/10/2018	01/11/2018	2W

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment/Quiz – 1	1	A1=5
Assignment/Quiz – 2	2	A2=5
I-Mid Examination	1,2	B1=20
Assignment/Quiz – 3	3	A3=5
Assignment/Quiz – 4	4	A4=5
Assignment/Quiz – 5	5	A5=5
II-Mid Examination	3,4,5	B2=20
Evaluation of Assignment/Quiz Marks: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=5
Evaluation of Mid Marks: $B=75\% \text{ of Max}(B1,B2)+25\% \text{ of Min}(B1,B2)$	1,2,3,4,5	B=20
Cumulative Internal Examination : A+B	1,2,3,4,5	A+B=25
Semester End Examinations	1,2,3,4,5	C=75
Total Marks: A+B+C	1,2,3,4,5	100

LAKKIREDDY BALI REDDY COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
(Autonomous & Affiliated to JNTUK, Kakinada & Approved by AICTE, New Delhi,
NAAC Accredited with 'A' grade, Accredited by NBA, Certified by ISO 9001:2015)
L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

COURSE HANDOUT

PROGRAM : B.Tech, V-Sem., MECH
ACADEMIC YEAR : 2018-19
COURSE NAME & CODE : Metal Cutting and Machine Tools- S 308
L-T-P STRUCTURE : 4-1-0
COURSE CREDITS : 3
COURSE INSTRUCTOR : Dr.K.MURAHARI
COURSE COORDINATOR : Dr.K.MURAHARI

PRE-REQUISITE: Basic concepts of Engineering Drawing, Production Technology, Materials and Metallurgy.

COURSE OBJECTIVE: To enable the learners to gain knowledge about metal cutting operation, tool nomenclature, tool geometry and the various operations performed on machine tools for manufacturing of engineering objects to produce the desired shape, size, accuracy; finish etc. and also students able to understand the basic concepts of Jigs and fixtures designs.

COURSE OUTCOMES (CO): At the end of the course, the student will be able to:
CO1: Comprehend the basic principles of metal cutting and analyze the forces in machining.
CO2: Understand detailed working and applications of lathe
CO3: Comprehend the detailed working principle and applications on shaper, slotter, planar, drilling and boring machines
CO4: Relate the knowledge of milling and grinding operations with manufacturing industry
CO5: Identify various kinds of finishing processes and different kinds of holding and guiding mechanisms.

COURSE ARTICULATION MATRIX (Correlation between COs&POs, PSOs):

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	2			2						2	2	3	2
CO2	3	1				2	2					2		3	
CO3	3	2				2	2					2		3	
CO4	3	2					3					2		3	
CO5	3	2	3	2	1							3		3	

Note: Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put '-'
1- Slight (Low), **2** - Moderate (Medium), **3** - Substantial (High).

BOS APPROVED TEXT BOOKS:

- T1** R.K. Jain and S.C. Gupta, Production Technology, Khanna publication, 17th Edition, 2012.
- T2** H.M.T. (Hindustan Machine Tools), Production Technology, Tata McGraw Hill, 2009.

BOS APPROVED REFERENCE BOOKS:**R1** B.S.RaghuVamshi ,Workshop Technology, Dhanpat Rai & Co, 10th edition, 2009**R2** Gosh and Malik , Manufacturing Science, East west press Pv.t Ltd., 2ndEdition, 2011.**COURSE DELIVERY PLAN (LESSON PLAN): Section-B****UNIT-I: ELEMENTARY TREATMENT OF METAL CUTTING THEORY**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
308.	Metal cutting and Machine tools, COs and POs PEOs	1	11-06-18		TML1/TML2	CO1	T1/T2	
309.	Introduction, Classification of Machine tools	1	13-06-18		TML1/TML2	CO1	T1/T2	
310.	Basic elements of Metal cutting, Methods of Metal Cutting	1	15-06-18		TML1/TML2	CO1	T1/T2	
311.	Classification of Cutting Tools	1	16-06-18		TML1/TML2	CO1	T1/T2	
312.	Cutting tool materials	1	18-06-18		TML1/TML2	CO1	T1/T2	
313.	Geometry of Single Point Cutting Tool	1	20-06-18		TML1/TML2	CO1	T1/T2	
314.	Mechanism of Metal cutting	1	22-06-18		TML1/TML2	CO1	T1/T2	
315.	Types of chips and Chip breakers	1	23-06-18		TML1/TML2	CO1	T1/T2	
316.	measurement of chip thickness ratio, shear angle	1	25-06-18		TML1/TML2	CO1	T1/T2	
317.	Tutorial - I	1	27-06-18		TML3/TML6	CO1	T1/T2	
318.	measurement of cutting forces, velocity diagrams	1	29-06-18		TML1/TML2	CO1	T1/T2	
319.	Merchant's Force diagram	1	30-06-18		TML1/TML2	CO1	T1/T2	
320.	Numericals	1	02-07-18		TML1/TML2	CO1	T1/T2	
321.	Machining parameters - Tool Life, related problems	1	04-07-18		TML1/TML2	CO1	T1/T2	
322.	Work done in cutting. Metal cutting theories	1	06-07-18		TML1/TML2	CO1	T1/T2	
323.	Tool Failure	1	07-07-18		TML1/TML2	CO1	T1/T2	
324.	Cutting fluids	1	09-07-18		TML1/TML2	CO1	T1/T2	
325.	Tutorial – II, Quiz – I, Assignment - I	1	11-07-18		TML3/TML6	CO1	T1/T2	
No. of classes required to complete UNIT-I		18			No. of classes taken:			

UNIT-II: ENGINE LATHE, TURRET AND CAPSTAN LATHES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
326.	Introduction, Principle of working	1	13-07-18		TML1/TML2	CO2	T1/T2	
327.	Specification of lathe, classification of Lathes	1	14-07-18		TML1/TML2	CO2	T1/T2	
328.	Lathe accessories, Tool	1	16-07-18		TML1/TML2	CO2	T1/T2	

	holding,							
329.	Work holding and Special attachments	1	18-07-18		TML1/TML2	CO2	T1/T2	
330.	Lathe Operations, Tutorial – III	1	20-07-18		TML1/TML2/TML6	CO2	T1/T2	
331.	Taper turning methods, Thread turning methodology	1	21-07-18		TML1/TML2	CO2	T1/T2	
332.	Turret and Capstan Lathes: Introduction	1	23-07-18		TML1/TML2	CO2	T1/T2	
333.	Principle of working - Collet chucks	1	25-07-18		TML1/TML2	CO2	T1/T2	
334.	Other work and tool holding devices	1	27-07-18		TML1/TML2	CO2	T1/T2	
335.	Box and tool layout, Assignment – II, Quiz-II	1	28-07-18		TML1/TML2/TML6	CO2	T1/T2	
No. of classes required to complete UNIT-II		10			No. of classes taken:			

UNIT-III: SHAPING, SLOTTING, PLANING, DRILLING AND BORING MACHINES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
336.	Introduction to reciprocating machines, Planning	1	06-08-18		TML1/TML2	CO3	T1/T2	
337.	Principles of working – Principal parts, Specification	1	08-08-18		TML1/TML2	CO3	T1/T2	
338.	classification	1	10-08-18		TML1/TML2	CO3	T1/T2	
339.	Operations performed, Machining time calculations	1	11-08-18		TML1/TML2	CO3	T1/T2	
340.	Numericals	1	13-08-18		TML1/TML2	CO3	T1/T2	
341.	Tutorial - IV	1	17-08-18		TML3/TML6	CO3	T1/T2	
342.	Drilling and Boring Machines : Introduction	1	18-08-18		TML1/TML2	CO3	T1/T2	
343.	Principles of working – Principal parts, Specification	1	20-08-18		TML1/TML2	CO3	T1/T2	
344.	Types of drilling machines, boring machines	1	22-08-18		TML1/TML2	CO3	T1/T2	
345.	operations performed	1	24-08-18		TML3/TML6	CO3	T1/T2	
346.	Tool holding devices, Twist drill	1	25-08-18		TML1/TML2	CO3	T1/T2	
347.	Boring machines, Fine boring machines	1	27-08-18		TML1/TML2	CO3	T1/T2	
348.	Deep hole drilling machine	1	29-08-18		TML1/TML2	CO3	T1/T2	
349.	Tutorial – V, Assignment – III, Quiz-III	1	31-08-18		TML3/TML6	CO3	T1/T2	
No. of classes required to complete UNIT-III		14			No. of classes taken:			

UNIT-IV: MILLING AND GRINDING MACHINES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
350.	Principle of working – Specifications	1	1-09-18		TML1/TML2	CO4	T1/T2	

351.	Classifications of milling machines, Principal features of horizontal, vertical and universal milling machines	1	03-09-18		TML1/TML2	CO4	T1/T2	
352.	Methods of operations, various types of operations	1	05-03-18		TML1/TML2	CO4	T1/T2	
353.	Geometry of milling cutters	1	07-09-18		TML1/TML2	CO4	T1/T2	
354.	Types of Milling cutters	1	08-09-18		TML1/TML2	CO4	T1/T2	
355.	Methods of indexing – Accessories to milling machines	1	10-09-18		TML1/TML2	CO4	T1/T2	
356.	Tutorial – VI, Assignment – IV, Grinding Machines: Introduction,	1	12-09-18		TML1/TML2/ TML3/TML6	CO4	T1/T2	
357.	Fundamentals – Theory of grinding, Classification of grinding machine	1	14-09-18		TML1/TML2	CO4	T1/T2	
358.	Grinding wheel description, Types of Abrasive materials and signatures	1	15-09-18		TML1/TML2	CO4	T1/T2	
359.	Cylindrical and surface grinding machine	1	17-09-18		TML1/TML2	CO4	T1/T2	
360.	Tool and cutter grinding machine	1	19-09-18		TML1/TML2	CO4	T1/T2	
361.	special types of grinding machines, Quiz-IV	1	21-09-18		TML1/TML2/TML6	CO4	T1/T2	
No. of classes required to complete UNIT-IV		12			No. of classes taken:			

UNIT-V: LAPPING, HONING AND BROACHING MACHINES, JIGS AND FIXTURES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
362.	Introduction to super finishing processes, Types	1	22-09-18		TML1/TML2	CO5	T1/T2	
363.	Working Principle, Comparison to grinding – lapping and honing	1	24-09-18		TML1/TML2	CO5	T1/T2	
364.	Constructional features, Speed, Feed, DC and M/C	1	26-09-18		TML1/TML2	CO5	T1/T2	
365.	Tutorial - VII and Assignment – V	1	28-09-18		TML3/TML6	CO5	T1/T2	
366.	Definitions of Jig and Fixture, comparisons and classifications, Principles of design of Jigs and fixtures	1	29-09-18		TML1/TML2	CO5	T1/T2	
367.	Types of clamping & work holding devices. Typical examples of jigs and fixtures, Tutorial - VIII , Quiz – V, Assignment - VI	1	01-10-18		TML1/TML2	CO5	T1/T2	
No. of classes required to complete UNIT-V		6			No. of classes taken:			

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
368.	Various types of forces, measurement techniques, Machinability case study	1	03-10-18		TML2\ TML 9	CO1	Journal paper, NPTL	
369.	Kinematic Diagrams of Shaper, planner , Drilling machines	1	05-10-18		TML 2	CO2	R1	
370.	Milling machine applications like FSP, FSW	1	06-10-18		TML 9	CO4	Journal paper	

Teaching Learning Methods					
TLM1	Chalk and Talk	TLM4	Problem Solving	TLM7	Seminars or GD
TLM2	PPT	TLM5	Programming	TLM8	Lab Demo
TLM3	Tutorial	TLM6	Assignment or Quiz	TLM9	Case Study

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	11/06/2018	28/07/2018	7W
I Mid Examinations	30/07/2018	04/08/2018	1W
II Phase of Instructions	06/08/2018	06/10/2018	9W
II Mid Examinations	08/10/2018	13/10/2018	1W
Preparation and Practical's	15/10/2018	27/10/2018	2W
Semester End Examinations	29/10/2018	01/11/2018	2W

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment/Quiz – 1	1	A1=5
Assignment/Quiz – 2	2	A2=5
I-Mid Examination	1,2	B1=20
Assignment/Quiz – 3	3	A3=5
Assignment/Quiz – 4	4	A4=5
Assignment/Quiz – 5	5	A5=5
II-Mid Examination	3,4,5	B2=20
Evaluation of Assignment/Quiz Marks: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=5
Evaluation of Mid Marks: $B=75\% \text{ of Max}(B1,B2)+25\% \text{ of Min}(B1,B2)$	1,2,3,4,5	B=20
Cumulative Internal Examination : A+B	1,2,3,4,5	A+B=25
Semester End Examinations	1,2,3,4,5	C=75
Total Marks: A+B+C	1,2,3,4,5	100

Course Instructor

Course Coordinator

Module Coordinator

HOD

LAKKIREDDY BALI REDDY COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
(Autonomous & Affiliated to JNTUK, Kakinada & Approved by AICTE, New Delhi,
NAAC Accredited with 'A' grade, Accredited by NBA, Certified by ISO 9001:2015)
L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

COURSE HANDOUT

PROGRAM : B.Tech, V-Sem., MECH
ACADEMIC YEAR : 2018-19
COURSE NAME & CODE : Metal Cutting and Machine Tools- S 308
L-T-P STRUCTURE : 4-0-0
COURSE CREDITS : 3
COURSE INSTRUCTOR : R.PRAVEEN KUMAR
COURSE COORDINATOR : Dr.K.MURAHARI

PRE-REQUISITE: Basic concepts of Engineering Drawing, Production Technology, Materials and Metallurgy.

COURSE OBJECTIVE: To enable the learners to gain knowledge about metal cutting operation, tool nomenclature, tool geometry and the various operations performed on machine tools for manufacturing of engineering objects to produce the desired shape, size, accuracy; finish etc. and also students able to understand the basic concepts of Jigs and fixtures designs.

COURSE OUTCOMES (CO): At the end of the course, the student will be able to:

CO1: Comprehend the basic principles of metal cutting and analyze the forces in machining.

CO2: Understand detailed working and applications of lathe

CO3: Comprehend the detailed working principle and applications on shaper, slotter, planar, drilling and boring machines

CO4: Relate the knowledge of milling and grinding operations with manufacturing industry

CO5: Identify various kinds of finishing processes and different kinds of holding and guiding mechanisms.

COURSE ARTICULATION MATRIX (Correlation between COs&POs, PSOs):

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	2			2						2	2	3	2
CO2	3	1				2	2					2		3	
CO3	3	2				2	2					2		3	
CO4	3	2					3					2		3	
CO5	3	2	3	2	1							3		3	

Note: Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put '-'
3- Slight (Low), **2** - Moderate (Medium), **3** - Substantial (High).

BOS APPROVED TEXT BOOKS:

T1 R.K. Jain and S.C. Gupta, Production Technology, Khanna publication, 17th Edition, 2012.

T2 H.M.T. (Hindustan Machine Tools), Production Technology, Tata McGraw Hill, 2009.

BOS APPROVED REFERENCE BOOKS:

R1 B.S.RaghuVamshi ,Workshop Technology, DhanpatRai & Co, 10th edition, 2009

R2 Gosh and Malik , Manufacturing Science, East west press Pv.t Ltd., 2ndEdition, 2011.

COURSE DELIVERY PLAN (LESSON PLAN): Section-C

UNIT-I: ELEMENTARY TREATMENT OF METAL CUTTING THEORY

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
371.	Metal cutting and Machine tools, COs and POs PEOs	1	11-06-18		TML1/TML2	CO1	T1/T2	
372.	Introduction, Classification of Machine tools	1	13-06-18		TML1/TML2	CO1	T1/T2	
373.	Basic elements of Metal cutting, Methods of Metal Cutting	1	14-06-18		TML1/TML2	CO1	T1/T2	
374.	Classification of Cutting Tools	1	16-06-18		TML1/TML2	CO1	T1/T2	
375.	Cutting tool materials	1	18-06-18		TML1/TML2	CO1	T1/T2	
376.	Geometry of Single Point Cutting Tool	1	20-06-18		TML1/TML2	CO1	T1/T2	
377.	Mechanism of Metal cutting	1	21-06-18		TML1/TML2	CO1	T1/T2	
378.	Types of chips and Chip breakers	1	23-06-18		TML1/TML2	CO1	T1/T2	
379.	measurement of chip thickness ratio, shear angle	1	25-06-18		TML1/TML2	CO1	T1/T2	
380.	Tutorial - I	1	27-06-18		TML3/TML6	CO1	T1/T2	
381.	measurement of cutting forces, velocity diagrams	1	28-06-18		TML1/TML2	CO1	T1/T2	
382.	Merchant's Force diagram	1	30-06-18		TML1/TML2	CO1	T1/T2	
383.	Numericals	1	02-07-18		TML1/TML2	CO1	T1/T2	
384.	Machining parameters - Tool Life, related problems	1	04-07-18		TML1/TML2	CO1	T1/T2	
385.	Work done in cutting. Metal cutting theories	1	05-07-18		TML1/TML2	CO1	T1/T2	
386.	Tool Failure	1	07-07-18		TML1/TML2	CO1	T1/T2	
387.	Cutting fluids	1	09-07-18		TML1/TML2	CO1	T1/T2	
388.	Tutorial – II, Quiz – I, Assignment - I	1	11-07-18		TML3/TML6	CO1	T1/T2	
No. of classes required to complete UNIT-I		18			No. of classes taken:			

UNIT-II: ENGINE LATHE, TURRET AND CAPSTAN LATHES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
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389.	Introduction, Principle of working	1	12-07-18		TML1/TML2	CO2	T1/T2		
390.	Specification of lathe, classification of Lathes	1	16-07-18		TML1/TML2	CO2	T1/T2		
391.	Lathe accessories, Tool holding,	1	18-07-18		TML1/TML2	CO2	T1/T2		
392.	Work holding and Special attachments	1	19-07-18		TML1/TML2	CO2	T1/T2		
393.	Lathe Operations, Tutorial – III	1	21-07-18		TML1/TML2/TML6	CO2	T1/T2		
394.	Taper turning methods, Thread turning methodology	1	23-07-18		TML1/TML2	CO2	T1/T2		
395.	Turret and Capstan Lathes: Introduction	1	25-07-18		TML1/TML2	CO2	T1/T2		
396.	Principle of working - Collet chucks	1	26-07-18		TML1/TML2	CO2	T1/T2		
397.	Other work and tool holding devices	1	28-07-18		TML1/TML2	CO2	T1/T2		
398.	Box and tool layout, Assignment – II, Quiz-II	1	06-08-18		TML1/TML2/TML6	CO2	T1/T2		
No. of classes required to complete UNIT-II		10			No. of classes taken:				

UNIT-III: SHAPING, SLOTTING, PLANING, DRILLING AND BORING MACHINES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
399.	Introduction to reciprocating machines, Planning	1	08-08-18		TML1/TML2	CO3	T1/T2	
400.	Principles of working – Principal parts, Specification	1	09-08-18		TML1/TML2	CO3	T1/T2	
401.	classification	1	13-08-18		TML1/TML2	CO3	T1/T2	
402.	Operations performed, Machining time calculations	1	16-08-18		TML1/TML2	CO3	T1/T2	
403.	Numericals	1	18-08-18		TML1/TML2	CO3	T1/T2	
404.	Tutorial - IV	1	20-08-18		TML3/TML6	CO3	T1/T2	
405.	Drilling and Boring Machines : Introduction	1	22-08-18		TML1/TML2	CO3	T1/T2	
406.	Principles of working – Principal parts, Specification	1	23-08-18		TML1/TML2	CO3	T1/T2	
407.	Types of drilling machines, boring machines	1	25-08-18		TML1/TML2	CO3	T1/T2	
408.	operations performed	1	27-08-18		TML3/TML6	CO3	T1/T2	
409.	Tool holding devices, Twist drill	1	29-08-18		TML1/TML2	CO3	T1/T2	
410.	Boring machines, Fine boring machines	1	30-08-18		TML1/TML2	CO3	T1/T2	
411.	Deep hole drilling machine	1	01-09-18		TML1/TML2	CO3	T1/T2	

412.	Tutorial – V, Assignment – III, Quiz-III	1	03-09-18		TML3/TML6	CO3	T1/T2	
No. of classes required to complete UNIT-III		14			No. of classes taken:			

UNIT-IV: MILLING AND GRINDING MACHINES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
413.	Principle of working – Specifications	1	05-03-18		TML1/TML2	CO4	T1/T2	
414.	Classifications of milling machines, Principal features of horizontal, vertical and universal milling machines	1	06-09-18		TML1/TML2	CO4	T1/T2	
415.	Methods of operations, various types of operations	1	10-09-18		TML1/TML2	CO4	T1/T2	
416.	Geometry of milling cutters	1	12-09-18		TML1/TML2	CO4	T1/T2	
417.	Types of Milling cutters	1	13-09-18		TML1/TML2	CO4	T1/T2	
418.	Methods of indexing – Accessories to milling machines	1	15-09-18		TML1/TML2	CO4	T1/T2	
419.	Tutorial – VI, Assignment – IV, Grinding Machines: Introduction,	1	17-09-18		TML1/TML2/ TML3/TML6	CO4	T1/T2	
420.	Fundamentals – Theory of grinding, Classification of grinding machine	1	19-09-18		TML1/TML2	CO4	T1/T2	
421.	Grinding wheel description, Types of Abrasive materials and signatures	1	20-09-18		TML1/TML2	CO4	T1/T2	
422.	Cylindrical and surface grinding machine	1	22-09-18		TML1/TML2	CO4	T1/T2	
423.	Tool and cutter grinding machine	1	24-09-18		TML1/TML2	CO4	T1/T2	
424.	special types of grinding machines, Quiz-IV	1	26-09-18		TML1/TML2/TML6	CO4	T1/T2	
No. of classes required to complete UNIT-IV		12			No. of classes taken:			

UNIT-V: LAPPING, HONING AND BROACHING MACHINES, JIGS AND FIXTURES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome Cos	Text Book followed	HOD Sign Weekly
425.	Introduction to super finishing processes, Types	1	27-09-18		TML1/TML2	CO5	T1/T2	

426.	Working Principle, Comparison to grinding – lapping and honing	1	29-09-18		TML1/TML2	CO5	T1/T2	
427.	Constructional features, Speed, Feed, DC and M/C	1	01-10-18		TML1/TML2	CO5	T1/T2	
428.	Tutorial - VII and Assignment – V	1	03-10-18		TML3/TML6	CO5	T1/T2	
429.	Definitions of Jig and Fixture, comparisons and classifications, Principles of design of Jigs and fixtures	1	04-10-18		TML1/TML2	CO5	T1/T2	
430.	Types of clamping & work holding devices. Typical examples of jigs and fixtures, Tutorial - VIII , Quiz – V, Assignment - VI	1	06-10-18		TML1/TML2	CO5	T1/T2	
No. of classes required to complete UNIT-V		6				No. of classes taken:		

Contents beyond the Syllabus

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
431.	Various types of forces, measurement techniques, Machinability case study	1	11-07-18		TML2\ TML 9	CO1	Journal paper, NPTL	
432.	Kinematic Diagrams of Shaper, planner , Drilling machines	1	06-08-18		TML 2	CO2	R1	
433.	Milling machine applications like FSP, FSW	1	26-09-18		TML 9	CO4	Journal paper	

Teaching Learning Methods

TLM1	Chalk and Talk	TLM4	Problem Solving	TLM7	Seminars or GD
TLM2	PPT	TLM5	Programming	TLM8	Lab Demo
TLM3	Tutorial	TLM6	Assignment or Quiz	TLM9	Case Study

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	11/06/2018	28/07/2018	7W
I Mid Examinations	30/07/2018	04/08/2018	1W
II Phase of Instructions	06/08/2018	06/10/2018	9W
II Mid Examinations	08/10/2018	13/10/2018	1W
Preparation and Practical's	15/10/2018	27/10/2018	2W
Semester End Examinations	29/10/2018	01/11/2018	2W

EVALUATION PROCESS:

Evaluation Task	COs	Marks
Assignment/Quiz – 1	1	A1=5
Assignment/Quiz – 2	2	A2=5
I-Mid Examination	1,2	B1=20
Assignment/Quiz – 3	3	A3=5

Assignment/Quiz – 4	4	A4=5
Assignment/Quiz – 5	5	A5=5
II-Mid Examination	3,4,5	B2=20
Evaluation of Assignment/Quiz Marks: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=5
Evaluation of Mid Marks: $B=75\%$ of Max(B1,B2)+25% of Min(B1,B2)	1,2,3,4,5	B=20
Cumulative Internal Examination : A+B	1,2,3,4,5	A+B=25
Semester End Examinations	1,2,3,4,5	C=75
Total Marks: A+B+C	1,2,3,4,5	100

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

Graduates of Mechanical Engineering programme will be:

PEO1: To build a professional career and pursue higher studies with sound knowledge in Mathematics, Science and Mechanical Engineering.

PEO2: To inculcate strong ethical values and leadership qualities for graduates to become successful in multidisciplinary activities.

PEO3: To develop inquisitiveness towards good communication and lifelong learning.

PROGRAMME OUTCOMES (POs):

Engineering Graduates will be able to:

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PSOs:

Graduate of the Mechanical Engineering will have the ability to

1. To apply the principles of thermal sciences to design and develop various thermal systems.
2. To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.
3. To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Course Instructor
Mr.R.Praveen kumar

Course Coordinator
Dr.K.Murahari

Module Coordinator
Mr.J.Subba Reddy

HOD
Dr.S.Pichi
Reddy

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING
(Autonomous & Affiliated to JNTUK, Kakinada & Approved by AICTE, New Delhi,
NAAC Accredited with 'A' grade, Accredited by NBA, Certified by ISO 9001:2015)
L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

COURSE HANDOUT

Part-A

PROGRAM	: B.Tech., V-Sem., Mechanical Engineering
ACADEMIC YEAR	: 2018-19
COURSE NAME & CODE	: Operations Research – S 329
L-T-P STRUCTURE	: 3 (L) – 1 (T) - 0 (P)
COURSE CREDITS	: 3
COURSE INSTRUCTOR	: Mr. J. Subba Reddy, Associate Prof; Mr. B. Chaitanya, Asso. Prof (T)
COURSE COORDINATOR	: Mr. B. Chaitanya, Asso. Prof.
PRE-REQUISITES	: Basic Management Principles, Engineering Mathematics

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of this course is to introduce the concepts of formulating an engineering problem into a mathematical model to develop an optimal solution.

COURSE OUTCOMES (COs)

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

- CO1** : Apply linear programming approach for optimizing the objectives of industrial oriented problems.
- CO2** : Formulate and solve Transportation Models and assignment Models
- CO3** : Implement the strategies in competitive situations and Identify the replacement period of the equipment.
- CO4** : Analyze the waiting situations in an organization.
Determine the optimum inventory level and resolve the complex problem into
- CO5** : simple problems by dynamic programming approach and apply optimum strategies.

COURSE ARTICULATION MATRIX (Correlation between COs&POs,PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3				3			3		3	
CO2	3	3	1	2	1				3			3		3	
CO3	3	3	3	2	1				3			3		3	
CO4	3	2	3	2	3				1			3		3	
CO5	2	3	3	2	1				1			3		3	

Note: Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put '-' **1**- Slight (Low), **2** – Moderate (Medium), **3** - Substantial (High).

BOS APPROVED TEXT BOOKS:

- T1** Kantiswarup. P.K.Gupta, Man Mohan, Operations Research, Sultan Chand & Sons, Educational Publications, New Delhi, 14th Edition, 2008
- T2** Hiller & Libermann, Introduction to Operations Research (TMH), 9TH Edition, 2009

BOS APPROVED REFERENCE BOOKS:

- R1** Singiresu S Rao, Engineering Optimization: Theory and Practice, A Wiley- Interscience Publication, 4th edition,2009.
- R2** A.M.Natarajan, P.Balasubramani, A. Tamilarasi, Operations Research, Pearson Education, 2nd edition, 2014.
- R3** Taha, Introduction to O.R .PHI, 9th edition, 2010.
- R4** S.D.Sharma, Operations Research: Theory and Applications, Kedarnath, Ramnath &Co 2014

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I: INTRODUCTION to OR, LINEAR PROGRAMMING PROBLEM

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	INTRODUCTION : Introduction to Operations Research	1	11-06-2018		TLM1	CO1	T1, T2	
2.	History, Operations Research Models, Applications	1	13-06-2018		TLM1	CO1	T1, T2	
3.	Linear Programming Problem (LPP): Introduction	1	14-06-2018		TLM1	CO1	T1, T2	
4.	Linear Programming Problem Formulation, Tutorial I, Quiz I	1	15-06-2018		TLM1, TLM3	CO1	R1 to R4	
5.	Numericals	1	18-06-2018		TLM1	CO1	T1, T2	
6.	LPP: Graphical Method, Numericals	1	20-06-2018		TLM1	CO1	T1, T2	
7.	Graphical solution for Special Cases of LPP	1	21-06-2018		TLM1	CO1	T1, T2	
8.	Simplex Method, Numericals, Tutorial II, Quiz II	1	22-06-2018		TLM1, TLM3	CO1	R1 to R4	
9.	Numericals	1	25-06-2018		TLM1	CO1	T1, T2	
10.	Problem of degeneracy, its resolution	1	27-06-2018		TLM1	CO1	T1, T2	
11.	Numericals, Big M Method (Artificial Variable Technique)	1	28-06-2018		TLM1	CO1	T1, T2	
12.	Big M Method , Tutorial III, Quiz III	1	29-06-2018		TLM1, TLM3	CO1	R1 to R4	
13.	Two Phase Simplex Method (Artificial Variable Technique)	1	02-07-2018		TLM1	CO1	T1, T2	
14.	Numericals	1	04-07-2018		TLM1	CO1	T1, T2	
15.	Duality Principle	1	05-07-2018		TLM1	CO1	T1, T2	
16.	Numericals, Tutorial IV, Quiz IV	1	06-07-2018		TLM1, TLM3	CO1	R1 to R4	
No. of classes required to complete UNIT-I: 16					No. of classes taken:			

UNIT-II: TRANSPORTATION PROBLEM, ASSIGNMENT PROBLEM

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	TRANSPORTATION PROBLEM (TP) : Introduction to TP, Terminology, Formulation	1	09-07-2018		TLM1	CO2	T1, T2	
2.	Standard form, Unbalanced T P, Numericals	1	11-07-2018		TLM1	CO2	T1, T2	
3.	Initial Basic Feasible Solution to TP: North West Corner Method, Least Cost Entry Method, Vogel's Approximation Method (VAM)	1	12-07-2018		TLM1	CO2	T1, T2	
4.	Numericals, Tutorial V, Quiz V	1	13-07-2018		TLM1, TLM3	CO2	R1 to R4	
5.	Test for Optimality: Stepping Stone Method, Modified Distribution Method (MODI Method)	1	16-07-2018		TLM1	CO2	T1, T2	
6.	Numericals	1	18-07-2018		TLM3	CO2	T1, T2	
7.	Degeneracy in TP, Numericals	1	19-07-2018		TLM1	CO2	T1, T2	
8.	ASSIGNMENT PROBLEM (AP) : Introduction to AP, Terminology; Tutorial VI, Quiz VI	1	20-07-2018		TLM1, TLM3	CO2	R1 to R4	
9.	Variants of Assignment Problem	1	23-07-2018		TLM1	CO2	T1, T2	
10.	Optimal Solution, Numericals	1	25-07-2018		TLM3	CO2	T1, T2	
11.	Travelling Salesmen Problem, Numericals	1	26-07-2018		TLM1	CO2	T1, T2	
12.	Numericals, Tutorial VII, Quiz VII	1	27-07-2018		TLM1, TLM3	CO2	R1 to R4	
13.	I Mid Examinations	6 days	30-07-2018 To 04-08-2018					
No. of classes required to complete UNIT-II: 12					No. of classes taken:			

UNIT-III: GAMES THEORY, REPLACEMENT MODELS (THEORY OF REPLACEMENT)

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	GAMES THEORY: Introduction to Games Theory, Terminology	1	06-08-2018		TLM1	CO3	T1, T2	
2.	Minimax or Maxmini Criterion, Optimal Strategy	1	08-08-2018		TLM1	CO3	T1, T2	
3.	Solution of games with saddle point, without saddle points	1	09-08-2018		TLM3	CO3	T1, T2	
4.	Dominance Principle , Numericals, Tutorial VIII, Quiz VIII	1	10-08-2018		TLM1, TLM3	CO3	R1 to R4	
5.	Dominance Principle, mx2, 2xn games, Graphical approach	1	13-08-2018		TLM1	CO3	T1, T2	
6.	mxn games, LPP Method, Numericals	1	16-08-2018		TLM3	CO3	T1, T2	
7.	THEORY OF REPLACEMENT: Introduction, Terminology, Numericals, Tutorial IX, Quiz IX	1	17-08-2018		TLM1, TLM3	CO3	R1 to R4	
8.	Replacement of Equipment that Deteriorates Gradually, Numericals	1	20-08-2018		TLM3	CO3	T1, T2	
9.	Replacement of Equipment that fails suddenly, Numericals	1	23-08-2018		TLM1	CO3	T1, T2	
10.	Group Replacement Policy, Numericals, Tutorial X, Quiz X	1	24-08-2018		TLM1, TLM3	CO3	R1 to R4	
11.	Numericals	1	27-08-2018		TLM3	CO3	T1, T2	
12.	Numericals	1	29-08-2018		TLM1	CO3	T1, T2	
No. of classes required to complete UNIT-I: 12					No. of classes taken:			

UNIT-IV: WAITING LINES, INVENTORY MODELS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	WAITING LINES: Introduction to Queuing Theory, Single Channel – Poisson arrivals – exponential service times – with infinite population, other distributions	1	30-08-2018		TLM1	CO4	T1, T2	
2.	Derivation, Numericals, Tutorial XI, Quiz XI	1	31-08-2018		TLM1, TLM3	CO4	R1 to R4	
3.	Single Channel – Poisson arrivals – exponential service times – with finite population, Numericals	1	05-09-2018		TLM3	CO4	T1, T2	
4.	Numericals	1	06-09-2018		TLM1	CO4	T1, T2	
5.	Numericals, Tutorial XII, Quiz XII	1	07-09-2018		TLM1, TLM3	CO4	R1 to R4	
6.	INVENTORY MODELS: Introduction to Inventory, Inventory control, Terminology, Economic Order Quantity (EOQ), Numericals	1	10-09-2018		TLM3	CO4	T1, T2	
7.	Deterministic models — Instantaneous production, finite production, continuous demand, no set up cost, shortages are not allowed, Derivation, Numericals	1	12-09-2018		TLM1	CO4	T1, T2	
8.	Numericals, Tutorial XIII, Quiz XIII	1	14-09-2018		TLM1, TLM3	CO4	R1 to R4	
9.	Purchase inventory models with one price break and multiple price breaks, Numericals	1	17-09-2018		TLM3	CO4	T1, T2	
10.	Numericals	1	19-09-2018		TLM1	CO4	T1, T2	
11.	Numericals, Tutorial XIV, Quiz XIV	1	20-09-2018		TLM1, TLM3	CO4	R1 to R4	
No. of classes required to complete UNIT-I: 11					No. of classes taken:			

UNIT-V: DYNAMIC PROGRAMMING (DP), INTRODUCTION TO OPTIMIZATION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	DYNAMIC PROGRAMMING (DP): Introduction to DP, Bellman's Principle of Optimality, Applications of Dynamic Programming	1	24-09-2018		TLM1	CO5	T1, T2	
2.	Capital Budgeting Problem, Numericals	1	26-09-2018		TLM1	CO5	T1, T2	
3.	Shortest Path Problem, Numericals	1	27-09-2018		TLM3	CO5	T1, T2	
4.	Linear Programming Problem, Numericals Tutorial XV, Quiz XV	1	28-09-2018		TLM1, TLM3	CO5	R1 to R4	
5.	Numericals	1	01-10-2018		TLM1	CO5	T1, T2	
6.	INTRODUCTION TO OPTIMIZATION: Introduction, Engineering Applications of Optimization, Problem Statement, Design Vector, Design Constraints, Constraints Surface, Objective Function, Objective Function Surfaces, Numericals	1	03-10-2018		TLM3	CO5	T1, T2	
7.	Classification of Optimization Problems, Optimization Techniques: Introduction, Single Variable Optimization	1	04-10-2018		TLM1	CO5	T1, T2	
8.	Numericals, Tutorial XVI, Quiz XVI	1	05-10-2018		TLM1, TLM3	CO5	R1 to R4	
9.	II Mid Examinations	6 days	08-10-2018 To 13-10-2018					

No. of classes required to complete UNIT-I: 08

No. of classes taken:

CONTENTS BEYOND THE SYLLABUS:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign
1.	Advanced Topics in Unit I	1	06-07-2018		TLM1	CO1	T1, T2, R1 to R5	
2.	Advanced Topics in Unit II	1	27-07-2018		TLM1	CO2		
3.	Advanced Topics in Unit III	1	29-08-2018		TLM1	CO3		
4.	Advanced Topics in Unit IV	1	20-09-2018		TLM1	CO4		
5.	Advanced Topics in Unit V	1	05-10-2018		TLM1	CO5		

Teaching Learning Methods			
TLM1	Chalk and Talk	TLM4	Demonstration (Lab/Field Visit)
TLM2	PPT	TLM5	ICT (NPTEL/Swayam Prabha/MOOCs)
TLM3	Tutorial	TLM6	Group Discussion/Project

ACADEMIC CALENDAR:

Description	From	To	Weeks
Commencement of Class Work: 18-12-2017			
I Phase of Instructions	11-06-2018	28-07-2018	7
I Mid Examinations	30-07-2018	04-08-2018	1
II Phase of Instructions	06-08-2018	06-10-2018	9
II Mid Examinations	08-10-2018	13-10-2018	1
Preparation and Practicals	15-10-2018	27-10-2018	2
Semester End Examinations	29-10-2018	10-11-2018	2

Part - C**EVALUATION PROCESS:**

Evaluation Task	COs	Marks
Assignment/Quiz – 1	1	A1=05
Assignment/Quiz – 2	2	A2=05
I-Mid Examination	1,2	B1=20
Assignment/Quiz – 3	3	A3=05
Assignment/Quiz – 4	4	A4=05
Assignment/Quiz – 5	5	A5=05
II-Mid Examination	3,4,5	B2=20
Evaluation of Assignment/Quiz Marks: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=05
Evaluation of Mid Marks: $B=75\% \text{ of Max}(B1,B2)+25\% \text{ of Min}(B1,B2)$	1,2,3,4,5	B=20
Cumulative Internal Examination : A+B	1,2,3,4,5	A+B=25
Semester End Examinations	1,2,3,4,5	C=75
Total Marks: A+B+C	1,2,3,4,5	A+B+C=100

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO1: To build a professional career and pursue higher studies with sound knowledge in Mathematics, Science and Mechanical Engineering.

PEO2: To inculcate strong ethical values and leadership qualities for graduates to become successful in multidisciplinary activities.

PEO3: To develop inquisitiveness towards good communication and lifelong learning.

PROGRAMME OUTCOMES (POs):

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO1: To apply the principles of thermal sciences to design and develop various thermal systems.

PSO2: To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.

PSO3: To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Position	Course Instructor	Course Coordinator	Module Coordinator	HOD
Name	J. SUBBA REDDY	B. CHAITANYA	J. SUBBA REDDY	Dr. S. PICHU REDDY
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
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L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

COURSE HANDOUT

Part-A

PROGRAM	: B.Tech., V-Sem., Mechanical Engineering
ACADEMIC YEAR	: 2018-19
COURSE NAME & CODE	: Operations Research – S 329
L-T-P STRUCTURE	: 3 (L) – 1 (T) - 0 (P)
COURSE CREDITS	: 3
COURSE INSTRUCTOR	: Mr. B.Chaitanya, Associate Prof; Mr.J.Subba Reddy Associate Prof
COURSE COORDINATOR	: Mr. B. Chaitanya, Asso. Prof.
PRE-REQUISITES	: Basic Management Principles, Engineering Mathematics

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of this course is to introduce the concepts of formulating an engineering problem into a mathematical model to develop an optimal solution.

COURSE OUTCOMES (COs)

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

- CO1** : Apply linear programming approach for optimizing the objectives of industrial oriented problems.
- CO2** : Formulate and solve Transportation Models and assignment Models
- CO3** : Implement the strategies in competitive situations and Identify the replacement period of the equipment.
- CO4** : Analyze the waiting situations in an organization.
Determine the optimum inventory level and resolve the complex problem into
- CO5** : simple problems by dynamic programming approach and apply optimum strategies.

COURSE ARTICULATION MATRIX (Correlation between COs&POs,PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3				3			3		3	
CO2	3	3	1	2	1				3			3		3	
CO3	3	3	3	2	1				3			3		3	
CO4	3	2	3	2	3				1			3		3	
CO5	2	3	3	2	1				1			3		3	

Note: Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put '-' **1-** Slight (Low), **2 –** Moderate (Medium), **3 -** Substantial (High).

BOS APPROVED TEXT BOOKS:

- T1** Kantiswarup. P.K.Gupta, Man Mohan, Operations Research, Sultan Chand & Sons, Educational Publications, New Delhi, 14th Edition, 2008
- T2** Hiller & Libermann, Introduction to Operations Research (TMH), 9TH Edition, 2009

BOS APPROVED REFERENCE BOOKS:

- R1** Singiresu S Rao, Engineering Optimization: Theory and Practice, A Wiley- Interscience Publication, 4th edition,2009.
- R2** A.M.Natarajan, P.Balasubramani, A. Tamilarasi, Operations Research, Pearson Education, 2nd edition, 2014.
- R3** Taha, Introduction to O.R .PHI, 9th edition, 2010.
- R4** S.D.Sharma, Operations Research: Theory and Applications, Kedarnath, Ramnath &Co 2014

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-B

UNIT-I: INTRODUCTION to OR, LINEAR PROGRAMMING PROBLEM

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
17.	INTRODUCTION : Introduction to Operations Research	1	11-06-2018		TLM1	CO1	T1, T2	
18.	History, Operations Research Models, Applications	1	13-06-2018		TLM1	CO1	T1, T2	
19.	Linear Programming Problem (LPP): Introduction	1	14-06-2018		TLM1	CO1	T1, T2	
20.	Linear Programming Problem Formulation, Tutorial I, Quiz I	1	15-06-2018		TLM1, TLM3	CO1	R1 to R4	
21.	Numericals	1	18-06-2018		TLM1	CO1	T1, T2	
22.	LPP: Graphical Method, Numericals	1	20-06-2018		TLM1	CO1	T1, T2	
23.	Graphical solution for Special Cases of LPP	1	21-06-2018		TLM1	CO1	T1, T2	
24.	Simplex Method, Numericals, Tutorial II, Quiz II	1	22-06-2018		TLM1, TLM3	CO1	R1 to R4	
25.	Numericals	1	25-06-2018		TLM1	CO1	T1, T2	
26.	Problem of degeneracy, its resolution	1	27-06-2018		TLM1	CO1	T1, T2	
27.	Numericals, Big M Method (Artificial Variable Technique)	1	28-06-2018		TLM1	CO1	T1, T2	
28.	Big M Method , Tutorial III, Quiz III	1	29-06-2018		TLM1, TLM3	CO1	R1 to R4	
29.	Two Phase Simplex Method (Artificial Variable Technique)	1	02-07-2018		TLM1	CO1	T1, T2	
30.	Numericals	1	04-07-2018		TLM1	CO1	T1, T2	
31.	Duality Principle	1	05-07-2018		TLM1	CO1	T1, T2	
32.	Numericals, Tutorial IV, Quiz IV	1	06-07-2018		TLM1, TLM3	CO1	R1 to R4	
No. of classes required to complete UNIT-I: 16					No. of classes taken:			

UNIT-II: TRANSPORTATION PROBLEM, ASSIGNMENT PROBLEM

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
14.	TRANSPORTATION PROBLEM (TP) : Introduction to TP, Terminology, Formulation	1	09-07-2018		TLM1	CO2	T1, T2	
15.	Standard form, Unbalanced T P, Numericals	1	11-07-2018		TLM1	CO2	T1, T2	
16.	Initial Basic Feasible Solution to TP: North West Corner Method, Least Cost Entry Method, Vogel's Approximation Method (VAM)	1	12-07-2018		TLM1	CO2	T1, T2	
17.	Numericals, Tutorial V, Quiz V	1	13-07-2018		TLM1, TLM3	CO2	R1 to R4	
18.	Test for Optimality: Stepping Stone Method, Modified Distribution Method (MODI Method)	1	16-07-2018		TLM1	CO2	T1, T2	
19.	Numericals	1	18-07-2018		TLM3	CO2	T1, T2	
20.	Degeneracy in TP, Numericals	1	19-07-2018		TLM1	CO2	T1, T2	
21.	ASSIGNMENT PROBLEM (AP) : Introduction to AP, Terminology; Tutorial VI, Quiz VI	1	20-07-2018		TLM1, TLM3	CO2	R1 to R4	
22.	Variants of Assignment Problem	1	23-07-2018		TLM1	CO2	T1, T2	
23.	Optimal Solution, Numericals	1	25-07-2018		TLM3	CO2	T1, T2	
24.	Travelling Salesmen Problem, Numericals	1	26-07-2018		TLM1	CO2	T1, T2	
25.	Numericals, Tutorial VII, Quiz VII	1	27-07-2018		TLM1, TLM3	CO2	R1 to R4	
26.	I Mid Examinations	6 days	30-07-2018 To 04-08-2018					
No. of classes required to complete UNIT-II: 12					No. of classes taken:			

UNIT-III: GAMES THEORY, REPLACEMENT MODELS (THEORY OF REPLACEMENT)

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
13.	GAMES THEORY: Introduction to Games Theory, Terminology	1	06-08-2018		TLM1	CO3	T1, T2	
14.	Minimax or Maxmini Criterion, Optimal Strategy	1	08-08-2018		TLM1	CO3	T1, T2	
15.	Solution of games with saddle point, without saddle points	1	09-08-2018		TLM3	CO3	T1, T2	
16.	Dominance Principle , Numericals, Tutorial VIII, Quiz VIII	1	10-08-2018		TLM1, TLM3	CO3	R1 to R4	
17.	Dominance Principle, mx2, 2xn games, Graphical approach	1	13-08-2018		TLM1	CO3	T1, T2	
18.	mxn games, LPP Method, Numericals	1	16-08-2018		TLM3	CO3	T1, T2	
19.	THEORY OF REPLACEMENT: Introduction, Terminology, Numericals, Tutorial IX, Quiz IX	1	17-08-2018		TLM1, TLM3	CO3	R1 to R4	
20.	Replacement of Equipment that Deteriorates Gradually, Numericals	1	20-08-2018		TLM3	CO3	T1, T2	
21.	Replacement of Equipment that fails suddenly, Numericals	1	23-08-2018		TLM1	CO3	T1, T2	
22.	Group Replacement Policy, Numericals, Tutorial X, Quiz X	1	24-08-2018		TLM1, TLM3	CO3	R1 to R4	
23.	Numericals	1	27-08-2018		TLM3	CO3	T1, T2	
24.	Numericals	1	29-08-2018		TLM1	CO3	T1, T2	
No. of classes required to complete UNIT-I: 12					No. of classes taken:			

UNIT-IV: WAITING LINES, INVENTORY MODELS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
12.	WAITING LINES: Introduction to Queuing Theory, Single Channel – Poisson arrivals – exponential service times – with infinite population, other distributions	1	30-08-2018		TLM1	CO4	T1, T2	
13.	Derivation, Numericals, Tutorial XI, Quiz XI	1	31-08-2018		TLM1, TLM3	CO4	R1 to R4	
14.	Single Channel – Poisson arrivals – exponential service times – with finite population, Numericals	1	05-09-2018		TLM3	CO4	T1, T2	
15.	Numericals	1	06-09-2018		TLM1	CO4	T1, T2	
16.	Numericals, Tutorial XII, Quiz XII	1	07-09-2018		TLM1, TLM3	CO4	R1 to R4	
17.	INVENTORY MODELS: Introduction to Inventory, Inventory control, Terminology, Economic Order Quantity (EOQ), Numericals	1	10-09-2018		TLM3	CO4	T1, T2	
18.	Deterministic models — Instantaneous production, finite production, continuous demand, no set up cost, shortages are not allowed, Derivation, Numericals	1	12-09-2018		TLM1	CO4	T1, T2	
19.	Numericals, Tutorial XIII, Quiz XIII	1	14-09-2018		TLM1, TLM3	CO4	R1 to R4	
20.	Purchase inventory models with one price break and multiple price breaks, Numericals	1	17-09-2018		TLM3	CO4	T1, T2	
21.	Numericals	1	19-09-2018		TLM1	CO4	T1, T2	
22.	Numericals, Tutorial XIV, Quiz XIV	1	20-09-2018		TLM1, TLM3	CO4	R1 to R4	
No. of classes required to complete UNIT-I: 11					No. of classes taken:			

UNIT-V: DYNAMIC PROGRAMMING (DP), INTRODUCTION TO OPTIMIZATION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
10.	DYNAMIC PROGRAMMING (DP): Introduction to DP, Bellman's Principle of Optimality, Applications of Dynamic Programming	1	24-09-2018		TLM1	CO5	T1, T2	
11.	Capital Budgeting Problem, Numericals	1	26-09-2018		TLM1	CO5	T1, T2	
12.	Shortest Path Problem, Numericals	1	27-09-2018		TLM3	CO5	T1, T2	
13.	Linear Programming Problem, Numericals Tutorial XV, Quiz XV	1	28-09-2018		TLM1, TLM3	CO5	R1 to R4	
14.	Numericals	1	01-10-2018		TLM1	CO5	T1, T2	
15.	INTRODUCTION TO OPTIMIZATION: Introduction, Engineering Applications of Optimization, Problem Statement, Design Vector, Design Constraints, Constraints Surface, Objective Function, Objective Function Surfaces, Numericals	1	03-10-2018		TLM3	CO5	T1, T2	
16.	Classification of Optimization Problems, Optimization Techniques: Introduction, Single Variable Optimization	1	04-10-2018		TLM1	CO5	T1, T2	
17.	Numericals, Tutorial XVI, Quiz XVI	1	05-10-2018		TLM1, TLM3	CO5	R1 to R4	
18.	II Mid Examinations	6 days	08-10-2018 To 13-10-2018					

No. of classes required to complete UNIT-I: 08

No. of classes taken:

CONTENTS BEYOND THE SYLLABUS:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign
6.	Advanced Topics in Unit I	1	06-07-2018		TLM1	CO1	T1, T2, R1 to R5	
7.	Advanced Topics in Unit II	1	27-07-2018		TLM1	CO2		
8.	Advanced Topics in Unit III	1	29-08-2018		TLM1	CO3		
9.	Advanced Topics in Unit IV	1	20-09-2018		TLM1	CO4		
10.	Advanced Topics in Unit V	1	05-10-2018		TLM1	CO5		

Teaching Learning Methods			
TLM1	Chalk and Talk	TLM4	Demonstration (Lab/Field Visit)
TLM2	PPT	TLM5	ICT (NPTEL/Swayam Prabha/MOOCs)
TLM3	Tutorial	TLM6	Group Discussion/Project

ACADEMIC CALENDAR:

Description	From	To	Weeks
Commencement of Class Work: 18-12-2017			
I Phase of Instructions	11-06-2018	28-07-2018	7
I Mid Examinations	30-07-2018	04-08-2018	1
II Phase of Instructions	06-08-2018	06-10-2018	9
II Mid Examinations	08-10-2018	13-10-2018	1
Preparation and Practicals	15-10-2018	27-10-2018	2
Semester End Examinations	29-10-2018	10-11-2018	2

Part - C**EVALUATION PROCESS:**

Evaluation Task	COs	Marks
Assignment/Quiz – 1	1	A1=05
Assignment/Quiz – 2	2	A2=05
I-Mid Examination	1,2	B1=20
Assignment/Quiz – 3	3	A3=05
Assignment/Quiz – 4	4	A4=05
Assignment/Quiz – 5	5	A5=05
II-Mid Examination	3,4,5	B2=20
Evaluation of Assignment/Quiz Marks: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=05
Evaluation of Mid Marks: $B=75\% \text{ of Max}(B1,B2)+25\% \text{ of Min}(B1,B2)$	1,2,3,4,5	B=20
Cumulative Internal Examination : A+B	1,2,3,4,5	A+B=25
Semester End Examinations	1,2,3,4,5	C=75
Total Marks: A+B+C	1,2,3,4,5	A+B+C=100

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO1: To build a professional career and pursue higher studies with sound knowledge in Mathematics, Science and Mechanical Engineering.

PEO2: To inculcate strong ethical values and leadership qualities for graduates to become successful in multidisciplinary activities.

PEO3: To develop inquisitiveness towards good communication and lifelong learning.

PROGRAMME OUTCOMES (POs):

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

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8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

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10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO1: To apply the principles of thermal sciences to design and develop various thermal systems.

PSO2: To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.

PSO3: To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Position	Course Instructor	Course Coordinator	Module Coordinator	HOD
Name				
Signature	B.Chaitanya	B.Chaitanya	J.Subba Reddy	Dr S.Pichi Reddy

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L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

COURSE HANDOUT

Part-A

PROGRAM	: B.Tech., V-Sem., Mechanical Engineering
ACADEMIC YEAR	: 2018-19
COURSE NAME & CODE	: Operations Research – S 329
L-T-P STRUCTURE	: 3 (L) – 1 (T) - 0 (P)
COURSE CREDITS	: 3
COURSE INSTRUCTOR	: Mr. B.Chaitanya, Associate Prof; Mr.J.Subba Reddy Associate Prof
COURSE COORDINATOR	: Mr. B. Chaitanya, Asso. Prof.
PRE-REQUISITES	: Basic Management Principles, Engineering Mathematics

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of this course is to introduce the concepts of formulating an engineering problem into a mathematical model to develop an optimal solution.

COURSE OUTCOMES (COs)

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

- CO1** : Apply linear programming approach for optimizing the objectives of industrial oriented problems.
- CO2** : Formulate and solve Transportation Models and assignment Models
- CO3** : Implement the strategies in competitive situations and Identify the replacement period of the equipment.
- CO4** : Analyze the waiting situations in an organization.
Determine the optimum inventory level and resolve the complex problem into
- CO5** : simple problems by dynamic programming approach and apply optimum strategies.

COURSE ARTICULATION MATRIX (Correlation between COs&POs,PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3				3			3		3	
CO2	3	3	1	2	1				3			3		3	
CO3	3	3	3	2	1				3			3		3	
CO4	3	2	3	2	3				1			3		3	
CO5	2	3	3	2	1				1			3		3	

Note: Enter Correlation Levels **1** or **2** or **3**. If there is no correlation, put '-' **1-** Slight (Low), **2 –** Moderate (Medium), **3 -** Substantial (High).

BOS APPROVED TEXT BOOKS:

- T1** Kantiswarup. P.K.Gupta, Man Mohan, Operations Research, Sultan Chand & Sons, Educational Publications, New Delhi, 14th Edition, 2008
- T2** Hiller & Libermann, Introduction to Operations Research (TMH), 9th Edition, 2009

BOS APPROVED REFERENCE BOOKS:

- R1** Singiresu S Rao, Engineering Optimization: Theory and Practice, A Wiley- Interscience Publication, 4th edition,2009.
- R2** A.M.Natarajan, P.Balasubramani, A. Tamilarasi, Operations Research, Pearson Education, 2nd edition, 2014.
- R3** Taha, Introduction to O.R .PHI, 9th edition, 2010.
- R4** S.D.Sharma, Operations Research: Theory and Applications, Kedarnath, Ramnath &Co 2014

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-C

UNIT-I: INTRODUCTION to OR, LINEAR PROGRAMMING PROBLEM

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
33.	INTRODUCTION : Introduction to Operations Research	1	11-06-2018		TLM1	CO1	T1, T2	
34.	History, Operations Research Models, Applications	1	13-06-2018		TLM1	CO1	T1, T2	
35.	Linear Programming Problem (LPP): Introduction	1	14-06-2018		TLM1	CO1	T1, T2	
36.	Linear Programming Problem Formulation, Tutorial I, Quiz I	1	15-06-2018		TLM1, TLM3	CO1	R1 to R4	
37.	Numericals	1	18-06-2018		TLM1	CO1	T1, T2	
38.	LPP: Graphical Method, Numericals	1	20-06-2018		TLM1	CO1	T1, T2	
39.	Graphical solution for Special Cases of LPP	1	21-06-2018		TLM1	CO1	T1, T2	
40.	Simplex Method, Numericals, Tutorial II, Quiz II	1	22-06-2018		TLM1, TLM3	CO1	R1 to R4	
41.	Numericals	1	25-06-2018		TLM1	CO1	T1, T2	
42.	Problem of degeneracy, its resolution	1	27-06-2018		TLM1	CO1	T1, T2	
43.	Numericals, Big M Method (Artificial Variable Technique)	1	28-06-2018		TLM1	CO1	T1, T2	
44.	Big M Method , Tutorial III, Quiz III	1	29-06-2018		TLM1, TLM3	CO1	R1 to R4	
45.	Two Phase Simplex Method (Artificial Variable Technique)	1	02-07-2018		TLM1	CO1	T1, T2	
46.	Numericals	1	04-07-2018		TLM1	CO1	T1, T2	
47.	Duality Principle	1	05-07-2018		TLM1	CO1	T1, T2	
48.	Numericals, Tutorial IV, Quiz IV	1	06-07-2018		TLM1, TLM3	CO1	R1 to R4	
No. of classes required to complete UNIT-I: 16					No. of classes taken:			

UNIT-II: TRANSPORTATION PROBLEM, ASSIGNMENT PROBLEM

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
27.	TRANSPORTATION PROBLEM (TP) : Introduction to TP, Terminology, Formulation	1	09-07-2018		TLM1	CO2	T1, T2	
28.	Standard form, Unbalanced T P, Numericals	1	11-07-2018		TLM1	CO2	T1, T2	
29.	Initial Basic Feasible Solution to TP: North West Corner Method, Least Cost Entry Method, Vogel's Approximation Method (VAM)	1	12-07-2018		TLM1	CO2	T1, T2	
30.	Numericals, Tutorial V, Quiz V	1	13-07-2018		TLM1, TLM3	CO2	R1 to R4	
31.	Test for Optimality: Stepping Stone Method, Modified Distribution Method (MODI Method)	1	16-07-2018		TLM1	CO2	T1, T2	
32.	Numericals	1	18-07-2018		TLM3	CO2	T1, T2	
33.	Degeneracy in TP, Numericals	1	19-07-2018		TLM1	CO2	T1, T2	
34.	ASSIGNMENT PROBLEM (AP) : Introduction to AP, Terminology; Tutorial VI, Quiz VI	1	20-07-2018		TLM1, TLM3	CO2	R1 to R4	
35.	Variants of Assignment Problem	1	23-07-2018		TLM1	CO2	T1, T2	
36.	Optimal Solution, Numericals	1	25-07-2018		TLM3	CO2	T1, T2	
37.	Travelling Salesmen Problem, Numericals	1	26-07-2018		TLM1	CO2	T1, T2	
38.	Numericals, Tutorial VII, Quiz VII	1	27-07-2018		TLM1, TLM3	CO2	R1 to R4	
39.	I Mid Examinations	6 days	30-07-2018 To 04-08-2018					
No. of classes required to complete UNIT-II: 12					No. of classes taken:			

UNIT-III: GAMES THEORY, REPLACEMENT MODELS (THEORY OF REPLACEMENT)

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
25.	GAMES THEORY: Introduction to Games Theory, Terminology	1	06-08-2018		TLM1	CO3	T1, T2	
26.	Minimax or Maxmini Criterion, Optimal Strategy	1	08-08-2018		TLM1	CO3	T1, T2	
27.	Solution of games with saddle point, without saddle points	1	09-08-2018		TLM3	CO3	T1, T2	
28.	Dominance Principle , Numericals, Tutorial VIII, Quiz VIII	1	10-08-2018		TLM1, TLM3	CO3	R1 to R4	
29.	Dominance Principle, mx2, 2xn games, Graphical approach	1	13-08-2018		TLM1	CO3	T1, T2	
30.	mxn games, LPP Method, Numericals	1	16-08-2018		TLM3	CO3	T1, T2	
31.	THEORY OF REPLACEMENT: Introduction, Terminology, Numericals, Tutorial IX, Quiz IX	1	17-08-2018		TLM1, TLM3	CO3	R1 to R4	
32.	Replacement of Equipment that Deteriorates Gradually, Numericals	1	20-08-2018		TLM3	CO3	T1, T2	
33.	Replacement of Equipment that fails suddenly, Numericals	1	23-08-2018		TLM1	CO3	T1, T2	
34.	Group Replacement Policy, Numericals, Tutorial X, Quiz X	1	24-08-2018		TLM1, TLM3	CO3	R1 to R4	
35.	Numericals	1	27-08-2018		TLM3	CO3	T1, T2	
36.	Numericals	1	29-08-2018		TLM1	CO3	T1, T2	
No. of classes required to complete UNIT-I: 12					No. of classes taken:			

UNIT-IV: WAITING LINES, INVENTORY MODELS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
23.	WAITING LINES: Introduction to Queuing Theory, Single Channel – Poisson arrivals – exponential service times – with infinite population, other distributions	1	30-08-2018		TLM1	CO4	T1, T2	
24.	Derivation, Numericals, Tutorial XI, Quiz XI	1	31-08-2018		TLM1, TLM3	CO4	R1 to R4	
25.	Single Channel – Poisson arrivals – exponential service times – with finite population, Numericals	1	05-09-2018		TLM3	CO4	T1, T2	
26.	Numericals	1	06-09-2018		TLM1	CO4	T1, T2	
27.	Numericals, Tutorial XII, Quiz XII	1	07-09-2018		TLM1, TLM3	CO4	R1 to R4	
28.	INVENTORY MODELS: Introduction to Inventory, Inventory control, Terminology, Economic Order Quantity (EOQ), Numericals	1	10-09-2018		TLM3	CO4	T1, T2	
29.	Deterministic models — Instantaneous production, finite production, continuous demand, no set up cost, shortages are not allowed, Derivation, Numericals	1	12-09-2018		TLM1	CO4	T1, T2	
30.	Numericals, Tutorial XIII, Quiz XIII	1	14-09-2018		TLM1, TLM3	CO4	R1 to R4	
31.	Purchase inventory models with one price break and multiple price breaks, Numericals	1	17-09-2018		TLM3	CO4	T1, T2	
32.	Numericals	1	19-09-2018		TLM1	CO4	T1, T2	
33.	Numericals, Tutorial XIV, Quiz XIV	1	20-09-2018		TLM1, TLM3	CO4	R1 to R4	
No. of classes required to complete UNIT-I: 11					No. of classes taken:			

UNIT-V: DYNAMIC PROGRAMMING (DP), INTRODUCTION TO OPTIMIZATION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
19.	DYNAMIC PROGRAMMING (DP): Introduction to DP, Bellman's Principle of Optimality, Applications of Dynamic Programming	1	24-09-2018		TLM1	CO5	T1, T2	
20.	Capital Budgeting Problem, Numericals	1	26-09-2018		TLM1	CO5	T1, T2	
21.	Shortest Path Problem, Numericals	1	27-09-2018		TLM3	CO5	T1, T2	
22.	Linear Programming Problem, Numericals Tutorial XV, Quiz XV	1	28-09-2018		TLM1, TLM3	CO5	R1 to R4	
23.	Numericals	1	01-10-2018		TLM1	CO5	T1, T2	
24.	INTRODUCTION TO OPTIMIZATION: Introduction, Engineering Applications of Optimization, Problem Statement, Design Vector, Design Constraints, Constraints Surface, Objective Function, Objective Function Surfaces, Numericals	1	03-10-2018		TLM3	CO5	T1, T2	
25.	Classification of Optimization Problems, Optimization Techniques: Introduction, Single Variable Optimization	1	04-10-2018		TLM1	CO5	T1, T2	
26.	Numericals, Tutorial XVI, Quiz XVI	1	05-10-2018		TLM1, TLM3	CO5	R1 to R4	
27.	II Mid Examinations	6 days	08-10-2018 To 13-10-2018					

No. of classes required to complete UNIT-I: 08

No. of classes taken:

CONTENTS BEYOND THE SYLLABUS:

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign
11.	Advanced Topics in Unit I	1	06-07-2018		TLM1	CO1	T1, T2, R1 to R5	
12.	Advanced Topics in Unit II	1	27-07-2018		TLM1	CO2		
13.	Advanced Topics in Unit III	1	29-08-2018		TLM1	CO3		
14.	Advanced Topics in Unit IV	1	20-09-2018		TLM1	CO4		
15.	Advanced Topics in Unit V	1	05-10-2018		TLM1	CO5		

Teaching Learning Methods			
TLM1	Chalk and Talk	TLM4	Demonstration (Lab/Field Visit)
TLM2	PPT	TLM5	ICT (NPTEL/Swayam Prabha/MOOCs)
TLM3	Tutorial	TLM6	Group Discussion/Project

ACADEMIC CALENDAR:

Description	From	To	Weeks
Commencement of Class Work: 18-12-2017			
I Phase of Instructions	11-06-2018	28-07-2018	7
I Mid Examinations	30-07-2018	04-08-2018	1
II Phase of Instructions	06-08-2018	06-10-2018	9
II Mid Examinations	08-10-2018	13-10-2018	1
Preparation and Practicals	15-10-2018	27-10-2018	2
Semester End Examinations	29-10-2018	10-11-2018	2

Part - C**EVALUATION PROCESS:**

Evaluation Task	COs	Marks
Assignment/Quiz – 1	1	A1=05
Assignment/Quiz – 2	2	A2=05
I-Mid Examination	1,2	B1=20
Assignment/Quiz – 3	3	A3=05
Assignment/Quiz – 4	4	A4=05
Assignment/Quiz – 5	5	A5=05
II-Mid Examination	3,4,5	B2=20
Evaluation of Assignment/Quiz Marks: $A=(A1+A2+A3+A4+A5)/5$	1,2,3,4,5	A=05
Evaluation of Mid Marks: $B=75\% \text{ of Max}(B1,B2)+25\% \text{ of Min}(B1,B2)$	1,2,3,4,5	B=20
Cumulative Internal Examination : A+B	1,2,3,4,5	A+B=25
Semester End Examinations	1,2,3,4,5	C=75
Total Marks: A+B+C	1,2,3,4,5	A+B+C=100

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO1: To build a professional career and pursue higher studies with sound knowledge in Mathematics, Science and Mechanical Engineering.

PEO2: To inculcate strong ethical values and leadership qualities for graduates to become successful in multidisciplinary activities.

PEO3: To develop inquisitiveness towards good communication and lifelong learning.

PROGRAMME OUTCOMES (POs):

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO1: To apply the principles of thermal sciences to design and develop various thermal systems.

PSO2: To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.

PSO3: To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Position	Course Instructor	Course Coordinator	Module Coordinator	HOD
Name				
Signature	<i>B.Chaitanya</i>	<i>B.Chaitanya</i>	<i>J.Subba Reddy</i>	<i>Dr S.Pichi Reddy</i>

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

DEPARTMENT OF MECHANICAL ENGINEERING

Schedule of Thermal Engineering Lab (Section – A)

Name of the Faculty : V Dhanaraju (Sr. Assistant Professor) / A.V.V.R Prasad Y (Assistant Professor)
Class : B. Tech – V Semester (**Section – A**) **A.Y.** : 2018-19
Subject : Thermal Engineering Lab **Branch:** Mechanical
Batch : B1 **Regd Nos** : 16761A0301 – 16761A0337 = 33

S. No	Date	Batches					
		B11	B12	B13	B14	B15	B16
Cycle - I							
1	12/06/18	Demo	Demo	Demo	Demo	Demo	Demo
2	19/06/18	Exp 1	Exp – 2	Exp – 3	Exp – 4	Exp – 5	Exp - 6
3	26/06/18	Exp – 2	Exp– 3	Exp – 4	Exp – 5	Exp - 6	Exp – 1
4	03/07/18	Exp – 3	Exp– 4	Exp – 5	Exp - 6	Exp – 1	Exp – 2
5	10/07/18	Exp – 4	Exp-5	Exp - 6	Exp – 1	Exp – 2	Exp – 3
6	17/07/18	Exp – 5	Exp-6	Exp – 1	Exp – 2	Exp – 3	Exp – 4
7	24/07/18	Exp - 6	Exp – 1	T Exp – 2	Exp – 3	Exp – 4	Exp – 5
Cycle -II							
8	7/8/18	Demo	Demo	Demo	Demo	Demo	Demo
9	14/8/18	Exp - 7	Exp – 8	Exp – 9	Exp - 10	Exp - 11	Exp - 12
10	21/8/18	Exp – 8	Exp – 9	Exp – 10	Exp - 11	Exp - 12	Exp - 7
11	28/8/18	Exp – 9	Exp – 10	Exp – 11	Exp - 12	Exp - 7	Exp - 8
12	4/9/18	Exp – 10	Exp – 11	Exp – 12	Exp - 7	Exp - 8	Exp - 9
13	11/9/18	Exp – 11	Exp – 12	Exp – 7	Exp - 8	Exp - 9	Exp - 10
14	18/9/18	Exp - 12	Exp - 7	Exp - 8	Exp - 9	Exp - 10	Exp - 11
15	25/9/18	Repetition					
16		Internal Examination					

Batches:

Batch	B11	B12	B13	B14	B15	B16
Regd Nos	16761A0301– 306	16761A0307 – 313	16761A0314 – 318	16761A0319 – 324	16761A0325– 330	16761A0331 – 337

Staff In-charge

HoD

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

DEPARTMENT OF MECHANICAL ENGINEERING

Schedule of Thermal Engineering Lab (Section – A)

Name of the Faculty : V Dhanaraju (Sr. Assistant Professor) / A.V.V.R Prasad Y (Assistant Professor)
Class : B. Tech – V Semester (Section – A) **A.Y.** : 2018-19
Subject : Thermal Engineering Lab **Branch:** Mechanical
Batch : B2 **Regd Nos** : 16761A0338 –357 & 17765A0301-312 = 32

S. No	Date	Batches					
		A21	A22	A23	A24	A25	A26
Cycle - I							
1	14/06/18	Demo	Demo	Demo	Demo	Demo	Demo
2	21/06/18	Exp 1	Exp – 2	Exp – 3	Exp – 4	Exp – 5	Exp - 6
3	28/06/18	Exp – 2	Exp– 3	Exp – 4	Exp – 5	Exp - 6	Exp – 1
4	05/07/18	Exp – 3	Exp– 4	Exp – 5	Exp - 6	Exp – 1	Exp – 2
5	12/07/17	Exp – 4	Exp-5	Exp - 6	Exp – 1	Exp – 2	Exp – 3
6	19/07/18	Exp – 5	Exp-6	Exp – 1	Exp – 2	Exp – 3	Exp – 4
7	26/07/18	Exp - 6	Exp – 1	T Exp – 2	Exp – 3	Exp – 4	Exp – 5
Cycle - II							
8	9/8/18	Demo	Demo	Demo	Demo	Demo	Demo
9	16/8/18	Exp - 7	Exp – 8	Exp – 9	Exp - 10	Exp - 11	Exp - 12
10	23/8/18	Exp – 8	Exp – 9	Exp – 10	Exp - 11	Exp - 12	Exp - 7
11	30/8/18	Exp – 9	Exp – 10	Exp – 11	Exp - 12	Exp - 7	Exp - 8
12	6/9/18	Exp – 10	Exp – 11	Exp – 12	Exp - 7	Exp - 8	Exp - 9
13	20/9/18	Exp – 11	Exp – 12	Exp – 7	Exp - 8	Exp - 9	Exp - 10
14	27/9/18	Exp - 12	Exp - 7	Exp - 8	Exp - 9	Exp - 10	Exp - 11
15	4/10/18	Repetition					
16		Internal Examination					

Batches:

Batch	B21	B22	B23	B24	B25	B26
Regd Nos	16761A0338– 342	16761A0343 – 347	16761A0348 – 352	16761A0353 – 357	17765A0301– 306	17765A0307 -312

Staff In-charge

HoD

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L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

LIST OF EXPERIMENTS- B.Tech-V SEM -ME-B/S

A.Y:2018-19

1. I.C. Engines Valve & Port Timing Diagrams
2. Performance Test on Variable Compression Ratio single cylinder 4-Stroke petrol Engine By using Eddy Current Dynamometer
3. Performance Test on single cylinder 4 -Stroke Diesel Engine by using Mechanical Dynamometer
4. Evaluation of performance parameters of twin cylinder 4-stroke diesel engine.
5. Determination of performance characteristics of 2-Stroke Petrol Engine.
6. Evaluation of engine friction power by conducting Morse test on Multi cylinder 4-Stroke Petrol Engine.
7. Heat Balance of 4 stroke single cylinder diesel engine
8. Performance Test on Reciprocating Air – Compressor.
9. Determination of COP of Vapour Compression Refrigeration Unit.
10. Performance Test on Air Conditioning Unit.
11. Demonstration of automobile working components.
12. Determination of calorific value of fuel using bomb calorimeter.

Lab in charge

LAKKIREDDY BALI REDDY COLLEGE OF ENGINEERING
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L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

B.Tech-IV SEM -ME-B/S

A.Y:2017-18

Course Objective:

The main objective of this laboratory is to familiarize the basic principles and its recent advancements in the area of Internal Combustion engines for Graduates and Post graduates. To study and analyze the various performance parameters such as fuel consumption, frictional power, mechanical efficiency etc. The graduates are empowered with principles of working and its performance analysis on Refrigerator, Air Conditioner, Air compressor, solar concentrator and fuel testing apparatus. It also focuses on to measure the amount of exhaust emissions coming from the engines and creating awareness among the graduates about its impact on the global environment.

Course Outcomes:

After completion of this lab, student will be able to

CO 1: Identify the various apparatus for fuel characterization through experimentation

CO 2: Analyze the performance characteristics of an internal combustion engines

CO 3: Evaluate the performance parameters of refrigeration systems

CO4: Analyze the air compressor characteristics

Lab in charge

LAKKIREDDY BALI REDDY COLLEGE OF ENGINEERING
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L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

Laboratory Code : L 181

Lab: THERMAL ENGINEERING LAB

Class: B. Tech – V Semester (Section – B)

Credits: 02

Continuous Internal Assessment : 25

Semester End Examination : 75

Name of the Faculty: S.RAMI REDDY/D.MALLIKARJUNA RAO

A.Y.: 2018-2019

Lab/Practical's: 2 hrs/ week

Batches (Section – B)

Total No. of students	: 16761A0358 – 3B4 17765A0314-326	=	66
Batch A1	: 16761A0358-363	=	06
Batch A2	: 16761A0364 – 369	=	06
Batch A3	: 16761A0371– 376	=	06
Batch A4	:16761A0377 – 382	=	06
Batch A5	:16761A0383– 387	=	05
Batch A6	:16761A0389 – 394	=	05
Batch B1	: 16761A0395 – 399	=	05
Batch B2	: 16761A03A1 – 3A5	=	05
Batch B3	: 16761A03A6 – 3B0	=	05
Batch B4	:16761A03B1 – 17765A0315	=	06
Batch B5	:17765A0316 – 321	=	06
Batch B6	:17761A0322 – 326	=	05

Schedule of Experiments (Section –B)

BATCH-I

Date	Experiment (Batch)					
	Ex - 1	Ex – 2	Ex – 3	Ex – 4	Ex – 5	Ex – 6
13/06/18	Demonstration of all experiments, CEOs and COs of the Laboratory					
CYCLE-I						
20/06/18	A1	A2	A3	A4	A5	A6
27/06/18	A2	A3	A4	A5	A6	A1
04/07/18	A3	A4	A5	A6	A1	A2
11/07/18	A4	A5	A6	A1	A2	A3
18/07/18	A5	A6	A1	A2	A3	A4
25/07/18	A6	A1	A2	A3	A4	A5

CYCLE-II						
08/08/18	A1	A2	A3	A4	A5	A6
22/08/18	A2	A3	A4	A5	A6	A1
29/08/18	A3	A4	A5	A6	A1	A2
05/09/18	A4	A5	A6	A1	A2	A3
12/09/18	A5	A6	A1	A2	A3	A4
19/09/18	A6	A1	A2	A3	A4	A5
26/09/18	REPETITION					
03/10/18	INTERNAL EXAMINATION					

BATCH-II

Date	Experiment (Batch)					
	Ex - 1	Ex - 2	Ex - 3	Ex - 4	Ex - 5	Ex - 6
15/06/18	Demonstration of all experiments, CEOs and COs of the Laboratory					
CYCLE-I						
22/06/18	B1	B2	B3	B4	B5	B6
29/06/18	B2	B3	B4	B5	B6	B1
06/07/18	B3	B4	B5	B6	B1	B2
13/07/18	B4	B5	B6	B1	B2	B3
20/07/18	B5	B6	B1	B2	B3	B4
27/07/18	B6	B1	B2	B3	B4	B5

CYCLE-II						
10/08/18	B1	B2	B3	B4	B5	B6
17/08/18	B2	B3	B4	B5	B6	B1
24/8/18	B3	B4	B5	B6	B1	B2
31/08/18	B4	B5	B6	B1	B2	B3
07/09/18	B5	B6	B1	B2	B3	B4
14/09/18	B6	B1	B2	B3	B4	B5
21/09/18	REPETITION					
28/09/18	REPETITION					
05/10/18	INTERNAL EXAMINATION					

Lab in charge

HOD

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
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L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

NOTIFICATION OF CYCLES -ME-B/S

A.Y:2018-19

CYCLE-I

1. I.C. Engines Valve & Port Timing Diagrams
2. Performance Test on Variable Compression Ratio single cylinder 4-Stroke petrol Engine By using Eddy Current Dynamometer
3. Test on single cylinder 4 -Stroke Diesel Engine by using Mechanical Dynamometer
4. Evaluation of performance parameters of twin cylinder 4-stroke diesel engine.
5. Determination of performance characteristics of 2-Stroke Petrol Engine.
6. Evaluation of engine friction power by conducting Morse test on Multi cylinder 4-Stroke Petrol Engine.
7. Heat Balance of 4 stroke single cylinder diesel engine

CYCLE-II

1. Performance Test on Reciprocating Air – Compressor.
2. Determination of COP of Vapour Compression Refrigeration Unit.
3. Performance Test on Air Conditioning Unit.
4. Demonstration of automobile working components.
5. Measurement of exhaust emissions and smoke of I.C Engines.
6. Solar parabolic concentrator apparatus
7. Determination of calorific value of fuel using bomb calorimeter

Lab in charge

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A.Y:2018-19

VIVA QUESTIONS B.Tech-IV SEM-ME-B/S

1. Define retardation test?
2. Which is the various energy losses associated with an IC engine?
3. Explain the construction and working of dynamometers?
4. What is need of measurement of speed of an I.C. Engine?
5. What is the brake power of I.C. Engines?
6. Define Volumetric efficiency
7. What is Indicated thermal efficiency?
8. What is Brake thermal efficiency?
9. Define Mechanical efficiency
10. Define Brake mean effective pressure
11. What is air fuel ratio?
12. Define the friction power?
13. Define Willian's lines methods?
What is combustion phenomenon?
14. What is knocking?
15. What is detonation?
16. How knocking can be prevented?
17. What is octane number?
18. What is cetane number?
19. What is carburation?
20. Explain the working and construction of a carburetor?
21. What is indicated power?
22. Explain the rich mixture, Lean Mixture & Stoichiometric Mixture
23. Define valve timing in four stroke petrol engine?
24. What is overlapping?
25. What do you mean by ignition?
26. What are the various types of ignition systems that are commonly used?
27. Explain the construction and working of fuel pump and fuel injector.
28. What is viscosity?
29. State Newton's law of viscosity?
30. Differentiate absolute and kinematic viscosity.
31. What are the different types of lubrication systems for IC engines?
32. What are the properties of lubricating oil?
33. What are the properties of fuel?
34. What is flash point and fire point?
35. What are the major emissions from an IC engine?
36. How can we reduce emissions?
37. Explain the working of a silencer.
38. Explain the working of a catalytic converter.
39. What is supercharging of an engine?
40. What is turbo charger?
41. What you mean by turbo lag?
42. Define MPFI system.
43. What is CRDI?
44. What is the function of a decompression valve?
45. Define COP.

46. Define compression ratio.
47. What is scavenging?
48. What is meant by self ignition temperature?
49. Define calorific value.
50. What are the reasons for incomplete combustion?

LAKKIREDDY BALI REDDY COLLEGE OF ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING
(Autonomous & Affiliated to JNTUK, Kakinada & Approved by AICTE, New Delhi,
NAAC Accredited with 'A' grade, Accredited by NBA, Certified by ISO 9001:2015)
L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

LIST OF EXPERIMENTS- B.Tech-V SEM -ME-C/S

A.Y:2018-19

1. I.C. Engines Valve & Port Timing Diagrams
2. Performance Test on Variable Compression Ratio single cylinder 4-Stroke petrol Engine By using Eddy Current Dynamometer
3. Test on single cylinder 4 -Stroke Diesel Engine by using Mechanical Dynamometer
4. Evaluation of performance parameters of twin cylinder 4-stroke diesel engine.
5. Determination of performance characteristics of 2-Stroke Petrol Engine.
6. Evaluation of engine friction power by conducting Morse test on Multi cylinder 4-Stroke Petrol Engine.
7. Heat Balance of 4 stroke single cylinder diesel engine
8. Performance Test on Reciprocating Air – Compressor.
9. Determination of COP of Vapour Compression Refrigeration Unit.
10. Performance Test on Air Conditioning Unit.
11. Demonstration of automobile working components.
12. Measurement of exhaust emissions and smoke of I.C Engines.
13. Solar parabolic concentrator apparatus
14. Determination of calorific value of fuel using bomb calorimeter.

Faculty

Lab in charge

Head of the Department

LAKKIREDDY BALI REDDY COLLEGE OF ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING

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L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

B.Tech-V SEM -ME-C/S

A.Y:2018-19

Course Objective:

The main objective of this laboratory is to familiarize the basic principles and its recent advancements in the area of Internal Combustion engines for Graduates and Post graduates. To study and analyze the various performance parameters such as fuel consumption, frictional power, mechanical efficiency etc. The graduates are empowered with principles of working and its performance analysis on Refrigerator, Air Conditioner, Air compressor, solar concentrator and fuel testing apparatus. It also focuses on to measure the amount of exhaust emissions coming from the engines and creating awareness among the graduates about its impact on the global environment.

Course Outcomes:

After completion of this lab, student will be able to

CO 1: Identify the various apparatus for fuel characterization through experimentation

CO 2: Analyze the performance characteristics of an internal combustion engines

CO 3: Evaluate the performance parameters of refrigeration systems

CO4: Analyze the air compressor characteristics

Faculty

Lab in charge

Head of the Department

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L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

Laboratory Code : L 181

Lab: THERMAL ENGINEERING LAB

Class: B. Tech – V Semester (Section – C)

Credits: 02

Continuous Internal Assessment : 25

Semester End Examination : 75

Name of the Faculty: A.Naresh Kumar/P.Tarun Sai

A.Y.: 2018-2019

Lab/Practical's: 2 hrs/ week

Batches (Section – C)

Total No. of students	: 16761A03B5 – 3F2				
	16761A03F3- 16761A03H1 & 17765A0327-340	=		67	
Batch A1	: 16761A03B5-3B7, 16761A03B9-3C1	=		06	
Batch A2	: 16761A03C2 – 3C4, 16761A03C6 – 3C8	=		06	
Batch A3	: 16761A03D0, 16761A03D2 – 3D6	=		06	
Batch A4	:16761A03D7 – 3E2	=		06	
Batch A5	:16761A03E2– 3E7	=		05	
Batch A6	:16761A03E8 – 3F2	=		05	
Batch B1	: 16761A03F3 – 3F8	=		06	
Batch B2	: 16761A03F9 – 3G4	=		06	
Batch B3	: 16761A03G5 – 3H0	=		06	
Batch B4	: 16761A03H1, 17765A0327 – 330	=		05	
Batch B5	:17765A0331 – 335	=		05	
Batch B6	:17761A03336– 340	=		05	

Schedule of Experiments (Section –C)

BATCH-I

Date	Experiment (Batch)					
	Ex - 1	Ex – 2	Ex – 3	Ex – 4	Ex – 5	Ex – 6
13/06/18	Demonstration of all experiments, CEOs and COs of the Laboratory					
CYCLE-I						
20/06/18	A1	A2	A3	A4	A5	A6
27/06/18	A2	A3	A4	A5	A6	A1
04/07/18	A3	A4	A5	A6	A1	A2
11/07/18	A4	A5	A6	A1	A2	A3
18/07/18	A5	A6	A1	A2	A3	A4
25/07/18	A6	A1	A2	A3	A4	A5

CYCLE-II						
08/08/18	A1	A2	A3	A4	A5	A6
29/08/18	A2	A3	A4	A5	A6	A1
05/09/18	A3	A4	A5	A6	A1	A2
12/09/18	A4	A5	A6	A1	A2	A3
19/09/18	A5	A6	A1	A2	A3	A4
26/09/18	A6	A1	A2	A3	A4	A5
03/10/18	INTERNAL EXAMINATION					

BATCH-II

Date	Experiment (Batch)					
	Ex - 1	Ex - 2	Ex - 3	Ex - 4	Ex - 5	Ex - 6
15/06/18	Demonstration of all experiments, CEOs and COs of the Laboratory					
CYCLE-I						
22/06/18	B1	B2	B3	B4	B5	B6
29/06/18	B2	B3	B4	B5	B6	B1
06/07/18	B3	B4	B5	B6	B1	B2
13/07/18	B4	B5	B6	B1	B2	B3
20/07/18	B5	B6	B1	B2	B3	B4
27/07/18	B6	B1	B2	B3	B4	B5

CYCLE-II						
10/08/18	B1	B2	B3	B4	B5	B6
17/08/18	B2	B3	B4	B5	B6	B1
24/08/18	B3	B4	B5	B6	B1	B2
31/08/18	B4	B5	B6	B1	B2	B3
07/09/18	B5	B6	B1	B2	B3	B4
14/09/18	B6	B1	B2	B3	B4	B5
21/09/18	REPETITION					
28/09/18	REPETITION					
05/10/18	INTERNAL EXAMINATION					

Faculty

Lab in charge

Head of the Department

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
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L B Reddy Nagar, Mylavaram-521 230, Krishna District, Andhra Pradesh.

NOTIFICATION OF CYCLES –V Sem- ME-/CS

A.Y:2018-19

CYCLE-I

1. I.C. Engines Valve & Port Timing Diagrams
2. Performance Test on Variable Compression Ratio single cylinder 4-Stroke petrol Engine By using Eddy Current Dynamometer
3. Test on single cylinder 4 -Stroke Diesel Engine by using Mechanical Dynamometer
4. Evaluation of performance parameters of twin cylinder 4-stroke diesel engine.
5. Determination of performance characteristics of 2-Stroke Petrol Engine.
6. Evaluation of engine friction power by conducting Morse test on Multi cylinder 4-Stroke Petrol Engine.
7. Heat Balance of 4 stroke single cylinder diesel engine

CYCLE-II

1. Performance Test on Reciprocating Air – Compressor.
2. Determination of COP of Vapour Compression Refrigeration Unit.
3. Performance Test on Air Conditioning Unit.
4. Demonstration of automobile working components.
5. Measurement of exhaust emissions and smoke of I.C Engines.
6. Solar parabolic concentrator apparatus
7. Determination of calorific value of fuel using bomb calorimeter

Faculty

Lab in charge

Head of the Department

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VIVA QUESTIONS B.Tech-V SEM-ME-C/S

A.Y. 2018-2019

1. Define retardation test?
2. Which is the various energy losses associated with an IC engine?
3. Explain the construction and working of dynamometers?
4. What is need of measurement of speed of an I.C. Engine?
5. What is the brake power of I.C. Engines?
6. Define volumetric efficiency
7. What is Indicated thermal efficiency?
8. What is Brake thermal efficiency?
9. Define Mechanical efficiency
10. Define Brake mean effective pressure
11. What is air fuel ratio?
12. Define the friction power?
13. Define William's lines method?
14. What is knocking?
15. What is detonation?
16. How knocking can be prevented?
17. What is octane number?
18. What is cetane number?
19. What is carburation?
20. Explain the working and construction of a carburettor?
21. What is indicated power?
22. Explain the rich mixture, Lean Mixture & Stichiometric Mixture
23. Draw valve timing in four stroke petrol engine?
24. What is overlapping?
25. What do you mean by ignition?

26. What are the various types of ignition systems that are commonly used?
27. Explain the construction and working of fuel pump and fuel injector.
28. What is viscosity?
29. State Newton's law of viscosity?
30. Differentiate absolute and kinematic viscosity.
31. What are the different types of lubrication systems for IC engines?
32. What are the properties of lubricating oil?
33. What are the properties of fuel?
34. What is flash point and fire point?
35. What are the major emissions from an IC engine?
36. How can we reduce emissions?
37. Explain the working of a silencer.
38. Explain the working of a catalytic converter.
39. What is supercharging of an engine?
40. What is turbo charger?
41. What you mean by turbo lag?
42. Define MPFI system.
43. What is CRDI?
44. What is the function of a decompression valve?
45. Define COP.
46. Define compression ratio.
47. What is scavenging?
48. What is meant by self ignition temperature?
49. Define calorific value.
50. What are the reasons for incomplete combustion?



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DEPARTMENT OF MECHANICAL ENGINEERING

Laboratory Code	: L 156	Lab:	MACHINE TOOLS AND DYNAMICS LAB
Lab/Practicals	: 3 hrs/ Week	Continuous Internal Assessment	: 25
A.Y.	: 2018-19	Semester End Examination	: 75
Class & Semester	: B. Tech – V Semester	Section	: A
Instructors	: Mr. Dr.K.Murahari, Associate Professor Mr. B. Sudheer Kumar, Sr.Assistant Professor		

COURSE EDUCATIONAL OBJECTIVES:

The objectives of the course are to

1. Understand the various machining processes.
2. Familiarize with the tools used in machine shop.
3. Understand basic operations of lathe, milling, drilling, shaping and planning machines.
4. Study the static and dynamic behavior of Mechanisms & Machines.
5. To know the kinematic concepts of mechanisms such as cams, governors, gyroscopes etc
6. Understand the concepts of vibrations.

COURSE OUTCOMES:

After completion of the course students are able to:

- CO 1 Ability in developing sequence of machining operations required for industry.
- CO 2 Capable of manufacturing components according to given working drawings.
- CO 3 Apply the dynamics of cams, governors, gyroscopes, to any practical problems
- CO 4 Analyze the effects of vibrations.

Course Articulation Matrix:

L156	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	1	2	3			2					2		3	
CO 2	3	2	2	3			2					2		3	
CO 3	3		2	3								1			3
CO 4	3		2	3	1							2			3

Course Instructor

Course Coordinator

Module Coordinator



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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DEPARTMENT OF MECHANICAL ENGINEERING

Laboratory Code	: L 156	Lab:	MACHINE TOOLS LAB
Lab/Practicals	: 3 hrs/ Week	Continuous Internal Assessment	: 25
A.Y.	: 2018-19	Semester End Examination	: 75
Class & Semester	: B. Tech – V Semester	Section	: A
Instructor	: Mr. Dr.K.Murahari, Associate Professor		

At least 06 experiments are to be conducted:

LIST OF EXPERIMENTS (Machine Tools Lab):

1. To perform the step turning operation and taper turning operation on a given M.S. work piece **(MT 1)**
2. To perform knurling operation and threading operation on a given M.S. work piece. **(MT 2)**
3. To form and grind the given work piece into single point cutting tool. **(MT 3)**
4. To cut a rectangular groove (or key way) with given dimensions on work piece using Shaping machine. **(MT 4)**
5. To perform drilling and tapping operations on a given M.S. plate using universal drilling machine. **(MT 5)**
6. To cut spur gear on a given M.S.Round blank using milling machine. **(MT 6)**
7. To prepare a smooth flat surface on M.S.flat using surface Grinding machine. **(MT 7)**
8. To analyze the forces in x-y-z directions during turning operation using Lathe Tool Dynamometer **(MT 8)**
9. To perform the boring operation on GI pipe. **(MT 9)**

STUDY EXPERIMENTS:

Study the principal parts and specifications of Lathe Machine, Capstan and Torrent Lathe Machine, Universal Drilling Machine, Horizontal Milling Machine, Shaper Machine, Planar Machine, Slotter Machine, Surface Grinding Machine, Tool Cutter and Grinder, CNC Turing Machine and CNC Milling Machine **(MT - SE)**

REFERENCES

Lab Manual

Course Instructor

Course Coordinator

Module Coordinator



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
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DEPARTMENT OF MECHANICAL ENGINEERING

Laboratory Code	: L 156	Lab:	DYNAMICS LAB	
Lab/Practicals	: 3 hrs/ Week	Continuous Internal Assessment		: 25
A.Y.	: 2018-19	Semester End Examination		: 75
Class & Semester	: B. Tech – V Semester	Section		: A
Instructor	: Mr. B. Sudheer Kumar, Sr.Assistant Professor			

At least 06 experiments are to be conducted:

LIST OF EXPERIMENTS (DYNAMICS LAB):

1. To determine gyroscopic couple on Motorized Gyroscope **(DY 1)**
2. To compute the stability and sensitivity of Watt and Porter governors**(DY 2)**
3. To determine the critical speed of shaft with various boundary conditions **(DY 3)**
4. To determine the damping parameters of single degree of freedom system using spring mass system. **(DY 4)**
5. To investigate the transverse vibrations of cantilever and fixed beam **(DY 5)**
6. To determine the torsional vibrations of single rotor system. **(DY 6)**

STUDY EXPERIMENTS:

1. Balancing of rotating masses and reciprocating masses **(DY – SE1)**
2. To study various types of cam and follower mechanisms and observe CAM JUMP phenomenon**(DY – SE2)**
3. To study inversions of four bar mechanisms, single and double slider crank mechanisms. **(DY – SE3)**
4. To study various types of gear trains- simple, compound reverted, Epicyclic and differential. **(DY – SE4)**
5. To study the forced vibrations of beams with varying boundary conditions **(DY – SE5)**

REFERENCES

Lab Manual

Course Instructor

Course Coordinator

Module Coordinator



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DEPARTMENT OF MECHANICAL ENGINEERING

Laboratory Code : L 156 Lab: MACHINE TOOLS AND DYNAMICS LAB
Lab/Practicals : 3 hrs/ Week Continuous Internal Assessment : 25
A.Y. : 2018-19 Semester End Examination : 75
Class & Semester : B. Tech – V Semester Section : A
Instructors : Mr. Dr.K.Murahari, Associate Professor
Mr. B. Sudheer Kumar, Sr.Assistant Professor

Batches (Section – A)

Total No. of students : 16761A0301 – 309, 311,313 – 332, 334 – 350, 351-357
17765A0301-312 = 65
Batch A1 : 16761A0301 – 303, 304 – 307, 308 – 311, 313-315, 316 – 318,
319 – 321,322-324,325-327,328-330,331-334,335-337 = 33
Batch A2 : 14761A0338 – 357, 17785A0301 – 312 = 32
Sub Batches of A1:

S. No	Batch	Registered Nos	Total
1	A1 ₁	16761A0301 – 303	03
2	A1 ₂	16761A0304 – 307	03
3	A1 ₃	16761A0308 – 311	03
4	A1 ₄	16761A0313 – 315	03
5	A1 ₅	16761A0316 – 318	03
6	A1 ₆	16761A0319 – 321	03
7	A1 ₇	16761A0322– 324	03
8	A1 ₈	16761A0325– 327	03
9	A1 ₉	16761A0328 – 330	03
10	A1 ₁₀	16761A0331 – 334	03
11	A1 ₁₁	16761A0335 – 337	03
Total			33

Sub Batches of A2:

S. No	Batch	Registered Nos	Total
1	A2 ₁	16761A0338 – 340	03
2	A2 ₂	16761A0341– 343	03
3	A2 ₃	16761A0344 – 346	03
4	A2 ₄	16761A0347 – 349	03
5	A2 ₅	16761A0350 – 352	03
6	A2 ₆	16761A0353 – 355	03
7	A2 ₇	16761A0356 – 357	02
8	A2 ₈	17765A0301– 303	03
9	A2 ₉	17765A0304 – 306	03
10	A2 ₁₀	17765A0307 – 309	03
11	A2 ₁₁	17765A0310– 312	03
Total			32

Course Instructor

Course Coordinator

Module Coordinator



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DEPARTMENT OF MECHANICAL ENGINEERING

Laboratory Code	: L 156	Lab:	MACHINE TOOLS AND DYNAMICS LAB
Lab/Practicals	: 3 hrs/ Week	Continuous Internal Assessment	: 25
A.Y.	: 2018-19	Semester End Examination	: 75
Class & Semester	: B. Tech – V Semester	Section	: C
Instructors	: Mr. J. Subba Reddy, Associate Professor Mr. Ch. Siva Shankar Babu, Assistant Professor		

COURSE EDUCATIONAL OBJECTIVES:

The objectives of the course are to

1. Understand the various machining processes, familiarize with the tools used in machine shop to understand basic operations of lathe, milling, drilling, shaping and planing machines.
2. Study the static and dynamic behavior of Mechanisms & Machines, to know the kinematic concepts of mechanisms such as cams, governors, gyroscopes etc and vibrations.

COURSE OUTCOMES:

After completion of the course students are able to:

- CO 1 Ability in developing sequence of machining operations required for industry.
- CO 2 Capable of manufacturing components according to given working drawings.
- CO 3 Apply the dynamics of cams, governors, gyroscopes, to any practical problems
- CO 4 Analyze the effects of vibrations.

Course Articulation Matrix:

L156	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C01	2	1	2	3			2					2		3	
C02	3	2	2	3			2					2		3	
C03	3		2	3								1			3
C04	3		2	3	1							2			3

Course Instructor

Course Coordinator

Module Coordinator



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DEPARTMENT OF MECHANICAL ENGINEERING

Laboratory Code	: L 156	Lab:	MACHINE TOOLS LAB
Lab/Practicals	: 3 hrs/ Week	Continuous Internal Assessment	: 25
A.Y.	: 2018-19	Semester End Examination	: 75
Class & Semester	: B. Tech – V Semester	Section	: C
Instructor	: Mr. J. Subba Reddy, Associate Professor		

At least 06 experiments are to be conducted:

LIST OF EXPERIMENTS (Machine Tools Lab):

1. To perform the step turning operation and taper turning operation on a given M.S. work piece **(MT 1)**
2. To perform knurling operation and threading operation on a given M.S. work piece. **(MT 2)**
3. To form and grind the given work piece into single point cutting tool. **(MT 3)**
4. To cut a rectangular groove (or key way) with given dimensions on work piece using Shaping machine. **(MT 4)**
5. To perform drilling and tapping operations on a given M.S. plate using universal drilling machine. **(MT 5)**
6. To cut spur gear on a given M.S.Round blank using milling machine. **(MT 6)**
7. To prepare a smooth flat surface on M.S.flat using surface Grinding machine. **(MT 7)**
8. To analyze the forces in x-y-z directions during turning operation using Lathe Tool Dynamometer **(MT 8)**
9. To perform the boring operation on GI pipe. **(MT 9)**

STUDY EXPERIMENTS:

Study the principal parts and specifications of Lathe Machine, Capstan and Torrent Lathe Machine, Universal Drilling Machine, Horizontal Milling Machine, Shaper Machine, Planar Machine, Slotter Machine, Surface Grinding Machine, Tool Cutter and Grinder, CNC Turing Machine and CNC Milling Machine **(MT - SE)**

REFERENCES

Lab Manual

S

Course Instructor

Course Coordinator

Module Coordinator



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Accredited by NBA (Tier – I), New Delhi & certified by ISO 9001:2015

DEPARTMENT OF MECHANICAL ENGINEERING

Laboratory Code	: L 156	Lab:	DYNAMICS LAB
Lab/Practicals	: 3 hrs/ Week	Continuous Internal Assessment	: 25
A.Y.	: 2018-19	Semester End Examination	: 75
Class & Semester	: B. Tech – V Semester	Section	: C
Instructor	: Mr. Ch. Siva Shankar Babu, Assistant Professor		

At least 06 experiments are to be conducted:

LIST OF EXPERIMENTS (DYNAMICS LAB):

1. To determine gyroscopic couple on Motorized Gyroscope (DY 1)
2. To compute the stability and sensitivity of Watt and Porter governors (DY 2)
3. To determine the critical speed of shaft with various boundary conditions (DY 3)
4. To determine the damping parameters of single degree of freedom system using spring mass system. (DY 4)
5. To investigate the transverse vibrations of cantilever and fixed beam (DY 5)
6. To determine the torsional vibrations of single rotor system. (DY 6)

STUDY EXPERIMENTS:

1. Balancing of rotating masses and reciprocating masses (DY – SE1)
2. To study various types of cam and follower mechanisms and observe CAM JUMP phenomenon (DY – SE2)
3. To study inversions of four bar mechanisms, single and double slider crank mechanisms. (DY – SE3)
4. To study various types of gear trains- simple, compound, reverted, epicyclic and differential. (DY – SE4)
5. To study the forced vibrations of beams with varying boundary conditions (DY – SE5)

REFERENCES

Lab Manual

Course Instructor

Course Coordinator

Module Coordinator

Sub Batches of C2:

S. No	Batch	Registered Nos	Total
1	C2 ₁	16761A03F3 – 3F5	03
2	C2 ₂	16761A03F6 – 3F8	03
3	C2 ₃	16761A03F9 – 3G1	03
4	C2 ₄	16761A03G2 – 3G4	03
5	C2 ₅	16761A03G5 – 3G7	03
6	C2 ₆	16761A03G8 – 3G9	02
7	C2 ₇	16761A03H0 – 3H1	02
8	C2 ₈	17765A0327 – 329	03
9	C2 ₉	17765A0330 – 332	03
10	C2 ₁₀	17765A0333 – 335	03
11	C2 ₁₁	17765A0336 – 338	03
12	C2 ₁₂	17765A0339 – 340	02
Total			33

Course Instructor

Course Coordinator

Module Coordinator

