NPR College of Engineering & Technology
NPR Nagar, Natham, Dindigul - 624401, Tamil Nadu, India.
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1.3.2 AVERAGE PERCENTAGE OF COURSES THAT INCLUDE EXPERIMENTAL LEARNING THROUGH PROJECT WORK / FIELD WORK / INTERNSHIP DURING 2020-21

S. No.	Programme offering	Name of the Course	Course Code	Project / Field Work / Internship	Page No.
1	BE – Mechanical Engineering	Materials Science	PH8251	Project	3
2	BE – Mechanical Engineering	Basic Electrical, Electronics and Instrumentation Engineering	BE8253	Field Work	10
3	BE – Mechanical Engineering	Engineering Mechanics	GE8292	Field Work	12
4	BE – Mechanical Engineering	Engineering Thermodynamics	ME8391	Internship	15
5	BE – Mechanical Engineering	Fluid Mechanics and Machinery	CE8394	Internship	18
6	BE – Mechanical Engineering	Manufacturing Technology - I	ME8351	Internship	21
7	BE – Mechanical Engineering	Electrical Drives and Controls	EE8353	Field Work	24
8	BE – Mechanical Engineering	Kinematics of Machinery	ME8492	Internship	26
9	BE – Mechanical Engineering	Manufacturing Technology – II	ME8451	Project	29
10	BE – Mechanical Engineering	Engineering Metallurgy	ME8491	Project	35
11	BE – Mechanical Engineering	Strength of Materials for Mechanical Engineers	CE8395	Field Work	41
12	BE – Mechanical Engineering	Thermal Engineering- I	ME8493	Internship	43
13	BE – Mechanical Engineering	Thermal Engineering- II	ME8595	Field Work	46
14	BE – Mechanical Engineering	Design of Machine Elements	ME8593	Internship	49
15	BE – Mechanical Engineering	Metrology and Measurements	ME8501	Project	52
16	BE – Mechanical Engineering	Dynamics of Machines	ME8594	Project	59
17	BE – Mechanical Engineering	Automotive System	OAT551	Internship	65
18	BE – Mechanical Engineering	Design of Transmission Systems	ME8651	Internship	68
19	BE – Mechanical Engineering	Computer Aided Design and Manufacturing	ME8691	Project	71
20	BE – Mechanical Engineering	Heat and Mass Transfer	ME8693	Internship	77

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21	BE – Mechanical Engineering	Finite Element Analysis	ME8692	Project	80
22	BE – Mechanical Engineering	Hydraulics and Pneumatics	ME8694	Internship	86
23	BE – Mechanical Engineering	Welding Technology	PR8592	Project	88
24	BE – Mechanical Engineering	Power Plant Engineering	ME8792	Internship	97
25	BE – Mechanical Engineering	Process Planning and Cost Estimation	ME8793	Internship	100
26	BE – Mechanical Engineering	Mechatronics	ME8791	Project	102
27	BE – Mechanical Engineering	Robotics	OIE751	Field Work	109
28	BE – Mechanical Engineering	Unconventional Machining Processes	ME8073	Internship	112
29	BE – Mechanical Engineering	Non Destructive Testing and Evaluation	ME8097	Internship	114
30	BE – Mechanical Engineering	Principles of Management	MG8591	Field Work	117
31	BE – Mechanical Engineering	Production Planning and Control	IE8693	Internship	119
32	BE – Mechanical Engineering	Project Work	ME8811	Project	122

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		L	T	P	C
PH8251	**MATERIALS SCIENCE** (Common to courses offered in Faculty of Mechanical Engineering Except B.E. Materials Science and Engineering)	3	0	0	3

OBJECTIVES:

- To introduce the essential principles of materials science for mechanical and related engineering applications.

UNIT I PHASE DIAGRAMS 9

Solid solutions - Hume Rothery's rules – the phase rule - single component system - one-component system of iron - binary phase diagrams - isomorphous systems - the tie-line rule - the lever rule - application to isomorphous system - eutectic phase diagram - peritectic phase diagram - other invariant reactions – free energy composition curves for binary systems - microstructural change during cooling.

UNIT II FERROUS ALLOYS 9

The iron-carbon equilibrium diagram - phases, invariant reactions - microstructure of slowly cooled steels - eutectoid steel, hypo and hypereutectoid steels - effect of alloying elements on the Fe-C system - diffusion in solids - Fick's laws - phase transformations - T-T-T-diagram for eutectoid steel – pearlitic, baintic and martensitic transformations - tempering of martensite – steels – stainless steels – cast irons.

UNIT III MECHANICAL PROPERTIES 9

Tensile test - plastic deformation mechanisms - slip and twinning - role of dislocations in slip - strengthening methods - strain hardening - refinement of the grain size - solid solution strengthening - precipitation hardening - creep resistance - creep curves - mechanisms of creep - creep-resistant materials - fracture - the Griffith criterion - critical stress intensity factor and its determination - fatigue failure - fatigue tests - methods of increasing fatigue life - hardness - Rockwell and Brinell hardness - Knoop and Vickers microhardness.

UNIT IV MAGNETIC, DIELECTRIC AND SUPERCONDUCTING MATERIALS 9

Ferromagnetism – domain theory – types of energy – hysteresis – hard and soft magnetic materials – ferrites - dielectric materials – types of polarization – Langevin-Debye equation – frequency effects on polarization - dielectric breakdown – insulating materials – Ferroelectric materials - superconducting materials and their properties.

UNIT V NEW MATERIALS 9

Ceramics – types and applications – composites: classification, role of matrix and reinforcement, processing of fiber reinforced plastics – metallic glasses: types , glass forming ability of alloys, melt spinning process, applications - shape memory alloys: phases, shape memory effect, pseudoelastic effect, NiTi alloy, applications – nanomaterials: preparation (bottom up and top down approaches), properties and applications – carbon nanotubes: types.

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of this course,

- the students will have knowledge on the various phase diagrams and their applications
- the students will acquire knowledge on Fe-Fe_3C phase diagram,various microstructures and alloys
- the students will get knowledge on mechanical properties of materials and their measurement
- the students will gain knowledge on magnetic, dielectric and superconducting properties of materials
- the students will understand the basics of ceramics, composites and nanomaterials.

TEXT BOOKS:

1. Balasubramaniam, R. "Callister's Materials Science and Engineering". Wiley India Pvt. Ltd., 2014.
2. Raghavan, V. "Physical Metallurgy: Principles and Practice". PHI Learning, 2015.
3. Raghavan, V. "Materials Science and Engineering : A First course". PHI Learning, 2015.

REFERENCES

1. Askeland, D. "Materials Science and Engineering". Brooks/Cole, 2010.
2. Smith, W.F., Hashemi, J. & Prakash, R. "Materials Science and Engineering". Tata McGraw Hill Education Pvt. Ltd., 2014.
3. Wahab, M.A. "Solid State Physics: Structure and Properties of Materials". Narosa Publishing House, 2009.

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DESIGN AND FABRICATION OF A WALKING CHAIR USING THEO JANSEN MECHANISM

A PROJECT REPORT

Submitted by

K. AAKASH	**920817114001**
J. ALAN JACOB	**920817114007**
B. ARAVIND	**920817114011**
K. GOWTHAM	**920817114022**

In partial fulfilment for the award of the degree

of

BACHELOR OF ENGINEERING

In

MECHANICAL ENGINEERING

NPR COLLEGE OF ENGINEERING & TECHNOLOGY,

DINDIGUL-624 401

ANNA UNIVERSITY:: CHENNAI 600 025

April 2021

ANNA UNIVESITY:: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project report **"DESIGN AND FABRICATION OF A WALKING CHAIR USING THEO JANSEN MECHANISM"** is the bonafide work **K. AAKASH (920817114001), J. ALAN JACOB (920817114007) B. ARAVIND (920817114011), K. GOWTHAM (920817114022),** who carried out the project under my supervision. Certified further that to the best of my knowledge the work reported herein does not form part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

SIGNATURE

Dr.T.MALAICHAMY, M.E., Ph.D.,

HEAD OF DEPARTMENT

Department of Mechanical Engineering,

NPR College of Engg & Tech.,

Dindigul-624 401

SIGNATURE

Mr. T. BALASUBRAMANI , M.E.,

SUPERVISOR

ASSISTANT PROFESSOR

Department of Mechanical Engineering,

NPR College of Engg &Tech.,

Dindigul-624 401

Submitted to the VIVA-VOCE examination held on 30.7.21.

INTERNAL EXAMINER

EXTERNAL EXAMINER

ABSTRACT

A machine is designed with the intentions of exploiting the advantages of the alking motion over the traditional rolling motion. Over the years people with omotive disability have struggled to live a life of independency, many ideas were eveloped to kill the dependency but those ideas were lost either in research or the eavy expenses doomed them. For a country like India, whose majority of the ovement disabled population resides in the rural areas, it is very important to develop nd alternative to their woes at very minimal cost. The answer to this was sought in he development of the walking chair. The project is intended to develop a chair that an be used on varied terrain and that can overcome small obstacles at the price of most basic wheelchair available in India. This idea utilizes a parent idea of Theo Jansen, a Dutch physicist who invented a mechanism for the leg like motion of a system and called it the Jansen linkage. Now using these linkages we intend to build a chair that is propelled by motor using a mechanism in order to make it cost effective. Hence to sum up in a line our project changes the history of 8000 years in locomotion technology keeping in mind the social need for a change.

Keywords : Walking motion, disability, Theo Jansen

CHAPTER 9

CONCLUSION

The literature collected provides us with an idea of the various application possibilities based on the Theo Jansen mechanism. Most of the literature collected provide us with a hint that most of the applications described are still in a proposal or prototype level and have not yet been mass produced. The literature collected is based on the internet database and no case study is involved which investigates the usage of the mechanism in practical life. Design and fabrication of the walking mechanism done in prototype with two different materials and size in small with acrylic and larger scale with metal results shows it could be helpful for the disabled persons living in the rural areas of our country.

From the above results it can be seen the objective are achieved which are required for the smooth running of the walking mechanism. The following conclusions can be drawn from the designed mechanism:

- Ability to avoid obstacles by stepping over them because of the path followed by the leg toe and heel.
- Because of the more taking time in support phase and there will be four legs will be in contact with ground it can be statically stable during entire locomotive cycle Toe and Heel
- Durable joints/hinges/moving parts which will not become blocked by debris over time
- It can made with inexpensive materials like plastic components
- It utilizes less power for movement of legs compared to traditional system i.e wheels on the uneven surfaces, steps climbing, rock or hill areas therefore it is energy efficient.
- No control mechanism necessary for movement like hydraulic systems and control systems etc.

Hence to sum up in a line our project changes the history of 8000 years in locomotion technology keeping in mind the social need for a change. Also, there is high potential for development of other applications like bomb disposal, security surveillance, spy operations, exploration, pitch marking, stair climbing, moving furniture, etc based on this mechanism in future. In future we have to use this robot to perform different type of operations automatically by using sensors.

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BE8253 **BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING**

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on

- Electric circuit laws, single and three phase circuits and wiring
- Working principles of Electrical Machines
- Working principle of Various electronic devices and measuring instruments

UNIT I ELECTRICAL CIRCUITS **9**

Basic circuit components – Ohms Law - Kirchoff's Law – Instantaneous Power – Inductors - Capacitors – Independent and Dependent Sources - steady state solution of DC circuits - Nodal analysis, Mesh analysis- Thevinin's Theorem, Norton's Theorem, Maximum Power transfer theorem- Linearity and Superposition Theorem.

UNIT II AC CIRCUITS **9**

Introduction to AC circuits – waveforms and RMS value – power and power factor, single phase and three-phase balanced circuits – Three phase loads - housing wiring, industrial wiring, materials of wiring

UNIT III ELECTRICAL MACHINES **9**

Principles of operation and characteristics of DC machines, Transformers (single and three phase) ,Synchronous machines , three phase and single phase induction motors.

UNIT IV ELECTRONIC DEVICES & CIRCUITS **9**

Types of Materials – Silicon & Germanium- N type and P type materials – PN Junction –Forward and Reverse Bias –Semiconductor Diodes –Bipolar Junction Transistor – Characteristics – Field Effect Transistors – Transistor Biasing –Introduction to operational Amplifier –Inverting Amplifier –Non Inverting Amplifier –DAC – ADC .

UNIT V MEASUREMENTS & INSTRUMENTATION **9**

Introduction to transducers - Classification of Transducers: Resistive, Inductive, Capacitive, Thermoelectric, piezoelectric, photoelectric, Hall effect and Mechanical - ,Classification of instruments - Types of indicating Instruments - multimeters –Oscilloscopes- – three-phase power measurements – instrument transformers (CT and PT)

TOTAL : 45 PERIODS

OUTCOMES:

Ability to

- Understand electric circuits and working principles of electrical machines
- Understand the concepts of various electronic devices
- Choose appropriate instruments for electrical measurement for a specific application

TEXT BOOKS

1. Leonard S Bobrow, "Foundations of Electrical Engineering", Oxford University Press, 2013
2. D P Kothari and I.J Nagarath, "Electrical Machines "Basic Electrical and Electronics Engineering", McGraw Hill Education(India) Private Limited, Third Reprint ,2016
3. Thereja .B.L., "Fundamentals of Electrical Engineering and Electronics", S. Chand & Co. Ltd., 2008

REFERENCES

1. Del Toro, "Electrical Engineering Fundamentals", Pearson Education, New Delhi, 2007
2. John Bird, "Electrical Circuit Theory and Technology", Elsevier, First Indian Edition, 2006
3. Allan S Moris, "Measurement and Instrumentation Principles", Elsevier, First Indian Edition, 2006

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E-mail : accounts@bnazrum.com
Website : www.bnazrum.com

Date: 11.09.2020

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. MANI VANNAN V, III** year Mechanical Engineering of NPR college of Engineering & Technology, Natham, Dindigul, has successfully completed Five days inplant training from 07.09.2020 to 11.09.2020 in our organization. During this period, he was sincere, enthusiastic and hard working.

Dr. J.SUNDARARAJAN,
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Natham, Dindigul (Dt) - 624 401.

For BNAZRUM AGRO EXPORTS (P) LTD.,

(A.M.Yusuf Ansari)
General Manager

fssai 100 % E.O.U FDA BSCI

GE8292 **ENGINEERING MECHANICS** L T P C 3 2 0 4

OBJECTIVES:

- To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering.

UNIT I STATICS OF PARTICLES 9+6

Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces – Vectorial representation of forces – Vector operations of forces -additions, subtraction, dot product, cross product – Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility

UNIT II EQUILIBRIUM OF RIGID BODIES 9+6

Free body diagram – Types of supports –Action and reaction forces – stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions

UNIT III PROPERTIES OF SURFACES AND SOLIDS 9+6

Centroids and centre of mass – Centroids of lines and areas - Rectangular, circular, triangular areas by integration – T section, I section, - Angle section, Hollow section by using standard formula – Theorems of Pappus - Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Principal moments of inertia of plane areas – Principal axes of inertia-Mass moment of inertia –mass moment of inertia for prismatic, cylindrical and spherical solids from first principle – Relation to area moments of inertia.

UNIT IV DYNAMICS OF PARTICLES 9+6

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion - Newton's laws of motion – Work Energy Equation– Impulse and Momentum – Impact of elastic bodies.

UNIT V FRICTION AND RIGID BODY DYNAMICS 9+6

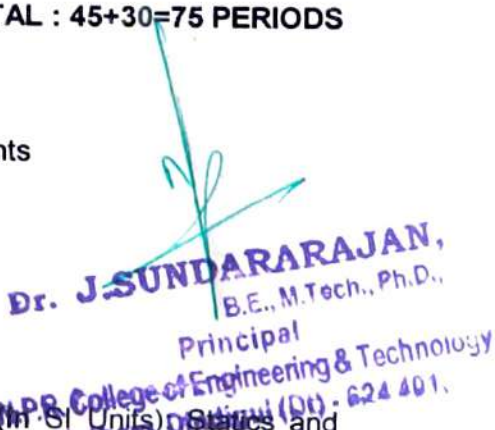
Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction-. Rolling resistance -Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.

TOTAL : 45+30=75 PERIODS

OUTCOMES:

On successful completion of this course, the student will be able to

- illustrate the vectorial and scalar representation of forces and moments
- analyse the rigid body in equilibrium
- evaluate the properties of surfaces and solids
- calculate dynamic forces exerted in rigid body
- determine the friction and the effects by the laws of friction



TEXT BOOKS:

1. Beer, F.P and Johnston Jr. E.R., "Vector Mechanics for Engineers (In SI Units) Statics and Dynamics", 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2004).
2. Vela Murali, "Engineering Mechanics", Oxford University Press (2010)

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1. Bhavikatti, S.S and Rajashekarappa, K.G., "Engineering Mechanics", New Age International (P) Limited Publishers, 1998.
2. Hibbeller, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, Pearson Education 2010.
3. Irving H. Shames and Krishna Mohana Rao. G., "Engineering Mechanics – Statics and Dynamics", 4th Edition, Pearson Education 2006.
4. Meriam J.L. and Kraige L.G., " Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2", Third Edition, John Wiley & Sons,1993.
5. Rajasekaran S and Sankarasubramanian G., "Engineering Mechanics Statics and Dynamics", 3rd Edition, Vikas Publishing House Pvt. Ltd., 2005.

COLLEGE OF ENGG. & TECHNOLOGY * NPR * NATHAM

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MADURAI - 625 018

Date: **05.09.2020**

TO WHOM IT MAY CONCERN

This is to certify that **BHUVANESWARAN C** a student of BE (Mechanical Engineering-Third year) NPR college of Engineering & Technology, Natham, Dindigul, India has successfully completed INPLANT TRAINING **(31.08.2020 to 05.09.2020)** at this **OSHO BODY BUILDERS, MADURAI**. During the period of his INPLANT TRAINING with us, he was found Punctual, Hardworking and Inquisitive.

For

For Osho Body Builders

Manager.

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
Principal
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ELEGANCE IN SHAPE AND EXCELLENCE IN QUALITY IS OUR WATCH WORD

ME8391 **ENGINEERING THERMODYNAMICS** **L T P C**
3 2 0 4

OBJECTIVE:

- To familiarize the students to understand the fundamentals of thermodynamics and to perform thermal analysis on their behavior and performance.

(Use of Standard and approved Steam Table, Mollier Chart, Compressibility Chart and Psychrometric Chart permitted)**UNIT I BASIC CONCEPTS AND FIRST LAW 9+6**

Basic concepts - concept of continuum, comparison of microscopic and macroscopic approach. Path and point functions. Intensive and extensive, total and specific quantities. System and their types. Thermodynamic Equilibrium State, path and process. Quasi-static, reversible and irreversible processes. Heat and work transfer, definition and comparison, sign convention. Displacement work and other modes of work .P-V diagram. Zeroth law of thermodynamics – concept of temperature and thermal equilibrium– relationship between temperature scales –new temperature scales. First law of thermodynamics –application to closed and open systems – steady and unsteady flow processes.

UNIT II SECOND LAW AND AVAILABILITY ANALYSIS 9+6

Heat Reservoir, source and sink. Heat Engine, Refrigerator, Heat pump. Statements of second law and its corollaries. Carnot cycle Reversed Carnot cycle, Performance. Clausius inequality. Concept of entropy, T-s diagram, Tds Equations, entropy change for - pure substance, ideal gases - different processes, principle of increase in entropy. Applications of II Law. High and low grade energy. Available and non-available energy of a source and finite body. Energy and irreversibility. Expressions for the energy of a closed system and open systems. Energy balance and entropy generation. Irreversibility. I and II law Efficiency.

UNIT III PROPERTIES OF PURE SUBSTANCE AND STEAM POWER CYCLE 9+6

Formation of steam and its thermodynamic properties, p-v, p-T, T-v, T-s, h-s diagrams. p-v-T surface. Use of Steam Table and Mollier Chart. Determination of dryness fraction. Application of I and II law for pure substances. Ideal and actual Rankine cycles, Cycle Improvement Methods - Reheat and Regenerative cycles, Economiser, preheater, Binary and Combined cycles.

UNIT IV IDEAL AND REAL GASES, THERMODYNAMIC RELATIONS 9+6

Properties of Ideal gas- Ideal and real gas comparison- Equations of state for ideal and real gases- Reduced properties. Compressibility factor-.Principle of Corresponding states. -Generalised Compressibility Chart and its use-. Maxwell relations, Tds Equations, Difference and ratio of heat capacities, Energy equation, Joule-Thomson Coefficient, Clausius Clapeyron equation, Phase Change Processes. Simple Calculations.

UNIT V GAS MIXTURES AND PSYCHROMETRY 9+6

Mole and Mass fraction, Dalton's and Amagat's Law. Properties of gas mixture – Molar mass, gas constant, density, change in internal energy, enthalpy, entropy and Gibbs function. Psychrometric properties, Psychrometric charts. Property calculations of air vapour mixtures by using chart and expressions. Psychrometric process – adiabatic saturation, sensible heating and cooling, humidification, dehumidification, evaporative cooling and adiabatic mixing. Simple Applications

TOTAL : 75 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

CO1 Apply the first law of thermodynamics for simple open and closed systems under steady and unsteady conditions.

CO2 Apply second law of thermodynamics to open and closed systems and calculate entropy and availability.

CO3 Apply Rankine cycle to steam power plant and compare few cycle improvement methods

CO4 Derive simple thermodynamic relations of ideal and real gases
CO5 Calculate the properties of gas mixtures and moist air and its use in psychometric processes

TEXT BOOKS :

1. R.K.Rajput, "A Text Book Of Engineering Thermodynamics ",Fifth Edition,2017.
2. Yunus a. Cengel & michael a. Boles, "Thermodynamics", 8th edition 2015.

REFERENCES:

1. Arora C.P, "Thermodynamics", Tata McGraw-Hill, New Delhi, 2003.
2. Borgnakke & Sonnatag, "Fundamental of Thermodynamics", 8th Edition , 2016.
3. Chattopadhyay, P, "Engineering Thermodynamics", Oxford University Press, 2016.
4. Michael J. Moran, Howard N. Shapiro, "Fundamentals of Engineering Thermodynamics", 8th Edition.
5. Nag.P.K., "Engineering Thermodynamics", 5th Edition, Tata McGraw-Hill, New Delhi, 2013.

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CIN: U28131TZ2009PTC015549

Date: 28.09.2020

TO WHOM IT MAY CONCERN

This is to certify that Mr. MELVIN INFANT RAJ J studying in final year Mechanical Engineering of NPR College of Engineering & Technology, Natham has undergone Internship in our organization from 01.09.2020 to 28.09.2020.

During the period, their conduct was found to be good.

With Regards

(For Thermo Solutions (INDIA) Pvt. Ltd)

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
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CE8394

FLUID MECHANICS AND MACHINERY

L T P C
4 0 0 4

OBJECTIVES

- The properties of fluids and concept of control volume are studied
- The applications of the conservation laws to flow through pipes are studied.
- To understand the importance of dimensional analysis
- To understand the importance of various types of flow in pumps.
- To understand the importance of various types of flow in turbines.

UNIT I FLUID PROPERTIES AND FLOW CHARACTERISTICS 12

Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure, surface tension and capillarity. Flow characteristics – concept of control volume - application of continuity equation, energy equation and momentum equation.

UNIT II FLOW THROUGH CIRCULAR CONDUITS 12

Hydraulic and energy gradient - Laminar flow through circular conduits and circular annuli- Boundary layer concepts – types of boundary layer thickness – Darcy Weisbach equation –friction factor- Moody diagram- commercial pipes- minor losses – Flow through pipes in series and parallel.

UNIT III DIMENSIONAL ANALYSIS 12

Need for dimensional analysis – methods of dimensional analysis – Similitude –types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis.

UNIT IV PUMPS 12

Impact of jets - Euler's equation - Theory of roto-dynamic machines – various efficiencies– velocity components at entry and exit of the rotor- velocity triangles - Centrifugal pumps– working principle - work done by the impeller - performance curves - Reciprocating pump- working principle – Rotary pumps –classification.

UNIT V TURBINES 12

Classification of turbines – heads and efficiencies – velocity triangles. Axial, radial and mixed flow turbines. Pelton wheel, Francis turbine and Kaplan turbines- working principles - work done by water on the runner – draft tube. Specific speed - unit quantities – performance curves for turbines – governing of turbines.

TOTAL: 60 PERIODS

OUTCOMES:

Upon completion of this course, the students will be able to

- Apply mathematical knowledge to predict the properties and characteristics of a fluid.
- Can analyse and calculate major and minor losses associated with pipe flow in piping networks.
- Can mathematically predict the nature of physical quantities
- Can critically analyse the performance of pumps
- Can critically analyse the performance of turbines.

TEXT BOOK:

1. Modi P.N. and Seth, S.M. "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, 2013.

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REFERENCES:

1. Graebel. W.P, "Engineering Fluid Mechanics", Taylor & Francis, Indian Reprint, 2011
2. Kumar K. L., "Engineering Fluid Mechanics", Eurasia Publishing House(p) Ltd., New Delhi 2016
3. Robert W.Fox, Alan T. McDonald, Philip J.Pritchard, "Fluid Mechanics and Machinery", 2011.
4. Streeter, V. L. and Wylie E. B., "Fluid Mechanics", McGraw Hill Publishing Co. 2010

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CIN: U28131TZ2009PTC015549

Date: 25.08.2021

TO WHOM IT MAY CONCERN

This is to certify that Mr. JOTHIVEL M studying in final year Mechanical Engineering of NPR College of Engineering & Technology, Natham has undergone Internship in our organization from 05.08.2021 to 25.08.2021.

During the period, their conduct was found to be good.

With Regards

(For Thermo Solutions (INDIA) Pvt. Ltd)

Dr. J.SUNDARARAJAN,
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Principal
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ME8351 **MANUFACTURING TECHNOLOGY – I** L T P C 3 0 0 3

OBJECTIVE:

- To introduce the concepts of basic manufacturing processes and fabrication techniques, such as metal casting, metal joining, metal forming and manufacture of plastic components.

UNIT I METAL CASTING PROCESSES 9

Sand Casting : Sand Mould – Type of patterns - Pattern Materials – Pattern allowances –Moulding sand Properties and testing – Cores –Types and applications – Moulding machines– Types and applications; Melting furnaces : Blast and Cupola Furnaces; Principle of special casting processes : Shell - investment – Ceramic mould – Pressure die casting - Centrifugal Casting - CO_2 process – Stir casting; Defects in Sand casting

UNIT II JOINING PROCESSES 9

Operating principle, basic equipment, merits and applications of: Fusion welding processes: Gas welding - Types – Flame characteristics; Manual metal arc welding – Gas Tungsten arc welding - Gas metal arc welding – Submerged arc welding – Electro slag welding; Operating principle and applications of: Resistance welding - Plasma arc welding – Thermit welding – Electron beam welding – Friction welding and Friction Stir Welding; Brazing and soldering; Weld defects: types, causes and cure.

UNIT III METAL FORMING PROCESSES 9

Hot working and cold working of metals – Forging processes – Open, impression and closed die forging – forging operations. Rolling of metals– Types of Rolling – Flat strip rolling – shape rolling operations – Defects in rolled parts. Principle of rod and wire drawing – Tube drawing – Principles of Extrusion – Types – Hot and Cold extrusion.

UNIT IV SHEET METAL PROCESSES 9

Sheet metal characteristics – shearing, bending and drawing operations – Stretch forming operations – Formability of sheet metal – Test methods –special forming processes-Working principle and applications – Hydro forming – Rubber pad forming – Metal spinning– Introduction of Explosive forming, magnetic pulse forming, peen forming, Super plastic forming – Micro forming

UNIT V MANUFACTURE OF PLASTIC COMPONENTS 9

Types and characteristics of plastics – Moulding of thermoplastics – working principles and typical applications – injection moulding – Plunger and screw machines – Compression moulding, Transfer Moulding – Typical industrial applications – introduction to blow moulding –Rotational moulding – Film blowing – Extrusion – Thermoforming – Bonding of Thermoplastics.

TOTAL: 45 PERIODS

OUTCOMES:

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CO1 Explain different metal casting processes, associated defects, merits and demerits
CO2 Compare different metal joining processes.
CO3 Summarize various hot working and cold working methods of metals.
CO4 Explain various sheet metal making processes.
CO5 Distinguish various methods of manufacturing plastic components.

TEXT BOOKS:

1. Hajra Chouldhary S.K and Hajra Choudhury. AK., "Elements of workshop Technology", volume I and II, Media promoters and Publishers Private Limited, Mumbai, 2008
2. Kalpakjian. S, "Manufacturing Engineering and Technology", Pearson Education India Edition, 2013

REFERENCES:

1. Gowri P. Hariharan, A.Suresh Babu, "Manufacturing Technology I", Pearson Education, 2008
2. Paul Degarma E, Black J.T and Ronald A. Kosher, "Materials and Processes, in Manufacturing" Eight Edition, Prentice – Hall of India, 1997.
3. Rao, P.N. "Manufacturing Technology Foundry, Forming and Welding", 4th Edition, TMH-2013
4. Roy. A. Lindberg, "Processes and Materials of Manufacture", PHI / Pearson education, 2006
5. Sharma, P.C., "A Text book of production Technology", S.Chand and Co. Ltd., 2014.

N.P.R. COLLEGE OF ENGG. & TECHNOLOGY * NATHAM

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JM Frictech India Pvt Ltd (JMI)
G27, SIPCOT Industrial Park,
Katrambakkam Village, Irrungattukottai,
Chennai-Nadu 602105

Date: **30/09/2020**

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **NARESHKUMAR S** studying IV year Mechanical Engineering in NPR College of Engineering & Technology, Natham, Dindigul, has successfully completed Twenty Nine days from **03/09/2020 to 30/09/2020** internship in our company. During the period the training period he was has been extremely inquisitive and hard working .He summed to be writing to learn the functions/process with kwon interest.

We wish him every success in life.

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
Principal
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JM Frictech India Pvt. Ltd,
G-27, SIPCOT Industrial Park,
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Chennai-602 105.

EE8353 **ELECTRICAL DRIVES AND CONTROLS** **L T P C**
3 0 0 3

OBJECTIVES:

- To understand the basic concepts of different types of electrical machines and their performance.
- To study the different methods of starting D.C motors and induction motors.
- To study the conventional and solid-state drives

UNIT I INTRODUCTION **8**

Basic Elements – Types of Electric Drives – factors influencing the choice of electrical drives – heating and cooling curves – Loading conditions and classes of duty – Selection of power rating for drive motors with regard to thermal overloading and Load variation factors**UNIT II DRIVE MOTOR CHARACTERISTICS** **9**

Mechanical characteristics – Speed-Torque characteristics of various types of load and drive motors – Braking of Electrical motors – DC motors: Shunt, series and compound - single phase and three phase induction motors.

UNIT III STARTING METHODS **8**

Types of D.C Motor starters – Typical control circuits for shunt and series motors – Three phase squirrel cage and slip ring induction motors.

UNIT IV CONVENTIONAL AND SOLID STATE SPEED CONTROL OF D.C. DRIVES **10**

Speed control of DC series and shunt motors – Armature and field control, Ward-Leonard control system - Using controlled rectifiers and DC choppers –applications.

UNIT V CONVENTIONAL AND SOLID STATE SPEED CONTROL OF A.C. DRIVES **10**

Speed control of three phase induction motor – Voltage control, voltage / frequency control, slip power recovery scheme – Using inverters and AC voltage regulators – applications.

TOTAL: 45 PERIODS

OUTCOME:

- Upon Completion of this subject, the students can able to explain different types of electrical machines and their performance

TEXT BOOKS:

1. Nagrath .I.J. & Kothari .D.P, "Electrical Machines", Tata McGraw-Hill, 2006
2. Vedam Subrahmaniam, "Electric Drives (Concepts and Applications)", Tata McGraw-Hill, 2010

REFERENCES:

1. Partab. H., "Art and Science and Utilisation of Electrical Energy", Dhanpat Rai and Sons, 2017
2. Pillai.S.K "A First Course on Electric Drives", Wiley Eastern Limited, 2012
3. Singh. M.D., K.B.Khanchandani, "Power Electronics", Tata McGraw-Hill, 2006.

N.P.R. COLLEGE OF ENGG. & TECHNOLOGY NATHAM

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E-mail : accounts@bnazrum.com
Website : www.bnazrum.com

Date: 11.09.2020

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. SRIVEL A,** III year Mechanical Engineering of NPR college of Engineering & Technology, Natham, Dindigul, has successfully completed Five days inplant training from 07.09.2020 to 11.09.2020 in our organization. During this period, he was sincere, enthusiastic and hard working.

Dr. J.SUNDARARAJAN,
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Principal
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Natham, Dindigul (Dt) - 624 401.

For BNAZRUM AGRO EXPORTS (P) LTD.,

(A.M.Yusuf Ansari)
General Manager

fssai 100 % E.O.U FDA BSCI

ME8492 **KINEMATICS OF MACHINERY**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the basic components and layout of linkages in the assembly of a system machine.
- To understand the principles in analyzing the assembly with respect to the displacement, velocity, and acceleration at any point in a link of a mechanism.
- To understand the motion resulting from a specified set of linkages, design few linkage mechanisms and cam mechanisms for specified output motions.
- To understand the basic concepts of toothed gearing and kinematics of gear trains and the effects of friction in motion transmission and in machine components.

UNIT I BASICS OF MECHANISMS **9**

Classification of mechanisms – Basic kinematic concepts and definitions – Degree of freedom, Mobility – Kutzbach criterion, Gruebler's criterion – Grashof's Law – Kinematic inversions of four-bar chain and slider crank chains – Limit positions – Mechanical advantage – Transmission Angle – Description of some common mechanisms – Quick return mechanisms, Straight line generators, Universal Joint – rocker mechanisms.

UNIT II KINEMATICS OF LINKAGE MECHANISMS **9**

Displacement, velocity and acceleration analysis of simple mechanisms – Graphical method– Velocity and acceleration polygons – Velocity analysis using instantaneous centres – kinematic analysis of simple mechanisms – Coincident points – Coriolis component of Acceleration – Introduction to linkage synthesis problem.

UNIT III KINEMATICS OF CAM MECHANISMS **9**

Classification of cams and followers – Terminology and definitions – Displacement diagrams – Uniform velocity, parabolic, simple harmonic and cycloidal motions – Derivatives of follower motions – Layout of plate cam profiles – Specified contour cams – Circular arc and tangent cams – Pressure angle and undercutting – sizing of cams.

UNIT IV GEARS AND GEAR TRAINS **9**

Law of toothed gearing – Involutes and cycloidal tooth profiles – Spur Gear terminology and definitions – Gear tooth action – contact ratio – Interference and undercutting. Helical, Bevel, Worm, Rack and Pinion gears [Basics only]. Gear trains – Speed ratio, train value – Parallel axis gear trains – Epicyclic Gear Trains.

UNIT V FRICTION IN MACHINE ELEMENTS **9**

Surface contacts – Sliding and Rolling friction – Friction drives – Friction in screw threads – Bearings and lubrication – Friction clutches – Belt and rope drives – Friction in brakes- Band and Block brakes.

TOTAL: 45 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

CO1 Discuss the basics of mechanism
CO2 Calculate velocity and acceleration in simple mechanisms
CO3 Develop CAM profiles
CO4 Solve problems on gears and gear trains
CO5 Examine friction in machine elements

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TEXT BOOKS:

1. F.B. Sayyad, "Kinematics of Machinery", MacMillan Publishers Pvt Ltd., Tech-max Educational resources, 2011.
2. Rattan, S.S, "Theory of Machines", 4th Edition, Tata McGraw-Hill, 2014.
3. Uicker, J.J., Pennock G.R and Shigley, J.E., "Theory of Machines and Mechanisms", 4 Edition, Oxford University Press, 2014.

REFERENCES:

1. Allen S. Hall Jr., "Kinematics and Linkage Design", Prentice Hall, 1961
2. Cleghorn. W. L, "Mechanisms of Machines", Oxford University Press, 2014
3. Ghosh. A and Mallick, A.K., "Theory of Mechanisms and Machines", 3rd Edition Affiliated East-West Pvt. Ltd., New Delhi, 2006.
4. John Hannah and Stephens R.C., "Mechanics of Machines", Viva Low-Prices Student Edition, 1999.
5. Thomas Bevan, "Theory of Machines", 3rd Edition, CBS Publishers and Distributors, 2005.

N.P.R. COLLEGE OF ENGG. & TECHNOLOGY * NATHAM

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Osho Body builders

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Kovil Pappakudi (P o)
MADURAI - 625 018

Date: **28.09.2020**

TO WHOM IT MAY CONCERN

This is to certify that **GOKULNATH R** a student of BE (Mechanical Engineering-Fourth year) NPR college of Engineering & Technology, Natham, Dindigul, India has successfully completed INTERNSHIP **(08.09.2020 to 28.09.2020)** at this **OSHO BODY BUILDERS, MADURAI**. During the period of his INTERNSHIP with us, he was found Punctual, Hardworking and Inquisitive.

For

For Osho Body Builders

Manager.

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
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ELEGANCE IN SHAPE AND EXCELLENCE IN QUALITY IS OUR WATCH WORD

ME8451 **MANUFACTURING TECHNOLOGY – II**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the concept and basic mechanics of metal cutting, working of standard machine tools such as lathe, shaping and allied machines, milling, drilling and allied machines, grinding and allied machines and broaching.
- To understand the basic concepts of Computer Numerical Control (CNC) of machine tools and CNC Programming

UNIT I THEORY OF METAL CUTTING 9

Mechanics of chip formation, single point cutting tool, forces in machining, Types of chip, cutting tools– nomenclature, orthogonal metal cutting, thermal aspects, cutting tool materials, tool wear, tool life, surface finish, cutting fluids and Machinability.

UNIT II TURNING MACHINES 9

Centre lathe, constructional features, specification, operations – taper turning methods, thread cutting methods, special attachments, machining time and power estimation. Capstan and turret lathes- tool layout – automatic lathes: semi automatic – single spindle : Swiss type, automatic screw type – multi spindle:

UNIT III SHAPER, MILLING AND GEAR CUTTING MACHINES 9

Shaper - Types of operations. Drilling ,reaming, boring, Tapping. Milling operations-types of milling cutter. Gear cutting – forming and generation principle and construction of gear milling ,hobbing and gear shaping processes –finishing of gears.

UNIT IV ABRASIVE PROCESS AND BROACHING 9

Abrasive processes: grinding wheel – specifications and selection, types of grinding process– cylindrical grinding, surface grinding, centreless grinding and internal grinding- Typical applications – concepts of surface integrity, broaching machines: broach construction – push, pull, surface and continuous broaching machines

UNIT V CNC MACHINING 9

Numerical Control (NC) machine tools – CNC types, constructional details, special features, machining centre, part programming fundamentals CNC – manual part programming – micromachining – wafer machining.

TOTAL : 45 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

CO1 Explain the mechanism of material removal processes.
CO2 Describe the constructional and operational features of centre lathe and other special purpose lathes.
CO3 Describe the constructional and operational features of shaper, planner, milling, drilling, sawing and broaching machines.
CO4 Explain the types of grinding and other super finishing processes apart from gear manufacturing processes.
CO5 Summarize numerical control of machine tools and write a part program.

TEXT BOOKS:

1. Hajra Choudhury, "Elements of Workshop Technology", Vol.II., Media Promoters 2014
2. Rao. P.N "Manufacturing Technology - Metal Cutting and Machine Tools", 3rd Edition, Tata

REFERENCES:

1. Richerd R Kibbe, John E Neely, Roland O Merges and Warren J.White "Machine Tool Practices", Prentice Hall of India, 1998
2. Geofrey Boothroyd, "Fundamentals of Metal Machining and Machine Tools", Mc Graw Hill, 1984
3. HMT, "Production Technology", Tata McGraw Hill, 1998.
4. Roy A.Lindberg, "Process and Materials of Manufacture," Fourth Edition, PHI/Pearson Education 2006.

N.P.R. COLLEGE OF ENGG & TECHNOLOGY • NATHAM

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DRAG ANALYSIS AND COMPARISION FOR DIFFERENT SPORTS BALL

A PROJECT REPORT

Submitted by

JEEVA V **(Reg.No. 920817114031)**

KALIDAS P **(Reg.No. 920817114034)**

MAGARAJ PRASANNA S **(Reg.No. 920817114040)**

MANOJ KUMAR S **(Reg.No. 920817114043)**

in partial fulfilment for the award of the degree

of

BACHELOR OF ENGINEERING

in

MECHANICAL ENGINEERING

NPR COLLEGE OF ENGINEERING AND TECHNOLOGY,

DINDIGUL-624 401

ANNA UNIVERSITY: CHENNAI 600 025

April 2021

ANNA UNIVESITY: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project report **"DRAG ANALYSIS AND COMPARISION FOR DIFFERENT SPORTS BALL"** is the Bonafide work of **V JEEVA (920817114031), P KALIDAS (920817114034), S MAGARAJ PRASANNA (920817114040), and S MANOJ KUMAR (920817114043)** who carried out the project under my supervision.

SIGNATURE

Dr.T.MALAICHAMY, M.E.,Ph.D.,

PROFESSOR AND HEAD OF DEPARTMENT

Department of Mechanical Engineering,

NPR College of Engg &Tech.,

Dindigul-624 401

SIGNATURE

Dr.T.MALAICHAMY,M.E.,Ph.D.,

PROFESSOR AND HEAD OF DEPARTMENT

Department of Mechanical Engineering,

NPR College of Engg &Tech.,

Dindigul-624 401

Submitted to the VIVA-VOCE examination held on 30/7/21

INTERNAL EXAMINER

EXTERNAL EXAMINER

ABSTRACT

Drag is resistance force occurred, when a body is traveling in a fluid medium(AIR), due to the shape and size of the body. At speeds less than about 1 m/s, the drag force on sphere is proportional to the speed and is given by Stokes 'law. At higher speeds, the drag force is proportional to the velocity squared and is usually small compared with the gravitational force if the object mass is large and its speed is low. The effect of the drag force can also be increased by increasing the surface area of the object. In this project, a relationship between the drag coefficient in terms of height of the ball falling towards the ground and the time taken by the ball to reach the ground is derived mathematically. An experimental setup was fabricated to hold and release the ball and detect the ball when it touches the ground by using suitable sensors. The output of the setup gives the time taken by the ball to reach the ground. The flow of air is simulated for different sports ball by using computational fluid dynamics (CFD) to calculate the drag forces occurred when the ball is travelling in the air.

CHAPTER 8

CONCLUSION

We had done an experimental setup to calculate the drag force on different sports ball. The drag force is a resistance force caused by the motion of a body through a fluid such as water or air. We made a ball holder to hold the ball for measuring the velocity of free falling ball. The IR sensor and the sound sensor is used to detect the ball to start and stop the timer. Once the ball holder releases the ball the Arduino circuit that has been made to calculate the time taken by the ball to fall on the ground. The IR sensor detects the ball when it is released and the timer is started. Then the sound sensor detects the ball by the sound made by the ball once it touches the ground and the timer is stopped. The time taken by the ball is measured and it is used to calculate the velocity of the ball. By this velocity we can calculate the drag force by using CFD analysis. The terminal velocity of the free falling ball is calculated and a relationship is derived to calculate the velocity at any time instance. Drag coefficient values are determined experimentally using larger wind tunnels at various Reynolds number, but in our project we derive a relation between drag coefficient in terms of some constant value, which is a function of position and time. Hence the drag coefficient values are determined by calculating the falling time and travelling distance. These values are substituted in that equation to get the drag coefficient, the results obtained are checked and closely matches the values analysed using ANSYS WORKBENCH. In experimental setup, the sensors play the most vital role. The accuracy of the response time of the sensors affect the results. Use of piezoelectric sensors for deducting the falling balls will actually give more accurate results instead of using proximity IR sensor.

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ME8491 **ENGINEERING METALLURGY**

L	T	P	C
3	0	0	3

OBJECTIVE:

- To impart knowledge on the structure, properties, treatment, testing and applications of metals and non-metallic materials so as to identify and select suitable materials for various engineering applications.

UNIT I ALLOYS AND PHASE DIAGRAMS 9

Constitution of alloys – Solid solutions, substitutional and interstitial – phase diagrams, Isomorphous, eutectic, eutectoid, peritectic, and peritectoid reactions, Iron – carbon equilibrium diagram. Classification of steel and cast Iron microstructure, properties and application.

UNIT II HEAT TREATMENT 9

Definition – Full annealing, stress relief, recrystallisation and spheroidising – normalising, hardening and Tempering of steel. Isothermal transformation diagrams – cooling curves superimposed on I.T. diagram CCR – Hardenability, Jominy end quench test - Austempering, martempering – case hardening, carburizing, Nitriding, cyaniding, carbonitriding – Flame and Induction hardening – Vacuum and Plasma hardening. .

UNIT III FERROUS AND NON-FERROUS METALS 9

Effect of alloying additions on steel- α and β stabilisers– stainless and tool steels – HSLA, Maraging steels – Cast Iron - Grey, white, malleable, spheroidal – alloy cast irons, Copper and copper alloys – Brass, Bronze and Cupronickel – Aluminium and Al-Cu – precipitation strengthening treatment – Bearing alloys, Mg-alloys, Ni-based super alloys and Titanium alloys.

UNIT IV NON-METALLIC MATERIALS 9

Polymers – types of polymer, commodity and engineering polymers – Properties and applications of various thermosetting and thermoplastic polymers (PP, PS, PVC, PMMA, PET,PC, PA, ABS, PI, PAI, PPO, PPS, PEEK, PTFE, Polymers – Urea and Phenol formaldehydes)- Engineering Ceramics – Properties and applications of Al_2O_3, SiC, Si_3N_4, PSZ and SIALON –Composites- Classifications- Metal Matrix and FRP - Applications of Composites.

UNIT V MECHANICAL PROPERTIES AND DEFORMATION MECHANISMS 9

Mechanisms of plastic deformation, slip and twinning – Types of fracture – Testing of materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell), hardness tests, Impact test Izod and charpy, fatigue and creep failure mechanisms.

TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of this course the students will be able to

CO1 Explain alloys and phase diagram, Iron-Iron carbon diagram and steel classification.
CO2 Explain isothermal transformation, continuous cooling diagrams and different heat treatment processes.
CO3 Clarify the effect of alloying elements on ferrous and non-ferrous metals
CO4 Summarize the properties and applications of non metallic materials.
CO5 Explain the testing of mechanical properties.

TEXT BOOKS:

1. Avner, S.H., "Introduction to Physical Metallurgy", McGraw Hill Book Company,1997
2. Williams D Callister, "Material Science and Engineering" Wiley India Pvt Ltd, Revised Indian Edition 2014

REFERENCES:

1. Kenneth G.Budinski and Michael K. Budinski, "Engineering Materials", Prentice Hall of India Private Limited, 2010.
2. Raghavan.V, "Materials Science and Engineering", Prentice Hall of India Pvt. Ltd., 2015.
3. U.C.Jindal : Material Science and Metallurgy, "Engineering Materials and Metallurgy", First Edition, Dorling Kindersley, 2012
4. Upadhyay. G.S. and Anish Upadhyay, "Materials Science and Engineering", Viva Books Pvt. Ltd., New Delhi, 2006.

N.P.R. COLLEGE OF ENGG. & TECHNOLOGY * NATHAM

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Fault detection and rectification in tunnels using tele operated robot

A PROJECT REPORT

Submitted

L.GOWTHAM	**920817114023**
M.ANIS RAM PRABU	**920817114010**
A.SIVAPERUMAL	**920817114309**
N.SABAREESWARNATH	**920817114308**

In partial fulfillment for the award of the degree

of

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In

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DINDIGUL-624 401

ANNA UNIVERSITY: CHENNAI 600 025

April 2021

BONAFIDE CERTIFICATE

Certified that this project report"**Fault detection and rectification in tunnels using tele operated robot**" is the bonafide work of **L.GOWTHAM(920817114023), M.ANIS RAMPRABU(920817114010),A.SARBAREESWARNATH(920817114309),N.SABAREESWARNATH(920817114308)**who carried out the project under my supervision.

SIGNATURE

Dr.T.MALAICHAMY, M.E.,Ph.D.,

HEAD OF THE DEPARTMENT

Npr College Of Engg & Tech

Natham

Dindigul - 624 401

SIGNATURE

Dr. S. Paulsingarayar, M.E., PhD.,

SUPERVISOR

Assistant Professor

NPR college of engg & tech

Natham

Dindigul - 624 401

Submitted to the VIVA-VOCE examination held on....30/7/21....

INTERNAL EXAMINER

EXTERNAL EXAMINER

ABSTRACT

In the future, it will become more common for humans to team up with robotic systems to perform tasks that humans cannot realistically accomplish alone. Even for autonomous and semiautonomous systems, Teleoperation will be an important default mode and a challenging task, because the operator is remotely located. As a result, the operator's situation awareness of the remote environment can be compromised and the mission effectiveness can suffer. This project presents a detailed examination human performance issues and suggested mitigation solutions. This work was motivated by the accidents in recent years that were caused by falling parts of the inner wall of concrete tunnels. This brought about serious damage to national property, In this method, we aim to inspect the tunnel manually and completely at high speed by using Manipulators to inspect the tunnel online in the dangerous environment. Usually, the cable tunnel is full of poisonous gases after fire, such as CO, CH4, and CO2 and so on. Then, the mobile robot is able to tell us whether the tunnel environment is safe or not then the architecture of the robot is designed at first to meet the motion requirement in the tunnel. These characteristics distinguish the mobile robot from others like compact structure, small size, little weight and easily being carried.

CHAPTER 7
CONCLUSION

The project is aimed at providing human safety for the rescue team in hazardous environments such as coal mines .This is a prototype which can be implemented in real time by using components with better range and efficiency. This robot enters into hazardous environments and provides data like the live view of what happened inside the tunnel which the rescue team will be sent with necessary precautionary measures in order to make sure that the rescue team does not come to any harm.. In future this can be developed by the use of higher transmission range transceivers so that it can travel for a greater distance and can be used in different environments based on the transmission range. Development can also be made in the number of sensors incorporated in the robot. Implantation of an arm on the robot can help the robot pick up samples or remove small debris from path or open or close any doors if needed inside the mine. The Counter Tunnel project has focused on developing solutions to traverse, characterize, and map a tunnel-like environment. The main control problem in Teleoperated systems is the instability induced by the communication time-delay and incomplete information on both sides (master and slave). Unfortunately, these type of devices are too expensive and are only used in simulators and not in teleoperation systems. Some other aspects belong to the sociology such as the interaction between the human and the machine. The current systems do not provide the same dexterity that a human has.

OBJECTIVES:

- To understand the concepts of stress, strain, principal stresses and principal planes.
- To study the concept of shearing force and bending moment due to external loads in determinate beams and their effect on stresses.
- To determine stresses and deformation in circular shafts and helical spring due to torsion.
- To compute slopes and deflections in determinate beams by various methods.
- To study the stresses and deformations induced in thin and thick shells.

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 9

Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic constants – Volumetric strains –Stresses on inclined planes – principal stresses and principal planes – Mohr's circle of stress.

UNIT II TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM 9

Beams – types transverse loading on beams – Shear force and bending moment in beams – Cantilevers – Simply supported beams and over – hanging beams. Theory of simple bending– bending stress distribution – Load carrying capacity – Proportioning of sections – Flitched beams – Shear stress distribution.

UNIT III TORSION

9

Torsion formulation stresses and deformation in circular and hollows shafts – Stepped shafts– Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriage springs.

UNIT IV DEFLECTION OF BEAMS 9

Double Integration method – Macaulay's method – Area moment method for computation of slopes and deflections in beams - Conjugate beam and strain energy – Maxwell's reciprocal theorems.

UNIT V THIN CYLINDERS, SPHERES AND THICK CYLINDERS 9

Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin and thick cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells – Lame's theorem.

TOTAL: 45 PERIODS

OUTCOMES

Students will be able to

- Understand the concepts of stress and strain in simple and compound bars, the importance of principal stresses and principal planes.
- Understand the load transferring mechanism in beams and stress distribution due to shearing force and bending moment.
- Apply basic equation of simple torsion in designing of shafts and helical spring
- Calculate the slope and deflection in beams using different methods.
- Analyze and design thin and thick shells for the applied internal and external pressures.

TEXT BOOKS:

1. Bansal, R.K., "Strength of Materials", Laxmi Publications (P) Ltd., 2016
2. Jindal U.C., "Strength of Materials", Asian Books Pvt. Ltd., New Delhi, 2008

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Osho Body builders

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MADURAI - 625 018

Date: **19.07.2021**

TO WHOM IT MAY CONCERN

This is to certify that **ASWINBALAJI S** a student of BE (Mechanical Engineering-Third year) NPR college of Engineering & Technology, Natham, Dindigul, India has successfully completed INPLANT TRAINING **(13.07.2021 to 19.07.2021)** at this **OSHO BODY BUILDERS, MADURAI**. During the period of his INPLANT TRAINING with us, he was found Punctual, Hardworking and Inquisitive.

For

For Osho Body Builders

Manager.

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
Principal
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ME8493 **THERMAL ENGINEERING - I**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To integrate the concepts, laws and methodologies from the first course in thermodynamics into analysis of cyclic processes
- To apply the thermodynamic concepts into various thermal application like IC engines, Steam.
- Turbines, Compressors and Refrigeration and Air conditioning systems

(Use of standard refrigerant property data book, Steam Tables, Mollier diagram and Psychrometric chart permitted)

UNIT I GAS AND STEAM POWER CYCLES 9

Air Standard Cycles - Otto, Diesel, Dual, Brayton – Cycle Analysis, Performance and Comparison – Rankine, reheat and regenerative cycle.

UNIT II RECIPROCATING AIR COMPRESSOR 9

Classification and comparison, working principle, work of compression - with and without clearance, Volumetric efficiency, Isothermal efficiency and Isentropic efficiency. Multistage air compressor with Intercooling. Working principle and comparison of Rotary compressors with reciprocating air compressors.

UNIT III INTERNAL COMBUSTION ENGINES AND COMBUSTION 9

IC engine – Classification, working, components and their functions. Ideal and actual : Valve and port timing diagrams, p-v diagrams- two stroke & four stroke, and SI & CI engines – comparison. Geometric, operating, and performance comparison of SI and CI engines. Desirable properties and qualities of fuels. Air-fuel ratio calculation – lean and rich mixtures. Combustion in SI & CI Engines – Knocking – phenomena and control.

UNIT IV INTERNAL COMBUSTION ENGINE PERFORMANCE AND SYSTEMS 9

Performance parameters and calculations. Morse and Heat Balance tests. Multipoint Fuel Injection system and Common Rail Direct Injection systems. Ignition systems – Magneto, Battery and Electronic. Lubrication and Cooling systems. Concepts of Supercharging and Turbocharging – Emission Norms.

UNIT V GAS TURBINES 9

Gas turbine cycle analysis – open and closed cycle. Performance and its improvement Regenerative, Intercooled, Reheated cycles and their combinations. Materials for turbines.

TOTAL : 45 PERIODS

CO1 Apply thermodynamic concepts to different air standard cycles and solve problems. CO2 Solve problems in single stage and multistage air compressors
CO3 Explain the functioning and features of IC engines, components and auxiliaries. CO4 Calculate performance parameters of IC Engines.
CO5 Explain the flow in Gas turbines and solve problems.

TEXT BOOKS:

1. Kothandaraman.C.P., Domkundwar. S,Domkundwar. A.V., "A course in thermal Engineering", Fifth Edition, "Dhanpat Rai & sons , 2016
2. Rajput. R. K., "Thermal Engineering" S.Chand Publishers, 2017

REFERENCES:

1. Arora.C.P, "Refrigeration and Air Conditioning ," Tata McGraw-Hill Publishers 2008
2. Ganesan V.." Internal Combustion Engines" , Third Edition, Tata Mcgraw-Hill 2012
3. Ramalingam. K.K., "Thermal Engineering", SCITECH Publications (India) Pvt. Ltd., 2009.
4. Rudramoorthy, R, "Thermal Engineering ",Tata McGraw-Hill, New Delhi,2003
5. Sarkar, B.K,"Thermal Engineering" Tata McGraw-Hill Publishers, 2007

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CIN: U28131TZ2009PTC015549

Date: 28.09.2020

TO WHOM IT MAY CONCERN

This is to certify that Mr. MOHAMED JAVED N studying in final year Mechanical Engineering of NPR College of Engineering & Technology, Natham has undergone Internship in our organization from 01.09.2020 to 28.09.2020.

During the period, their conduct was found to be good.

With Regards

(For Thermo Solutions (INDIA) Pvt. Ltd)

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ME8595 **THERMAL ENGINEERING – II**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To apply the thermodynamic concepts for Nozzles, Boilers, Turbines, and Refrigeration & Air Conditioning Systems.
- To understand the concept of utilising residual heat in thermal systems.

UNIT I STEAM NOZZLE 9

Types and Shapes of nozzles, Flow of steam through nozzles, Critical pressure ratio, Variation of mass flow rate with pressure ratio. Effect of friction. Metastable flow.

UNIT II BOILERS 9

Types and comparison. Mountings and Accessories. Fuels - Solid, Liquid and Gas. Performance calculations, Boiler trial.

UNIT III STEAM TURBINES 9

Types, Impulse and reaction principles, Velocity diagrams, Work done and efficiency – optimal operating conditions. Multi-staging, compounding and governing.

UNIT IV COGENERATION AND RESIDUAL HEAT RECOVERY 9

Cogeneration Principles, Cycle Analysis, Applications, Source and utilisation of residual heat. Heat pipes, Heat pumps, Recuperative and Regenerative heat exchangers. Economic Aspects.

UNIT V REFRIGERATION AND AIR – CONDITIONING 9

Vapour compression refrigeration cycle, Effect of Superheat and Sub-cooling, Performance calculations, Working principle of air cycle, vapour absorption system, and Thermoelectric refrigeration. Air conditioning systems, concept of RSHF, GSHF and ESHF, Cooling load calculations. Cooling towers – concept and types.

TOTAL:45 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

CO1 Solve problems in Steam Nozzle

CO2 Explain the functioning and features of different types of Boilers and auxiliaries and calculate performance parameters.

CO3 Explain the flow in steam turbines, draw velocity diagrams for steam turbines and solve problems.

CO4 Summarize the concept of Cogeneration, Working features of Heat pumps and Heat exchangers

CO5 Solve problems using refrigerant table / charts and psychrometric charts

TEXT BOOKS:

1. Kothandaraman, C.P., Domkundwar .S and Domkundwar A.V.,"A course in Thermal Engineering", Dhanpat Rai & Sons, 2016.
2. Mahesh. M. Rathore, "Thermal Engineering", 1st Edition, Tata Mc Graw Hill Publications, 2010.

REFERENCES:

1. Arora .C.P., "Refrigeration and Air Conditioning", Tata Mc Graw Hill, 2008
2. Ballaney. P.L ." Thermal Engineering", Khanna publishers, 24th Edition 2012
3. Charles H Butler : Cogeneration" McGraw Hill, 1984.
4. Donald Q. Kern, " Process Heat Transfer", Tata Mc Graw Hill, 2001.
5. Sydney Reiter "Industrial and Commercial Heat Recovery Systems" Van Nostrand Reinhols, 1985.

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CIN: U28131TZ2009PTC015549

Date: 10.08.2021

TO WHOM IT MAY CONCERN

This is to certify that Mr. MANIKANDAN R studying in third year Mechanical Engineering of NPR College of Engineering & Technology, Natham has undergone in-plant Training in our organization from 04.08.2021 to 10.08.2021.

During the period, their conduct was found to be good.

With Regards

(For Thermo Solutions (INDIA) Pvt. Ltd)

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THERMO SOLUTIONS (INDIA) PRIVATE LIMITED
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ME8593

DESIGN OF MACHINE ELEMENTS

L	T	P	C
3	0	0	3

OBJECTIVES

- To familiarize the various steps involved in the Design Process
- To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements
- To learn to use standard practices and standard data
- To learn to use catalogues and standard machine components
- (Use of P S G Design Data Book is permitted)

UNIT I STEADY STRESSES AND VARIABLE STRESSES IN MACHINE MEMBERS 9

Introduction to the design process - factors influencing machine design, selection of materials based on mechanical properties - Preferred numbers, fits and tolerances – Direct, Bending and torsional stress equations – Impact and shock loading – calculation of principle stresses for various load combinations, eccentric loading – curved beams – crane hook and 'C' frame- Factor of safety - theories of failure – Design based on strength and stiffness – stress concentration – Design for variable loading.

UNIT II SHAFTS AND COUPLINGS 9

Design of solid and hollow shafts based on strength, rigidity and critical speed – Keys, keyways and splines - Rigid and flexible couplings.

UNIT III TEMPORARY AND PERMANENT JOINTS 9

Threaded fastners - Bolted joints including eccentric loading, Knuckle joints, Cotter joints – Welded joints, riveted joints for structures - theory of bonded joints.

UNIT IV ENERGY STORING ELEMENTS AND ENGINE COMPONENTS 9

Various types of springs, optimization of helical springs - rubber springs - Flywheels considering stresses in rims and arms for engines and punching machines- Connecting Rods and crank shafts.

UNIT V BEARINGS 9

Sliding contact and rolling contact bearings - Hydrodynamic journal bearings, Sommerfeld Number, Raimondi and Boyd graphs, -- Selection of Rolling Contact bearings.

TOTAL: 45 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

CO1 Explain the influence of steady and variable stresses in machine component design.
CO2 Apply the concepts of design to shafts, keys and couplings.
CO3 Apply the concepts of design to temporary and permanent joints.
CO4 Apply the concepts of design to energy absorbing members, connecting rod and crank shaft.
CO5 Apply the concepts of design to bearings

TEXT BOOKS:

1. Bhandari V, "Design of Machine Elements", 4th Edition, Tata McGraw-Hill Book Co, 2016.
2. Joseph Shigley, Charles Mischke, Richard Budynas and Keith Nisbett, "Mechanical Engineering Design", 9th Edition, Tata McGraw-Hill, 2011.

REFERENCES:

1. Alfred Hall, Halowenko, A and Laughlin, H., "Machine Design", Tata McGraw-Hill BookCo.(Schaum's Outline), 2010
2. Ansel Ugural, "Mechanical Design – An Integral Approach", 1st Edition, Tata McGraw-Hill Book Co, 2003.
3. P.C. Gope, "Machine Design – Fundamental and Application", PHI learning private ltd, New Delhi, 2012.
4. R.B. Patel, "Design of Machine Elements", MacMillan Publishers India P Ltd., Tech-Max Educational resources, 2011.
5. Robert C. Juvinall and Kurt M. Marshek, "Fundamentals of Machine Design", 4th Edition, Wiley, 2005
6. Sundararajamoorthy T. V. Shanmugam .N, "Machine Design", Anuradha Publications, Chennai, 2015.

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Date: **23.08.2021**

TO WHOM IT MAY CONCERN

This is to certify that **ASWIN NAGANATH G** a student of BE (Mechanical Engineering-Fourth year) NPR college of Engineering & Technology, Natham, Dindigul, India has successfully completed INTERNSHIP **(27.07.2021 to 23.08.2021)** at this **OSHO BODY BUILDERS, MADURAI**. During the period of his INTERNSHIP with us, he was found Punctual, Hardworking and Inquisitive.

For

For Osho Body Builders

Manager.

Dr. J.SUNDARARAJAN,
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ME8501 **METROLOGY AND MEASUREMENTS**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To provide knowledge on various Metrological equipments available to measure the dimension of the components.
- To provide knowledge on the correct procedure to be adopted to measure the dimension of the components.

UNIT I BASICS OF METROLOGY 9

Introduction to Metrology – Need – Elements – Work piece, Instruments – Persons – Environment – their effect on Precision and Accuracy – Errors – Errors in Measurements – Types – Control – Types of standards.

UNIT II LINEAR AND ANGULAR MEASUREMENTS 9

Linear Measuring Instruments – Evolution – Types – Classification – Limit gauges – gauge design – terminology – procedure – concepts of interchange ability and selective assembly – Angular measuring instruments – Types – Bevel protractor clinometers angle gauges, spirit levels sine bar – Angle alignment telescope – Autocollimator – Applications.

UNIT III ADVANCES IN METROLOGY 9

Basic concept of lasers Advantages of lasers – laser Interferometers – types – DC and AC Lasers interferometer – Applications – Straightness – Alignment. Basic concept of CMM – Types of CMM – Constructional features – Probes – Accessories – Software – Applications – Basic concepts of Machine Vision System – Element – Applications.

UNIT IV FORM MEASUREMENT 9

Principles and Methods of straightness – Flatness measurement – Thread measurement, gear measurement, surface finish measurement, Roundness measurement – Applications.

UNIT V MEASUREMENT OF POWER, FLOW AND TEMPERATURE 9

Force, torque, power - mechanical , Pneumatic, Hydraulic and Electrical type. Flow measurement: Venturimeter, Orifice meter, rotameter, pitot tube – Temperature: bimetallic strip, thermocouples, electrical resistance thermometer – Reliability and Calibration – Readability and Reliability.

TOTAL : 45 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

CO1 Describe the concepts of measurements to apply in various metrological instruments
CO2 Outline the principles of linear and angular measurement tools used for industrial applications
CO3 Explain the procedure for conducting computer aided inspection
CO4 Demonstrate the techniques of form measurement used for industrial components
CO5 Discuss various measuring techniques of mechanical properties in industrial applications

TEXT BOOKS:

1. Gupta. I.C., "Engineering Metrology", Dhanpatrai Publications, 2005.
2. Jain R.K. "Engineering Metrology", Khanna Publishers, 2009.

REFERENCES:

1. Alan S. Morris, "The essence of Measurement", Prentice Hall of India 1996.
2. Beckwith, Marangoni, Lienhard, "Mechanical Measurements", Pearson Education , 2014.
3. Charles Reginald Shotbolt, "Metrology for Engineers", 5th edition, Cengage Learning EMEA,1990.
4. Donald Peckman, "Industrial Instrumentation", Wiley Eastern, 2004.
5. Raghavendra ,Krishnamurthy "Engineering Metrology & Measurements", Oxford Univ. Press, 2013.

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OBSTACLE SENSING VEHICLE USING RF CONTROL

A PROJECT REPORT

Submittedby

AMEER KHAN.A	**(920817114008)**
GOKULNATH.R	**(920817114020)**
KARTHIKEYAN.K	**(920817114035)**
KUMARESAN.N	**(920817114038)**

in partial fulfillment for the award of the degree of

BACHELOROFENGINEERING

In

MECHANICALENGINEERING

NPR COLLEGE OF ENGINEERING AND TECHNOLOGY

NATHAM, DINDIGUL

ANNA UNIVERSITY::CHENNAI 600025

April 2021

ANNA UNIVERSITY::CHENNAI 600025

BONAFIDE CERTIFICATE

Certified that this report titled "**OBSTACLE SENSING VEHICLE USING RF CONTROL**" is the bonafide work of **AMEER KHAN.A(920817114008),GOKULNATH(920817114020),KARTHIKEYAN.K (920817114035), KUMARESAN(920817114038)** who carried out the work under my supervision. Certified further that to the best of my knowledge the work reported here in does not form part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

Dr.T.MALAICHAMY M.E.,Ph.D.,
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Mr.M.MATHANRAJ, M.E.,
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Submitted for the project VIVA-VOCE examination held on 30/4/21

INTERNAL EXAMINER

EXTERNAL EXAMINER

OBSTACLE SENSING VEHICLE USING RF CONTROL

ABSTRACT

stly people prefer using cars and four wheelers for efficient transportation. Vehicle :hnology is increasing to a wide extent especially in braking systems and sensing systems. hicles equipped with modern braking technology is designed with simple collision avoidance tem. which will help to detect a collision which is likely to occur and applying emergency ke to avoid it. Such technologies will reduce the number of accidents which causes worst nages. serious injury, and even death. In this automatic braking system, there is a four-wheel t in which rare wheels are being motorized for drive wheel. FRONT wheels have been oted for staring mechanisms. New friction brakes are designed for emergency braking. The kes are operated by motorized mechanism, which is spring-loaded. The drive of the car is iote operated. Two sensors are used for front and rare for avoiding damage to the car at the e of parking. The sensors used are a capacitive type which can sense both Metal and non-tal obstacles. Also, two relays are used after the sensors which activate the braking motor en obstacles are sensed either in forward or reverse direction.

CHAPTER 7
COCLUSION

has been developed by integrating features of all the hardware components used. esence of every module has been reasoned out and placed carefully thus ntributing to the best working of the unit. Thus the data to be sent is encoded thin the transmitted signal so that a well designed receiver can separate the data)m the signal upon reception of this signal. The decoded data can then be used to rform specified tasks. Secondly, using highly advanced IC"s and with the help of owing technology the project has been successfully implemented. A low-cost and mple system to ensure the safety of passengers and pedestrians. It certainly provides hope for bringing down the alarming rate of road accidents. The proposed system is ıpable of simply displaying the traffic signals in an LCD screen inside the vehicle. ı future, provisions may be included to cut out the fuel supply to the engine to rovide a smooth deceleration if the speed of the vehicle exceeds a threshold value. his is a very useful technique to control the vehicle speed automatically. By using ficrocontroller , we Controlled the

ed of the vehicle according to zones It is mainly useful in the areas where high rate

cidents are recorded. As in city traffic control to conserve the fuel and

ıplement the traffic rules. It presents architecture for automatic adaptation of the ;itudinal speed control of a vehicle to the circumstances of the road which can help lecrease one of the major causes of fatalities: the excessive or inadequate vehicle d. Our approach is based on a combination of three different sensor technologies: D tagging of traffic signals to convey their information to the car,. Sensor fusion is lied to the information received by these subsystems, and used to adjust the gitudinal speed of the vehicle with a fuzzy controller. The proposed on-board hitecture is portable and easily adaptable to any commercial car with minimal difications. The system shows promising results, since active RFID technology mits to detect the presence and identity of the traffic signals reliably and sufficiently

advance, so corrective actions on the vehicle"s behaviour can be taken. In the pirical trials in our installations, the vehicle"s speed was successfully changed as a sult of the detection of the signals, increasing the driver"s safety. The technology veloped can assist human drivers in difficult road circumstances, as well as a mplement ISA or CWS systems if the car is already equipped with them. In our periments, only the test vehicle was present on the road. In normal driving situations, e can expect other vehicles circulating nearby and possibly blocking or attenuating me of the RFID transmitting signals, especially with large vehicles like trucks. In this pect, more experimentation is needed to know how this circumstance will affect the hicle"s control performance. A possible solution is the use of redundant RFID tags ince their cost relatively low), placed at different locations near the traffic signal, to arantee RF signal reception in unfavourable conditions. The results suggest that an tomatic intelligent speed control system can be used to prevent any unexpected traffic rcumstance and improve the safety of the occupants of the vehicle.

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ME8594

DYNAMICS OF MACHINES

L	T	P	C
4	0	0	4

OBJECTIVES:

- To understand the force-motion relationship in components subjected to external forces and analysis of standard mechanisms.
- To understand the undesirable effects of unbalances resulting from prescribed motions in mechanism.
- To understand the effect of Dynamics of undesirable vibrations.
- To understand the principles in mechanisms used for speed control and stability control.

UNIT I FORCE ANALYSIS 12

Dynamic force analysis – Inertia force and Inertia torque– D Alembert's principle –Dynamic Analysis in reciprocating engines – Gas forces – Inertia effect of connecting rod– Bearing loads – Crank shaft torque – Turning moment diagrams –Fly Wheels – Flywheels of punching presses- Dynamics of Cam- follower mechanism.

UNIT II BALANCING 12

Static and dynamic balancing – Balancing of rotating masses – Balancing a single cylinder engine – Balancing of Multi-cylinder inline, V-engines – Partial balancing in engines – Balancing of linkages – Balancing machines-Field balancing of discs and rotors.

UNIT III FREE VIBRATION 12

Basic features of vibratory systems – Degrees of freedom – single degree of freedom – Free vibration– Equations of motion – Natural frequency – Types of Damping – Damped vibration– Torsional vibration of shaft – Critical speeds of shafts – Torsional vibration – Two and three rotor torsional systems.

UNIT IV FORCED VIBRATION 12

Response of one degree freedom systems to periodic forcing – Harmonic disturbances – Disturbance caused by unbalance – Support motion –transmissibility – Vibration isolation vibration measurement.

UNIT V MECHANISM FOR CONTROL 12

Governors – Types – Centrifugal governors – Gravity controlled and spring controlled centrifugal governors – Characteristics – Effect of friction – Controlling force curves. Gyroscopes –Gyroscopic forces and torques – Gyroscopic stabilization – Gyroscopic effects in Automobiles, ships and airplanes.

TOTAL : 60 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

CO1 Calculate static and dynamic forces of mechanisms.
CO2 Calculate the balancing masses and their locations of reciprocating and rotating masses.
CO3 Compute the frequency of free vibration.
CO4 Compute the frequency of forced vibration and damping coefficient.
CO5 Calculate the speed and lift of the governor and estimate the gyroscopic effect on automobiles, ships and airplanes.

TEXT BOOKS:

1. F. B. Sayyad, "Dynamics of Machinery", McMillan Publishers India Ltd., Tech-Max Educational resources, 2011.
2. Rattan, S S, "Theory of Machines", 4th Edition, Tata McGraw-Hill, 2014.
3. Uicker, J.J., Pennock G.R and Shigley, J.E., "Theory of Machines and Mechanisms", 4th Edition, Oxford University Press, 2014.

REFERENCES:

1. Cleghorn. W. L, "Mechanisms of Machines", Oxford University Press, 2014
2. Ghosh. A and Mallick, A.K., "Theory of Mechanisms and Machines", 3rd Edition Affiliated East-West Pvt. Ltd., New Delhi, 2006.
3. Khurmi, R.S.,"Theory of Machines", 14th Edition, S Chand Publications, 2005.
4. Rao.J.S. and Dukkipati.R.V. "Mechanisms and Machine Theory", Wiley-Eastern Ltd., New Delhi, 1992.
5. Robert L. Norton, "Kinematics and Dynamics of Machinery", Tata McGraw-Hill, 2009.
6. V.Ramamurthi, "Mechanics of Machines", Narosa Publishing House, 2002.

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DESIGN AND FABRICATION OF AUTOMATIC BENDING AND CUTTING BY USING HYDRAULIC

A PROJECT REPORT

Submittedby

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Inpartial fulfillment fortheawardofthedegree of

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IN

MECHANICAL ENGINEERING

NPR COLLEGE OF ENGINEERING & TECHNOLOGY

ANNA UNIVERSITY:: CHENNAI 600025

April 2021

ANNA UNIVERSITY: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project report "**DESIGN AND FABRICATION OF AUTOMATIC BENDING AND CUTTING BY USING HYDRAULIC** "is the bonafide work of **MOHAMMEDJAVED.N - (920817114048),MURALI MANOGARAN.V - (920817114049),HARISH KUMAR.A - (920817114303),**

MUTHUMANI.V - (920817114307)who carried out the workunder my supervision. Certified further that to the best of my knowledge thework reported herein does not form part of any other thesis or dissertation onthe basis of which a degree or award was conferred on an earlier occasion onthisor anyother candidate.

SIGNATURE

Dr .T.MALAICHAMY ,M.E.,Ph.D.,
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SIGNATURE

Dr .S.PAULSINGARAAYAR ,M.E .,Ph.D
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INTERNALEXAMINER

EXTERNALEXAMINER

CHAPTER 1

ABSTRACT

A Easy Metal Bending and Cutting is a device which enables the single persons to operate it alone and cut and bend the All types of Metals from the jack driving shaft in the industries and products. Heavy work is needed to operate the bending and cutting process in the metal work industries. It can widely used. It is easy to fit on the driving shaft and bending and cutting. It is need not necessity of work place for setting the bend and cut. This can be effectively used for metal bending and cutting for such as metal box and metal parts etc.

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CHAPTER 16

CONCLUSION

We the students took the initiative in doing this project work "**DESIGN AND FABRICATION OF AUTOMATIC BENDING AND CUTTING USING HYDRAULIC** " to the peak of success .During the course of action of our project work , we have gained sufficient technical as well as practical knowledge as how a machine is to be designed, fabricated and priced .

This machine was fabricated successfully and tested. It works satisfactorily. We hope that this will be one among the most versatile and interchangeable even in future.

N.P.R. COLLEGE OF ENGG. & TECHNOLOGY * NATHAM

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OAT551 **AUTOMOTIVE SYSTEMS** L T P C
3 0 0 3

OBJECTIVES:

- To understand the construction and working principle of various parts of an automobile.
- To have the practice for assembling and dismantling of engine parts and transmission system

UNIT I AUTOMOTIVE ENGINE AUXILIARY SYSTEMS 9

Automotive engines- External combustion engines –Internal combustion engines -classification of engines- SI Engines- CI Engines- two stroke engines -four stroke engines-construction and working principles - IC engine components- functions and materials -valve timing –port timing diagram- Injection system -Unit injector system- Rotary distributor type - Electronically controlled injection system for SI engines-CI engines-Ignition system - Electronic ignition system -Transistorized ignition system, capacitive discharge ignition system.

UNIT II VEHICLE FRAMES AND STEERING SYSTEM 9

Vehicle construction and different Chassis layouts –classifications of chassis- types of frames-frameless chassis construction –articulated vehicles- vehicle body - Vehicle aerodynamics-various resistances and its effects - steering system –conventional – sophisticated vehicle- and types of steering gear box-Power Steering- Steering geometry-condition for true rolling motion-Ackermann's- Devi's steering system - types of stub axle –Types of rear axles.

UNIT III TRANSMISSION SYSTEMS 9

Clutch-types and construction, gear boxes- manual and automatic, gear shift mechanisms, Over drive, transfer box, fluid flywheel, torque converter, propeller shaft, slip joints, universal joints — Hotchkiss Drive and Torque Tube Drive- rear axle- Differential-wheels and tyres.

UNIT IV SUSPENSION AND BRAKES SYSTEMS 9

Suspension Systems- conventional Suspension Systems -independent Suspension Systems –leaf spring – coil spring –taper-lite - eligo,s spring Types of brakes -Pneumaticand Hydraulic Braking Systems, Antilock Braking System (ABS), electronic brake force distribution (EBD) and Traction Control. Derive the equation of Forces acting while applying a brakes on plain surface - inclined road-gradient.

UNIT V ALTERNATIVE ENERGY SOURCES 9

Use of Natural Gas, Liquefied Petroleum Gas, Bio-diesel, Bio-ethanol, Gasohol and Hydrogen in Automobiles- Engine modifications required –Performance, Combustion and Emission Characteristics of SI and CI engines with these alternate fuels - Electric and HybridVehicles, Fuel Cell. Turbo chargers -Engine emission control by three way catalytic convertersystem.

Note: Practical Training in dismantling and assembling of Engine parts and Transmission Systems should be given to the students.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students will be able to identify the different components in automobile engineering.
- Have clear understanding on different auxiliary and transmission systems usual.

TEXT BOOKS:

1. Ganesan V. "Internal Combustion Engines", Third Edition, Tata McGraw-Hill, 2007.
2. Jain K.K. and Asthana .R.B, "Automobile Engineering" Tata McGraw Hill Publishers, New Delhi, 2002.
3. Kirpal Singh, "Automobile Engineering", Vol 1 & 2, Seventh Edition, Standard Publishers,New Delhi, 1997.

REFERENCES:

1. Heinz Heisler, "Advanced Engine Technology," SAE International Publications USA, 1998.
2. Joseph Heitner, "Automotive Mechanics," Second Edition, East-West Press, 1999.
3. Martin W, Stockel and Martin T Stockle , "Automotive Mechanics Fundamentals,"The Good heart –Will Cox Company Inc, USA ,1978.
4. Newton ,Steeds and Garet, "Motor Vehicles", Butterworth Publishers,1989.

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Kovil Pappakudi (P o)
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Date: **23.08.2021**

TO WHOM IT MAY CONCERN

This is to certify that **DINESH KUMAR S** a student of BE (Mechanical Engineering-Fourth year) NPR college of Engineering & Technology, Natham, Dindigul, India has successfully completed INTERNSHIP **(27.07.2021 to 23.08.2021)** at this **OSHO BODY BUILDERS, MADURAI**. During the period of his INTERNSHIP with us, he was found Punctual, Hardworking and Inquisitive.

For

For Osho Body Builders

Manager.

Dr. J.SUNDARARAJAN,
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ME8651 **DESIGN OF TRANSMISSION SYSTEMS**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To gain knowledge on the principles and procedure for the design of Mechanical power Transmission components.
- To understand the standard procedure available for Design of Transmission of Mechanical elements
- To learn to use standard data and catalogues
  (Use of P S G Design Data Book permitted)

UNIT I DESIGN OF FLEXIBLE ELEMENTS 9

Design of Flat belts and pulleys - Selection of V belts and pulleys – Selection of hoisting wire ropes and pulleys – Design of Transmission chains and Sprockets.

UNIT II SPUR GEARS AND PARALLEL AXIS HELICAL GEARS 9

Speed ratios and number of teeth-Force analysis -Tooth stresses - Dynamic effects – Fatigue strength - Factor of safety - Gear materials – Design of straight tooth spur & helical gears based on strength and wear considerations – Pressure angle in the normal and transverse plane-Equivalent number of teeth-forces for helical gears.

UNIT III BEVEL, WORM AND CROSS HELICAL GEARS 9

Straight bevel gear: Tooth terminology, tooth forces and stresses, equivalent number of teeth. Estimating the dimensions of pair of straight bevel gears. Worm Gear: Merits and demerits-terminology. Thermal capacity, materials-forces and stresses, efficiency, estimating the size of the worm gear pair. Cross helical: Terminology-helix angles-Estimating the size of the pair of cross helical gears.

UNIT IV GEAR BOXES 9

Geometric progression - Standard step ratio - Ray diagram, kinematics layout -Design of sliding mesh gear box - Design of multi speed gear box for machine tool applications - Constant mesh gear box - Speed reducer unit. – Variable speed gear box, Fluid Couplings, Torque Converters for automotive applications.

UNIT V CAMS, CLUTCHES AND BRAKES 9

Cam Design: Types-pressure angle and under cutting base circle determination-forces and surface stresses. Design of plate clutches –axial clutches-cone clutches-internal expanding rim clutches-Electromagnetic clutches. Band and Block brakes - external shoe brakes – Internal expanding shoe brake.

TOTAL : 45 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

CO1 apply the concepts of design to belts, chains and rope drives.
CO2 apply the concepts of design to spur, helical gears.
CO3 apply the concepts of design to worm and bevel gears.
CO4 apply the concepts of design to gear boxes .
CO5 apply the concepts of design to cams, brakes and clutches

TEXT BOOKS:

1. Bhandari V, "Design of Machine Elements", 4th Edition, Tata McGraw-Hill Book Co., 2016.
2. Joseph Shigley, Charles Mischke, Richard Budynas and Keith Nisbett, "Mechanical Engineering Design", 8th Edition, Tata McGraw-Hill, 2008.

REFERENCES:

1. Merhyle F. Spotts, Terry E. Shoup and Lee E. Hornberger, "Design of Machine Elements" 8th Edition, Printice Hall, 2003.
2. Orthwein W, "Machine Component Design", Jaico Publishing Co, 2003.
3. Prabhu. T.J., "Design of Transmission Elements", Mani Offset, Chennai, 2000.
4. Robert C. Juvinall and Kurt M. Marshek, "Fundamentals of Machine Design", 4th Edition, Wiley, 2005
5. Sundararajamoorthy T. V, Shanmugam .N, "Machine Design", Anuradha Publications, Chennai, 2003.

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Date: **23.08.2021**

TO WHOM IT MAY CONCERN

This is to certify that **MANOJ KUMAR R** a student of BE (Mechanical Engineering-Fourth year) NPR college of Engineering & Technology, Natham, Dindigul, India has successfully completed INTERNSHIP **(27.07.2021 to 23.08.2021)** at this **OSHO BODY BUILDERS, MADURAI**. During the period of his INTERNSHIP with us, he was found Punctual, Hardworking and Inquisitive.

For

For Osho Body Builders

Manager.

Dr. J.SUNDARARAJAN,
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ELEGANCE IN SHAPE AND EXCELLENCE IN QUALITY IS OUR WATCH WORD

ME8691 **COMPUTER AIDED DESIGN AND MANUFACTURING** L T P C 3 0 0 3

OBJECTIVES:

- To provide an overview of how computers are being used in mechanical component design
- To understand the application of computers in various aspects of Manufacturing viz., Design, Proper planning, Manufacturing cost, Layout & Material Handling system.

UNIT I INTRODUCTION 9

Product cycle- Design process- sequential and concurrent engineering- Computer aided design – CAD system architecture- Computer graphics – co-ordinate systems- 2D and 3D transformations- homogeneous coordinates - Line drawing -Clipping- viewing transformation-Brief introduction to CAD and CAM – Manufacturing Planning, Manufacturing control- Introduction to CAD/CAM –CAD/CAM concepts —Types of production - Manufacturing models and Metrics – Mathematical models of Production Performance

UNIT II GEOMETRIC MODELING 9

Representation of curves- Hermite curve- Bezier curve- B-spline curves-rational curves-Techniques for surface modeling – surface patch- Coons and bicubic patches- Bezier and B-spline surfaces. Solid modeling techniques- CSG andB-rep

UNIT III CAD STANDARDS 9

Standards for computer graphics- Graphical Kernel System (GKS) - standards for exchange images- Open Graphics Library (OpenGL) - Data exchange standards - IGES, STEP, CALS etc. - communication standards.

UNIT IV FUNDAMENTAL OF CNC AND PART PROGRAMING 9

Introduction to NC systems and CNC - Machine axis and Co-ordinate system- CNC machine tools- Principle of operation CNC- Construction features including structure- Drives and CNC controllers- 2D and 3D machining on CNC- Introduction of Part Programming, types - Detailed Manual part programming on Lathe & Milling machines using G codes and M codes- Cutting Cycles, Loops, Sub program and Macros- Introduction of CAM package.

UNIT V CELLULAR MANUFACTURING AND FLEXIBLE MANUFACTURING SYSTEM (FMS) 9

Group Technology(GT),Part Families–Parts Classification and coding–Simple Problems in Opitz Part Coding system–Production flow Analysis–Cellular Manufacturing–Composite part concept–Types of Flexibility - FMS – FMS Components – FMS Application & Benefits – FMS Planning and Control–Quantitative analysis in FMS

TOTAL : 45 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

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CO1	Explain the 2D and 3D transformations, clipping algorithm, Manufacturing models and Metri cs
CO2	Explain the fundamentals of parametric curves, surfaces and Solids
CO3	Summarize the different types of Standard systems used in CAD
CO4	Apply NC & CNC programming concepts to develop part programme for Lathe & Milling Machines
CO5	Summarize the different types of techniques used in Cellular Manufacturing and FMS

TEXT BOOKS:

1. Ibrahim Zeid "Mastering CAD CAM" Tata McGraw-Hill PublishingCo.2007
2. Mikell.P.Groover "Automation, Production Systems and Computer Integrated Manufacturing", Prentice Hall of India, 2008.
3. Radhakrishnan P, SubramanyanS.andRaju V., "CAD/CAM/CIM", 2nd Edition, New Age International (P) Ltd, New Delhi,2000.

REFERENCES:

1. Chris McMahon and Jimmie Browne "CAD/CAM Principles", "Practice and Manufacturing management " Second Edition, Pearson Education, 1999.
2. Donald Hearn and M. Pauline Baker "Computer Graphics"'. Prentice Hall, Inc,1992.
3. Foley, Wan Dam, Feiner and Hughes - "Computer graphics principles & practice" Pearson Education -2003
4. William M Neumann and Robert F.Sproul "Principles of Computer Graphics", McGraw Hill Book Co. Singapore, 1989.

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EXPERIMENTAL INVESTIGATION OF DISSMILAR METAL JOINING PROCESS BY USING TUNGSTEN INERT GAS WELDING

Submitted by

M.DHAYALAN	**920817114017**
M.IMRANKHAN	**920817114029**
M.DINESH	**920817114018**
G.GOWTHAM	**920817114021**

in partial fulfilment for the award of the degree

of

BACHELOR OF ENGINEERING

in

MECHANICAL ENGINEERING

NPR COLLEGE OF ENGINEERING & TECHNOLOGY,

DINDIGUL-624 401

ANNA UNIVERSITY: CHENNAI 600 025

April 2021

ANNA UNIVESITY: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project report **"EXPERIMENTAL INVESTIGATION OF DISSMILAR METAL JOINING PROCESS BY USING TUNGSTEN INERT GAS WELDING"** is the bonafide work of **M.DHAYALAN-920817114017,M.IMRANKHAN -920817114029, M.DINESH-920817114018,G.GOWTHAM-920817114021** who carried out the project under my supervision.

SIGNATURE

Dr.T.MALAICHAMY, M.E.,Ph.D.,

PROFESSOR AND HEAD OF DEPARTMENT

Department of Mechanical Engineering,

NPR College of Engg & Tech.,

Dindigul-624 401

SIGNATURE

Mr.S.SURESH KUMAR, M.E.,

SUPERVISOR

ASSISTANT PROFESSOR

Department of Mechanical Engineering,

NPR College of Engg &Tech.,

Dindigul-624 401

Submitted to the VIVA-VOCE examination held on 30/07/21

INTERNAL EXAMINER

EXTERNAL EXAMINER

ABSTRACT:

Austenitic stainless steel 316L and E250BR Mild steel are welded by tungsten inert gas welding with thicker welded zone and the micro structure of tungsten inert gas welding is important an welding strength. The main role of this project is to study the micro structure, micro hardness, tensile test and mechanical properties of welded zone and heat affected area if change in mechanical property are mentioned below.

CONCLUSION

- In this study investigates the optimization of tungsten inert gas welding process parameters through Response Surface Methodology (RSM) tungsten inert gas welding process parameters like, welding speed and shielding gas flow rate on the maximum tensile strength of dissimilar metal joints were determined in this parametric study. The maximum ultimate tensile strength 478.02 MPa obtained by the conditions shielding gas flow rate (15 lit/min) and welding speed (2.5 m/min). A conformation experiment was also conducted in order to validate the optimal process parameters values. The developed relationship can be effectively used to predict the tensile strength of tungsten inert gas welded joints at 95% confidence level. The dissimilar weld zone consisting columnar dendrites along with few amount chromium carbides.

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ME8693 **HEAT AND MASS TRANSFER**

L	T	P	C
3	2	0	4

OBJECTIVES:

- To understand the mechanisms of heat transfer under steady and transient conditions.
- To understand the concepts of heat transfer through extended surfaces.
- To learn the thermal analysis and sizing of heat exchangers and to understand the basic concepts of mass transfer.

(Use of standard HMT data book permitted)

UNIT I CONDUCTION **9+6**

General Differential equation of Heat Conduction– Cartesian and Polar Coordinates – One Dimensional Steady State Heat Conduction — plane and Composite Systems – Conduction with Internal Heat Generation – Extended Surfaces – Unsteady Heat Conduction – Lumped Analysis – Semi Infinite and Infinite Solids –Use of Heisler's charts.

UNIT II CONVECTION **9+6**

Free and Forced Convection - Hydrodynamic and Thermal Boundary Layer. Free and Forced Convection during external flow over Plates and Cylinders and Internal flow through tubes .

UNIT III PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGERS **9+6**

Nusselt's theory of condensation - Regimes of Pool boiling and Flow boiling. Correlations in boiling and condensation. Heat Exchanger Types - Overall Heat Transfer Coefficient – Fouling Factors - Analysis – LMTD method - NTU method.

UNIT IV RADIATION **9+6**

Black Body Radiation – Grey body radiation - Shape Factor – Electrical Analogy – Radiation Shields. Radiation through gases.

UNIT V MASS TRANSFER **9+6**

Basic Concepts – Diffusion Mass Transfer – Fick's Law of Diffusion – Steady state Molecular Diffusion – Convective Mass Transfer – Momentum, Heat and Mass Transfer Analogy – Convective Mass Transfer Correlations.

TOTAL : 75 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

CO1	Apply heat conduction equations to different surface configurations under steady state and transient conditions and solve problems
CO2	Apply free and forced convective heat transfer correlations to internal and external flows through/over various surface configurations and solve problems
CO3	Explain the phenomena of boiling and condensation, apply LMTD and NTU methods of thermal analysis to different types of heat exchanger configurations and solve problems
CO4	Explain basic laws for Radiation and apply these principles to radiative heat transfer between different types of surfaces to solve problems
CO5	Apply diffusive and convective mass transfer equations and correlations to solve problems for different applications

TEXT BOOKS:

1. Holman, J.P., "Heat and Mass Transfer", Tata McGraw Hill, 2000
2. Yunus A. Cengel, "Heat Transfer A Practical Approach", Tata McGraw Hill, 3rd Edition, 2015

REFERENCES:

1. Frank P. Incropera and David P. Dewitt, "Fundamentals of Heat and Mass Transfer", John Wiley & Sons, 1998.
2. Kothandaraman, C.P., "Fundamentals of Heat and Mass Transfer", New Age International, New Delhi, 1998.
3. Nag, P.K., "Heat Transfer", Tata McGraw Hill, New Delhi, 2002
4. Ozisik, M.N., "Heat Transfer", McGraw Hill Book Co., 1994.
5. R.C. Sachdeva, "Fundamentals of Engineering Heat & Mass transfer", New Age International Publishers, 2009

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CIN: U28131TZ2009PTC015549

Date: 25.08.2021

TO WHOM IT MAY CONCERN

This is to certify that Mr. VINITH KUMAR A studying in final year Mechanical Engineering of NPR College of Engineering & Technology, Natham has undergone Internship in our organization from 05.08.2021 to 25.08.2021.

During the period, their conduct was found to be good.

With Regards

(For Thermo Solutions (INDIA) Pvt. Ltd)

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ME8692 **FINITE ELEMENT ANALYSIS** L T P C
3 0 0 3

OBJECTIVES:

- To introduce the concepts of Mathematical Modeling of Engineering Problems.
- To appreciate the use of FEM to a range of Engineering Problems.

UNIT I INTRODUCTION 9

Historical Background – Mathematical Modeling of field problems in Engineering – Governing Equations – Discrete and continuous models – Boundary, Initial and Eigen Value problems– Weighted Residual Methods – Variational Formulation of Boundary Value Problems – Ritz Technique – Basic concepts of the Finite Element Method.

UNIT II ONE-DIMENSIONAL PROBLEMS 9

One Dimensional Second Order Equations – Discretization – Element types- Linear and Higher order Elements – Derivation of Shape functions and Stiffness matrices and force vectors- Assembly of Matrices - Solution of problems from solid mechanics and heat transfer. Longitudinal vibration frequencies and mode shapes. Fourth Order Beam Equation –Transverse deflections and Natural frequencies of beams.

UNIT III TWO DIMENSIONAL SCALAR VARIABLE PROBLEMS 9

Second Order 2D Equations involving Scalar Variable Functions – Variational formulation –Finite Element formulation – Triangular elements – Shape functions and element matrices and vectors. Application to Field Problems - Thermal problems – Torsion of Non circular shafts –Quadrilateral elements – Higher Order Elements.

UNIT IV TWO DIMENSIONAL VECTOR VARIABLE PROBLEMS 9

Equations of elasticity – Plane stress, plane strain and axisymmetric problems – Body forces and temperature effects – Stress calculations - Plate and shell elements.

UNIT V ISOPARAMETRIC FORMULATION 9

Natural co-ordinate systems – Isoparametric elements – Shape functions for iso parametric elements – One and two dimensions – Serendipity elements – Numerical integration and application to plane stress problems - Matrix solution techniques – Solutions Techniques to Dynamic problems – Introduction to Analysis Software.

TOTAL : 45 PERIODS

OUTCOMES

CO1 Summarize the basics of finite element formulation.
CO2 Apply finite element formulations to solve one dimensional Problems.
CO3 Apply finite element formulations to solve two dimensional scalar Problems.
CO4 Apply finite element method to solve two dimensional Vector problems.
CO5 Apply finite element method to solve problems on iso parametric element and dynamic Problems.

TEXT BOOKS:

1. Reddy. J.N., "An Introduction to the Finite Element Method", 3rd Edition, Tata McGraw-Hill, 2005
2. Seshu, P, "Text Book of Finite Element Analysis", Prentice-Hall of India Pvt. Ltd., New Delhi, 2007.

REFERENCES:

1. Bhatti Asghar M, "Fundamental Finite Element Analysis and Applications", John Wiley & Sons, 2005 (Indian Reprint 2013)*
2. Chandrupatla & Belagundu, "Introduction to Finite Elements in Engineering", 3rd Edition, Prentice Hall College Div, 1990
3. Logan, D.L., "A first course in Finite Element Method", Thomson Asia Pvt. Ltd., 2002
4. Rao, S.S., "The Finite Element Method in Engineering", 3rd Edition, Butterworth Heinemann, 2004
5. Robert D. Cook, David S. Malkus, Michael E. Plesha, Robert J. Witt, "Concepts and Applications of Finite Element Analysis", 4th Edition, Wiley Student Edition, 2002.

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SEMI-AUTOMATIC SEED SOWING ROBOT BY USING SOLAR PANAL

A PROJECT REPORT

Submitted by

ABDULLA BEE.A (920817114002)

MATHIVANAN.N (920817114044)

MELVIN INFANT RAJ.J (920817114045)

MUKILAN.R.A (920817114306)

in partial fulfilment for the award of the degree of

BACHELOR OF ENGINEERING

in

MECHANICAL ENGINEERING

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NATHAM, DINDIGUL

ANNA UNIVERSITY :: CHENNAI 600 025

April 2021

ANNA UNIVERSITY :: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this report titled "**SEMI - AUTOMATIC SEED SOWING ROBOT BY USING SOLAR PANAL**" is the bonafide work of **ABDULLA BEE.A (920817114002)** who carried out the work under my supervision. Certified further that to the best of my knowledge the work reported herein does not form part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

Dr.T.MALAICHAMY M.E., Ph.D.,
HEAD OF THE DEPARTMENT
Assistant Professor,
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Natham - 624401.

Mr.B.DEEPAN, M.E.,
SUPERVISIOR
Assistant Professor,
NPR College of Engg, & Tech,
Natham - 624401.

Submitted for the project VIVA-VOCE examination held on 30/7/21

INTERNAL EXAMINER

EXTERNAL EXAMINER

FABRICATION OF SEMI AUTOMATIC SEED SOWING ROBOT BY USING SOLAR PANAL

ABSTRACT

Sowing is the most important process in farming. It is a very tiring and time
ısuming process that requires a lot of human effort. Here we propose the design
l fabrication of a semi automatic solar power seed sowing robot that automates
; task. The proposed robot uses motors for running it in desired directions. We use
mall bracket for pouring seeds. The robot consists of a funnel like arrangement in
ler to pour seeds into a lower container. There we use a shaft with gear like bucket
th to pick up limited quantity of seeds and pour them on the ground in a steady
nner in proper quantity. The front of the robot consists of a bent plate that drags
the soil to make a slot ahead of the machine before seeds are poured in it. The
:k portion of the robot consists of a tail like bent rod that is again used to pour soil
seeds sowed thus covering them with soil. Thus the system semi automated to
erate.

CHAPTER 10

CONCLUTION

Innovative Seed sowing equipment is has remarkable influence in riculture. By using this innovative project of seed sowing equipment we can save ore time required for sowing process and also it reduces lot of laborer cost. It is ry helpful for small scale formers. After comparing the different method of seed wing and limitations of the existing machine, it is concluded that the this solar wered seed sowing machine can

- Maintain row spacing and controls seed rate.
- Control the seed depth and proper utilization of seeds can be done with less loss.
- Perform the various simultaneous operations and hence saves labour requirementso as labour cost, labour time and also save lots of energy.

Hence it is easily affordable by farmers. So we feel that this project serves mething good to this world and we would like to present it before this prosperous rld.

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ME8694 **HYDRAULICS AND PNEUMATICS**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To provide student with knowledge on the application of fluid power in process, construction and manufacturing Industries.
- To provide students with an understanding of the fluids and components utilized in modern industrial fluid power system.
- To develop a measurable degree of competence in the design, construction and operation of fluid power circuits.

UNIT I FLUID POWER PRINICIPLES AND HYDRAULIC PUMPS 9

Introduction to Fluid power – Advantages and Applications – Fluid power systems – Types of fluids - Properties of fluids and selection – Basics of Hydraulics – Pascal's Law – Principles of flow - Friction loss – Work, Power and Torque Problems, Sources of Hydraulic power : Pumping Theory – Pump Classification – Construction, Working, Design, Advantages, Disadvantages, Performance, Selection criteria of Linear and Rotary – Fixed and Variable displacement pumps – Problems.

UNIT II HYDRAULIC ACTUATORS AND CONTROL COMPONENTS 9

Hydraulic Actuators: Cylinders – Types and construction, Application, Hydraulic cushioning – Hydraulic motors - Control Components : Direction Control, Flow control and pressure control valves – Types, Construction and Operation – Servo and Proportional valves – Applications – Accessories : Reservoirs, Pressure Switches – Applications – Fluid Power ANSI Symbols – Problems.

UNIT III HYDRAULIC CIRCUITS AND SYSTEMS 9

Accumulators, Intensifiers, Industrial hydraulic circuits – Regenerative, Pump Unloading, Double-Pump, Pressure Intensifier, Air-over oil, Sequence, Reciprocation, Synchronization, Fail-Safe, Speed Control, Hydrostatic transmission, Electro hydraulic circuits, Mechanical hydraulic servo systems.

UNIT IV PNEUMATIC AND ELECTRO PNEUMATIC SYSTEMS 9

Properties of air – Perfect Gas Laws – Compressor – Filters, Regulator, Lubricator, Muffler, Air control Valves, Quick Exhaust Valves, Pneumatic actuators, Design of Pneumatic circuit – Cascade method – Electro Pneumatic System – Elements – Ladder diagram – Problems, Introduction to fluidics and pneumatic logic circuits.

UNIT V TROUBLE SHOOTING AND APPLICATIONS 9

Installation, Selection, Maintenance, Trouble Shooting and Remedies in Hydraulic and Pneumatic systems, Design of hydraulic circuits for Drilling, Planning, Shaping, Surface grinding, Press and Forklift applications. Design of Pneumatic circuits for Pick and Place applications and tool handling in CNC Machine tools – Low cost Automation – Hydraulic and Pneumatic power packs.

TOTAL:45 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

CO1 Explain the Fluid power and operation of different types of pumps.
CO2 Summarize the features and functions of Hydraulic motors, actuators and Flow control valves
CO3 Explain the different types of Hydraulic circuits and systems
CO4 Explain the working of different pneumatic circuits and systems
CO5 Summarize the various trouble shooting methods and applications of hydraulic and pneumatic systems.

TEXT BOOKS:

Bnazrum
Agro Exports (P) Ltd.

Sirumalai Road, Reddiapatti P.O.,
Erandalapara, Dindigul - 624 003.
Tamil Nadu, India.
GST No : 33AABCB2418B1ZJ
CIN : U05110TZ1998PTC008488
Phone : +91 451 2471572, 2470454
E-mail : accounts@bnazrum.com
Website : www.bnazrum.com

Date: 30/09/2020

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. KEERTHIVASAN R** IV year Mechanical Engineering of NPR college of Engineering & Technology, Natham, Dindigul, has successfully completed Twenty one days internship from 10/09/2020 - 30/09/2020 in our organization. During this period, he was sincere, enthusiastic and hard working.

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
Principal
N.P.R. College of Engineering & Technology
Natham, Dindigul (Dt) - 624 401.

For BNAZRUM AGRO EXPORTS (P) LTD.,

(A.M.Yusuf Ansari)
General Manager

fssai 100 % E.O.U FDA BSCI

PR8592 **WELDING TECHNOLOGY** **L T P C**
3 0 0 3

OBJECTIVE:

- To understand the basics of welding and to know about the various types of welding processes

UNIT I GAS AND ARC WELDING PROCESSES: 9

Fundamental principles – Air Acetylene welding, Oxyacetylene welding, Carbon arc welding, Shielded metal arc welding, Submerged arc welding, TIG & MIG welding, Plasma arc welding and Electroslag welding processes - advantages, limitations and applications.

UNIT II RESISTANCE WELDING PROCESSES: 9

Spot welding, Seam welding, Projection welding, Resistance Butt welding, Flash Butt welding, Percussion welding and High frequency resistance welding processes - advantages, limitations and applications.

UNIT III SOLID STATE WELDING PROCESSES: 9

Cold welding, Diffusion bonding, Explosive welding, Ultrasonic welding, Friction welding, Forge welding, Roll welding and Hot pressure welding processes - advantages, limitations and applications.

UNIT IV OTHER WELDING PROCESSES: 9

Thermit welding, Atomic hydrogen welding, Electron beam welding, Laser Beam welding, Friction stir welding, Under Water welding, Welding automation in aerospace, nuclear and surface transport vehicles.

UNIT V DESIGN OF WELD JOINTS, WELDABILITY AND TESTING OF WELDMENTS 9

Various weld joint designs – Welding defects – causes and remedies - Weldability of Aluminium, Copper, and Stainless steels. Destructive and non destructive testing of weldments.

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of this course, the students can able

- Understand the construction and working principles of gas and arc welding process.
- Understand the construction and working principles of resistance welding process.
- Understand the construction and working principles of various solid state welding process.
- Understand the construction and working principles of various special welding processes.
- Understand the concepts on weld joint design, weldability and testing of weldments.

TEXT BOOKS

1. Little R.L., "Welding and welding Technology", Tata McGraw Hill Publishing Co., Ltd., New Delhi, 34th reprint, 2008.
2. Parmer R.S., "Welding Engineering and Technology", 1st Edition, Khanna Publishers, New Delhi, 2008.
3. Parmer R.S., "Welding Processes and Technology", Khanna Publishers, New Delhi, 1992.

REFERENCES

1. AWS- Welding Hand Book. 8th Edition. Vol- 2. "Welding Process"
2. Christopher Davis. "Laser Welding- Practical Guide". Jaico Publishing House.
3. Davis A.C., "The Science and Practice of Welding", Cambridge University Press, Cambridge, 1993
4. Nadkarni S.V. "Modern Arc Welding Technology", Oxford IBH Publishers, 1st Edition, 2005.
5. Schwartz M.M. "Metals Joining Manual". McGraw Hill Books, 1979.
6. Tylecote R.F. "The Solid Phase Welding of Metals". Edward Arnold Publishers Ltd. London.

NPR COLLEGE OF ENGG. & TECHNOLOGY NATHAM

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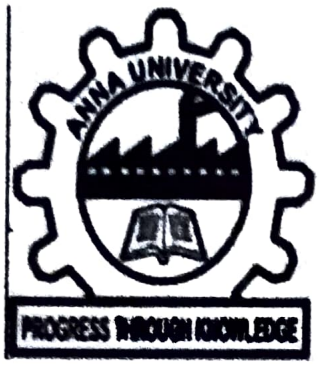

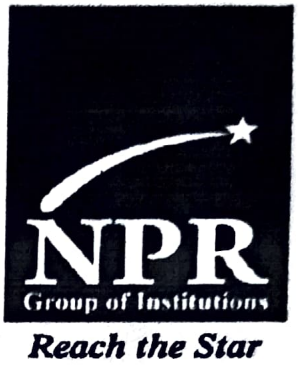

Design And Optomization Of Extruder Head In Fused Deposit Modelling (FDM) Machine

A PROJECT REPORT

Submitted By

HARISH.S	**920817114025**
HIRICHARAN.V.N	**920817114028**
JEYAPRAKASH.P	**920817114033**
KEERTHI VASAN.R	**920817114037**

in partial fulfillment for the award of the degree
of
BACHELOR OF ENGINEERING
in
MECHANICAL ENGINEERING

NPR COLLEGE OF ENGINEERING AND TECHNOLOGY,
DINDIGUL-624 401
ANNA UNIVERSITY: CHENNAI 600 025

April 2021

ANNA UNIVESITY: CHENNAI 600 025
BONAFIDE CERTIFICATE

Certified that this project report **"Design And Optimization Of Extruder Head Of Fused Deposit Modelling (FDM) Machine "** is the bonafide work of **JEYAPRAKASH.P (920817114033)**,who carried out the project under my supervision.

SIGNATURE

Dr.T.MALAICHAMY, M.E.,PH.D.,
PROFESSOR AND HEAD OF DEPARTMENT
Department of Mechanical Engineering,
NPR College of Engg & Tech.,
Dindigul-624 401.

SIGNATURE

Mr.M.MATHAN RAJ,M.E.
SUPERVISOR
ASSISTANT PROFESSOR
Department of Mechanical Engineering,
NPR College of Engg &Tech.,
Dindigul-624 401.

Submitted to the VIVA-VOCE examination held on 30/7/21

INTERNAL EXAMINER

EXTERNAL EXAMINER

N·S·D·C National Skill Development Corporation
ansforming the skill landscape

3D MAKERS R&D and Automation
ISO 9001:2015 Certified

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www.caddacademy.in| Unit of CADD ACADEMY Group

Date: 27/03/2021

TO WHOMSOEVER IT MAY CONCERN

This is to Certify that, Mr. **HIRICHARAN V N** Final year B.E MECHANICAL IGINEERING at **NPR College of Engineering and Technology** has done his oject work in our Organization under the title **"Design and Optimization of Extruder ad in Fused Deposit Modelling Machine"** during the period of 01-03-2021 to .03.2021.

uring this period his attendance & attitude was found to be good.

e wish him all success in his future endeavors.

For 3D MAKERS R&D AND AUTOMATION

JAIKUMAR C
MANAGING DIRECTOR.

N·S·D·C National Skill Development Corporation
ansforming the skill landscape

3D MAKERS R&D and Automation ISO 9001:2015 Certified

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www.caddacademy.in | Unit of CADD ACADEMY Group

Date: 27/03/2021

TO WHOMSOEVER IT MAY CONCERN

This is to Certify that, Mr. **HARISH S** Final year B.E MECHANICAL NGINEERING at **NPR College of Engineering and Technology** has done his oject work in our Organization under the title **"Design and Optimization of Extruder ead in Fused Deposit Modelling Machine"** during the period of 01-03-2021 to .03.2021.

uring this period his attendance & attitude was found to be good.

'e wish him all success in his future endeavors.

For 3D MAKERS R&D AND AUTOMATION

JAIKUMAR C
MANAGING DIRECTOR.

R CLIENTS

IFE(MADURAI-OPERATION PLANT), TVS FIRE STONE PVT LTD, TVS RUBBER, HI-TECH ARAI LTD, SUN-ENGGINEERING PVT LTD, IICISION PRODUCTS PVT LTD, MERCH M/C TOOL PVT LTD, BALAJI PAPER CUPS, KUTANGKULAM NUCLER POWER PLANT,MERCH /C TOOL, MANIS ALLAYS, AURUNA ALLAYS.... ETC ...

OMPLETE CAD/ CAM / CAE SOLUTION

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Date: 27/03/2021

TO WHOMSOEVER IT MAY CONCERN

This is to Certify that, Mr. **KEERTHIVASAN R** Final year B.E MECHANICAL IGINEERING at **NPR College of Engineering and Technology** has done his oject work in our Organization under the title "**Design and Optimization of Extruder ad in Fused Deposit Modelling Machine**" during the period of 01-03-2021 to .03.2021.

ring this period his attendance & attitude was found to be good.

wish him all success in his future endeavors.

For 3D MAKERS R&D AND AUTOMATION

JAIKUMAR C
MANAGING DIRECTOR.

CLIENTS

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Date: 27/03/2021

TO WHOMSOEVER IT MAY CONCERN

This is to Certify that, Mr. **JEYAPRAKASH P** Final year B.E MECHANICAL NGINEERING at **NPR College of Engineering and Technology** has done his oject work in our Organization under the title "**Design and Optimization of Extruder ead in Fused Deposit Modelling Machine**" during the period of 01-03-2021 to .03.2021.

uring this period his attendance & attitude was found to be good.

e wish him all success in his future endeavors.

For 3D MAKERS R&D AND AUTOMATION

JAIKUMAR C
MANAGING DIRECTOR.

CLIENTS

E(MADURAI-OPERATION PLANT), TVS FIRE STONE PVT LTD, TVS RUBBER, HI-TECH ARAI LTD, SUN-ENGGINEERING PVT LTD, ISION PRODUCTS PVT LTD, MERCH M/C TOOL PVT LTD, BALAJI PAPER CUPS, KUTANGKULAM NUCLER POWER PLANT,MERCH TOOL, MANIS ALLAYS, AURUNA ALLAYS.... ETC ...

MPLETE CAD/ CAM / CAE SOLUTION

ABSTRACT

The Project is Researched and Developed about the " **Design And Optimization Of Extruder Head In Fused Deposit Modelling (FDM) Machine** " so the project basically explains about the problems occurring in the Existing Extruder Head Of The Fused Deposit Modelling (FDM) Machine, such as Over Heating of the Extruder of Head during the process of running. This causes the filament to warp over the stepper motor and melt the filament even before it has reached the nozzle.

So to reduce the amount of heat produced in the extruder head, a newly Designed setup of the Extruder Head is being Assembled with a different setup to reduce the amount Heat Produced in the Head and obtain the product with high precision, accuracy and finishing.

CHAPTER 6
CONCLUSION

To print intricate and complicated parts and to reduce the amount of heat produced in the extruder head of the FDM machine, in the above chapter all these problems were solved by rearranging the setup of the Extruder head with some designed parts in extra and the model was a successful one. This model included two extra parts with the actual setup and the those extra parts were useful in the process of the reducing the amount of heat produced in the Extruder head. So as the heat produced in the Extruder head was successfully reduced, problems like Filament warping, filament breakage in the stepper motor and Filament over heating did not occur during the process of printing done with the redesigned model of the Extruder head .

In this process since the problem of the Filament overheating was stopped, products which were complicated and intricate, products of larger volume were also been able to print. Thus the process of reducing the heat produced in the extruder head and the other problems such as filament breakage and etc, have been solved.

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
Principal
N.P.R. College of Engineering & Technology
Natham, Dindigul (Dt) - 624 401.

ME8792	POWER PLANT ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVE:

- Providing an overview of Power Plants and detailing the role of Mechanical Engineers in their operation and maintenance.

UNIT I COAL BASED THERMAL POWER PLANTS 9

Rankine cycle - improvisations, Layout of modern coal power plant, Super Critical Boilers, FBC Boilers, Turbines, Condensers, Steam & Heat rate, Subsystems of thermal power plants – Fuel and ash handling, Draught system, Feed water treatment. Binary Cycles and Cogeneration systems.

UNIT II DIESEL, GAS TURBINE AND COMBINED CYCLE POWER PLANTS 9

Otto, Diesel, Dual & Brayton Cycle - Analysis & Optimisation. Components of Diesel and Gas Turbine power plants. Combined Cycle Power Plants. Integrated Gasifier based Combined Cycle systems.

UNIT III NUCLEAR POWER PLANTS 9

Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of Nuclear Reactors : Boiling *Water Reactor* (BWR), *Pressurized Water Reactor* (PWR), CANada Deuterium- Uranium reactor (CANDU), Breeder, Gas Cooled and Liquid Metal Cooled Reactors. Safety measures for Nuclear Power plants.

UNIT IV POWER FROM RENEWABLE ENERGY 9

Hydro Electric Power Plants – Classification, Typical Layout and associated components including Turbines. Principle, Construction and working of Wind, Tidal, *Solar* Photo Voltaic (SPV), Solar Thermal, Geo Thermal, Biogas and Fuel Cell power systems.

UNIT V ENERGY, ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS 9

Power tariff types, Load distribution parameters, load curve, Comparison of site selection criteria, relative merits & demerits, Capital & Operating Cost of different power plants. Pollution control technologies including Waste Disposal Options for Coal and Nuclear Power Plants.

TOTAL : 45 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

CO1 Explain the layout, construction and working of the components inside a thermal power plant.

CO2 Explain the layout, construction and working of the components inside a Diesel, Gas and Combined cycle power plants.

CO3 Explain the layout, construction and working of the components inside nuclear power plants.

CO4 Explain the layout, construction and working of the components inside Renewable energy power plants.

CO5 Explain the applications of power plants while extend their knowledge to power plant economics and environmental hazards and estimate the costs of electrical energy production.

TEXT BOOK:

1. Nag. P.K., "Power Plant Engineering", Third Edition, Tata McGraw – Hill Publishing Company Ltd., 2008.

REFERENCES:

1. El-Wakil. M.M., "Power Plant Technology", Tata McGraw – Hill Publishing Company Ltd., 2010.
2. Godfrey Boyle, "Renewable energy", Open University, Oxford University Press in association with the Open University, 2004.
3. Thomas C. Elliott, Kao Chen and Robert C. Swanekamp, "Power Plant Engineering", Second Edition, Standard Handbook of McGraw - Hill, 1998.

Dr. J.SUNDARARAJAN,
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Principal
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Natham, Dindigul (Dt) - 624 401.

CIN: U28131TZ2009PTC015549

Date: 25.08.2021

TO WHOM IT MAY CONCERN

This is to certify that Mr. SURYA VISWA M studying in final year Mechanical Engineering of NPR College of Engineering & Technology, Natham has undergone Internship in our organization from 05.08.2021 to 25.08.2021.

During the period, their conduct was found to be good.

With Regards

(For Thermo Solutions (INDIA) Pvt. Ltd)

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
Principal
N.P.R. College of Engineering & Technology
Natham, Dindigul (Dt) - 624 401.

ME8793	PROCESS PLANNING AND COST ESTIMATION	L	T	P	C
		3	0	0	3

OBJECTIVE:

- To introduce the process planning concepts to make cost estimation for various products after process planning

UNIT I INTRODUCTION TO PROCESS PLANNING 9

Introduction- methods of process planning-Drawing interpretation-Material evaluation – steps in process selection-.Production equipment and tooling selection

UNIT II PROCESS PLANNING ACTIVITIES 9

Process parameters calculation for various production processes-Selection jigs and fixtures election of quality assurance methods - Set of documents for process planning-Economics of process planning- case studies

UNIT III INTRODUCTION TO COST ESTIMATION 9

Importance of costing and estimation -methods of costing-elements of cost estimation -Types of estimates – Estimating procedure- Estimation labor cost, material cost- allocation of over head charges- Calculation of depreciation cost

UNIT IV PRODUCTION COST ESTIMATION 9

Estimation of Different Types of Jobs - Estimation of Forging Shop, Estimation of Welding Shop, Estimation of Foundry Shop

UNIT V MACHINING TIME CALCULATION 9

Estimation of Machining Time - Importance of Machine Time Calculation- Calculation of Machining Time for Different Lathe Operations ,Drilling and Boring - Machining Time Calculation for Milling, Shaping and Planning -Machining Time Calculation for Grinding.

TOTAL: 45 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

CO1 select the process, equipment and tools for various industrial products.
CO2 prepare process planning activity chart.
CO3 explain the concept of cost estimation.
CO4 compute the job order cost for different type of shop floor.
CO5 calculate the machining time for various machining operations.

TEXT BOOKS:

1. Peter scalon, "Process planning, Design/Manufacture Interface", Elsevier science technology Books, Dec 2002.
2. Sinha B.P, "Mechanical Estimating and Costing", Tata-McGraw Hill publishing co, 1995.

REFERENCES:

1. Chitale A.V. and Gupta R.C., "Product Design and Manufacturing", 2nd Edition, PHI, 2002.
2. Ostwalal P.F. and Munez J., "Manufacturing Processes and systems", 9th Edition, John Wiley, 1998.
3. Russell R.S and Tailor B.W, "Operations Management", 4th Edition, PHI, 2003.
4. Mikell P. Groover, "Automation, Production, Systems and Computer Integrated Manufacturing", Pearson Education 2001.
5. K.C. Jain & L.N. Aggarwal, "Production Planning Control and Industrial Management", Khanna Publishers 1990.

Dr. J.SUNDARARAJAN,
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Phone : +91 451 2471572, 2470454
E-mail : accounts@bnazrum.com
Website : www.bnazrum.com

Date: 27.08.2021

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. AATHITHYAN B** IV year Mechanical Engineering of NPR college of Engineering & Technology, Natham, Dindigul, has successfully completed Twenty Six days internship from 02.08.2021 to 27.08.2021 in our organization. During this period, he was sincere, enthusiastic and hard working.

Dr. J.SUNDARARAJAN,
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Principal
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For BNAZRUM AGRO EXPORTS (P) LTD.,

(A.M.Yusuf Ansari)
General Manager

fssai 100 % E.O.U FDA BSCI

ME8791 **MECHATRONICS**

L	T	P	C
3	0	0	3

OBJECTIVE:

- To impart knowledge about the elements and techniques involved in Mechatronics systems which are very much essential to understand the emerging field of automation.

UNIT I INTRODUCTION 9

Introduction to Mechatronics – Systems – Concepts of Mechatronics approach – Need for Mechatronics - Emerging areas of Mechatronics - Classification of Mechatronics. Sensors and Transducers: Static and dynamic Characteristics of Sensor, Potentiometers - LVDT - Capacitance sensors - Strain gauges - Eddy current sensor - Hall effect sensor - Temperature sensors - Light sensors

UNIT II MICROPROCESSOR AND MICROCONTROLLER 9

Introduction - Architecture of 8085 - Pin Configuration - Addressing Modes -Instruction set, Timing diagram of 8085 - Concepts of 8051 microcontroller - Block diagram,.

UNIT III PROGRAMMABLE PERIPHERAL INTERFACE 9

Introduction - Architecture of 8255, Keyboard interfacing, LED display -interfacing, ADC and DAC interface, Temperature Control - Stepper Motor Control - Traffic Control interface.

UNIT IV PROGRAMMABLE LOGIC CONTROLLER 9

Introduction - Basic structure - Input and output processing - Programming - Mnemonics - Timers, counters and internal relays - Data handling – Selection of PLC.

UNIT V ACTUATORS AND MECHATRONIC SYSTEM DESIGN 9

Types of Stepper and Servo motors – Construction – Working Principle – Advantages and Disadvantages. Design process-stages of design process - Traditional and Mechatronics design concepts - Case studies of Mechatronics systems - Pick and place Robot - Engine Management system – Automatic car park barrier.

TOTAL : 45 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

CO1 Discuss the interdisciplinary applications of Electronics, Electrical, Mechanical and Computer Systems for the Control of Mechanical, Electronic Systems and sensor technology.

CO2 Discuss the architecture of Microprocessor and Microcontroller, Pin Diagram, Addressing Modes of Microprocessor and Microcontroller.

CO3 Discuss Programmable Peripheral Interface, Architecture of 8255 PPI, and various device interfacing

CO4 Explain the architecture, programming and application of programmable logic controllers to problems and challenges in the areas of Mechatronic engineering.

CO5 Discuss various Actuators and Mechatronics system using the knowledge and skills acquired through the course and also from the given case studies

TEXT BOOKS:

1. Bolton, "Mechatronics", Prentice Hall, 2008
2. Ramesh S Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", 5th Edition, Prentice Hall, 2008.

REFERENCES:

1. Bradley D.A, Dawson D, Buru N.C and Loader A.J, "Mechatronics", Chapman and Hall, 1993.
2. Clarence W, de Silva, "Mechatronics" CRC Press, First Indian Re-print, 2013
3. Devadas Shetty and Richard A. Kolk, "Mechatronics Systems Design", PWS publishing company, 2007.
4. Krishna Kant, "Microprocessors & Microcontrollers", Prentice Hall of India, 2007.
5. Michael B.Histand and Davis G.Alciatore, "Introduction to Mechatronics and Measurement systems", McGraw Hill International edition, 2007.

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FABRICATION OF MULTI PURPOSE AGRICULTURAL VEHICLE

REPORT

Submitted by

HARIHARA SUDHAN. T	**(920817114024)**
MANIBHARATHI. S	**(920817114041)**
MANIKANDAN. K	**(920817114042)**
MOHAMED RIYAS. A	**(920817114047)**

in partial fulfilment for the award of the degree of

BACHELOR OF ENGINEERING

in

MECHANICAL ENGINEERING

NPR COLLEGE OF ENGINEERING AND TECHNOLOGY

NATHAM, DINDIGUL

ANNAUNIVERSITY :: CHENNAI 600025

April 2021

ANNA UNIVERSITY :: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this report titled "FABRICATION OF MULTI PURPOSE AGRICULTURAL VEHICLE" is the bonafide work of **HARIHARA SUDHAN. T (920817114024), MANIBHARATHI. S (920817114041),MANIKANDAN.K (920817114042) and MOHAMED RIYAS. A (920817114047)** who carried out the work under my supervision. Certified further that to the best of my knowledge the work reported herein does not form part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

Dr.T.MALAICHAMY M.E., Ph.D.,
HEAD OF THE DEPARTMENT
Assistant Professor,
NPR College of Engg, & Tech,
Natham - 624401.

Mr. G. SUNDARARAJAN M.E.,
SUPERVISIOR
Assistant Professor,
NPR College of Engg, & Tech,
Natham - 624401.

Submitted for the project VIVA-VOCE examination held on 30/7/21

INTERNALEXAMINER **EXTERNAL EXAMINER**

FABRICATION OF MULTI PURPOSE AGRICULTURAL VEHICLE

ABSTRACT

Presently, small land holding farmers use work bulls mostly for land preparation. Their use can be increased and made more economical by using them for other farm operations such as ploughing, harrowing, fertilizer application, sowing and weeding. Improved hand tools will also facilitate farm work. Oxen can be used to pull a cart throughout the year which keeps them in training. Ploughs, ridgers, seeders and weeders are all seasonal implements. Manual method of seed planting, results in low seed placement, low crop yield and serious back ache for the farmer which limits the size of field that can be planted. The cost price of imported planters has gone beyond the purchasing power of most of our farmers. Farmers can do much to increase crop production especially grains if drudgery can be reduced or totally removed from their planting operations.

Generally cultivation of any crop involves various steps like seed selection, field preparation, fertilizing, sowing, irrigation, germination, thinning and filling, weed removal, vegetative stage, flowering stage, pesticide spraying, fruit or pod formation stage, harvesting and threshing. Farmer has to use various agricultural equipments and labors for caring out those steps, our purpose is to combine all the individual tools to provide farmers with multipurpose equipment which implements all the scientific farming techniques and specifications and suitable for all type of seed to seed cultivation with as minimum cost as possible.

This project work is focused on the design and fabrication of multipurpose equipment which is used for land preparation, sowing, fertilizing, leveling and weed removal process. The multi- crop planter has the capability of delivering the seeds precisely with uniform depth in the furrow, and also with uniform spacing between the seeds .

The seed planter consist of the main frame, adjustable handle, seed hopper, eed metering disc, adjustable furrow opener, adjustable furrow closer, drive vheels, seed tube . Seedmetering disc was designed to be interchangeable to llow forsowing of the different varieties of seeds. The multipurpose agricultural quipment is very simple to use, the various adjustments are made with ease, and : is maintenance free.

CHAPTER 6

RESULTS AND CONCULSION

Practically our multipurpose agricultural equipment can be used for tilling, fertilizing, sowing, leveling and also used for weed removal purposes. All the parts are connected in such a way that in every stage of agriculture the equipment can be rearranged or easily assembled with fasteners to required length and specifications of field operation.

Our team has successfully combined many ideas from various fields of mechanical engineering and agricultural knowledge to improve the yield and by reducing the labor effort and expenses. The whole idea of multipurpose equipment is a new concept, patentable and can be successfully implement in real life situations.

6.1 Scope for future work

By increasing the equipment strength and quality to its peak, we can have multipurpose agricultural equipment for life time usage. By providing hydraulics, gear arrangements and some minor adjustments the equipment can also be made as tractor powered equipment.

N.P.R. COLLEGE OF ENGG. & TECHNOLOGY NATHAM

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OIE751 **ROBOTICS**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the functions of the basic components of a Robot.
- To study the use of various types of End of Effectors and Sensors
- To impart knowledge in Robot Kinematics and Programming
- To learn Robot safety issues and economics.

UNIT I FUNDAMENTALS OF ROBOT 6

Robot - Definition - Robot Anatomy - Co ordinate Systems, Work Envelope Types and Classification- Specifications-Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load-Robot Parts and their Functions-Need for Robots-Different Applications.

UNIT II ROBOT DRIVE SYSTEMS AND END EFFECTORS 9

Pneumatic Drives-Hydraulic Drives-Mechanical Drives-Electrical Drives-D.C. Servo Motors, Stepper Motors, A.C. Servo Motors-Salient Features, Applications and Comparison of all these Drives, End Effectors-Grippers-Mechanical Grippers, Pneumatic and Hydraulic- Grippers, Magnetic Grippers,
Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations.

UNIT III SENSORS AND MACHINE VISION 12

Requirements of a sensor, Principles and Applications of the following types of sensors- Position sensors - Piezo Electric Sensor, LVDT, Resolvers, Optical Encoders, pneumatic Position Sensors, Range Sensors Triangulations Principles, Structured, Lighting Approach, Time of Flight, Range Finders, Laser Range Meters, Touch Sensors ,binary Sensors., Analog Sensors, Wrist Sensors, Compliance Sensors, Slip Sensors, Camera, Frame Grabber, Sensing and Digitizing Image Data- Signal Conversion, Image Storage, Lighting Techniques, Image Processing and Analysis-Data Reduction, Segmentation, Feature Extraction, Object Recognition, Other Algorithms, Applications- Inspection, Identification, Visual Serving and Navigation.

UNIT IV ROBOT KINEMATICS AND ROBOT PROGRAMMING 13

Forward Kinematics, Inverse Kinematics and Difference; Forward Kinematics and Reverse Kinematics of manipulators with Two, Three Degrees of Freedom (in 2 Dimension), Four Degrees of freedom (in 3 Dimension) Jacobians, Velocity and Forces-Manipulator Dynamics, Trajectory Generator, Manipulator Mechanism Design-Derivations and problems. Lead through Programming, Robot programming Languages-VAL Programming-Motion Commands, Sensor Commands, End Effector commands and simple Programs.

UNIT V IMPLEMENTATION AND ROBOT ECONOMICS 5

RGV, AGV; Implementation of Robots in Industries-Various Steps; Safety Considerations for Robot Operations - Economic Analysis of Robots.

TOTAL: 45 PERIODS

OUTCOME:

- Upon completion of this course, the students can able to apply the basic engineering knowledge for the design of robotics

TEXT BOOKS:

1. Klafter R.D., Chmielewski T.A and Negin M., "Robotic Engineering - An Integrated Approach", Prentice Hall, 2003.
2. Groover M.P., "Industrial Robotics -Technology Programming and Applications", McGraw Hill, 2001.

REFERENCES:

1. Craig J.J., "Introduction to Robotics Mechanics and Control", Pearson Education, 2008.
2. Deb S.R., "Robotics Technology and Flexible Automation" Tata McGraw Hill Book Co., 1994.
3. Koren Y., "Robotics for Engineers", Mc Graw Hill Book Co., 1992.
4. Fu.K.S.,Gonzalz R.C. and Lee C.S.G., "Robotics Control, Sensing, Vision and Intelligence", McGraw Hill Book Co., 1987.

5. Janakiraman P.A., "Robotics and Image Processing", Tata McGraw Hill, 1995.
6. Rajput R.K., "Robotics and Industrial Automation", S.Chand and Company, 2008.
7. Surender Kumar, "Industrial Robots and Computer Integrated Manufacturing", Oxford and IBH Publishing Co. Pvt. Ltd., 1991.

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Date: **19.08.2021**

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **RAKESH M** studying III year Mechanical Engineering in NPR College of Engineering & Technology, Natham, Dindigul, has successfully completed Eight days from **12.08.2021** to **19.08.2021** inplant training in our company. During the period the training period he was has been extremely inquisitive and hard working .He summed to be writing to learn the functions/process with kwon interest.

We wish him every success in life.

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ME8073	UNCONVENTIONAL MACHINING PROCESSES	L	T	P	C
		3	0	0	3

OBJECTIVE:

- To learn about various unconventional machining processes, the various process parameters and their influence on performance and their applications

UNIT I INTRODUCTION AND MECHANICAL ENERGY BASED PROCESSES 9

Unconventional machining Process – Need – classification – merits, demerits and applications. Abrasive Jet Machining – Water Jet Machining – Abrasive Water Jet Machining - Ultrasonic Machining. (AJM, WJM, AWJM and USM). Working Principles – equipment used – Process parameters – MRR- Applications.

UNIT II THERMAL AND ELECTRICAL ENERGY BASED PROCESSES 9

Electric Discharge Machining (EDM) – Wire cut EDM – Working Principle-equipments-Process Parameters-Surface Finish and MRR- electrode / Tool – Power and control Circuits-Tool Wear – Dielectric – Flushing — Applications. Laser Beam machining and drilling, (LBM), plasma, Arc machining (PAM) and Electron Beam Machining (EBM). Principles – Equipment –Types - Beam control techniques – Applications.

UNIT III CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES 9

Chemical machining and Electro-Chemical machining (CHM and ECM)- Etchants – Maskant - techniques of applying maskants - Process Parameters – Surface finish and MRR-Applications. Principles of ECM- equipments-Surface Roughness and MRR Electrical circuit-Process Parameters-ECG and ECH - Applications.

UNIT IV ADVANCED NANO FINISHING PROCESSES 9

Abrasive flow machining, chemo-mechanical polishing, magnetic abrasive finishing, magneto rheological finishing, magneto rheological abrasive flow finishing their working principles, equipments, effect of process parameters, applications, advantages and limitations.

UNIT V RECENT TRENDS IN NON-TRADITIONAL MACHINING PROCESSES 9

Recent developments in non-traditional machining processes, their working principles, equipments, effect of process parameters, applications, advantages and limitations. Comparison of non-traditional machining processes.

TOTAL: 45 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

CO1 Explain the need for unconventional machining processes and its classification
CO2 Compare various thermal energy and electrical energy based unconventional machining processes.
CO3 Summarize various chemical and electro-chemical energy based unconventional machining processes.
CO4 Explain various nano abrasives based unconventional machining processes.
CO5 Distinguish various recent trends based unconventional machining processes.

TEXT BOOKS:

1. Vijay.K. Jain "Advanced Machining Processes" Allied Publishers Pvt. Ltd., New Delhi, 2007
2. Pandey P.C. and Shan H.S. "Modern Machining Processes" Tata McGraw-Hill, New Delhi, 2007.

REFERENCES:

1. Benedict. G.F. "Nontraditional Manufacturing Processes", Marcel Dekker Inc., New York, 1987.
2. Mc Geough, "Advanced Methods of Machining", Chapman and Hall, London, 1998.
3. Paul De Garmo, J.T.Black, and Ronald. A.Kohser, "Material and Processes in Manufacturing" Prentice Hall of India Pvt. Ltd., 8thEdition, New Delhi , 2001.

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Date: **30/09/2020**

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **RAJA V** studying IV year Mechanical Engineering in NPR College of Engineering & Technology, Natham, Dindigul, has successfully completed Twenty Nine days from **03/09/2020 to 30/09/2020** internship in our company. During the period the training period he was has been extremely inquisitive and hard working .He summed to be writing to learn the functions/process with kwon interest.

We wish him every success in life.

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ME8097	NON DESTRUCTIVE TESTING AND EVALUATION	L	T	P	C
		3	0	0	3

OBJECTIVE:

- To study and understand the various Non Destructive Evaluation and Testing methods, theory and their industrial applications.

UNIT I OVERVIEW OF NDT **9**

NDT Versus Mechanical testing, Overview of the Non Destructive Testing Methods for the detection of manufacturing defects as well as material characterisation. Relative merits and limitations, Various physical characteristics of materials and their applications in NDT., Visual inspection – Unaided and aided.

UNIT II SURFACE NDE METHODS **9**

Liquid Penetrant Testing - Principles, types and properties of liquid penetrants, developers, advantages and limitations of various methods, Testing Procedure, Interpretation of results. Magnetic Particle Testing- Theory of magnetism, inspection materials Magnetisation methods, Interpretation and evaluation of test indications, Principles and methods of demagnetization, Residual magnetism.

UNIT III THERMOGRAPHY AND EDDY CURRENT TESTING (ET) **9**

Thermography- Principles, Contact and non contact inspection methods, Techniques for applying liquid crystals, Advantages and limitation - infrared radiation and infrared detectors, Instrumentations and methods, applications. Eddy Current Testing-Generation of eddy currents, Properties of eddy currents, Eddy current sensing elements, Probes, Instrumentation, Types of arrangement, Applications, advantages, Limitations, Interpretation/Evaluation.

UNIT IV ULTRASONIC TESTING (UT) AND ACOUSTIC EMISSION (AE) **9**

Ultrasonic Testing-Principle, Transducers, transmission and pulse-echo method, straight beam and angle beam, instrumentation, data representation, A/Scan, B-scan, C-scan. Phased Array Ultrasound, Time of Flight Diffraction. Acoustic Emission Technique – Principle, AE parameters, Applications

UNIT V RADIOGRAPHY (RT) **9**

Principle, interaction of X-Ray with matter, imaging, film and film less techniques, types and use of filters and screens, geometric factors, Inverse square, law, characteristics of films - graininess, density, speed, contrast, characteristic curves, Penetrameters, Exposure charts, Radiographic equivalence. Fluoroscopy- Xero-Radiography, Computed Radiography, Computed Tomography

TOTAL : 45 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

CO1 Explain the fundamental concepts of NDT
CO2 Discuss the different methods of NDE
CO3 Explain the concept of Thermography and Eddy current testing
CO4 Explain the concept of Ultrasonic Testing and Acoustic Emission
CO5 Explain the concept of Radiography

TEXT BOOKS:

1. Baldev Raj, T.Jayakumar, M.Thavasimuthu "Practical Non-Destructive Testing", Narosa Publishing House, 2014.
2. Ravi Prakash, "Non-Destructive Testing Techniques", 1st revised edition, New Age International Publishers, 2010

REFERENCES:

1. ASM Metals Handbook, "Non-Destructive Evaluation and Quality Control", American Society of Metals, Metals Park, Ohio, USA, 200, Volume-17.
2. ASNT, American Society for Non Destructive Testing, Columbus, Ohio, NDT Handbook,Vol. 1, Leak Testing, Vol. 2, Liquid Penetrant Testing, Vol. 3, Infrared and Thermal Testing Vol. 4, Radiographic Testing, Vol. 5, Electromagnetic Testing, Vol. 6, Acoustic Emission Testing, Vol. 7, Ultrasonic Testing
3. Charles, J. Hellier," Handbook of Nondestructive evaluation", McGraw Hill, New York 2001.
4. Paul E Mix, "Introduction to Non-destructive testing: a training guide", Wiley, 2nd Edition New Jersey, 2005

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Date: **04.09.2021**

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **NAVEEN PRAKASH R** studying IV year Mechanical Engineering in NPR College of Engineering & Technology, Natham, Dindigul, has successfully completed Seventeen days from **19.08.2021 to 04.09.2021** internship in our company. During the period the training period he was has been extremely inquisitive and hard working .He summed to be writing to learn the functions/process with kwon interest.

We wish him every success in life.

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MG8591 **PRINCIPLES OF MANAGEMENT**

L	T	P	C
3	0	0	3

OBJECTIVE:

- To enable the students to study the evolution of Management, to study the functions and principles of management and to learn the application of the principles in an organization

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

Definition of Management - Science or Art - Manager Vs Entrepreneur - types of managers - managerial roles and skills - Evolution of Management - Scientific, human relations , system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.

UNIT II PLANNING 9

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives - policies - Planning premises - Strategic Management - Planning Tools and Techniques - Decision making steps and process.

UNIT III ORGANISING 9

Nature and purpose - Formal and informal organization - organization chart - organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

UNIT IV DIRECTING 9

Foundations of individual and group behaviour - motivation - motivation theories - motivational techniques - job satisfaction - job enrichment - leadership - types and theories of leadership - communication - process of communication - barrier in communication - effective communication - communication and IT.

UNIT V CONTROLLING 9

System and process of controlling - budgetary and non-budgetary control techniques - use of computers and IT in Management control - Productivity problems and management - control and performance - direct and preventive control - reporting.

TOTAL: 45 PERIODS

OUTCOME:

- Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

TEXT BOOKS:

1. JAF Stoner, Freeman R.E and Daniel R Gilbert "Management", 6th Edition, Pearson Education, 2004.
2. Stephen P. Robbins & Mary Coulter, "Management", Prentice Hall (India)Pvt. Ltd., 10th Edition, 2009.

REFERENCES:

1. Harold Koontz & Heinz Weihrich, "Essentials of Management", Tata McGraw Hill, 1998.
2. Robert Kreitner & Mamata Mohapatra, "Management", Biztantra, 2008.
3. Stephen A. Robbins & David A. Decenzo & Mary Coulter, "Fundamentals of Management", 7th Edition, Pearson Education, 2011.
4. Tripathy PC & Reddy PN, "Principles of Management", Tata Mcgraw Hill, 199

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Website : www.bnazrum.com

Date: 03.08.2021

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. RAKESH S** III year Mechanical Engineering of NPR college of Engineering & Technology, Natham, Dindigul, has successfully completed Six days inplant training from 28.07.2021 to 03.08.2021 in our organization. During this period, he was sincere, enthusiastic and hard working.

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For BNAZRUM AGRO EXPORTS (P) LTD.,

(A.M.Yusuf Ansari)
General Manager

fssai 100 % E.O.U FDA BSCI

IE8693 **PRODUCTION PLANNING AND CONTROL**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the various components and functions of production planning and control such as work study, product planning, process planning, production scheduling, Inventory Control.
- To know the recent trends like manufacturing requirement Planning (MRP II) and Enterprise Resource Planning (ERP).

UNIT I INTRODUCTION **9**

Objectives and benefits of planning and control-Functions of production control-Types of production- job- batch and continuous-Product development and design-Marketing aspect - Functional aspects- Operational aspect-Durability and dependability aspect aesthetic aspect. Profit consideration- Standardization, Simplification & specialization- Break even analysis-Economics of a new design.

UNIT II WORK STUDY **9**

Method study, basic procedure-Selection-Recording of process - Critical analysis, Development - Implementation - Micro motion and memo motion study – work measurement - Techniques of work measurement - Time study - Production study - Work sampling - Synthesis from standard data - Predetermined motion time standards.

UNIT III PRODUCT PLANNING AND PROCESS PLANNING **9**

Product planning-Extending the original product information-Value analysis-Problems in lack of product planning-Process planning and routing-Pre requisite information needed for process planning- Steps in process planning-Quantity determination in batch production-Machine capacity, balancing- Analysis of process capabilities in a multi product system.

UNIT IV PRODUCTION SCHEDULING **9**

Production Control Systems-Loading and scheduling-Master Scheduling-Scheduling rules-Gantt charts-Perpetual loading-Basic scheduling problems - Line of balance – Flow production scheduling- Batch production scheduling-Product sequencing – Production Control systems-Periodic batch control-Material requirement planning kanban - Dispatching-Progress reporting and expediting- Manufacturing lead time-Techniques for aligning completion times and due dates.

UNIT V INVENTORY CONTROL AND RECENT TRENDS IN PPC **9**

Inventory control-Purpose of holding stock-Effect of demand on inventories-Ordering procedures. Two bin system - Ordering cycle system-Determination of Economic order quantity and economic lot size- ABC analysis - Recorder procedure-Introduction to computer integrated production planning systems- elements of JUST IN TIME SYSTEMS-Fundamentals of MRP II and ERP.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to prepare production planning and control activities such as work study, product planning, production scheduling, Inventory Control.
- They can plan manufacturing requirements manufacturing requirement Planning (MRP II) and Enterprise Resource Planning (ERP).

TEXT BOOKS:

1. James. B. Dilworth, "Operations management – Design, Planning and Control for manufacturing and services" Mcgraw Hill International edition 1992.
2. Martand Telsang, "Industrial Engineering and Production Management", First edition, S. Chand and Company, 2000.

REFERENCES:

1. Chary. S.N., "Theory and Problems in Production & Operations Management", Tata McGraw Hill, 1995.
2. Elwood S.Buffa, and Rakesh K.Sarin, "Modern Production / Operations Management", 8th Edition John Wiley and Sons, 2000.
3. Jain. K.C. & Aggarwal. L.N., "Production Planning Control and Industrial Management", Khanna Publishers, 1990.
4. Kanishka Bedi, "Production and Operations management", 2nd Edition, Oxford university press, 2007.
5. Melynk, Denzler, " Operations management - A value driven approach" Irwin Mcgraw hill.
6. Norman Gaither, G. Frazier, "Operations Management" 9th Edition, Thomson learning IE, 2007
7. Samson Eilon, "Elements of Production Planning and Control", Universal Book Corpn.1984
8. Upendra Kachru, " Production and Operations Management - Text and cases" 1st Edition, Excel books 2007

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Date: **19.08.2021**

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **MEENAKSHI SUNDARAM G** studying III year Mechanical Engineering in NPR College of Engineering & Technology, Natham, Dindigul, has successfully completed Eight days from **12.08.2021** to **19.08.2021** inplant training in our company. During the period the training period he was has been extremely inquisitive and hard working .He summed to be writing to learn the functions/process with kwon interest.

We wish him every success in life.

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ME8811	PROJECT WORK	L	T	P	C
		0	0	20	10

OBJECTIVE:

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 300 PERIODS

OUTCOME:

- On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

SEMI-AUTOMATIC PREDATOR SENSING VEHICLE

A PROJECT REPORT

Submitted by

RUTHRESH.S	**(920817114074)**
SAMSUDEEN.A	**(920817114075)**
SHEIK ZAHID.S	**(920817114084)**
SIVANESAN.K	**(920817114085)**

in partial fulfilment for the award of the degree
of

BACHELOR OF ENGINEERING

in

MECHANICAL ENGINEERING

NPR COLLEGE OF ENGINEERING & TECHNOLOGY

NATHAM, DINDIGUL

ANNA UNIVERSITY :: CHENNAI 600 025

April 2021

ANNA UNIVERSITY :: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this report titled **"SEMI - AUTOMATIC PREDATOR SENSING VEHICLE"** is the bonafide work of **SAMSUDEEN.A (920817114075)** who carried out the work under my supervision. Certified further that to the best of my knowledge the work reported herein does not form part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

Dr.T.MALAICHAMY M.E., Ph.D.,
HEAD OF THE DEPARTMENT
Assistant Professor,
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Dr. S.PAULSINGARAYAR M.E., Ph.D.,
SUPERVISOR
Assistant Professor,
NPR College of Engg, & Tech.
Natham - 624401.

Submitted for the project VIVA-VOCE examination held on 31/7/21

INTERNAL EXAMINER

EXTERNAL EXAMINER

FABRICATION OF SEMIAUTOMATIC PREDATOR SENSING VEHICLE

ABSTRACT

The purpose of this project is to design and build the **SEMI-AUTOMATIC PREDATOR SENSING VEHICLE** is implemented. This system comprises the Bluetooth, Ultra sonic sensor, Bluetooth remote controller, Receiver, Motor for acceleration purpose, Motor for turning purpose, frame and PIC Microprocessor respectively. This is based on the concept of detecting predator automatically and controlled manually for the prevention. This system works on the basis of receiving and transmitting the data signal through Bluetooth modules. In the proposed work, ultrasonic sensor and Bluetooth module is used. When predator comes near to the vehicle then the ultrasonic sensor detects the animal movement. After getting that initial input signal, it will be given to the PIC microcontroller for further processing and the system will be activated immediately. The LED indication is received and the instruction is being processed to control the vehicle from the predator instantly.

CHAPTER-9

CONCLUSION

The above slides represents about the technical review of our project SEMI- AUTOMATIC PREDATOR SENSING VEHICLE. Itis completely a small scale model and it will get completed in large scale model. The effect of 25 kHz ultrasonic signals on animals are indicated that all animals tested can be subject to hearing disturbances at a distance of up to 15 m. This ultrasonic wave distance is highly dependent on the radiant power of the signal. The higher the emission power is offset by the ability of ultrasonic devices, the further the radiated distance. Therefore this sytem combines systems on transmitters and receivers of bluetooth with real-time monitoring of wild animal positions which is efficient and more sensitive prediction is handled by the vehicle automatically.

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