



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**  
**KAKINADA – 533 003, Andhra Pradesh, India**  
**DEPARTMENT OF MECHANICAL ENGINEERING**

**COURSE STRUCTURE**

**For UG – R20**

**B. TECH - MECHANICAL ENGINEERING**

*(Applicable for batches admitted from 2020-2021)*



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**

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## COURSE STRUCTURE

### I Year – I SEMESTER

Sl.No	Course Code	Subjects	L	T	P	Credits
1	BSC-1	Calculus & Differential Equations (M-I)	3	0	0	3
2	BSC-2	Engineering Physics	3	0	0	3
3	ESC-1	Programming for Problem Solving	3	0	0	3
4	HSC-1	Communicative English	3	0	0	3
5	ESC-2	Engineering Drawing	2	0	2	3
6	BSC-L1	Engineering Physics Lab	0	0	3	1.5
7	ESC-L1	Programming for Problem Solving Using C Laboratory	0	0	3	1.5
8	HSC-L1	English Communication Skills Laboratory	0	0	3	1.5
9	MC -1	Environmental Science	2	0	0	0
<b>Total Credits</b>						<b>19.5</b>

### I Year – II SEMESTER

Sl.No	Course Code	Subjects	L	T	P	Credits
1	BSC-3	Linear Algebra & Numerical Methods (M-II)	3	0	0	3
2	BSC-4	Engineering Chemistry	3	0	0	3
3	ESC-3	Engineering Mechanics	3	0	0	3
4	ESC-4	Basic Electrical & Electronics Engineering	3	0	0	3
5	ESC-5	Thermodynamics	3	0	0	3
6	ESC-L2	Workshop Practice Lab	0	0	3	1.5
7	BSC-L2	Engineering Chemistry Laboratory	0	0	3	1.5
8	ESC-L3	Basic Electrical & Electronics Engineering Lab	0	0	3	1.5
9	MC-2	Constitution of India	2	0	0	0
<b>Total Credits</b>						<b>19.5</b>



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**II YEAR I SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	BSC-5	Vector Calculus, Fourier Transforms and PDE(M-III)	3	0	0	3
2	PCC-1	Mechanics of Solids	3	0	0	3
3	PCC-2	Fluid Mechanics & Hydraulic Machines	3	0	0	3
4	PCC-3	Production Technology	3	0	0	3
5	PCC-4	Kinematics of Machinery	3	0	0	3
6	PCC-L1	Computer Aided Engineering Drawing Practice	0	0	3	1.5
7	PCC-L2	Fluid Mechanics & Hydraulic Machines Lab	0	0	3	1.5
8	PCC-L3	Production Technology Lab	0	0	3	1.5
9	SOC-1	Drafting and Modeling Lab	0	0	4	2
10	MC-3	Essence of Indian Traditional Knowledge	2	0	0	0
		<b>Total Credits</b>				<b>21.5</b>

**II YEAR II SEMESTER**

S. No	Course Code	Course Title	L	T	P	Credits
1	ESC-6	Material Science & Metallurgy	3	0	0	3
2	BSC-6	Complex Variables and Statistical Methods	3	0	0	3
3	PCC-5	Dynamics of Machinery	3	0	0	3
4	PCC-6	Thermal Engineering-I	3	0	0	3
5	HSC-2	Industrial Engineering and Management	3	0	0	3
6	ESC-L4	Mechanics of Solids and Metallurgy Lab	0	0	3	1.5
7	PCC-L6	Machine Drawing Practice	0	0	3	1.5
8	PCC-L7	Theory of Machines Lab	0	0	3	1.5
9	SOC-2	Python Programming Lab	1	0	2	2
		<b>Total Credits</b>				<b>21.5</b>
		<b>Honors/Minor courses</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

\* At the end of II Year II Semester, students must complete summer internship spanning between 1 to 2 months (Minimum of 6 weeks), @ Industries/ Higher Learning Institutions/ APSSDC.



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		<b>2</b>	<b>0</b>	<b>2</b>	<b>3</b>
<b>ENGINEERING DRAWING</b>					

**Course Objective:** Engineering drawing being the principal method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

### Unit I

**Objective:** To introduce the students to use drawing instruments and to draw polygons, Engg. Curves.

**Polygons:** Constructing regular polygons by general methods, inscribing and describing polygons on circles.

**Curves:** Parabola, Ellipse and Hyperbola by general and special methods, cycloids, involutes, tangents & normals for the curves.

**Scales:** Plain scales, diagonal scales and vernier scales

### Unit II

**Objective:** To introduce the students to use orthographic projections, projections of points & simple lines. To make the students draw the projections of the lines inclined to both the planes.

**Orthographic Projections:** Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to other plane.

Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces.

### Unit III

**Objective:** The objective is to make the students draw the projections of the plane inclined to both the planes.

Projections of planes: regular planes perpendicular/parallel to one reference plane and inclined to the other reference plane; inclined to both the reference planes.

### Unit IV

**Objective:** The objective is to make the students draw the projections of the various types of solids in different positions inclined to one of the planes.

Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to both the planes.

### Unit V

**Objective:** The objective is to represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer Aided Design, Drawing practice using Auto CAD, Creating 2D&3D drawings of objects using Auto CAD



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**Note:** In the End Examination there will be no question from CAD.

**TEXT BOOKS:**

1. Engineering Drawing by N.D. Bhatt, Chariot Publications
2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

**REFERENCE BOOKS:**

1. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers
2. Engineering Graphics for Degree by K.C. John, PHIPublishers
3. Engineering Graphics by PI Varghese, McGrawHill Publishers
4. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age

**Course Outcome:** The student will learn how to visualize 2D & 3D objects.



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		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>ENGINEERING PHYSICS LAB</b>					

(For All Non-Circuital Branches like ME, CE, Chemical etc)  
 (Any 10 of the following listed experiments)

**List of Engineering Physics Experiments**

1. Laser: Determination of wavelength using diffraction grating.
2. Young's modulus of given material by Strain gauge method.
3. Study of variation of magnetic field along the axis of a current carrying circular coil by Stewart & Gee's method.
4. Determination of ultrasonic velocity in given liquid (Acoustic grating).
5. Determination of dielectric constant using charging and discharging method.
6. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
7. Estimation of Planck's constant using photoelectric effect.
8. Rigidity modulus of material of a wire-dynamic method (Torsional pendulum).
9. Determination of numerical aperture and acceptance angle of an optical fiber.
10. Determination of thickness of thin object by wedge method.
11. Determination of radius of curvature of given plano convex lens by Newton's rings.
12. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
13. Determination of dispersive power of the prism.
14. Sonometer: Verification of laws of string.
15. Measurement of magnetic susceptibility by Kundt's tube method.

**References:**

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.



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		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>PROGRAMMING FOR PROBLEM SOLVING USING C LABORATORY</b>					

**Course Objectives:**

- 1) Apply the principles of C language in problem solving.
- 2) To design flowcharts, algorithms and knowing how to debug programs.
- 3) To design & develop of C programs using arrays, strings pointers & functions.
- 4) To review the file operations, preprocessor commands.

**Exercise 1:**

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.
3. Write a C program to display multiple variables.

**Exercise 2:**

1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

**Exercise 3:**

1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
3. Write a C program to calculate the factorial of a given number.

**Exercise 4:**

1. Write a program in C to display the n terms of even natural number and their sum.
2. Write a program in C to display the n terms of harmonic series and their sum.  $1 + 1/2 + 1/3 + 1/4 + 1/5 \dots 1/n$  terms.
3. Write a C program to check whether a given number is an Armstrong number or not.

**Exercise 5:**

1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.

**Exercise 6:**

1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

**Exercise 7:**

1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string in reverse order.

**Exercise 8:**

1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

**Exercise 9:**

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.



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**Exercise 10:**

1. Write a program in C to demonstrate the use of & (address of) and \*(value at address) operator.
2. Write a program in C to add two numbers using pointers.

**Exercise 11:**

1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

**Exercise 12:**

1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

**Exercise 13:**

1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( ) function.

**Exercise 14:**

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

**Exercise 15:**

1. Write a program in C to check whether a number is a prime number or not using the function.
2. Write a program in C to get the largest element of an array using the function.

**Exercise 16:**

1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name.
3. Write a program in C to remove a file from the disk.

**Course Outcomes:****By the end of the Lab, the student**

- 1) Gains Knowledge on various concepts of a C language.
- 2) Able to draw flowcharts and write algorithms.
- 3) Able design and development of C problem solving skills.
- 4) Able to design and develop modular programming skills.
- 5) Able to trace and debug a program





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		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>ENGLISH COMMUNICATION SKILLS LABORATORY</b>					

**TOPICS**

**UNIT I:**

Vowels, Consonants, Pronunciation, Phonetic Transcription, Common Errors in Pronunciation,

**UNIT II:**

Word stress-di-syllabic words, poly-syllabic words, weak and strong forms, contrastive stress (Homographs)

**UNIT III:**

Stress in compound words, rhythm, intonation, accent neutralisation.

**UNIT IV:**

Listening to short audio texts and identifying the context and specific pieces of information to answer a series of questions in speaking.

**UNIT V:**

Newspapers reading; Understanding and identifying key terms and structures useful for writing reports.

**Prescribed text book:** “**Infotech English**”, Maruthi Publications.

**References:**

1. Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
2. English Pronunciation in use- Mark Hancock, Cambridge University Press.
3. English Phonetics and Phonology-Peter Roach, Cambridge University Press.
4. English Pronunciation in use- Mark Hewings, Cambridge University Press.
5. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
6. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.



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	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>ENVIRONMENTAL SCIENCE</b>				

**Learning Objectives:**

The objectives of the course are to impart:

- Overall understanding of the natural resources.
- Basic understanding of the ecosystem and its diversity.
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
- An understanding of the environmental impact of developmental activities.
- Awareness on the social issues, environmental legislation and global treaties.

**UNIT-I:**

**Multidisciplinary nature of Environmental Studies:** Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects;. Role of information technology in environment and human health.

**Ecosystems:** Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

**UNIT-II:**

**Natural Resources:** Natural resources and associated problems.

Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

**UNIT-III:**

**Biodiversity and its conservation:** Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, man- wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.



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**UNIT – IV Environmental Pollution:** Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.

**Solid Waste Management:** Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

**UNIT – V Social Issues and the Environment:** Urban problems related to energy -Water conservation, rain water harvesting - Resettlement and rehabilitation of people; its problems and concerns.

Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act - Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.**Environmental Management:** Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics. The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

**Text Books:**

1. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
2. Environmental Studies, R. Rajagopalan, 2<sup>nd</sup> Edition, 2011, Oxford University Press.
3. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

**Reference:**

1. Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014



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		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>ENGINEERING CHEMISTRY LABORATORY</b>					

Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis

1. Determination of HCl using standard  $\text{Na}_2\text{CO}_3$  solution.
2. Determination of alkalinity of a sample containing  $\text{Na}_2\text{CO}_3$  and NaOH.
3. Determination of  $\text{Mn}^{+2}$  using standard oxalic acid solution.
4. Determination of ferrous iron using standard  $\text{K}_2\text{Cr}_2\text{O}_7$  solution.
5. Determination of  $\text{Cu}^{+2}$  using standard hypo solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of  $\text{Fe}^{+3}$  by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
9. Determination of iso-electric point of amino acids using pH-metry method/conductometric method.
10. Determination of the concentration of strong acid vs strong base (by conductometric method).
11. Determination of strong acid vs strong base (by potentiometric method).
12. Determination of  $\text{Mg}^{+2}$  present in an antacid.
13. Determination of  $\text{CaCO}_3$  present in an egg shell.
14. Estimation of Vitamin C.
15. Determination of phosphoric content in soft drinks.
16. Adsorption of acetic acid by charcoal.
17. Preparation of nylon-6, 6 and Bakelite (demonstration only).

Of the above experiments at-least 10 assessment experiments should be completed in a semester.

**Outcomes:** The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

**Reference Books**

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.



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		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>BASIC ELECTRICAL &amp; ELECTRONICS ENGINEERING LAB</b>					

**Learning Objectives:**

- To predetermine the efficiency of dc shunt machine using Swinburne's test. To predetermine the efficiency and regulation of 1-phase transformer with O.C and S.C tests.
- To obtain performance characteristics of DC shunt motor & 3-phase induction motor.
- To find out regulation of an alternator with synchronous impedance method.
- To control speed of dc shunt motor using Armature voltage and Field flux control methods.
- To find out the characteristics of PN junction diode & transistor
- To determine the ripple factor of half wave & full wave rectifiers.

**Section A: Electrical Engineering:**

The following experiments are required to be conducted as compulsory experiments:

1. Swinburne's test on D.C. Shunt machine (predetermination of efficiency of a given D.C. shunt machine working as motor and generator).
2. OC and SC tests on single phase transformer (predetermination of efficiency and regulation at given power factors).
3. Brake test on 3-phase Induction motor (determination of performance characteristics)
4. Regulation of alternator by Synchronous impedance method.
5. Speed control of D.C. Shunt motor by
  - a) Armature Voltage control
  - b) Field flux control method
6. Brake test on D.C. Shunt Motor.

**Section B: Electronics Engineering:**

The following experiments are required to be conducted as compulsory experiments:

1. PN junction diode characteristics a) Forward bias b) Reverse bias (Cut in voltage and resistance calculations)
2. Transistor CE characteristics (input and output)
3. Half wave rectifier with and without filters.
4. Full wave rectifier with and without filters.
5. CE amplifiers.
6. OP- amp applications (inverting, non inverting, integrator and differentiator)

**Learning Outcomes:**

The student should be able to:

- Compute the efficiency of DC shunt machine without actual loading of the machine.
- Estimate the efficiency and regulation at different load conditions and power factors for single phase transformer with OC and SC tests.
- Analyse the performance characteristics and to determine efficiency of DC shunt motor



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&3-Phaseinduction motor..



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- Pre-determine the regulation of an alternator by synchronous impedance method.
- Control the speed of dc shunt motor using Armature voltage and Field flux control methods. Draw the characteristics of PN junction diode & transistor
- Determine the ripple factor of half wave & full wave rectifiers.



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		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>COMPUTER AIDED ENGINEERING DRAWING PRACTICE</b>					

**Course Objective:** To enhance the student's knowledge and skills in engineering drawing and to introduce drafting packages and commands for computer aided drawing and modeling.

**UNIT-I:**

**Objective:** The knowledge of projections of solids is essential in 3D modeling and animation. The student will be able to draw projections of solids. The objective is to enhance the skills they already acquired in their earlier course in drawing of projection.

**PROJECTIONS OF SOLIDS:** Projections of Regular Solids inclined to both planes – Auxiliary Views.

**UNIT-II:**

The knowledge of sections of solids and development of surfaces is required in designing and manufacturing of the objects. Whenever two or more solids combine, a definite curve is seen at their intersection.

**SECTIONS OF SOLIDS:** Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views.

**DEVELOPMENT AND INTERPENETRATION OF SOLIDS:** Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid, Cone and their parts.

**UNIT-III:**

The intersection of solids also plays an important role in designing and manufacturing. The objective is to impart this knowledge through this topic. A perspective view provides a realistic 3D View of an object. The objective is to make the students learn the methods of Iso and Perspective views.

**INTERPENETRATION OF RIGHT REGULAR SOLIDS:** Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone, Prism Vs Cone.

**PERSPECTIVE PROJECTIONS:** Perspective View: Points, Lines, Plane Figures and Simple Solids, Vanishing Point Methods (General Method only).

*In part B computer aided drafting is introduced.*

**UNIT IV:**

The objective is to introduce various commands in AutoCAD to draw the geometric entities and to create 2D and 3D wire frame models.

**INTRODUCTION TO COMPUTER AIDED DRAFTING:** Generation of points, lines, curves, polygons, dimensioning. Types of modeling : object selection commands – edit, zoom, cross hatching, pattern filling, utility commands, 2D wire frame modeling, 3D wire frame modeling,.

**UNIT V:**

By going through this topic the student will be able to understand the paper-space environment thoroughly.

**VIEW POINTS AND VIEW PORTS:** view point coordinates and view(s) displayed, examples to exercise different options like save, restore, delete , joint , single option.





## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

### DEPARTMENT OF MECHANICAL ENGINEERING

#### UNIT VI:

The objective is to make the students create geometrical model of simple solids and machine parts and display the same as an Isometric, Orthographic or Perspective projection.

COMPUTER AIDED SOLID MODELING: Isometric projections, orthographic projections of isometric projections, Modeling of simple solids, Modeling of Machines & Machine Parts.

#### **TEXT BOOKS:**

1. Engineering drawing by N.D Bhatt ,Charotarpublications.
2. Engineering Graphics, K.C. john, PHIPublications

#### **REFERENCES:**

1. Mastering Auto CAD 2013 and Auto CAD LT 2013 – George Omura,Sybex
2. Auto CAD 2013 fundamentals- Elisemoss, SDCPubl.
3. Engineering Drawing and Graphics using Auto Cad – T Jeyapoovan,vikas
4. Engineering Drawing + AutoCAD – K Venugopal, V. Prabhu Raja, NewAge
5. Engineering Drawing – RK Dhawan, SChand
6. Engineering Drawing – MB Shaw, BC Rana,Pearson
7. Engineering Drawing – KL Narayana, P Kannaiah,Scitech
8. Engineering Drawing – Agarwal and Agarwal, Mc GrawHill
9. Engineering Graphics – PI Varghese, Mc GrawHill
10. Text book of Engineering Drawing with auto-CAD ,K.venkatareddy/B.S .publications.
11. Engineering Drawing with Auto CAD/ James D Bethune/Pearson Publications
12. Engineering Graphics with Auto CAD/Kulkarni D.M, Rastogi A.P, Sarkar A.K/PHI Publications

End Semester examination shall be conducted for **Four** hours with the following pattern:

- a) Two hours - Conventional drawing
- b) Two hours – Computer Aided Drawing

#### **Course outcomes:**

1. Student get exposed on working of sheet metal with help of development of surfaces.
2. Student understands how to know the hidden details of machine components with the help of sections and interpenetrations of solids.
3. Student shall exposed to modeling commands for generating 2D and 3D objects using computer aided drafting tools which are useful to create machine elements for computeraided analysis.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**

**DEPARTMENT OF MECHANICAL ENGINEERING**

<b>II Year - I Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>FLUID MECHANICS &amp; HYDRAULIC MACHINERY LAB</b>					

**Course Objective:** To impart practical exposure on the performance evaluation methods of various flow measuring equipment and hydraulic turbines and pumps.

1. Impact of jets on Vanes.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine.
5. Performance Test on Single Stage Centrifugal Pump.
6. Performance Test on Multi Stage Centrifugal Pump.
7. Performance Test on Reciprocating Pump.
8. Calibration of Venturimeter.
9. Calibration of Orificemeter.
10. Determination of friction factor for a given pipeline.
11. Determination of loss of head due to sudden contraction in a pipeline.
12. Turbine flowmeter.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**

**DEPARTMENT OF MECHANICAL ENGINEERING**

<b>II Year - I Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>PRODUCTION TECHNOLOGY LAB</b>					

**Course Objective:** To impart hands-on practical exposure on manufacturing processes and equipment.

1. Design and making of pattern
  - i. Single piece pattern
  - ii. Split pattern
2. Sand property testing
  - i. Sieve analysis (dry sand)
  - ii. Clay content test
  - iii. Moisture content test
  - iv. Strength test (Compression test & Shear test)
  - v. Permeability test
3. Mould preparation
  - i. Straight pipe
  - ii. Bent pipe
  - iii. Dumb
  - iv. Gear blank
4. Gas cutting and welding
5. Manual metal arc welding
  - i. Lap joint
  - ii. Butt joint
6. Injection Molding
7. Blow Molding
8. Simple models using sheet metal operations
9. Study of deep drawing and extrusion operations
10. Study of Basic powder compaction and sintering
11. Study of TIG/MIG Welding
12. Study of Resistance Spot Welding
13. Study of Brazing and soldering
14. Study of Plastic Moulding Process.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**

**DEPARTMENT OF MECHANICAL ENGINEERING**

<b>II Year - I Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>
<b>DRAFTING AND MODELING LAB</b>					

- DRAFTING:** Development of part drawings for various components in the form of orthographic and isometric. Representation of dimensioning and tolerances, Study of DXE, IGES files.
- SURFACE MODELING** - Generation of various Surfaces using surface modeling.

**A) DRAFTING:** Development of part drawings for various components in the form of orthographic and isometric. Representation of dimensioning and tolerances, Study of DXE, IGES files.

**B) SURFACE MODELING** - Generation of various Surfaces using surface modeling.

**C)** The following contents to be done by any 3D software package:

**(i) PART MODELING:** Generation of various 3D models through Pad, revolve, shell, sweep, parent child relation, Boolean operations and various standard translators.

**(ii) Assembly drawings:** (Any four of the following using solid model software) Generation of various Parts/assemblies: like Screw Jack, Oldham's Coupling, Foot step bearing, Couplings, knuckle and cotter joints, Crankshaft, Connecting Rod, Piston and Cylinder.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**

**DEPARTMENT OF MECHANICAL ENGINEERING**

<b>II Year - II Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>MECHANICS OF SOLIDS &amp; METALLURGY LAB</b>					

**Course Objective:** To impart practical exposure on the microstructures of various materials and their hardness evaluation. Also to impart practical knowledge on the evaluation of material properties through various destructive testing procedures.

**NOTE: Any 6 experiments from each section A and B.**

**(A) MECHANICS OF SOLIDSLAB:**

1. Direct tension test
2. Bending test on
  - a) Simple supported
  - b) Cantilever beam
3. Torsion test
4. Hardness test
  - a) Brinell's hardness test
  - b) Rockwell hardness test
5. Test on springs
6. Compression test on cube
7. Impact test
8. Punch shear test

**(B) METALLURGY LAB:**

1. Preparation and study of the Microstructure of pure metals like Iron, Cu and Al.
2. Preparation and study of the Microstructure of Mild steel, Medium carbon steels, High carbon steels.
3. Study of the Micro Structures of Cast Irons.
4. Study of the Micro Structures of Non-Ferrous alloys.
5. Study of the Micro structures of Heat treated steels.
6. Hardenability of steels by Jominy End Quench Test.
7. To find out the hardness of various treated and untreated steels.



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**DEPARTMENT OF MECHANICAL ENGINEERING**

<b>II Year - II Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>MACHINE DRAWING PRACTICE</b>					

***Course Objective:** The student will acquire knowledge in national and International standards while drawing machine components students will also familiarize in drawing assembly, orthographic and sectional views of various machine components.*

**Machine Drawing Conventions:**

Need for drawing conventions – introduction to IS conventions-Standardization-Interchangeability-Selective assembly-Tolerance

- a) Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
- b) Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
- c) Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved tapered features and surface finish indication
- d) Title boxes, their size, location and details - common abbreviations & their liberal usage
- e) Types of Drawings – working drawings for machine parts.

**PART-A**

**I. Drawing of Machine Elements and simple parts**

**Objective: To provide basic understanding and drawing practice of various joint, simple mechanical parts**

Selection of Views, additional views for the following machine elements and parts with every drawing proportions.

- a) Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, setscrews.
- b) Keys, cotter joints, knuckle joint, Hook's joint
- c) Riveted joints for plates
- d) Shaft couplings.
- e) Journal, pivot and collar and foot step bearings.

**PART-B**

**II. Assembly Drawings:**

**Objective: The student will be able to draw the assembly from the individual part drawing.** Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions.

- a) Engine parts – Gear pump, Fuel pump, petrol Engine connecting rod, piston, stuffing box and eccentric assembly.
- b) Other machine parts - Screws jack, Machine swivel vice, Plummer block, Tailstock and Tool post.

**III. Manufacturing Drawing**

Introduction of Limits and fits, fundamental deviations for Hole based and Shaft based systems, alpha numeric designation of limits & fits. Types of Fits. Form and positional tolerances.

Conventional practices of indicating limits and fits, geometrical form and position tolerances, surface finish and surface treatments requirements. Study of Examples involving selection of fits and calculation of limits. Suggestion of suitable fits for mating parts.

Representation of limits fits and tolerances for mating parts. Use any four parts of above assembly drawings and prepare manufacturing drawing with dimensional and geometric tolerances.



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

### DEPARTMENT OF MECHANICAL ENGINEERING

#### **TEXT BOOKS:**

1. Machine Drawing – N.Siddeswar, K.Kannaiah&V.V.S.Sastry -TMH
2. Machine Drawing –K.L.Narayana, P.Kannaiah&K. Venkata Reddy / New Age/Publishers
3. Production Drawing- K.L.Narayana, P.Kannaiah&K. Venkata Reddy / New Age/Publishers

#### **REFERENCES:**

1. Machine Drawing –P.S.Gill,
2. Machine Drawing –Luzzader
3. Machine Drawing –Rajput
4. Machine Drawing – N.D. Junnarkar,Pearson
5. Machine Drawing – Ajeeth Singh, McGrawHill
6. Machine Drawing – KC John,PHI
7. Machine Drawing – B Battacharya,Oxford
8. Machine Drawing – Gowtham and Gowtham,Pearson
9. Machine Drawing- Dhawan R K-S.chand&Company

#### **Course Outcome:**

CO1. Draw and represent standard dimensions of different mechanical fasteners and joints and Couplings.

CO2. Draw different types of bearings showing different components.

CO3. Assemble components of a machine part and draw the sectional assembly drawing showing the dimensions of all the components of the assembly as per bill of materials

CO4. Select and represent fits and geometrical form of different mating parts in assembly drawings.

CO5: To prepare manufacturing drawings indicating fits, tolerances, surface finish and surface treatment requirements.



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**DEPARTMENT OF MECHANICAL ENGINEERING**

<b>II Year - II Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>THEORY OF MACHINES LAB</b>					

1. To determine whirling speed of shaft theoretically and experimentally.
2. To determine the position of sleeve against controlling force and speed of a Hartnell governor and to plot the characteristic curve of radius of rotation.
3. To analyse the motion of a motorized gyroscope when the couple is applied along its spin axis
4. To determine the frequency of undamped free vibration of an equivalent spring mass system.
5. To determine the frequency of damped force vibration of a spring mass system
6. To study the static and dynamic balancing using rigid blocks.
7. To find the moment of inertia of a flywheel
8. To plot follower displacement vs cam rotation for various Cam Follower systems.
9. To plot slider displacement, velocity and acceleration against crank rotation for single slider crank mechanism/Four bar mechanism
10. To find coefficient of friction between belt and pulley.
11. To study simple and compound screw jack and determine the mechanical advantage, velocity ratio and efficiency
12. To study various types of gears- Spur, Helical, Worm and Bevel Gears

<b>II Year - II Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>1</b>	<b>0</b>	<b>2</b>	<b>2</b>
<b>PYTHON PROGRAMMING LAB</b>					

**Course Objective:** To understand the PYTHON environment and make numerical computations and analysis.

**Course Outcomes:**

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

**CO1** Solve the different methods for linear, non-linear and differential equations

**CO2** Learn the PYTHON Programming language

**CO3** Familiar with the strings and matrices in PYTHON

**CO4** Write the Program scripts and functions in PYTHON to solve the methods

**CONTENTS**

Write Programs in PYTHON Programming for the following:





## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA–533003, Andhra Pradesh, India

### DEPARTMENT OF MECHANICAL ENGINEERING

1. To find the roots of non-linear equation using Bisection method
2. To find the roots of non-linear equation using Newton Raphson's method.
3. Curve fitting by least – square approximations
4. To solve the system of linear equations using Gauss - elimination method
5. To solve the system of linear equations using Gauss - Siedal method
6. To solve the system of linear equations using Gauss - Jordan method
7. To integrate numerically using Trapezoidal rule
8. To integrate numerically using Simpsons rule
9. To find the largest eigen value of a matrix by Power – method
10. To find numerical solution of ordinary differential equations by Euler's method
11. To find numerical solution of ordinary differential equations by Runge-Kutta method
12. To find numerical solution of ordinary differential equations by Milne's method
13. To find the numerical solution of Laplace equation
14. To find the numerical solution of Wave equation
15. To find the solution of a tri-diagonal matrix using Thomas algorithm
16. To fit a straight using least square technique



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**DEPARTMENT OF MECHANICAL ENGINEERING**

**COURSE STRUCTURE AND SYLLABUS**

**For**

**B. TECH MECHANICAL ENGINEERING**

*(Applicable for batches admitted from 2019-2020)*



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**DEPARTMENT OF MECHANICAL ENGINEERING**

**III YEAR I SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	PCC-ME	Dynamics of Machinery	3	--	--	3
2	PCC-ME	Design of Machine Members-II	3	--	--	3
3	PCC-ME	Mechanical Measurements & Metrology	3	--	--	3
4	HSIMS	Managerial Economics and Financial Accountancy	3	--	--	3
5	PCC-ME	IC Engines & Gas turbines	3	--	--	3
6	PCC-Lab	Thermal Engineering Lab	--	--	3	1.5
7	PCC-Lab	Theory of Machines Lab	--	--	3	1.5
8	PCC-Lab	Mechanical Measurements & Metrology Lab	--	--	3	1.5
9	PROJ-3101	Socially Relevant Project				0.5
		<b>Total Credits</b>	<b>15</b>	<b>--</b>	<b>9</b>	<b>20</b>

**III YEAR II SEMESTER**

S. No	Course Code	Course Title	L	T	P	Credits
1	PCC-ME	Operations Research	3	--	--	3
2	PCC-ME	Heat Transfer	3	--	--	3
3	PCC-ME	CAD/CAM	3	--	--	3
4	PEC-ME1	1.Composite Materials 2.Refrigeration & Air Conditioning 3. Unconventional Machining Processes 4. Advanced Mechanics of Solids 5.MOOCs(NPTEL/Swayam)	3	--	--	3
5	PEC-ME2	1. Material Characterization 2. Tribology 3. Automobile Engineering 4.Mechatronics 5.MOOCs(NPTEL/Swayam)	3	--	--	3
6	PCC-Lab	Simulation of Mechanical Systems Lab	--	--	2	1
7	PCC-Lab	Heat Transfer Lab	--	--	3	1.5
8	PCC-Lab	CAD /CAM Lab	--	--	3	1.5
9	PROJ- ME	Summer Internship*	--	--		1
		<b>Total Credits</b>	<b>15</b>	<b>--</b>	<b>9</b>	<b>20</b>

\*The students have to undergo a summer internship for minimum of Four weeks duration from Industries/R&D/ Govt. Organizations after B.Tech III year II-Semester and credits will be awarded in B.Tech IV year I-Semester after evaluation.



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**DEPARTMENT OF MECHANICAL ENGINEERING**

<b>III Year - I Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>THERMAL ENGINEERING LAB</b>					

**Course objective: To provide hands on experience in operating various types of internal combustion engines and understand their functioning and performance.**

*Note: The students have to perform minimum 10 Experiments.*

1. I.C. Engines valve and port timing diagrams.
2. Testing of Fuels – Viscosity, flash point/fire point, carbon residue, calorific value.
3. I.C. Engine performance test and Exhaust emission measurements (4 -stroke diesel engine)
4. I.C. Engine performance test and Exhaust emission measurements (2-stroke petrol engine)
5. Evaluation of friction power by conducting Morse test on 4-stroke multi cylinder engine.
6. Determination of Friction Power by retardation or motoring test on IC engine.
7. I.C. Engine heat balance at different loads and show the heat distribution curve.
8. Economical speed test of an IC engine.
9. Performance test on variable compression ratio engines.
10. Performance test on reciprocating air compressor unit.
11. Dis-assembly / assembly of different parts of two wheelers. 3 wheelers & 4 wheelers. Tractor & Heavy duty engines covering 2-stroke and 4 stroke, SI and CI engines.
12. Study of boilers, mountings and accessories.



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**DEPARTMENT OF MECHANICAL ENGINEERING**

<b>III Year - I Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>THEORY OF MACHINES LAB</b>					

1. To determine whirling speed of shaft theoretically and experimentally.
2. To determine the position of sleeve against controlling force and speed of a Hartnell governor and to plot the characteristic curve of radius of rotation.
3. To analyse the motion of a motorized gyroscope when the couple is applied along its spin axis
4. To determine the frequency of undamped free vibration of an equivalent spring mass system.
5. To determine the frequency of damped force vibration of a spring mass system
6. To study the static and dynamic balancing using rigid blocks.
7. To find the moment of inertia of a flywheel
8. To plot follower displacement vs cam rotation for various Cam Follower systems.
9. To plot slider displacement, velocity and acceleration against crank rotation for single slider crank mechanism/Four bar mechanism
10. To find coefficient of friction between belt and pulley.
11. To study simple and compound screw jack and determine the mechanical advantage , velocity ratio and efficiency
12. To study various types of gears- Spur, Helical, Worm and Bevel Gears



# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

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## DEPARTMENT OF MECHANICAL ENGINEERING

III Year - I Semester	L	T	P	C
	0	0	3	1.5
<b>MECHANICAL MEASUREMENTS &amp; METROLOGY LAB</b>				

### Course Objectives:

(1) The Metrology Lab course is designed for measuring and gauging instruments for inspection of precision linear, geometric forms, angular and surface finish measurements. The student can learn the measurements with and calibration of instruments.

(2) Mechanical Measurements lab introduces the students with the theory and methods for conducting experimental work in the laboratory and calibration of various instruments for measuring pressure, temperature, displacement, speed, vibration etc.

**Note:** The students have to conduct at least 8 experiments from each lab

### METROLOGY LAB

1. Measurement of lengths, heights, diameters by vernier calipers, micrometers etc.
2. Measurement of bores by internal micrometers and dial bore indicators.
3. Use of gear tooth vernier caliper for tooth thickness inspection and flange micro meter for checking the chordal thickness of spur gear.
4. Measurement using Mechanical comparator.
5. Measurements using Optical Projector.
6. Measurement of alignment using Autocollimator.
7. Angle and taper measurements with bevel protractor, Sine bar, rollers and balls.
8. Use of spirit level in finding the straightness of a bed and flatness of a surface.
9. Thread inspection with two wire/ three wire method & tool makers microscope.
10. Surface roughness measurement with roughness measuring instrument.

### MECHANICAL MEASUREMENTS LAB

1. Calibration of pressure gauge.
2. Calibration of transducer for temperature measurement.
3. Study and calibration of LVDT transducer for displacement measurement.
4. Calibration of strain gauge.
5. Calibration of thermocouple.
6. Calibration of capacitive transducer.
7. Study and calibration of photo and magnetic speed pickups.
8. Calibration of resistance temperature detector.
9. Study and calibration of a rotameter.
10. Study and use of a seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
11. Study and calibration of McLeod gauge for low pressure.

### Course outcomes:

#### Metrology Lab

Student will become familiar with the different instruments that are available for linear, angular, roundness and roughness measurements they will be able to select and use the appropriate measuring instrument according to a specific requirement (in terms of accuracy, etc)

### MECHANICAL MEASUREMENTS LAB



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**DEPARTMENT OF MECHANICAL ENGINEERING**

Students will be able to select proper measuring instrument and know requirement of calibration, errors in measurement etc. They can perform accurate measurements.



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**DEPARTMENT OF MECHANICAL ENGINEERING**

<b>III Year - I Semester</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.5</b>
<b>SOCIALLY RELEVANT PROJECT</b>				

Student can choose any one of the given below / any other socially relevant problem and work on it to produce a project document.

1. Water Conservation Related Works
2. Swatch Bharath (Internal External)
3. Helping police
4. Traffic monitoring
5. Teaching Rural Kids (Sarva siksha Abhiyan)
6. Street light monitoring
7. Electricity Conservation
8. Solar panel utilization
9. E- policing & cyber solution
10. Pollution
11. Any social related





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**DEPARTMENT OF MECHANICAL ENGINEERING**

III Year - II Semester		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>
<b>SIMULATION OF MECHANICAL SYSTEMS LAB</b>					

1. Mass-Spring-Damper with controller
2. Double Mass-Spring- Damper
3. Simple Mechanical System
4. Mechanical System with Translational Friction
5. Mechanical System with Translational Hard stop
6. Mechanical Rotational System with stick-slip motion
7. Linkage Mechanism
8. Steering Mechanism

**Softwares Used:** MATLAB/SCILAB



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**DEPARTMENT OF MECHANICAL ENGINEERING**

<b>III Year - II Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>HEAT TRANSFER LAB</b>					

**Objectives:**

The laboratory course is aimed to provide the practical exposure to the students with regard to the determination of amount of heat exchange in various modes of heat transfer including condensation & boiling for several geometries.

*Note: The students have to perform minimum 12 Experiments.*

1. COP of VCR System with Capillary and thermal expansion valve.
2. Determination of overall heat transfer co-efficient of a composite slab
3. Determination of heat transfer rate through a lagged pipe.
4. Determination of heat transfer rate through a concentric sphere
5. Determination of thermal conductivity of a metal rod.
6. Determination of efficiency of a pin-fin
7. Determination of heat transfer coefficient in natural and forced convection
8. Determination of effectiveness of parallel and counter flow heat exchangers.
9. Determination of emissivity of a given surface.
10. Determination of Stefan Boltzman constant.
11. Determination of heat transfer rate in drop and film wise condensation.
12. Determination of critical heat flux.
13. Determination of Thermal conductivity of liquids and gases.
14. Investigation of Lambert's cosine law.

**Outcomes:**

The student should be able to evaluate the amount of heat exchange for plane, cylindrical & spherical geometries and should be able to compare the performance of extended surfaces and heat exchangers



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**DEPARTMENT OF MECHANICAL ENGINEERING**

<b>III Year - II Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>CAD/CAM LAB</b>					

**Course Objectives:**

1. To impart the fundamental knowledge on using various analytical tools like ANSYS, FLUENT, etc., for Engineering Simulation
  2. To know various fields of engineering where these tools can be effectively used to improve the output of a product.
  3. To impart knowledge on how these tools are used in Industries by solving some real time problems using these tools..
1. **DRAFTING:** Development of part drawings for various components in the form of orthographic and isometric. representation of dimensioning and tolerances scanning and plotting. study of script, DXE and IGES files.
  2. **PART MODELING:** Generation of various 3D models through protrusion, revolve, shell sweep. creation of various features. study of parent child relation. feature based and boolean based modeling surface and assembly modeling. study of various standard translators. design simple components.
  3. a). Study of various post processors used in NC Machines.  
 b). Machining of simple components on NC lathe and Mill by transferring NC Code / from a CAM package. Through RS 232.  
 c) Practice on CNC Sinutrain Turning  
 d) Practice on CNC Sinutrain Milling  
 e) CNC programming for turned components using FANUC Controller  
 f) CNC programming for milled components using FANUC Controller  
 g) Automated CNC Tool path & G-Code generation using Pro/E/MasterCAM

**Packages to be provided to cater to drafting and modeling from the following:**

CATIA, Pro-E, I-DEAS, Gibbs CAM, Master CAM etc.

**Course outcomes:**

Upon successful completion of this course student should be able to:

1. The student will be able to appreciate the utility of the modeling tools in creating 2D and 3D drawings.
2. Use of these tools for any engineering and real time applications
3. Acquire knowledge on utilizing these tools for a better project in their curriculum as well as they will be prepared to handle industry problems with confidence when it matters to use these tools in their Employment

# **COURSE STRUCTURE AND SYLLABUS**

**For**

## **MECHANICAL ENGINEERING**

*(Applicable for batches admitted from 2016-2017)*



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA**  
**KAKINADA - 533 003, Andhra Pradesh, India**

### IV Year - I Semester

S. NO	Subjects	L	T	P	Credits
1	Mechatronics	4	--	--	3
2	CAD/CAM	4	--	--	3
3	Finite Element Methods	4	--	--	3
4	Power Plant Engineering	4	--	--	3
5	<b>Elective I</b> 1. Computational Fluid Dynamics 2. Condition Monitoring 3. Additive Manufacturing	4	--	--	3
6	<b>Elective II</b> 1. Advanced Materials 2. Design for Manufacture 3. Gas Dynamics & Jet Propulsion	4	--	--	3
7	<b>CAD/CAM Lab</b>	--	--	2	2
8	<b>Mechatronics Lab</b>	--	--	2	2
<b>Total Credits</b>					<b>22</b>

### IV Year - II Semester

S. No.	Subjects	L	T	P	Credits
1	Production Planning and Control	4	--	--	3
T 2	Unconventional Machining Processes	4	--	--	3
3	Automobile Engineering	4	--	--	3
4	<b>Elective III</b> 1. Thermal Equipment Design 2. Non Destructive Evaluation 3. Quality and Reliability Engineering	4	--	--	3
5	Seminar	--	3	--	2
6	<b>Project</b>	--	--	--	10
<b>Total Credits</b>					<b>24</b>

**Total Course Credits = 48+44 + 42 + 46 = 180**

IV Year - I Semester

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>2</b>

**CAD/CAM LAB**

**Course Objectives:**

1. To impart the fundamental knowledge on using various analytical tools like ANSYS, FLUENT, etc., for Engineering Simulation
  2. To know various fields of engineering where these tools can be effectively used to improve the output of a product.
  3. To impart knowledge on how these tools are used in Industries by solving some real time problems using these tools..
- 
1. **DRAFTING:** Development of part drawings for various components in the form of orthographic and isometric representation of dimensioning and tolerances scanning and plotting. study of script, DXE and IGES files.
  2. **PART MODELING:** Generation of various 3D models through protrusion, revolve, shell sweep. creation of various features. study of parent child relation. feature based and boolean based modelling surface and assembly modelling. study of various standard translators. design simple components.
  3. a). Determination of deflection and stresses in 2D and 3D trusses and beams.  
b). Determination of deflections component and principal and Von-mises stresses in plane stress, plane strain and Axisymmetric components.  
c). Determination of stresses in 3D and shell structures (at least one example in each case)  
d). Estimation of natural frequencies and mode shapes, Harmonic response of 2D beam.  
e). Steady state heat transfer Analysis of plane and Axisymmetric components.
  4. a). Study of various post processors used in NC Machines.  
b). Machining of simple components on NC lathe and Mill by transferring NC Code / from a CAM package. Through RS 232.  
c). Practice on CNC Sinutrain Turning  
d). Practice on CNC Sinutrain Milling  
e). CNC programming for turned components using FANUC Controller  
f). CNC programming for milled components using FANUC Controller  
g). Automated CNC Tool path & G-Code generation using Pro/E/MasterCAM

**Packages to be provided to cater to drafting, modeling & analysis from the following:**

CATIA, Pro-E, I-DEAS, ANSYS, NISA, CAEFEM, Gibbs CAM, Master CAM etc.

**Course outcomes:**

Upon successful completion of this course student should be able to:

1. The student will be able to appreciate the utility of the tools like ANSYS or FLUENT in solving real time problems and day to day problems.
2. Use of these tools for any engineering and real time applications
3. Acquire knowledge on utilizing these tools for a better project in their curriculum as well as they will be prepared to handle industry problems with confidence when it matters to use these tools in their Employment

**IV Year - I Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

**MECHATRONICS LAB**

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

- 1 Measure load, displacement and temperature using analogue and digital sensors.
- 2 Develop PLC programs for control of traffic lights, water level, lifts and conveyor belts.
- 3 Simulate and analyse PID controllers for a physical system using MATLAB.
- 4 Develop pneumatic and hydraulic circuits using Automaton studio.

**List of Experiments**

1. DYNA 1750 Transducers Kit :-
  - a. Characteristics of LVDT
  - b. Principle & Characteristics of Strain Gauge
  - c. Characteristics of Summing Amplifier
  - d. Characteristics of Reflective Opto Transducer
2. PLC PROGRAMMING
  - a. Ladder programming on Logic gates ,Timers & counters
  - b. Ladder Programming for digital & Analogy sensors
  - c. Ladder programming for Traffic Light control, Water level control and Lift control Modules
3. AUTOMATION STUDIO software
  - a. Introduction to Automation studio & its control
  - b. Draw & Simulate the Hydraulic circuit for series & parallel cylinders connection
  - c. Draw & Simulate Meter-in, Meter-out and hydraulic press and clamping.
4. MATLAB Programming
  - a. Sample programmes on Matlab
  - b. Simulation and analysis of PID controller using SIMULINK