SYLLABUS

RK.UNIVERSITY

Course Title	**ELEMENTS OF ELECTRICAL ENGINEERING**		
Course Code	DEE116		
Course Credit	Lecture	:	2
	Practical	:	1
	Tutorial	:	0
	Total	:	3

Course Learning outcomes

At the end of course, students will be able to:
- **Classify** fundamentals of electric and magnetic circuits.
- **Understand** and **perform** Electrical & Electronics measuring instruments.
- **Practice** and **perform** domestic wiring and various protective devices.
- **Perform** Experiments on single phase circuit.

Detailed Syllabus

Module No.	Topics	No. Of hrs
	SECTION-I	
1	**FUNDAMENTALS OF ELECTRIC AND MAGNETIC CIRCUITS** Definitions of EMF, Current, Potential Difference, Power and Energy M.M.F, magnetic force, permeability, hysteresis loop, Reluctance, Leakage factor etc. Comparison of magnetic and electric circuit	4
2	**ELECTROMAGNETIC INDUCTION** State Faraday's laws of electromagnetic induction & Ohms law Dynamically induced EMF Statically induced EMF:- (a) Self-induced EMF (b) Mutually induced EMF	5
3	**A.C. FUNDAMENTALS** Define cycle, frequency, periodic time, amplitude, angular velocity or Frequency with reference to alternating EMF & current Definitions of RMS value, average value, form factor & peak factor.	5
	Total	**14**
	SECTION- II	
4	**A.C. CIRCUITS** A.C. through pure a) Resistors, b) Inductors and c) Capacitors. A.C. through R-L series, R-C series and R-L-C series circuit and simple Problems of series R-L circuit.	5

5	**ELECTRICAL MEASURING INSTRUMENTS** List of various measuring instruments (Voltmeter, Ammeter, Wattmeter, Megger, Clip-on meter, Energy meter, Lux meter and Multi-meter) Methods of connecting various indicating instruments	4
6	**PROTECTION AND UTILIZATION OF ELECTRICAL POWER** Domestic wiring (a) Lamp Control from one place (b) Staircase Wiring Different protective devices such as fuse, M.C.B. and ELCB Electrical safety and earthing.	5
	Total	**14**

Reference Books:

1. Principles of Electrical Machine by V.K. Mehta, S. Chand Publication.
2. Principles of Power System by V.K. Mehta, S. Chand Publication.
3. Electrical and Electronic Measurement and Instrumentation by A. K. S whney, Dhanpat rai Publication.
4. A Text book of Electrical Technology vol.I and II by B.L.Theraja, S. Chand Publication.

List of Experiments:

1. Demonstration of Digital Multi-meter.
2. Demonstration of Voltmeter, Ammeter & Wattmeter.
3. Demonstration of Megger, Clip-on meter& Energy meter.
4. Demonstration of MCB and ELCB.
5. Verification of Ohm's law.
6. Wiring diagram of one lamp control by one place.
7. Measurement of voltage, current & power in 1 phase circuit.
8. Measurement of power and power factor in R-L series circuit.
9. Measurement of power and power factor in R-C series circuit
10. Measurement of power and power factor in R-L-C series circuit**.**
11. Wiring diagram of one lamp control by two places.

Course Title	**MATHEMATICS-I**		
Course Code	DGN109		
Course Credit	Lecture	: 4	
	Practical	: 0	
	Tutorial	: 0	
	Total	: 4	

Course Learning Outcomes

At end of the course, students will be able to:
- **Demonstrate** algebraic facility with algebraic topics including linear, quadratic, exponential, Logarithmic and trigonometric functions. **(Application)**
- **Define** and **use** the elementary Trigonometric function sin, cosine.**(Knowledge)**
- **Classify** complex number algebraically and geometrically.**(Understanding)**
- **Calculate** the values of Trigonometric function for key angles in all Quadrates of unit circle Measured in both degrees and radius.**(Application)**

Detailed Syllabus

SECTION- I

Module No.	Topics	No. of Sessions
1	**EXPONENTIAL AND LOGARITHM FUNCTION** 1.1 Exponential function: definition & properties, logarithm functions: definition & concept, logarithm rules, examples based on rules & calculations. 1.2 Progression: Arithmetic & Geometric progression, computation of nth term of an A.P. and G.P., Sum of n terms of an A.P. and G.P., Arithmetic & Geometrical mean.	8
2	**MATRICES & DETERMINED** 2.1 Definition of determinants, expansion of determinants of order 2 and 3. definition of matrix, type of matrix, addition and subtraction of matrices, Product of a matrix with scalar, product of two matrices, Transpose of a matrix, Ad joint of a matrix, Inverse of a matrix for order 3, Examples to solve linear simultaneous equations in R^2 and R^3.	12
3	**VECTOR ALGEBRA** 3.1 Introduction, Geometrical representation of vectors, addition and subtraction of vector and its properties, multiplication of vector by scalar, position vector, product of two vector, scalar or dot product, definition of work done by force & momentum of force and their application.	8
	Total	**28**

		SECTION-II	
4	**COMPLEX NUMBER** 4.1 Concept, module and amplitude form, root of complex number, properties of complex number Addition and multiplication, Representation of complex number in the form a+ib, conjugate complex number.		5
5	**TRIGONOMETRY** 5.1 Measurement of angles, degree and radians, T-ratios, concept of allied angles, concept of addition & subtraction formula, sum & difference for 2A & 3A and their multiples.		16
6	**APPLICATION OF TRIGONOMETRY** 6.1 Periodic function, graph of sine and cosine, sine and cosine rules, projection formulae, Napier's formula, solution of triangle.		7
		Total	28

Reference Books:

1. Polytechnic Mathematics by Dr. R. P. Rethaliya, Nirav Prakasan.
2. Applied Mathematics for Polytechnics by H.K.Dass, S. Chand Publication.
3. Elementary Engineering Mathematics by Dr. B.S.Grewal, Khanna Publication.
4. Applied Mathematics –I by Dr. A. K. Shinha, Satya Prakashan.

SYLLABUS

Course Title	**ENGINEERING DRAWING**		
Course Code	DME101		
Course Credit	Lecture	:	2
	Practical	:	2
	Tutorial	:	0
	Total	:	4

Course Learning outcomes

At the end of course, students will be able to:
- **Understand** the use engineering drawings instruments.**(Comprehension)**
- **Draw** the various types of engineering curves, projection of lines and points. **(Comprehension)**
- **Analyze** the data given and represent it in form of various Pie & Bar charts.**(Analysis)**
- **Interpret** different types of orthographic views. **(Comprehension)**

Detailed Syllabus

Module No.	Topics	No. Of hrs
SECTION-I		
1	**USES OF DRAWING AIDS:** 1.1 Drawing, equipment instruments and materials. 1.2 Construction of Polygons.	1
2	**PLANNING & LAYOUT OF DRAWING:** 2.1 I.S. codes for planning & layout.	1
3	**LINES,LETTERING&DIMENSIONING:** 3.1Differenttypesoflines. 3.2 Vertical capital & lower case letters. 3.3 Inclined capital & lower case letters. 3.4 Numerals & Greek alphabets. 3.5 Dimensioning methods–aligned method & unilateral with chain, parallel, progressive.	2
4	**ENGINEERING CURVES:** 4.1 Various types of curves like Ellipse, parabola, hyperbola, cycloid. Epicycloids, Hypocycloid, Involutes & spiral.	4
5	**ORTHOGRAPHIC PROJECTIONS:** 5.1 Frontview, Topview, Sideview, Bottomview, Rearview	6
	Total	14
SECTION-II		
6	**PROJECTIONS OF POINTS, LINES & PLANES:** 6.1 Reference planes, orthographic projections.	4

	6.2 1stAngleand3rdAngleProjectionsofpointsProjectionsofLines–6.3 determination of true lengths & inclinations. 6.4 Projections of plane–determination of true shape.	
7	**ISOMETRIC PROJECTIONS:** 7.1 Difference between isometric projections & isometric drawing. 7.2 Isometric views & isometric projections.	**4**
8	**FASTENERS :** 8.1 Detachable & permanent fasteners–difference. Sketches of elements of screw threads, Sketches of thread forms–B.S, B.A, Square with worth, Acme with Knuckle, Buttress, Seller Unified, Internal & external threads, Left hand & right hand threads, Single & multi start threads. Lead & pitch. 8.2 Sketches of studs, cap screws machine screws, set screws, Locking, Devices, bolts, hexagonal & square nuts & nut bolt & washer assembly. 8.3 Sketches of plain spring lock, toothed lock, washers, cap nut, check nut, slotted nut, cassette\ nut, sawn nut, wing nut, eye blot, tee bolt & Foundation bolt. 8.4 Sketches of various types of rivet heads (snap–pan–conical–countersunk). Sketches of keys (sunk, flat, saddle, gib head, woodruff). 8.5 Sketches of hole & shaft Assembly.	**3**
9	**GRAPHS & CHARTS :** 9.1 Advantages–types (Bar, Pie, Percentage bar, Logarithmic) Preparation & interpretation of the graphs and charts.	**2**
10	**MODERN METHODS OF STORING & REPRODUCTION OF DRAWING:** 10.1Advantages, Methods, Micro films & computer Aided	**1**
	Total	**14**

Reference Books:
1. Engineering Drawing by P. J. Shah, S.Chand Publications   2. Engineering Drawing by N. D. Bhatt, Charotar Publications   3. Engineering Graphics by Arunoday Kumar, Techmax publications, Pune   4. A Textbook of Engineering Drawing by PS Gill, SK Kataria and sons, Delhi

List of Experiments:
1. To draw Practice sheet.   2. To draw a sheet on Engineering Curves.   3. To draw a sheet on Orthographic Projection.   4. To draw a sheet on Projection of Point and Line.   5. To draw a sheet on Projection of Plane.   6. To draw a sheet on Isometric projection.   7. To draw a sheet on Free hand Sketch.   8. To draw a sheet on Graph and charts.

Course Title	**BASICS OF CIVIL ENGINEERING**		
Course Code	**DCV107**		
Course Credit	Theory : 02		
	Practical : 01		
	Tutorial : 00		
	Credits : 03		

Course Learning Outcomes

After completion of the course students will be able to,
- **Understand and analyze** the scope of civil Engineering in the development of the country.
- **Understand** the importance and working principle of surveying.
- **Understand** the physical properties of construction materials.
- **Analyze** various components of building and their function and purposes.
- **Realize** the importance of the Civil Engineering Profession in fulfilling societal needs.

Detailed Syllabus

Module No.	Topics	No. of Sessions
	Section – I	
1.	**Scope of Civil Engineering** Impact of Infrastructural Development on the Economy of a Country, Role of Civil Engineers, Branches of civil engineering, Scope of civil engineering.	3
2.	**Engineering Materials**: Cement - varieties and grade of cement and its uses, cement mortar, stone- type and requirements, strength tests on stone, brick- varieties and strength, tests on bricks. Aggregates- types, requirements use Concrete- grades of concrete as per IS code, water cement ratio, workability, compaction and curing.	8
3.	**Surveying and Leveling** Surveying-Principles, instruments, ranging and chaining of survey lines, errors in chaining, compass surveying numerical. Leveling: Leveling instruments, different types and temporary adjustments.	8
4.	**Elements of building construction and planning:** Principles and basic requirements of a building planning, layout of residential & industrial buildings, Super structure: Brick masonry, English bond and Flemish bond, Stone masonry-Ashlar masonry- Rubble masonry.	6
5.	**Roads**- Classification of Rural and urban Roads. **Sources of Water** - Water Supply-Quality of Water.	3
	Total	**28**

Instructional method and Pedagogy:

- Lectures will be conducted with the aid of multi-media projector, blackboard, OHP etc. Assignments based on course contents will be given to the students at the end of each unit/topic and will be evaluated at regular interval
- Minimum Six experiments shall be there in the laboratory related to course contents
- TSEE will of 50 marks of one and half hour.

List of Experiments

1. To determine dimensions of brick and its tolerance limit.
2. To determine of water absorption of bricks.
3. To determine of water absorption of natural stone.
4. Demonstrate Surveying Equipment's (Tapes, Ranging Rods, And Optical Square Etc).
5. Demonstrate compass Surveying Equipment's
6. Linear measurement by direct method.
7. Symbols and sketches – I
8. Symbols and sketches – II
9. Prepare a model on residential building (G+1) as per principle of building planning.
10. Mini project on surveying.

Reference Books:

1. Dr.B.C.Punmia, Ashok Kr. Jain, Arun Kr. Jain, Surveying Vol-I,16th Edition, New Delhi :Laxmi Publications(P) Ltd., 2005Engineering Material by DrS.C.Rangwala, Charotar publication house.
2. Rangwala S. C. Rangwala K. S. and Rangwala P. S., Building Construction, 26th Edition, Charotar book Distributors, Anand, 2011.
3. Gurcharan Singh, Building Planning Designing and Scheduling, 5th Edition, Standard Book House Delhi

Additional Resources

- N.P.T.E.L. Lecture Series

	SYLLABUS

Course Title	**ENGLISH AS A SECOND LANGUAGE – Intermediate Level 1**
Course Code	**ESLB2A**
Course Credit	Lecture : 03
	Practical : 00
	Tutorial : 00
	Total : 03
Course Offered to	UG Programs Semester 1
Course Duration	45 hours

Course Learning Outcomes

At end of the course, students will be able to –
- **Develop original ideas or engage in creative thinking to deliver a mini-presentation.**
- **Summarise audio conversations and correlate them with the text.**
- **Break information down into its component elements and infer the exact meaning of texts by reading sub-skills.**
- **Use strategies, concepts, principles and theories in new situations to engage in internal written communication.**

Detailed Syllabus

SR No	UNITS	GRAMMAR	LISTENING	SPEAKING	READING	WRITING
1	The Working Day	Present simple and present continuous; time expressions; state verbs	--	**PART 1** Self-introduction & give personal opinions		--

2	Online Communication				PART 5 3-option MCQs based on a text	PART 1 Internal communication – note, message, memo, email
3	Corporate Culture			PART 1 Self-introduction & give personal opinions		PART 1 Internal communication – note, message, memo, email
4	Describing equipment				PART 7 Form-filling, note completion – 2 short texts	
5	Processes and procedures	The present passive			PART 1 MCQs from real world notices, message	PART 1 Internal communication – note, message, memo, email

6	Distribution and delivery	Model verbs of obligation	PART 1 MCQs based on Short conversation or monologues			
7	Making arrange--ments	Present continuous for future arrangements: will and going to future forms	PART 1 MCQs based on Short conversation or monologues			
8	Transport	Contras Words			ART 1 MCQs from real world notices, message	
9	Conferences	Superlatives			ART 1 MCQs from real world notices, message	
10	Thinking Globally	Expressions of quantity		PART 2 A mini-presentation on given topic		
11	Describing statistics	Adjectives and adverbs	PART 1 MCQs based on Short conversation or monologues			

12	Company Finances	Adjectives and adverbs			PART 5 3-option MCQs based on a text	
13	Investments		PART 4 MCQs based on interviews/discussion.			
14	Recruitment	First and second conditionals	PART 4 MCQs based on interviews/discussion.			
15	Staff development		PART 4 MCQs based on interviews/discussion.		PART 7 Form-filling, note completion – 2 short texts	
16	Employee productivity	infinitive and -ing forms; Grammar revision			PART 6 Gap-fill – 3 given options	

Note

Cambridge BEC Preliminary exam comprises of LSRW, each skill consists of several parts that are as follows - Listening - 4 parts, Speaking - 3 parts, Reading - 7 parts, Writing - 2 parts.
The above mentioned parts will be covered under different units as specified in the syllabus.

Reference Books

1. Cambridge: Business Benchmark Teacher's Resource
2. Cambridge: Business Benchmark Student's Book
3. Business Benchmark B1
4. Pass Cambridge BEC Preliminary: 2nd Edition (With CD)
5. Cambridge BEC Preliminary 3 Self Study Pack (BEC Practice Tests)

RK.UNIVERSITY

Course Title	**FUNDAMENTALS OF MECHANICAL ENGINEERING**	
Course Code	**DME106**	
Course Credit	Lecture : 3	
	Practical : 0	
	Tutorial : 1	
	Total : 4	

Course Learning Outcomes

At the completion of the course students will be able to :
- **Understand** the mechanical systems, equipment and process.**(Comprehension)**
- **Understand** the basic machine elements.**(Comprehension)**
- **Understand** the Sources of Energy and Power Generation.**(Comprehension)**
- **Understand** the various manufacturing processes.**(Comprehension)**

Detailed Syllabus

Module No.	Topics	No. Of hrs
	SECTION-I	
1	**Energy Resources** 1.1 Non-renewable and renewable energy resources, 1.2 Petroleum based solid, liquid and gaseous fuels 1.3 Calorific values of fuels, 1.4 Combustion and combustion products of fuels.	4
2	**Basics of Thermal Engineering:** 2.1 Basic terms 2.2 Internal Energy and Enthalpy 2.3 Prime Movers 2.4 Heat engine 2.5 Refrigerator 2.6 Air Conditioner 2.7 Air Blower and fan 2.8 Air Compressor 2.9 Boilers and its accessories	12
3	**Internal Combustion Engines** 3.1 Classification of Engine 3.2 I.C. Engines parts 3.3 2Stroke and 4 stroke Petrol engines and diesel engines.	5

	SECTION-II	
4	**Machine Elements:** 4.1 Springs 4.2 Bearing 4.3 Joints 4.4 Couplings 4.5 Shafts and Keys	**5**
5	**Manufacturing Process** 5.1 Basic Machine tools. 5.2 Lathe, Drilling, Milling, Shaping machine. 5.3 Various operations.	**6**
6	**Automobile** 6.1 Basics of Automobile Engineering. 6.2 Parts of vehicle. 6.3 Assembly.	**5**
7	**Automations** 7.1 Introduction. 7.2 Advanced machine tools. 7.3 CNC, VMC and HMC. 7.4 Non-convectional machine tools.	**5**

REFERENCE BOOKS:

1. Elements of Mechanical Engineering by R.K.Rajput, Laxmi Publication.
2. Elements of Workshop Technology by Hazara Chaudhary - MPPPL Publication.
3. Fundamental of Mechanical Engineering by G.S. Sawhney

LIST OF EXPERIMENTS:

1. To Demonstrate Internal Combustion (IC) Engine.
2. To understand construction and working of Boilers.
3. To understand construction and working of boiler mountings.
4. To understand construction and working of boiler accessories.
5. To understand construction and working of pump.
6. To study about Gas welding and Arc welding.
7. To demonstrate different machining operation on lathe machine.

Course Title	ENVIRONMENTAL SCIENCE	
Course Code	ES001	
Course Credit	Lecture	03
	Tutorial	00
	Practical	00
	Total	03

Course Learning Outcomes

At the end of the course students will be able to

- Understand the importance of the environmental
- Realize the importance of the natural resources
- Recognize various types of eco system and biodiversity
- Develop awareness among the society about environmental pollution
- Identify various types of pollution sources, causes, their effects, and control measures to mitigate the pollution
- Understand global environmental issue and their effect
- Develop awareness for the clean energy, smart city and green building

Detailed Syllabus

Sr. No.	Contents	Hours Allotted
	SECTION – I	
1.	**Introduction of Environment** Definition of Environment and Environmental science, Need for environmental education, Structure and Components of Environment, Relation between man and environment.	04
2.	**Natural Resources** Introduction of natural resources, Classification of natural resources, Water resources, Forest resources, Energy resources, Land resources, use of natural resources overuse and effect, prevent overuse, Renewable & Non-Renewable Resources.	04
3.	**Ecological Aspects of Environment and Biodiversity** Concept of an ecosystem, Structure and function of an ecosystem, Bio-Geo-Chemical Cycle like Water Cycle, Nitrogen Cycle, Carbon Cycle, Oxygen Cycle, Sulphur Cycle. Food chains & food webs, Ecological pyramids, Biodiversity, Levels of Biodiversity, threats to biodiversity, and conservation of biodiversity.	07
	Total Section - I	**15**

SECTION – II		
4.	**Environmental pollution** a) Water Pollution: Introduction – Water Quality Standards, Sources of Water Pollution, Causes, Effects and Prevention b) Air Pollution: Composition of air, Structure of atmosphere, Ambient Air Quality Standards, Causes, Effects and Prevention c) Noise Pollution: Introduction, Sound and Noise, Causes, Effects and Prevention d) Bio-medical Waste, E-waste, Nuclear hazards - Causes, Effects and Prevention e) 4R's Principles, Application of 4R's	**07**
5.	**Global environmental issues** Sustainable Development, Climate Change, Global Warming & Green House Effect, Acid Rain, Depletion of the Ozone layer, Carbon Footprint, Oil spills, prevention of Global Issue	**04**
6.	**The basic concept of green building and smart cities** Green Building: Introduction, Objectives, Fundamental Principles, Benefits of Green Building, Examples of Green Building and Smart Cities: Concept	**04**
7.	**Field Visit** Visit a local government work site (Municipal Corporation) i.e., Drainage Water Management System, Water Purification Site, Garbage Dumping Site, Garbage Sorting Site, Drinking Water Management Site, Agriculture Water Management Site etc. Visit a company that works for a better environment through their products, services and system of their work.	**15**
	Total Section – II	**30**
	Total Section I + II	**30**

Instructional Method and Pedagogy:

- Delivery of lectures using multi-media projectors.
- Individual interaction with students.

Reference Books:

1. R. Rajagopalan Environmental Studies: Oxford University Press.
2. K.C. Agrawal Environmental Pollution: Causes, Effects and Control.
3. Richard T Wright and Bernard J Nebel Environmental Science.

Additional Resources:

- https://nptel.ac.in/courses/122102006/
- https://nptel.ac.in/courses/127106004/45

Course Title	**WORKSHOP**		
Course Code	DME104		
Course Credit	Lecture : 0		
	Practical : 2		
	Tutorial : 0		
	Total : 2		

Course Learning outcomes:

At the end of course, students will be able to,
- **Understand** need & method of the safety and good housekeeping in a workshop. **(Comprehension)**
- **Use** of various tools, instruments and machines for different operations in fitting, smithy, carpentry, pipefitting and metal joining shop.**(Applying)**
- **Prepare** the required jobs correctly according to given specification in various sections of a workshop. **(Synthesis)**
- **Demonstrate** turning operations on lathe machine such as facing, centering, and taper turning. **(Comprehension)**

Detailed Syllabus

Module No.	Topics	No. of hrs
1	**INTRODUCTION TO WORKSHOP** 1.1 Workshop layout 1.2 Importance of various sections/shops of workshop 1.3 Type of jobs done in each shop 1.4 General safety rules and work-procedure of workshop	4
2	**FITTING** 2.1 Fitting tools like - files vice, chisels, punch, scriber, hammers, surface plate, try square, Calipers etc. 2.2 Fitting operations such as chipping, filing, scraping, grinding, sawing, marking, drilling, reaming, tapping. 2.3 Safety precautions. 2.4 Demonstration of various operations. 2.5 Preparation of male-female joints.	10

3	**SMITHY** 3.1 Smithy tool like - hammer, tongs, anvil, flatter etc. 3.2 Smithy operations such as upsetting, drawing down, bending, setting-Down, welding, cutting, punching and fullering etc. 3.3 Safety precautions. 3.4 Demonstration of various smithy operations.	14
4	**PIPE FITTING** 4.1 Pipe fitting tools 4.2 Pipe fitting operations such as marking, cutting, bending, threading assembling, dismantling etc. 4.3 Types of various spanners such as flat, fix, ring, box, adjustable etc. 4.4 Safety precautions. 4.5 Work on various operations.	6
5	**CARPENTARY** 5.1 Carpentry tools like - saws, planner, chisels, hammers, pallet, marking Gauge, vice, try square, rule etc. 5.2 Carpentry operations such as marking, sawing, planning, chiseling, Grooving, boring, and joining. 5.3 Types of woods and carpentry hardware. 5.4 Safety precautions. 5.5 Work on various operations using hardware.	12
6	**METAL JOINING** 6.1 Metal joining hand tools and equipment. 6.2 Metal joining temporary and permanent methods such as, screw, Nuts 6.3 Bolts and washers, rivets, keys, pins and welding soldering brazing. 6.4 Work on metal joining operations. 6.5 Safety precautions.	10
	Total	**56**

Reference Books:

1. Workshop Familiarization E. Wilkinson, Pitman Publication
2. Workshop Technology - I Hazra and Choudhary, MPPPL Publication
3. Workshop Technology - I W.A.J. Chapman, New Delhi CBD Publication
4. A Text Book. I.T.B. Hand Book, by Engineering Industry Training Board

Job to be Prepared by Student:

Carpentry
Fitting
Plumbing
Tin smithy
sheet metal

Course Title	COMPUTER APPLICATIONS		
Course Code	DCE104		
Course Credit	Lecture : 0		
	Practical : 1		
	Tutorial : 0		
	Total : 1		

Course Learning Outcomes

At the end of course, students will be able to:
- **Handle** and operate various computer peripherals and their applications.
- **Operate**, **practice** and **perform** task using various computer application software like Microsoft word, Microsoft excel, Microsoft PowerPoint and Photo editing software.
- **Create** and **design** basic graphics animations using animation software.
- **Implement** the use of branch related mobile applications.
- **Make** basic programs of C language as per requirements.
- **Use** various Google services.

Detailed Syllabus

Module No.	Topics	No. of sessions
1	**INTRODUCTION TO COMPUTER** Introduction to computer and its types. Input and output devices. Storage devices: hard disk drives, floppy disk drives, CD-ROMs and DVDs, System software and application software	3
2	**BASICS OF PROGRAMMING USING C LANGUAGE** Introduction to concepts of programming Writing simple c programs, printing patterns on screen. Data types and variables- int, float, char, string etc. Operators and expressions- arithmetic operators, logical operators, increment and decrement operators and assignment operators. Control Structures: conditional statements and looping statements.	12
3	**LEARNING BASICS OF PHOTO EDITING** Improve your photographs, maximize images for web and print, build image collages, and develop creative projects with photo editing software painting and drawing tools.	6
4	**LEARNING BASICS OF ANIMATION** Animation: create frames, layers and folder, use of tools, use of colors and symbols. Basics of animation: moving line, bouncing ball.	8
5	**MICROSOFT EXCEL** Introduction of excel.	8

	Sheets, moving with sheets, drag and drop method, copying and moving data, formatting numbers, functions like sum, average, headers and footers, creating charts, more commands.	
6	**MICROSOFT POWER POINT** Introduction of power point. Presentation by Auto content Wizard, Creating and saving a new Presentation, Moving the text, Changing the Color, Adding pictures to the background, Duplicating slides, Deleting slides, Adding audio, adding video effects, Adding effects and animation.	8
7	**MICROSOFT WORD** Introduction to word. Microsoft word screen, creating a document, saving the file, formatting the text, alignment of text, applying fonts, spell checking, closing of files, save as option, creating chart, replace text, creating table, modifying table.	6
8	**INRODUCTION TO VARIOUS GOOGLE SERVICES** Introduction to Gmail. Create and access account in Gmail, send attachments and mails, Access Google drive, Upload files and folders and share with others. Creating sharing sheets in Google. Creating Google forms. Subscribe in Google Alerts. Introduction to various websites for e-Learning.	5
	Total	**56**

Reference Books:

1. Computer Fundamentals and Information Technology, by Ramesh Bangia, Firewall Publication.
2. Computer Fundamental, by P.K. Sinha, BPB Publications.
3. Programming in ANSI 'C' by Balagurusamy, TMH Publications.
4. Macromedia Flash 8 Bible, by Robert Reinhardt, Snow Dowd Wiley Publications.
5. Adobe Photoshop CS6 Bible, by Lisa Danae, Brad Dayley, Wiley Publications.

List of Experiments

1. Introduction to the computer system and computer software.
2. Introduction to the peripherals of the computer system.
3. Introduction to the operating system, file identification, extension, bytes, directory.
4. Introduction to word, data entry, save, quit, retrieve.
5. Basic settings, page layout, sizing, left and right margins, Justification, tabulation.
6. Editing text using deleting character, word, line, search, replace, cut, copy, paste, move, sortfile, read and write file.
7. Prepare a table about details of employees and add columns and rows.
8. Prepare tree in word given by user.
9. Editing text using deleting character, word, line, etc. search and replace, cut, copy, paste, move, sort file read and write file.
10. Prepare a worksheet and preview, page break, margins, header, footer, gridlines.
11. Worksheet settings, width of column, colour, heading, hide & display, align data, bold, italics, orientation Freeze cell/row/column, split, sort and filter.
12. Introduction to Internet. Use of different websites for education purpose.

13. Introduction to web page language.
14. Prepare power point slide for results of the student.
15. Photo Editing - Practice of the following tools: crop, move, marquee, slice, magic wand, layers, healing brush and colours.
16. Animation – Practice of following tools: layers and folders, frames and key frames, tools and its properties, views, colours, symbols and motion guide.
17. Install various applications on mobile simulation.
18. Programming using C
    1. Write a program to print a "hello world" on the screen.
    2. Write a program to declare a variable and print its value.
    3. Write a program to add two numbers.
    4. Write a program to find simple interest.
    5. Write a program to find area of circle.
    6. Write a program to find maximum number among two numbers.
    7. Write a program to find whether the number entered by user is odd or even.
    8. Write a program to find average of 10 numbers.
    9. Write a program to input gender and salary of an employee and check whether salary of an employee is taxable or not. (Salary limit for male 2, 00,000 and female 1, 80,000).
    10. Write a program to make a calculator using switch case statement.
    11. Write a program to input any character and check whether it is a number, char or special symbol.

Course Title	MATHEMATICS -II
Course Code	DGN209

Course Credit	Lecture : 4	
	Practical : 0	
	Tutorial : 0	
	Total : 4	

Course Learning Outcomes

At end of the course, students will be able to:
- **Understand** the advance concepts and principles of Mathematics such as calculus coordinate geometry.**(Comprehension)**
- **Define** four different types of conic sections- the circle and its center and radius and the ellipse, the hyperbola and the parabola and its foci, latus rectum, and major and minor axis. (**Knowledge)**
- **Use** the standard techniques of multivariable calculus, both differential and integral, and utilize them to **solve** selected applied problems.**(Application)**
- **Calculate** the expression for the derivative of a function using the rules of differentiation Including the power rule, product rule, and quotient rule and chain rule.**(Application)**
- **Identify** the extreme of a function on an interval and **classify** them as minima, maxima using the first derivative test.**(Knowledge)**

Detailed Syllabus

<table>
<tr><td colspan="3" align="center">SECTION - I</td></tr>
<tr><td>Module No.</td><td align="center">Topics</td><td>No. of hrs</td></tr>
<tr><td>1</td><td>STRAIGHT LINE AND ITS APPLICATION
1.1 Distance formula for R^2, Circum-centre of a triangle, Area of a triangle, Division of a line segment, Cartesian equation of a straight line, Equation of a straight line in R^2: ax+by+c=0.,Slope of a straight line, Intercepts on axis, angle between two straight line, parallel and perpendicular lines, simple problems.</td><td>11</td></tr>
<tr><td>2</td><td>CONICS
2.1 Definition of a circle, general equation, standard equation, radius and centre of a circle. Standard equation, focus, eccentricity , directrix, latus rectum, major axis, minor axis of Parabola, Ellipse and Hyperbola and their Characteristic.</td><td>11</td></tr>
<tr><td>3</td><td>FUNCTIONS & LIMIT
3.1 Definition of function, examples, concept & rules of limit, evaluation of standard limit of algebraic &trigonometric function.</td><td>6</td></tr>
</table>

			Total	28
SECTION - II				
4	**DIFFERENTIATION** 4.1 Definition, derivative of constant function, formula: X^n, a^x, sinx, e^x, etc. formula for sum, product and quotient of functions, chain rule, derivative of parametric and Implicit functions, second order differentiation.			**10**
5	**APPLICATION OF DIFFERENTIATION** 5.1 Application of derivatives, velocity, acceleration, maximum and minimum of function, increasing and decreasing function.			**06**
6	**INTEGRATION** 6.1 Introduction of integration, formula for standard function as mentioned, simple basic rules of indefinite integration, evaluation of simple indefinite integrals, Integration by substitution, Definite Integrals, lower & upper limit, properties of definite integral.			**12**
			Total	**28**

Reference books:

1. Polytechnic Mathematics by Dr. R. P. Rethaliya, Nirav Prakasan
2. Applied Mathematics for polytechnic, by H. K. Dass, CBS Publisher & Distributors Pvt Ltd.
3. Elementary Engineering Mathematic by Dr. B. S. Grewals, Khanna Publisher.
4. Applied Mathematics –II by Dr. A. K. Shinha, Satya Prakashan.

Course Title	**APPLIED SCIENCE**	
Course Code	DGN105	
Course Credit	Lecture : 3	
	Practical : 1	
	Tutorial : 0	
	Total : 4	

Course Learning Outcomes

At end of the course, students will be able to:
- **Understand** the measurement systems and its units, use of instruments like Vernier calipers, Screw gauge etc. **(Understanding)**
- **Understand** the concept of Light, X-ray, Laser, sound waves etc.**(Understanding)**
- **Uses** of different laws related to force, motion, Atomic model, pH value and corrosion and their use in engineering applications.**(Application)**
- **Execute** basic experiments related to Physics and Chemistry.**(Application)**

Detailed Syllabus

Module No.	Topics	No. of hrs
	SECTION - I	
1	**UNITS AND MEASUREMENT** 1.1 Introduction : Physical Quantities 1.2 Types of physical quantities, Fundamental (Basic) physical quantities and their SI units, Derived quantities and their SI units 1.3 Various Measurement systems: F.P.S, C.G.S., M.K.S. and SI unit system, Multiples and Sub-multiples of Standard Units. 1.4 Measuring Instruments: 1.5 Vernier Calipers: Principle, Least count, Probable zero errors, Method of measurement, Numerical problems. 1.6 Micrometer Screw Gauge: Pitch, Least Count, Probable zero errors, Method of measurement, Numerical problems.	8
2	**FORCE AND MOTION** 2.1 Recapitulation of equations of motion, equations of motion. 2.2 Force: Basic forces, gravitational force, electrostatic force, electromagnetic force, nuclear force. 2.3 Newton's Fist law of motion: Law of statement, Types of inertia, examples. 2.4 Newton's second law of motion: Momentum, Measurement of force using second law, Impulse of force, examples of impulse, simple problems	8

	on impulse. 2.5 Newton's third law of motion: Law of Statement, conservation of momentum, simple problems, examples.		
3	**SOUND WAVES** 3.1 Introduction: Waves. 3.2 Types of sound waves: Transverse waves and longitudinal wave. Definition: Periodic time, Frequency, Wave length, speed of sound, simple harmonic motion. 3.3 Acoustics of building: Echo, reverberation time, coefficient of absorption of sound, factors affecting reverberation time and acoustics of building. 3.4 Ultrasonic and infrasonic sound waves, Piezo-electric method.	**5**	
	Total		**21**
SECTION - II			
4	**OPTICS** 4.1 Introduction: Properties of light. 4.2 Electromagnetic waves Velocity of light. 4.3 Reflection of light: Definition, justification, Laws of reflection, Reflection by plane mirror and curved mirror. 4.4 Refraction of light: Definition, justification, Laws of refraction, Refractive index (Snell's Law), Numerical Problem on refractive Index, Total 4.5 Internal reflection of Light. 4.6 Interference of light: Definition, Constructive and destructive Interference. 4.7 Polarization of light: Definition, justification and Uses. 4.8 Lens: Definition of Lens, Types of lenses, Uses of lenses, Definitions of various terms related to lens. Lens formula (Gaussian formula), Problem based on Lens formula and focal power. 4.9 Optical Instrument: Simple Microscope.	**8**	
5	**MODERN PHYSICS** 5.1 Introduction: 5.2 X – Ray: Introduction, Meaning of X-ray, production of X-ray by Coolidge tube, Properties of X-ray, Applications of X – Rays. 5.3 Laser: Introduction, Meaning of LASER, Stimulated & spontaneous emission, Population inversion method, Production of LASER by ruby crystal, Properties of Laser, Applications of Laser.	**8**	
6	**BASIC CONCEPTS OF CHEMISTRY** 6.1 Atomic structure of an Atom, Arrangement of electron, proton and neutron in Atom, Atomic number, Atomic Mass number with examples. 6.2 Concept of Orbit and orbital, Auf-bau Principle. 6.3 Chemical bonds: Ionic bond and covalent bond Definition of pH, pH of acid, Base and neutral solution.	**5**	

	6.4 Definition of Corrosion, standard condition and brief idea about factors influencing corrosion.	
	Total	**21**

Reference Books:

1. Fundamental of Physics by David Halliday, Robert Resnick,Jearl Walker, John Wiley & Sons.
2. Engineering Chemistry by Jain and Jain, Dhanpat Rai Publication.
3. Applied Physics for Polytechnics by Prakash Manikpure, S. Chand & Company Ltd.
4. Engineering Physics by R. K Gaur, S L Gupta, Dhanpat Rai Publication.

List of Experiments

1	Determination of acceleration due to gravity (g) using simple pendulum.
2	To determine moment of inertia of fly wheel.
3	Measurement of static friction for a block by friction apparatus.
4	Precision measurement by Micrometer screw gauge.
5	Linear measurement by using vernier calipers.
6	To measure the pH value of given samples of solution.
7	To measure the rate of Corrosion metals in acid or alkaline media.
8	To determine Acid value of oil titration of given sample.
9	Acid -Base titration of given sample.
10	Determination of refractive index of given liquid sample using travelling microscope.

Course Title	**ENGINEERING MECHANICS**	
Course Code	DCV202	
Course Credit	Lecture : 3	
	Practical : 1	
	Tutorial : 1	
	Total : 5	

Course Learning Outcomes

At end of this course, students will be able to,
- **Understand** concepts of forces in Static.**(Comprehension)**
- **Understand** concepts of different types of motions**(Comprehension)**
- **Solve** Static friction problems**.(Application)**
- **Understand** geometrical properties such as centroid of different sections.**(Comprehension)**

Detailed Syllabus

Module No.	Topics	No.of hrs
	SECTION - I	
1	**INTRODUCTION** 1.1. Scalar and Vector quantities. 1.2. Scope of Engineering Mechanics. 1.3. Static & Dynamics(a) Kinetics, (b) Kinematics 1.4. Different systems of units-Conversions-, Abbreviations.	2
2	**COPLANAR CONCURRENTFORCES:** 2.1 Forces, Units of Force, elements, Principles of super position, Principle of 2.2 Transmissibility. 2.3 Composition and resolution of forces, Resultant conditions of equilibrium, Analytical and graphical method. 2.4 Law of parallelogram of forces, law of triangle of forces, law of polygon of 2.5 Forces. 2.6 Lami's theorem-problems. 2.7 Collision of body	7

3	**COPLANAR – PARALLELANDNON–CONCURRENTFORCES** 3.1 Moment, Couple, Principle of moment, application. 3.2 Properties of Couples, numerical Problems. 3.3 Conditions of Equilibrium. 3.4 Reactions in Beams. 3.5 Statically Determinate beams 3.6 Types of supports 3.7 Types of Loading, Problems.	5
4	**CENTROIDANDCENTREOF GRAVITY** 4.1 Centroid & Centre of Gravity. 4.2 Centroid & Centre of Gravity of Standard shape 4.3 Indian standard sections-I, C,T,L, O Triangular Section. 4.4 Axis of symmetry 4.5 Theorem of Moment 4.6 Problems.	4
5	**FRICTION** 5.1 Friction, Laws of friction, Coefficient of friction, Angle of friction, Angle of Repose. 5.2 Types of friction 5.3 Coefficient of friction and its effect. 5.4 Application of Lami's theorem and theory of resolution of forces. 5.5 Laws of friction to Screw jacks.	3
	Total	**21**
	SECTION – II	
6	**RECTILINEAR MOTION:** 6.1 Kinetics, Kinematics. 6.2 Velocity, Average Velocity, Uniform Velocity, Speed, Displacement, Acceleration, Retardation. 6.3 Draw V-T diagram. 6.4 Problems, motion under gravity.	5
7	**CURVILINEAR MOTION-CENTRIPETAL FORCE:** 7.1 Angular displacement, Angular velocity, angular acceleration and Retardation, tangential velocity and its equations. 7.2 Centripetal and Centrifugal forces. 7.3 Skidding, overturning thrust on rails. 7.4 Engineering problems 7.5 Importance of super elevation& It's equations.	5
8	**MOTIONOFPROJECTILES:** 8.1 Trajectory range, maximum range, angle of projection, time of flight. 8.2 Maximum Height different equations of projectile. 8.3 Engineering problems.	3

9	**SIMPLEMACHINES:** 9.1 Mechanical Advantage, V.R., Efficiency, line sketch of different systems of 9.2 Pulley Blocks, simple and compound levers, simple machines and its problems.	**4**
10	**WORK-POWER-ENERGY** 10.1 Work &force-displacement diagram. 10.2 Work done in stretching the compound Spring Torque, work done by torque. 10.3 Power-I.H.P., B.H.P. of engine 10.4 Equation of H.P. in terms of torque and R.P.M. 10.5 Engineering Problems on it. 10.6 Energy, Kinetic and potential energy & Engineering problems on it	**4**
	Total	**21**

Reference Books:

1.EngineeringMechanics,R.S.Khurmi,S.Chand Publication
2.EngineeringMechanics, S. B. Junarkar, Sarita Prakashan
3. Applied Mechanics, I.B. Prasad, Dhanpat Publication
4. Applied Mechanics, Ramamrutham, Dhanpat Rai Publishing Company
5. Textbook of Applied Mechanics, R. S. Khurmi S. Chand.
6. Engineering Mechanics, Deo Sunil S. Nirali.

List of Experiments:

1. To study the law of Parallelogram of Forces

2. To study Law of Triangle of Forces and Lami's theorem of unknown weight.

3. To study the law of polygon of forces.

4. To determine the Co-efficient of Friction of given sample.

5. To study the centroid of given laminar.

6.To verify the velocity ratio for different simple machines (Wheel axle, simple purchase crab, Simple screw jack).

7. To draw velocity time diagram for different combination of velocity, uniform acceleration And uniform retardation.

8. To demonstrate the non concurrent non parallel forces.

9. To study the Velocity Ratio of Simple Machine

10. To study the Law of machine.

11. To study the efficiency of Machine.

Course Title	Software Lab
Course Code	DME202

	Lecture : 0
Course Credit	Practical : 2
	Tutorial : 0
	Total : 2

Course Objective

After Successful completion of the above course, students will be able to:
- **Recognize** the basic commands of AutoCAD software.
- **Understand** the concept of Computer Aided Drafting using AutoCAD software.
- **Understand** working of CAD software and hence **recognize** basic concepts of CAD.
- **Discriminate** proper selection and sequence of features.
- **Create** a detail drawing of a mechanical component.

Detailed Syllabus

	SECTION I	
Sr. No.	**Name of chapter & Details**	**Hours Allotted**
1	**Introduction to Auto CAD:** Starting with AutoCAD, AutoCAD dialog boxes, Co-ordinate Systems, drawing lines, circle, arcs, rectangle, ellipse, polygons, etc. [Exercises]	**06**
2	**Editing sketched objects:** Editing sketches, moving, copying, pasting, offsetting, scaling, chamfering, **trimming**, mirroring. Filleting, sketched objects. [Exercises]	**06**
3	**Basic dimensioning:** Geometric dimensioning and Tolerance: Dimensioning AutoCAD, creating linear, rotated, angular aligned base line Dimensions, Modifying dimensions. [Exercises]	**04**
4	**Plotting:** Plotting the drawings in AutoCAD, plotting drawing using the plot dialog box, adding plotters and using plot styles, plotting sheets. [Exercises]	**02**
5	**Basics of 3D Modeling:** Generation of Primitive Solids, Boolean Operations, Region, Boundary	**04**

	Layer operations [Exercises]		
6	**Modifying 3D Objects:** Extrude, Subtract, Union, Explode [Exercises]		**06**
		Total	**28**
	Section II		
7	**Introduction to Modeling software:** Sketcher (Draw, Dimensions, Modify, Constraints)		**02**
8	Practice of Sketcher.		**02**
9	**Solid modeling:** Understanding of Parent-Child Relations, Features, Wireframe and surface model understanding, Extrude and its practice, Mirror.		**02**
10	Revolve Round, Chamfer and its practice.		**02**
11	Hole and Patterning with practice.		**02**
12	Rib, Shell, Draft.		**02**
13	Sweep and its practice.		**02**
14	Surface modeling and its practice.		**02**
15	Sheet metal and its practice.		**02**
16	Drawing and Detailing: 2D view generation, General and projection view and its practice.		**04**
17	Dimensioning: Driving and Driven, practice.		**02**
18	Sectional view generation and Sheet Generation and printing.		**04**
		Total	**28**

Instructional Method and Pedagogy:

- Syllabus is to be covered in lab hours.
- Assignments / exercises based on course content will be given to the students at the end of each unit/topic.
- For each lab session first, the training session would be held and then hands on session would be executed.

Reference Books:

1. Sham Tickooet. al., "AutoCAD 2012 for engineering and designers" Dream tech press, New Delhi
2. Finkelstein Ellen et. al., "AutoCAD 2012 and AutoCAD LT 2012 Bible" Wiley India, New Delhi

Course Title	**ENGLISH AS A SECOND LANGUAGE - Intermediate Level 2**				
Course Code	**ESLB2B**				
Course Credit	Lecture : 03				
	Practical : 00				
	Tutorial : 00				
	Total : 03				
Course Offered to	UG Programs Semester 2				
Course Duration	45 hours				

Course Learning Outcomes

At the end of the course, students will be able to -
● Identify key words and infer the exact meaning of reading texts while using paraphrasing skills.
● Articulate a short message and or express opinions through a short mesage, letter or a story.
● Summarize and coorelate the audios with related texts and messages.
● Sketch, develop and articulate their opinions, ideas & descriptions on a given topic.

Detailed Syllabus

SR No	UNITS	GRAMMAR	LISTENING	SPEAKING	READING	WRITING
1	The working day	Present simple and present continuous; time expressions; state verbs			PART 2 Matching to parts of the text	
2	Company growth	Past simple: regular and irregular verbs and spelling of past simple forms: past continuous	PART 2 Note completion based on a conversation		PART 3 Matching to parts of the graphics	

3	Describing equipment		PART 2 Note completion based on a conversation			
4	Distribution and delivery	Model verbs of obligation	PART 2 Note completion based on a conversation		PART 2 Matching to parts of the text	
5	Advertising and marketing	World to describe causes and effects			PART 2 Matching to parts of the text	
6	Making arrangements	Present continuous for future arrangements: will and going to future forms	PART 2 Note completion based on a conversation			
7	Working holidays	Comparatives: as…as structures			PART 4 Right/wrong/ doesn't say	
8	Conferences	Superlatives	PART 3 Note completion based on a monologue			PART 2 Letter or email for external communica-tion
9	New places, New people	Present perfect: time expressions; Present perfect versus past simple			PART 4 Right/wrong/ doesn't say	
10	Corporate gift-giving	Countable and uncountable nouns; Articles	PART 3 Note completion based on a monologue	PART 3 Conversing using a visual scenario or written promts		PART 2 Letter or email for external communica-tion

11	Team Work			PART 3 Conversing using a visual scenario or written promts		
12	Thinking globally	Expressions of quantity			PART 4 Right/wrong/ doesn't say	PART 2 Letter or email for external communica-tion
13	Describing statistics	Adjectives and adverbs			PART 3 Matching to parts of the graphics	
14	Company Finances	Adjectives and adverbs	PART 3 Note completion based on a monologue			
15	Starting up	which/who/that/ where clauses	PART 3 Note completion based on a monologue			PART 2 Letter or email for external communica-tion
16	Job applicatio ns					PART 2 Letter or email for external communica-tion
17	Recruitm ent	First and second conditionals		PART 3 Conversing using a visual scenario or written promts		

18	Staff developm ent				PART 4 Right/wron g/ doesn't say	PART 2 Letter or email for external communica -tion

Note

Cambridge BEC Preliminary exam comprises of LSRW, each skill consists of several parts that are as follows - Listening - 4 parts, Speaking - 3 parts, Reading - 7 parts, Writing - 2 parts.
The above mentioned parts will be covered under different units as specified in the syllabus.

Reference Books

1. Cambridge: Business Benchmark Teacher's Resource
2. Cambridge: Business Benchmark Student's Book
3. Business Benchmark B1
4. 4. Pass Cambridge BEC Preliminary: 2nd Edition (With CD)
5. 5. Cambridge BEC Preliminary 3 Self Study Pack (BEC Practice Tests)

RK.UNIVERSITY

Course Title	**MECHANICAL DRAFTING**	
Course Code	**DME314**	
Course Credit	Lecture : 2	
	Practical : 2	
	Tutorial : 0	
	Total : 4	

Course Learning Outcomes

At the completion of the course students will be able to :
- **Understand** the Various standard Codes for drawing (IS, ISBN, BS, ISO). **(Comprehension)**
- **Draw/reproduce** assembly and detailed drawings of machine parts as per standards. **(Comprehension)**
- **Use** production of drawings/material codes.**(Application)**

Detailed Syllabus

Module No.	Topics	No. of hrs
	SECTION-I	
1	**MULTI VIEW REPRESENTATION:** 1.1 To Study various types of views of any Solid object. 1.2 Sectional View. 1.3 Missing view. 1.4 Draw the multi view of various Solid objects.	1
2	**PROJECTION OF SOLID :** 2.1 Study of Projections of solids-in various positions with respect to the reference planes. 2.2 Drawing of Projections of solids in various positions with respect to the reference planes.	4
3	**SECTION OF SOLID :** 3.1 Concepts of sectioning, Horizontal and vertical traces representing sectional planes. 3.2 Sectional views of different solids in given various positions – auxiliary section and true shape of section.	3
4	**INTERSECTION OF SOLID :** 4.1 Concept of intersecting the solid. 4.2 Importance of intersection. 4.3 Study and drawing of various method of intersection of different solid.	4

5	**DEVELOPMENT OF SURFACE** 5.1 Importance of development of surfaces. 5.2 Drawing of development of surfaces of various solid. 5.3 Surface development of combination of different solids and of section solids.	**2**
	Total	**14**

SECTION-II		
6	**DETAIL & ASSEMBLY DRAWING OF MACHINE ELEMENTS** 6.1 Important Terminology. 6.2 Lay-out for production drawings as per B.I.S. code 6.3 Detailed component drawings from given assembly. 6.4 Assembly drawing from given details of machine parts.	**6**
7	**SYSTEM OF LIMITS AND FITS AS PER B.I.S.** 7.1 Important Terminology. 7.2 Selection of appropriate limits and fits as per B.I.S. 7.3 Symbols of tolerance of form and position.	**4**
8	**WELDING, MACHINING AND PIPING SYMBOLS** 8.1 Symbols and conventions for welding and machining as per B.I.S. 8.2 Symbols and layout for piping.	**4**
	Total	**14**

REFERENCE BOOKS:

1. P.J. Shah ,Engineering Graphics, S.Chand Publishing
2. K. R. Gopala Krishna , Fundamentals of Drawing, Subhash Publishers, Bangalore.
3. N. D. Bhatt, Elementary Engineering Drawing, Charotar Publishing House Pvt. Ltd
4. N. D. Bhatt, Machine Drawing, Charotar Publishing House Pvt. Ltd

DRAWING EXPERIMENTS:

(1) Projections of solids
(2) Sections of solids
(3) Development of Surfaces
(4) Intersection of Solids
(5) Missing views and Sectional view
(6)Details production drawings of machine components including zone and fold mark, limit fits and tolerances.
(7) Assembly production drawing of machine component
(8) Pattern drawing showing draft and allowances of pattern.
(9) Welding, Piping & Machining Symbols.

Course Title	**FLUID MECHANICS AND HYDRAULIC MACHINES**	
Course Code	**DME308**	
Course Credit	Lecture : 3	
	Practical : 1	
	Tutorial : 0	
	Total : 4	

Course Learning Outcomes

At end of the course, students will be able to:
- **Understand** types of fluid and fluid properties.**(Comprehension)**
- **Understand** different types of Flow.**(Comprehension)**
- **Perform** flow Measurement.**(Application)**
- **Understand** Pumps, Hydraulic Devices, Pneumatic devices.**(Comprehension)**

Detailed Syllabus

Module No.	Topics	No. Of hrs
	SECTION-I	
1	**FLUID AND FLUID PROPERTIES:** 1.1 Concept and classification. 1.2 Properties of fluid.	4
2	**FLUID STATICS:** 2.1 Pressure and pressure measurement of fluid, laws of fluid Statics.	4
3	**FLUID KINEMATICS:** 3.1 Fluid flow: types and equations including ideal, laminar, Turbulent and compressible.	4
4	**FLUID DYNAMICS:** 4.1 Bernoulli's equation and its applications. 4.2 Euler's equation and its applications. 4.3 Archimedes principle & Concept of Meta center	5
5	**FLOW MEASUREMENT:** 5.1 Notches, Venturimeter, Orifice meter, Rota meters. 5.2 Selection criteria for flow measuring devices.	4
	Total	**21**

	SECTION-II	
6	**FLOW THROUGH PIPES:** 6.1 Reynolds's experiment, friction factor. 6.2 Water hammer effect. 6.3 Selection criteria for pipes and pipe sizes.	**3**
7	**IMPACT OF JETS:** 7.1 Impact of jet on flat and curved-stationary and moving plates. 7.2 Work done and efficiency calculations.	**2**
8	**HYDRAULIC PRIME MOVERS:** 8.1 Classification, construction, working and application of Various Hydraulic prime movers. 8.2 Specific speed and its importance.	**5**
9	**PUMPS:** 9.1 Concepts, classification and application of pumps. 9.2 Detailed study (construction, working) of (1) Centrifugal pump (2) Reciprocating pump (3) Turbine pump (4) Submersible pump (5) Rotary positive displacement type pumps 9.3 Performance of pumps, importance of efficiency, discharge, Head and power consumption.	**4**
10	**HYDRAULIC DEVICES:** 10.1 Construction, working, Probable causes and their remediesand preventive maintenance of: - Intensifier - Hydraulic lift - Accumulator - Hydraulic ram - Hydraulic crane - Hydraulic press 10.2 Advantages and limitations of hydraulic systems.	**4**
11	**PNEUMATIC DEVICES :** 11.1 Pneumatic elements used in pneumatic circuits-types, construction, working, applications and common troubles and remedies in working of them, precautions in Installations and assembly. 11.2 Working principle, working and applications of pressure regulators. 11.3 Advantages and limitations of pneumatic systems.	**3**
	Total	**21**

REFERENCE BOOKS:

1. Dr. D. S. Kumar, Fundamentals of Fluid Mechanics, Katson (in S.I. Units), Pub. House.
2. R. S. Khurmi,Fluid Mechanics & Hydraulic, S.Chand (In S. I. Units) &Co.Ltd.
3. Dr.Jagdishlal, Hydraulic Machines & Fluidics, Metropolitan Book Co.
4. Prof. V. P. Charotar,Hydraulic& Hydraulic Machines, Priyani Pub. House.
5. S.C.Gupta, Fluid mechanics and Hydraulics, Pearson Machines Education.

LIST OF EXPERIMENTS:

1 To measure fluid flow by Venturimeter
2 To measure fluid flow by orifice meter
3 To measure fluid flow by v Notch
4 To study and testing Of Centrifugal Pump
5 To study of Pelting Wheel.
6 To find fault and remedies For Centrifugal pump.
7 To Calculate work done and efficiency for impact of jet on flat and curved vanes
8 To study and write a report on working of different types of water turbines
9 To study and write a report on any one of hydraulic
10 To Study and write a report on any one of pneumatic devices.
11 To Perform testing of reciprocating pump as perBIS.
12 To Determine friction head losses through pipes.
13 To Measure friction losses in pipes.

Course Title	MATERIALS TECHNOLOGY		
Course Code	DME309		
Course Credit	Lecture	:	3
	Practical	:	1
	Tutorial	:	0
	Total	:	4

Course Learning Outcomes

At end of the course, students will be able to:
- **Understand** Properties of Engineering Materials.**(Comprehension)**
- **Understand** Metal Structure, Ferrous Material, Non-Ferrous Material and Its Alloy and Composite Material.**(Comprehension)**
- **Understand** Different types of Heat Treatment Processes.**(Comprehension)**
- **Understand** Non Destructive Testing.**(Comprehension)**
- **Understand** Powder metallurgy and Surface Coating.**(Comprehension)**

Detailed Syllabus

Module No.	Topics	No. Of Sessions
	SECTION-I	
1	**INTRODUCTION AND PROPERTIES OF ENGINEERING MATERIAL:** 1.1Introduction, need, classification of metals and non-metals materials Properties. - Mechanical - Chemical Properties - Thermal Properties - Electrical / Electromagnetic 1.2 Stress and strain-concept and it's relationship	4
2	**METALLURGICAL CONSIDERATION OF METALS:** 2.1 The concept of crystalline structure of metal, BCC, FCC, HCP. 2.2 The concept of solidification of metals, crystal, grain, grain boundaries, dendrite solidification, effect of cooling rates on material Properties. 2.3 Equilibrium diagrams, TTT Curve, applications. TTT curve for stainless steel. 2.4 Iron-carbon equilibrium diagram and its characteristic.	7
3	**FERROUS METALS AND ITS ALLOYS :** 3.1 Introduction and classification of ferrous metals. 3.2 Flow diagram for production of Iron and steel. 3.3 Ferrous metals – standards & designations (According to	5

	BIS,EN,ASME, JIS, DIN), composition, properties and uses. 3.4 Alloying of metals-properties and effect. 3.5 Shape memory alloys-concepts, materials, properties, Applications	
4	**NON FERROUS METALS AND ITS ALLOYS :** 4.1 Role of non-ferrous metals and its alloys related to engineering field Types, property, capabilities, composition, and industrial applications of : - Copper alloys. - Aluminium alloys. - Bearing materials. 4.2 Microstructure study of all non-ferrous metals.	**5**
	Total	**21**

SECTION-II		
5	**NON METALLIC AND COMPOSITE MATERIALS:** 5.1 Introduction 5.2 Main composition and applications of non-metallic material -plastic, rubbers, ceramic, refractory, insulators, Abrasives, Lubricants, adhesives, fibre and Teflon. 5.3 Composite materials-concept, structure, common materials, Properties, advantages and industrial applications.	**4**
6	**HEAT TREATMENT** 6.1 Introduction to heat treatment. 6.2 Types, method /process, process parameters and applications of various heat treatment processes/methods. 6.3 Study of quenching medias and their properties.	**5**
7	**SELECTION AND SPECIFICATION OF MATERIALS:** 7.1 Types of commercially available materials. 7.2 Specification of metals. 7.3 Factors to be considered while selecting material.	**3**
8	**NON-DESTRUCTIVE TESTING:** 8.1 Working principle. 8.2 Equipment specification, process, parameters procedure and applications of various Non-destructive Testing methods.	**4**
9	**POWDER METALLURGY:** 9.1 Basic concept of powder metallurgy and its applications, merits, demerits. 9.2 Manufacturing process of powder metallurgy.	**2**
10	**SURFACE COATINGS:** 10.1 Needs and scope of surface coatings. 10.2 Procedure and method of preparing surface. 10.3 Procedure of various surface coating methods. 10.4 Types of surface coatings and applications.	**3**
	Total	**21**

REFERENCE BOOKS:

1. O.P.Khanna, Material Technology, DhanpatRai& Sons.
2. G.B.S. Narang, Materials &Metallurgy,Khanna Publishers.
3. G.R.Nagpal,Material Science & Processes, Khanna Publishers.
4. S.P.Nayak,Elements of Engg. Metallurgy, Charotar Publishers.

LIST OF EXPERIMENTS:

1. Understand the criteria to identify the material, properties of each material and main alloying elements and reasons to add them.
2. To studyand demonstration of Metallurgical Microscope.
3. To Prepare ferrous and Non Ferrous micro specimen examine themand prepare report on this.
4. Perform hardening process on various Carbon steel components and Measure thehardness of hardened components
5. To Perform hardening process on various Alloy steel components. Measure thehardness of hardened components.
6. To Perform effect of various quenching media on high carbon steel and Prepare acomparative report on hardness.
8. To study the Annealing Process.
9. To study about the muffle Furnace.
10. To study about the corrosive materials to identify differenttypes of corrosion ofmetals.
11. To study different specimen of Composites materials.
12. To state the criteria to identify any five materials from the selected set of non-metallic materials.

Course Title	MANUFACTURING ENGINEERING - I	
Course Code	DME311	
Course Credit	Lecture : 3	
	Practical : 2	
	Tutorial : 0	
	Total : 5	

Course Learning Outcomes

At the completion of the course students will be able to know about:
- **Understand** different types of manufacturing processes.**(Comprehension)**
- **Demonstrate** casting equipment &processes.**(Application)**
- **Understand** Hot and cold working processes of metals.**(Comprehension)**
- **Understand** Different metal joining processes.**(Comprehension)**

Detailed Syllabus

Module No.	Topics	No. Of Sessions
	SECTION-I	
1	**INTRODUCTION TO MANUFACTURING PROCESSES:** 1.1 Nature, role and scope of manufacturing processes. 1.2 Classifications of Manufacturing process 1.3 Basic of Metal working process. 1.4 Role of metal working, metal casting and metal joining processes.	7
2	**BASICS OF CASTING:** 2.1 Introduction 2.2 Furnaces-types, working and applications. 2.3 Types of foundries. 2.4 Patterns-types, sketches, applications. 2.5 Pattern making-process and Pattern allowances. 2.6 Cores and its types. 2.7Moulding sand, sand properties, sand mixing and sand binders. 2.8 Types of mould, mould making, mould sintering and applications of mould. 2.9 Mouldingequipments, their major specifications, applications. 2.10 Casting defects-types, causes, effects, remedies. 2.11Metal melting and pouring-process, temperature, Precautions. 2.12 I.S. grade of casting and its uses. 2.13 Casting materials standards in BIS, EN, ASME, JIS it's compositions	9

	And applications. 2.14 Safety precautions in foundry.	

3	**TYPES OF CASTING**
	3.1 Classification of Casting.
	3.2 Type of castings
	  - Centrifugal Casting
	  - Die Casting
	  - Investment Casting
	  - Shell Casting
	  - Moulding
	  - Special Castings
	3.3 Recent trends in casting including Magnetic and Vacuum.
		5

	Total	**21**

	SECTION-II	

4	**METAL WORKING (FORMING) PROCESSES:**
	4.1 Hot and cold working processes.
	4.2 Process parameters and applications of:
	  - Rolling
	  - Bending
	  - Forging
	  - Spinning
	  - Drawing
	  - Shot peening
	  - Extrusion
	  - Coining
	  - Forming
	  - Swaging
	  - Embossing
	  - Sand blasting.
		11

5	**METAL JOINING PROCESSES:**
	5.1 Introduction and classification of metal joining process.
	5.2 Welding process
	  -Classification and Working principle, Specifications of equipment, functions of each element, process parameters for various materials.
	5.3 Safety precautions for following:
	  - Gas welding (Oxy-acetylene, Air-acetylene)
	  Arc welding (Carbon arc, metal arc, MIG, TIG, flux coated arc and Submerged arc)
	  - Resistance welding (Butt, spot, seam, projection and percussion)
	5.4 Soldering-working principle, Specifications of equipment Functions of each element.
	5.5 Brazing-working principle.
		10

5.6 Fastening process- process, applications
5.7 Recent trends in metal joining process
   - Laser beam welding
   - Ultrasonic welding	

Total	**21**

REFERENCE BOOKS:

1. J.A.Schey, Workshop Technology I &II, McGraw-Hill
2. Raghuwansh, Workshop Technology I & II, DhanpatRai and Co.
3. W.A.J. Chapman, Workshop Technology I, II &III,CBS Publication
4. M.L.Begman, Manufacturing Processes, Asia Publishing House, Bombay.
5. R.K.Jain and S.C.Gupta, ProductionTechnology,Khanna Publication.

LIST OF EXPERIMENTS:

1. To study and demonstrate different types of manufacturing process.
2. To study casting process.
3. Equipment used in foundry.
4. Study about forging process.
5. To study about rolling process.
6. To study about metal forming process.
7. To study about press tool.
8. To study and demonstration of welding processes.
9. Report on foundry practice

Course Title	STRENGTH OF MATERIALS	
Course Code	DME313	
Course Credit	Lecture : 3	
	Practical : 1	
	Tutorial : 1	
	Total : 5	

Course Learning Outcomes

At end of the course, students will be able to:
- **Understand** the concept of stress and strain.**(Comprehension)**
- **Draw** SF and BM diagram.**(Comprehension)**
- **Understand** Torsion and combine effect direct and bending Load.**(Comprehension)**

Detailed Syllabus

Module No.	Topics	No. Of Sessions
	SECTION-I	
1	**SIMPLE STRESS AND STRAIN:** 1.1 Stress and strains, types of stress. 1.2 Hook's Law, Modulus of Elasticity, Modulus of rigidity and factor of safety. 1.3 Longitudinal strain, Lateral strain and Poisson ratio and its examples. 1.4 Analysis of bar with varying cross sections and principal of Super position. 1.5 Analysis of bar with composite cross sections and its examples. 1.6 Thermal stress & strain.	8
2	**SHEAR FORCE (SF) AND BENDING MOMENT (BM):** 2.1 Terms associated with SF and BM. 2.2 SF and BM diagrams for cantilever with point load at free end and with Uniformly distributed load. 2.3 SF and BM diagrams for simply supported beam with point load at mid point and with uniformly distributed load	7
3	**MOMENT OF INERTIA** 3.1 Determination of area moment of inertia for rectangular and circular section.	2
4	**BENDING STRESSES IN BEAMS:** 4.1 Theory of simple bending 4.2 Expression for bending stress 4.3 Bending stress in symmetrical axis and section of modules for	4

	rectangular, hollow rectangular, circular and hollow circular section.	
	Total	**21**
	SECTION-II	
5	**COMBINED DIRECT AND BENDING STRESSES** 5.1 Effect of combined direct and bending stresses. 5.2 Resultant stress when column of rectangular section is subjected to eccentric load.	**4**
6	**COLUMNS AND STRUTS** 6.1 Failure of column 6.2 Euler's formula to determine crippling loads for both end of column are hinged and one end fixed and other end free.	**4**
7	**TORSION** 7.1 Shear stress produced in circular shaft subjected to torsion 7.2 Torque transmitted by solid circular shaft & hollow shaft. 7.3 Power transmitted by shaft	**4**
8	**RIVETED AND WELDED CONNECTIONS** 8.1 Types of riveted joints 8.2 Failure of riveted joints & efficiency of riveted joints. 8.3 Advantage & disadvantage of welded joints. 8.4 Types of welded joints (Butt weld & fillet weld)	**5**
9	**PRINCIPAL PLANES AND PRINCIPAL STRESSES** 9.1 Mohr's circle: Graphical method for determining stresses: 　(a) A body subjected to direct stresses in two mutually perpendicular direction when stresses are unequal & alike. 　(b) A body subjected to direct stresses in two mutually perpendicular direction when stresses are unequal & alike. 　(c) A body subjected to two mutually perpendicular principal tensile stresses of unequal intensities. 　(d) A body subjected to Two mutually perpendicular principal stresses which are unequal & unlike	**4**
	Total	**21**

REFERENCE BOOKS:

1. Dr. R. K. Bansal, Strength of Materials, Laxmi publication (p) Ltd.
2. R.S.Khurmi, Strength of Materials, S. Chand & Company Limited.
3. S.Ramamrutham, Strength of Materials, DhanpatRai & Sons.
4. S.B Junnarkar,Applied Mechanics, Charotar Publishing House.

LIST OF EXPERIMENTS:

1. Identify simple real mechanical elements subjected to direct stresses, sketch them with dimensions and loading conditions, calculate stress values Induced in them.
2. Study of Universal Testing Machine (UTM).
3. To demonstrate different end conditions of column using suitable mechanical components and solve numerical problems to find Euler's crippling load.
4. To study Complex stress analysis by Mohr circle method by giving graphical Exercise.
5. To perform a Tensile test on mild steel.
6. To perform a compression test on mild steel
7. To determine Hardness of mild steel.
8. To determine impact strength of steel (By Izod Test).
9. To determine impact strength of steel (By Charpy Test).
10. To perform Torsion test on Mild steel rod.
11. To demonstrate helical and leaf spring and solvematerial saving problem of spring.
12. To study different types of riveted and welded joint.
13. Draw shear force and bending moment diagram with typical loads for cantilever beam, simply supported beam and over hanging beam.

RK.UNIVERSITY

Course Title	THEORY OF MACHINES	
Course Code	DME405	
Course Credit	Lecture	: 3
	Practical	: 2
	Tutorial	: 0
	Total	: 5

Course Learning Outcomes

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

- **Identify** mechanisms & machine phenomenon. **(Knowledge)**
- **Draw** the Velocity & Acceleration Diagrams, Cam profile, turning moment diagram. **(Comprehension)**
- **Understand** the concept of Velocity and Acceleration and various Power Transmission Devices. **(Comprehension)**
- **Analyze** Torque & Friction of Screw jack, Thrust & Journal Bearing, Clutches, Brake, Dynamometer, flywheel and Power transmission device. **(Analysis)**

Detailed Syllabus

Module No.	Topics	No. Of hrs
	SECTION-I	

1	**INTRODUCTION**
	1.1 Need, Scope & importance of Theory of Machine in Design and Analysis.
	1.2 Basic terminology related to machines and mechanisms.
	1.3 Development of different mechanisms.
	   - Four bar mechanism.
	   - Slider cranks mechanisms.
	   - Inversion.
		4

2	**VELOCITY AND ACCELERATION DIAGRAMS**
	2.1 Basic concept used in solving velocity and acceleration problems.
	2.2 Approach to solve velocity and acceleration problems related to mechanisms using:
	   - Graphical Methods
	   - Klein's Construction
		8

3	**CAMS AND CAM PROFILES** 3.1 Introduction, function and types of cams and cam followers. 3.2 Types of motions and displacement for different types of cam and cam Followers. 3.3 Construction of different types of cam profile for given data	5

4	**FLY WHEEL AND GOVERNOR** 4.1 Turning moment diagram, Use, T.M. diag. for different machines and torque determination. 4.2 Coefficient of fluctuation of speed and energy. 4.3 Flywheel: Functions, types and moment of inertia and weight calculation. 4.4 Governor: functions, types and terminology associated.	4
	SECTION - II	
5	**FRICTION IN MACHINE ELEMENTS** 5.1 Introduction and basic concept of friction in Screw Jacks: 5.2 Appreciate the role of friction in thrust bearing, pivot bearing and collars, considering - Uniform wear and uniform pressure. 5.3 Function and working of different types of clutches. 5.4 Types and working of simple friction brakes. 5.5 Different types of dynamometers, operational principles and working.	10
6	**POWER TRANSMISSION** 6.1 Introduction, need, modes and applications. 6.2 Rope –types, applications. 6.3 Belt drive-types, terminology, ratio of tensions, effect of centrifugal forces and initial tension. 6.4 Gear trains- types and application.	7
7	**BALANCING AND VIBRATION** 7.1 Concept, types of balancing, balancing of masses revolving in the same plane (Only description), 7.2 Basic concept of balancing reciprocating masses. 7.3 Terminology of vibration causes and remedies of vibration.	4

Reference Books:

1. R. S. Khurmi, Theory of Machines, S. Chand & Co limited.
2. P. L. Bellaney, Theory of Machines, Khanna Publishers.
3. S. S. Rattan, Theory of Machines, TMH Publication.
4. V.P. Singh, Mechanical Vibrations, Dhanpat Rai Publications.

List of Experiments:

1. To follow basic concept of theory of machines.
2. To follow various type of mechanisms.
3. To trace the problem of turning moment diagram of flywheel.
4. To follow working of any one type of clutch & brake.
5. To follow working of any one type of flywheel & governor.
6. To follow on any one type of cam & follower assembly.
7. To replicate the velocity diagram of four bar chain mechanism by using relative - velocity method.
8. To replicate the velocity diagram of single slider crank mechanism by using relative - velocity method.
9. To replicate single slider crank mechanism by using Klein's construction method.
10. To replicate various types cam profile with various follower.
11. To reproduce the frictional torque and power from given data assuming   uniform wear &

      uniform pressure condition.
12. To trace the problem of various drives.
13. To trace the problem of balancing.
14. To replicate model or chart of any one mechanism.

Course Title	**ENGINEERING THERMODYNAMICS**		
Course Code	**DME406**		
Course Credit	Lecture : 3		
	Practical : 0		
	Tutorial : 1		
	Total : 4		

Course Learning Outcomes

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

- **Understand** the concept of thermodynamics system. **(Comprehension)**
- **Discuss** the concept of Enthalpy, Entropy, and Internal Energy. **(Comprehension)**
- **Explain** first and second law of thermodynamics. **(Comprehension)**
- **Discuss** Ideal gases and its process. **(Comprehension)**
- **Review** different types of thermodynamic cycles. **(Comprehension)**
- **Explain** phenomenon of two-phase system. **(Comprehension)**

Detailed Syllabus

Module No.	Topics	No. Of hrs
	SECTION-I	
1	**FUNDAMENTALS OF THERMODYNAMICS** 1.1 Concept of thermodynamics and its systems. 1.2 Classification of system and its properties (Enthalpy, Internal energy, Entropy, flow work, heat). 1.3 Forms of energy and energy interaction 1.4 Phenomenon of Thermodynamic Equilibrium 1.5 Type of process (reversible, irreversible), point function and path function 1.6 Concept of Zeroth law of Thermodynamics.	6
2	**FIRST LAW OF THERMODYNAMICS** 2.1 Law of conservation of energy 2.2 Joule's Experiment, Statement of first law of thermodynamics 2.3 First law applied for open and close system. 2.4 Concept of PMM-1 (perpetual motion machine of first Kind Concept of Control volume system, control mass system. 2.5 Steady flow Energy Equation (SFEE) and its applications.	7

| 3 | **SECOND LAW OF THERMODYNAMICS**

 3.1 Limitations of first law of thermodynamics.
 3.2 Phenomenon of heat reservoir, source, sink, heat engine, heat pump, refrigerator
 3.3 Kelvin Plank statement and Clausius statement
 3.4 Equivalence of Kelvin plank and Clausius statement
 3.5 Types of reversibility and irreversibility of Thermodynamic process | 8 |

SECTION - II		
4	**PROPERTIES OF GASES** 4.1 Laws of gases. 4.2 Characteristic gas equation and universal gas constant. 4.3 Type of flow and none flow processes. 4.4 Specific heats and its relationship	6
5	**THERMODYNAMIC CYCLES** 5.1 Concept of air standard efficiency. 5.2 General assumptions for deriving air-standard efficiency 5.3 Classification of cycles, Carnot, Otto, diesel, and Dual combustion Brayton cycle. 5.4 Refrigeration cycle (reverse Carnot, reversed Brayton) Limitations and applications of cycles.	9
6	**CONCEPT OF TWO-PHASE SYSTEM** 6.1 Concept of two-phase system. 6.2 P-V, T-S, H-S diagram of pure substance. 6.3 Concept of triple point, Critical Point, vaporization, Evaporation, boiling, Degree of super heat, dryness fraction	6

REFERENCE BOOKS

1. P. K. Nag, Engineering Thermodynamics, Tata Mc Graw-Hill, New Delhi.
2. R. C. Patel, Applied Thermodynamics, Charotar Publication.
3. Yunish Cengel, Thermodynamics, Tata McGraw-Hill.
4. R. K. Rajput, Engineering Thermodynamics, Laxmi Publications.

	SYLLABUS

Course Title	**MANUFACTURING ENGINEERING II**
Course Code	**DME407**

Course Credit	Lecture : 3
	Practical : 1
	Tutorial : 0
	Total : 4

Course Learning Outcomes

At end of the course, students will be able to:
- **Identify** different types of metal removing presses. **(Knowledge)**
- **Identify** different type of Machine Tools. **(Knowledge)**
- **Practice** the operation of Capstan and Turret lathe**. (Application)**
- **Use** cutting tools. **(Application)**
- **Operate** press and press tools. **(Application)**

Detailed Syllabus

Module No.	Topics	No. Of hrs
	SECTION-I	
1	**INTRODUCTION AND FUNDAMENTALS OF METAL REMOVAL PROCESSES** 1.1 Need, Scope & importance of Manufacturing processes in industries. 1.2 Differentiate between forming and generating processes. 1.3 Chip formation, types of chips. 1.4 Orthogonal and oblique cutting. 1.5 Functions and types of chip Breakers. 1.6 Cutting fluid- Basic need, types, properties and its applications. Influence of cutting variables on surface finish, tool life, economy and mass production. 1.7 Metal removal rate (MRR).	5
2	**KINEMATICS OF MACHINES** 2.1 Definition and concept. 2.2 Various kinematics examples-sketch, elements, working and applications. 2.3 Machine tool elements, drives and controls. 2.4 Common motion transmission methods in machine tools.	5

	2.5 Principle of setting speed and feed.	
3	**BASIC MACHINE TOOLS** 3.1 Define and classify basic machine tools. 3.2 Types, constructional features, transmissions, working principle, 3.3 Various mechanisms used materials for important Elements 3.4 Selection criteria of following basic machine tools - Lathe Machine - Drilling Machine - Milling Machine - Shaping Machine - Slotting Machine - Planning Machine - Boring Machine	**11**

	SECTION -II	
4	**CAPSTAN AND TURRET LATHE** 4.1Constructional features and working principle. 4.2 Functions and applications. 4.3 Preparation of tool layout. 4.4 Merits and Demerits of Capstan and Turret lathe in comparison with basic centre lathe.	**5**
5	**CUTTING TOOLS** 5.1 Various cutting tools materials, their compositions and properties. 5.2 Alloying elements in tool materials and their effects. Carbide inserts, its designations, its need, applications and benefits (As per ISO). 5.3 General cutting parameters for various cutting tools materials and work piece materials. 5.4 Various Cutting Tool geometry, nomenclature, tool materials, Sketch of each, ISO/BIS standard. 5.5 Specify cutting parameters for each cutting tool for commonly used work piece materials for commonly used operations.	**6**
6	**PRESSES AND PRESS TOOLS** 6.1 Classifications, constructional features, working and applications of presses. 6.2 Driving mechanism and its application criteria. 6.3 Press tools - Punch, Die, constructional features, Die assembly, punch and Diematerials 6.4 Clearance between punch and Die 6.5 Types of Dies, their working and its specific applications. 6.6 Press working - Various press working operations, its definition and field of applications	**10**

Reference Books:

1. B. S. Raghuwanshi, Workshop Technology Vol I & II, Dhanpat Rai & Corp, New Delhi.
2. W. A. J. Chapman, Workshop Technology Vol I& II, Arnold Publishers Delhi.
3. Hajra Choudhary, Workshop Technology Vol I & II, Media Promoters & Publishers Pvt Ltd., Mumbai.
4. R. K. Jain and S. C. Gupta, Manufacturing Processes, Khanna Publications.
5. R. K. Jain, Production Technology, Khanna Publishers, New Delhi.

List of Experiments:

1. To study Kinematics and Motion transmission of Lathe feed box.
2. To study Kinematics and Motion transmission of Shaper machine ram stoke.
3. To study Perform Mechanism and Working of indexing head of milling machine.
4. To study mechanism and working of capstan and turret lathe
5. Interpret surface finish, tool life and type of chip formation on varying cutting parameters for same work piece material and tool material.
6. Interpret surface finish and type of chip formation on varying work piece material with suitable cutting parameters.
7. Compute cutting force using dynamometer.
8. Perform various Press Tools operations.
9. Perform Grind Single Point Cutting Tool as per given geometry.
10. Reproduce a job on centre lathe as per the given drawing. (turning, taper turning etc)
11. Reproduce a job on Shaper as per the given drawing (V- Notch, Plain surface, Inclined surface).
12. Reproduce Gear cutting Job on Milling Machine.

SYLLABUS

Course Title	MECHANICAL MEASUREMENT & INSTRUMENTATION	
Course Code	**DME408**	
Course Credit	Lecture : 3	
	Practical : 1	
	Tutorial : 0	
	Total : 4	

Course Learning Outcomes

At end of the course, students will be able to:
- **Identify** measurement & inspection procedure. **(Knowledge)**
- **Practice** and **Use** of angular and linear measuring instrument. **(Application)**
- **Understand** the pressure, temperature, flow measurement procedure. **(Comprehension)**
- **Practice** testing of straightness, flatness, Gear measurement, Calibration of instrument. **(Application)**

Detailed Syllabus

Module No.	Topics	No. Of hrs
	SECTION-I	
1	**INTRODUCTION** 1.1 Need, Scope & importance of metrology and instrumentation in industries. 1.2 Need of attitude, knowledge & skill required for using metrology and Instrumentation aids in industries. 1.3 Inspection –types as for variables and attributes, need in industry, need for mass production. 1.4 Classification and functions of inspection including centralized and Decentralized inspection. 1.5 Relationship between inspection and metrology. Elements of measurement and factors affecting it. 1.6 Concept, need and importance of standard and specification. 1.7 Relationship between interchangeability and selective assembly. 1.8 Understand the fundamental linear measuring unit.	3
2	**LINEAR MEASUREMENT** 2.1 Least count, accuracy, precision, error. 2.2 Direct and indirect measuring instruments including digital type measuring instruments (All types of instruments must be included) 2.3 Construction, elements and their functions, methods for setting, least count, method to use, precautions to be taken in handling, and applications.	4

	2.4 Errors in measurements. 2.5 Working and use of dial indicator. 2.6 Selection of instrument for given situation.	
3	**ANGULAR MEASUREMENT** 3.1 Universal Bevel protectors, angle gauges, sine bar, spirit level. 3.2 Electronic level, clinometers, auto collimator, photo electric auto collimation. 3.3 Angle Decker and taper gauges.	**4**
4	**SCREW THREAD MEASUREMENT** 4.1 Terminology associated with screw thread measurement. 4.2 Measurement methods of external and internal thread elements. 4.3 Study of all type of thread measuring instruments.	**4**
5	**GEAR MEASUREMENT** 5.1 Terminology associated with gear measurements. 5.2 Gear tooth vernier caliper, Parkinson's gear tester, David Brown gear Tooth form testing. 5.3 Involute curve checking.	**3**
6	**LIMITS GAUGES** 6.1 Concept of gauging types and uses of gauges. 6.2 Use of various gauges. 6.3 Given a situation to be gauged, suggest the suitable type of gauges.	**3**

SECTION – II		
7	**SENSORS AND TRANSDUCERS** 7.1 Definitions and concept. 7.2 Static and dynamic characteristics. 7.3 Potentiometer sensor, electrical resistance strain gauge, optical encoder, proximity switch, piezoelectric sensors and light sensors	4
8	**TEMPERATURE MEASUREMENT** 8.1 Principles of temp. Measuring devices. 8.2 Bimetal thermometer, pressure spring thermometer, resistance 8.3 Thermometer, thermister, thermocouple, pyrometer. 8.4 Errors in temperature measurement. 8.5 Given a situation, suggest suitable temperature measuring device.	4
9	**PRESSURE MEASUREMENT** 9.1 Pressure measuring devices - types, applications. 9.2 Constructional details including vacuum. 9.3 Use of manometers, elastic gauges, tactile sensor and pressure transducers.	4
10	**FLOW MEASUREMENT** 10.1 Classification of flow measuring devices. 10.2 Use of various volumetric meters. 10.3 Application of obstruction meters.	4
11	**AUTOMATIC CONTROLS** 11.1 Meaning, general aspects and application of automatic control. 11.2 Automatic control system such as open loop control, feedback	3

12	control, on-off Control and proportional control.	
	CALIBRATION OF INSTRUMENTS 12.1 Need of calibration. 12.2 Standards. 12.3 Various standard procedures for calibration of instruments. 12.4 Calibration procedure of the given instrument	2

Reference Books:

1. R. K. Jain, Mechanical and Industrial Measurement, Khanna Publications, New Delhi.
2. S. C. Gupta, Engineering Metrology, Dhanpat Rai Publications.
3. R. S. Sirohi & H. C. Radha Krishna, Mechanical Measurement, Wiley Publishers.
4. R. K. Rajput, Mechanical Measurements and Instrumentation, Katson Books Publication.

List of Experiments:

1. Perform the application of Vernier Caliper & Micrometer.
2. Perform the application of Height gauge And Depth gauge.
3. Replicate the usage of Slip Gauge.
4. Perform the measurement of roundness.
5. Perform the measurement of Elements of Screw threads.
6. Perform the measurement of gear tooth thickness by Gear tooth Vernier Caliper.
7. Perform the measurement of Angle with the help of sine bar.
8. Reproduce the process of Pressure Measurement.
9. Reproduce the process of Temperature Measurement.
10. Replicate the usage of Limit gauges.
11. Reproduce the usage of bevel protector.
12. Perform the measurement of straightness & Flatness.
13. Perform the calibration of Micrometer/ Vernier Caliper.
14. Minor project

SYLLABUS

Course Title	Computer Aided Product Development	
Course Code	DME410	
Course Credit	Lecture : 3	
	Practical : 1	
	Tutorial : 0	
	Total : 4	

Course Objective

At the completion of the course students will be able to:
- **Select** configuration of CAD workstation.
- **List** various design software to perform different analysis of mechanical elements.
- **Perform** for Design, develop and model the given product using CAD software.
- **Develop** solid models & assembly of mechanical products.
- **Develop** a product using design thinking methodology.

Detailed Syllabus

Module No.	Topics	No. Of hrs
	SECTION-I	
1	**INTRODUCTION TO COMPUTER AIDED DESIGN (CAD)** 1.1 Computer graphics & its terminology. 1.2 CAD definition, concept & need. 1.3 CAD process. 1.4 Functional areas of CAD. 1.5 Coordinate systems. 1.6 Geometric transformation-concept and types. 1.7 2 dimensional (2D) geometric transformation- translation, scaling, rotation and mirror with numeric examples.	5
2	**HARDWARE AND SOFTWARE IN CAD SYSTEM** 2.1 CAD workstation, Requirement of workstation, Functions of it. 2.2 Different cords and ports used in CAD workstation. 2.3 Different input and output devices used in CAD. 2.4 Different graphic standards system. 2.5 Introduction about various graphic standards like GKS, DXF, STEP, IGES PHIGS. 2.6 Introduction to Animation with major tools used in animations.	7

3	**CAD MODELING** 3.1 Introduction to Geometric modeling. 3.2 Types Of Modeling 3.3 Difference between 2D and 3D. 3.4 Representation of surfaces with its types. 3.5 Representation of Curves with its types. 3.6 Solid modeling methods like Constructive Solid Geometry, Pure primitives & Boundary Representation. 3.7 Introduction of parametric modeling. 3.8 Difference between parametric and non-parametric modeling.	9
		21
	SECTION-II	
4	**ADVANCED CAD SOFTWARES.** 4.1 Introduction of CAD software. 4.2 Brief of Advanced CAD software. 4.3 Basic commands of Sketch like: UNITS, UCSICON, LINE, POLYLINE, CIRCLE, ARC, RECTANGLE, POLYGONE, LINETYPES, DIMENTION STYLE, ZOOM, OFFSET, LAYER, ARRAY, PAN, etc. Import and Export of drawings. 4.4 Brief on Part modeling software. 4.5 Basic Commands for Part modeling like: Extrude, Loft, Press-Pull, Cylinder, cube, Sphere, Pyramid, Cone, Revolve, Slice, Subtract, etc. 4.6 Basic Commands of Surface modeling: Extrude, Loft, Planer, Sweep, revolve, Blend, Patch, Extend, etc.	8
5	**PRODUCT DESIGN USING DESIGN THINKING METHODOLOGY.** 5.1 Introduction of Design Thinking 5.2 Need of Design Thinking. 5.3 Design Thinking methodology and steps: Empathy, Define, Ideate, Prototype and Test. 5.4 Sketching and Ideation 5.5 Product design and design thinking. 5.6 Prototyping techniques (Paper, Wood, Form/Thermocol, Clay)	9
6	**CASE STUDIES FOR DESIGN THINKING.** Case studies of various product design projects using design thinking methodology.	4
		21

Instructional method and Pedagogy:

- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Extensive demonstrations on various cad packages
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regularly.
- Surprise tests/Quizzes/Seminar/Tutorials will be conducted.
- Minimum two drawing sheets based Assembly and detailing.
- Laboratory work is to be done as per their lab workbook which has various practice models.

Reference Books:

- CAD/CAM Theory and Practice -IbrhimZeid -McGraw Hill international.

- Fundamental of Geometric dimensioning & tolerancing. - Alex kruleski - Cengage publication

- CAD/CAM: Computer-Aided Design and Manufacturing-Groover

- Cao Jerry, Zieba Kamil, Ellis Matt, "The Ultimate Guide to Prototypping", UXPin Inc.

- Bjarki Hallgrimsson, "Prototyping and Modelmaking for Product Design", Laurence King Publishing

- Karl T. Ulrich, "Product design and development", Tata McGraw Hill.

- Kristin Fontichiaro, "Design Thinking", cherry Lake Publishing

Course Title:	**CAMPUS TO CORPORATE TRAINING**	
Course Code:	**CD401**	
Course Credit:	Theory : 3	
	Practical : 0	
	Tutorial : 0	
	Total : 3	

Course Learning Outcomes:

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

- **Formulate** the problem quantitatively and use appropriate arithmetical, and/or statistical methods to solve the problem.
- **Recall** Formulae.
- **Demonstrate** various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.
- **Interpret** quantitative information (i.e., formulas, graphs, tables, models, and schematics) and draw implications from them.
- Critically **evaluate** various real life situations by resorting to analysis of key issues and factors.
- **Prepare** professional Resume.
- **Solve** different verbal and non-verbal problems and puzzles
- **Develop** their comprehensive approach on job skills & they will be ready for placements

Detailed Syllabus:

Module No.	Topics	No. Of hrs
Quantitative Ability		
1.	Numbers, H.C.F. & L.C.M., Simplification, Decimal Fractions	**04**
2.	Square & Cube roots, Average, Profit & Loss	**04**
3.	Ratio & Proportion, Problems on Age,Time and Work	**04**
4.	Time & Distance, Problems on Trains	**05**
Logical Verbal Reasoning		
5.	Character Puzzles, Series Completion, Venn Diagrams	**03**
6.	Seating Arrangement (Linear), Blood Relation Test, Direction Sense Test	**03**
7.	Logical Sequence of Words, Classification	**03**
VERBAL ABILITY		
8.	Verbal Ability: (Spotting errors, selecting words, ordering of words, Idioms and phrases, Verbal analogies, synonyms, spellings, Antonyms.)	**06**
9.	Essay Writing: Types of Essays/Paragraph writing, Structure of Essays	**03**
INTERVIEW READINESS		

10.	Resume Building: Formats of Resume, Difference between Resume and CV, Online Resume, Drafting resume	03
11.	Deportment Or Grooming: Components of Deportment, importance of grooming, Do's and Don'ts of grooming	02
12.	Interview Skills: About Interview, Types of Interviews, frequently asked interview questions, Blunders to be avoided during Interviews	05
	Total Hours	**45**

Instructional Method and Pedagogy:

- Lectures will be conducted with the aid of multi-media projector, blackboard, Classroom Teaching & Learning Activities etc.
- Though most of the class will be lecture, certain skill building exercises will be introduced to expose the students to increasingly more difficult content.
- Assessment will be conducted every week on content delivered during week.
- Participative – Student Centric Learning Method
- Activities and Role Plays and Audio-Visual tools will be used to enhance student participation.
- Use of Online application to make classroom participation more active. Like (Kahoot, Edmodo, Etc.)

Reference Books & Websites:

- **Books:**
  1. Dr. R.S. Aggarwal, "Quantitative Aptitude", S.Chand Publication, New Delhi.
  2. Abhijit Guha, "Quantitative Aptitude for Competitive Examinations", 4th Edition.
  3. Dr. R.S Agarwal, "A Modern Approach to Verbal & Non-Verbal Reasoning", S.Chand Publication, New Delhi.
  4. Arun Sharma, "How to Prepare for Logical Reasoning for the CAT"
- **Website:**
  1. www.indiabix.com
  2. www.freshersworld.com

Course Title	Orientation Program in Entrepreneurship	
Course Code	NEN002	
Course Credit	Theory: 03 (Diploma All Branch & BCA – 4th & BBA – 6th Sem.)	
	Practical: 00	
	Tutorial: 00	
	Credits: 03	

Course Learning Outcomes:

After Successful completion of the above course, students will be able to:
  Understand how E-Cell can transform individuals into Successful Leaders.
  Understand how ordinary people become Entrepreneurs.
Understand the need of Customers and Learn Selling effort to keep Customercentric.
Build and **Demonstrate** the elevator pitch to sell effectively.

Detailed Syllabus

Sr. No.	Name of chapter & details	Hours Allotted
SECTION-I		
1.	**Let's Get Started:** Discover Yourself, What is Entrepreneurship, Entrepreneurship Impact and change in World and understand Six Entrepreneurial myths. Activities: Form the Team, Entrepreneurial journey	**05**
2.	**Explore E – Cell on Campus** Understand the concept of E-Cell, Need of E-Cell on Campus, How ithelps to become Entrepreneur, what this cell does, who can and why to join E-Cell. Activities: Dream it Do it, Idea Plane	**05**
3.	**Listen to Some Success Stories:** Case studies on Successful Entrepreneurs: Practo, Flipkart, Uber,Alibaba etc. Activities: Global Legends, Your own heroes Assignment: Interview an Entrepreneur in your neighborhood or city.	**05**

4.	**Characteristics of a Successful Entrepreneurs** Entrepreneurial Mindset, style and decision making strategies, identify the difference between five Models of Wadhwani, identify your potential entrepreneurship style based on personality traits, strengths, and weaknesses. Activities: Built it	**05**
5.	**Communicate Effectively** Learn how incorrect assumptions and limiting our opinions about people can negatively impact our communication, Identify the barriers which cause communication breakdowns, such as miscommunication and poor listening, Importance of listening, and learn to listen actively. Activity: Prepare a report on communication strategies that helped entrepreneurs succeed in their ventures.	**05**
6.	**Design Thinking for Customer Delight** Understand Design Thinking as a problem-solving process, Learn the principles of Design Thinking, Describe the Design Thinking process. Activity: Keep it, Junk it Assignment: Identify a problem of your own and Re-Design the process/system.	**05**
7.	**Sales Skills to Become an Effective Entrepreneur** Customer profiling, Wowing your customers, Personal Selling – Concept and Process, Concept and Introduction to Elevator Pitch. Activity: Elevator Pitch	**05**
8.	**Managing Risks & Learning from Failures** Understand that risk-taking is a positive trait, Identify risk-taking traits and resilience traits, Managing Risk. Activity: Understanding Risk through Risk Takers Assignment: Interview an Entrepreneur and identify the risk management he did.	**06**
9.	**Are You Ready to Be an Entrepreneur** Activity: Why Do I Do What I Do	**04**
Total		**45**

Instructional method and Pedagogy:

At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
Lectures will be conducted with the aid of multi-media projector, use of WhiteBoard, OHP etc.
Attendance is compulsory in lectures and laboratory.
Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
Quizzes will be conducted.

Reference Books:

1. Traction : A Startup Guide to Getting Customers by Gabriel Weinberg and Justin Mares

Additional Resources

https://learnwise.org/#//en/user/redirection

RKUNIVERSITY

Course Title	DESIGN OF MACHINE ELEMENTS	
Course Code	DME509	
Course Credit	Lecture : 3	
	Practical : 2	
	Tutorial : 0	
	Total : 5	

Course Objective

At the completion of the course students will be able to:
- **Define** advanced designing system.**(Knowledge)**
- **Describe** material application. **(Comprehensive)**
- **Translate** knowledge about drafting and designing.**(Application)**
- **Identify** different designing methods.**(Knowledge)**

Detailed Syllabus

Module No.	Topics	No. of hrs
	SECTION-I	
1	**INTRODUCTION** 1.1 Methods to design machine tool 1.2 General consideration & factors influencing the design of machine element. 1.3 Concept of stress concentration & factor of safety. 1.4 Standardization and Preferred number, numerical method. 1.5 Aesthetic & Ergonomic consideration. 1.6 Concept of 'Composite Section and typical applications of it in Mechanical elements.	5

2	**MACHINE ELEMENT SUBJECTED TO DIRECT STRESS**
	2.1 Type of Joints.
	2.2 Design of Knuckle joint
	2.3 Design of cotter joint
	2.4 Design of threaded fasteners
	   - Design of bolts.
	   - Design of power screw.
		5

3	**DESIGN OF LEVERS.** 1.1 Fundamental equation of bending. 1.2 Levers - Definition and Application.	3

	- Types of levers - Design procedure of Bell Crank Lever	
4	**DESIGN OF SHAFT AND KEYS** 4.1 Equation of Twisting and bending moment. 4.2 Shaft - Definition of Shaft, Spindle, Axle. - Types of Shaft. - Design Procedure of shaft. 4.3 Keys - Types of keys. - Design procedure of keys	**4**
5	**DESIGN OF SPRING** 1.1 Types of spring 1.2 Materials of spring 1.3 Application 1.4 Design of Helical spring 1.5 Design of Leaf Spring	**4**
SECTION-II		
6	**DESIGN OF COUPLING** 6.1 Types of coupling 6.2 Difference between Clutch and Coupling. 6.3 Design procedure of Muff Coupling. 6.4 Design of Flange Coupling.	**4**
7	**DESIGN OF PRESSURE VESSELS.** 7.1 Types of Pressure vessel. 7.2 Various standards and codes. 7.3 Stress in pressure vessel. 7.4 Design of thick cylinders. 7.5 Design of thin cylinder.	**7**
8	**DESIGN OF BEARING** 8.1 Introduction to bearings. 8.2 Classification of bearings. 8.3 Types & Nomenclature of bearings. 8.4 Pros & Cons of Sliding and Rolling Contact bearings. 8.5 Application of bearings. 8.6 Design of Rolling Contact Bearings.	**6**
9	**DESIGN OF SPUR GEAR** 9.1 Concept of gears 9.2 Lubrication for gears	**4**

	9.3 Design procedure of Spur Gear	

Reference Books:

1. Design of Machine element- V.B. Bhandari
2. Machine design – Shah & Pandya

List of Experiments

1. Follow on Design of Knuckle Joint.
2. Follow on Design of cotter Joint.
3. Replicate Design of Helical Spring.
4. Replicate Design of Leaf Spring.
5. Reproduce Design of Bell Crank Lever
6. Replicate Design of Muff Coupling.
7. Replicate Design of Flange Coupling.
8. Follow on Design of Pressure vessel.
9. Replicate Design of Spur Gear.

Course Title	CAD/CAM	
Course Code	DME510	
Course Credit	Lecture : 3	
	Practical : 2	
	Tutorial : 0	
	Total : 5	

Course Objective

At the completion of the course students will be able to:

- **Understand** advanced manufacturing system.**(Comprehension)**
- **Perform** computer aided designing.**(Application)**
- **Recall** knowledge about CNC Part Program.**(Knowledge)**
- **List** various design software to perform different analysis of mechanical elements.**(Knowledge)**

Detailed Syllabus

Module No.	Topics	No. Of hrs
	SECTION-I	
1	**INTRODUCTION TO COMPUTER AIDED DESIGN (CAD)** 1.1 Define Computer Aided Design. 1.2 Need, Scope and Application of CAD. 1.3 Objectives of CAD. 1.4 Benefits and functional areas of CAD. 1.5 Design steps of CAD.	2
2	**HARDWARE AND SOFTWARE IN CAD SYSTEM** 2.1 Geometric Transformation matrix for-Transformation, Rotation and Scaling. 2.2 CAD workstation, Requirement of workstation, Functions of it. 2.3 Different cords and ports. 2.4 Different input and output devices used in CAD. 2.5 Different graphic standards system. 2.6 Introduction about GKS, IEGS. 2.7 Introduction to Animation.	6

3	**CAD MODELING** 3.1 Introduction to Geometric modeling. 3.2 Types Of Modeling 3.3 Difference between 2D and 3D. 3.4 Types of surfaces. 3.5 Introduction of parametric modeling. 3.6 Difference between parametric and non parametric modeling.	**5**
4	**ADVANCED CAD SOFT-WARES.** 4.1 Introduction of CAD software. 4.2 Advanced CAD software. 4.3 Basics of 2D commands. - Line, UCS, POLYLINE, ORTHO, PAN, RECTANGLE, polygon, line type, dimension, etc. 4.4 Basics of part modeling 4.5 Advanced CAD software.	**8**

SECTION-II		
5	**INTRODUCTION TO COMPUTER AIDED MANUFACTURING (CAM)** 5.1 Introduction to CAM. 5.2 Introduction of CNC machine. 5.3 History of CNC. 5.4 Numeric Control types. 5.5 Principle of operation of CNC 5.6 Construction features including structure, drive system, tool-work movement actuation system. 5.7 Work holding features. 5.8 Tool holding features. 5.9 Feedback system. 5.10 Automatic Tool Changer (ATC). 5.11 APC Automatic Pallet Changer.	**7**
6	**PART PROGRAMMING** 6.1 CNC axes. 6.2 Motion nomenclature and coordinate systems. 6.3 CNC part programming: Structure of part program. 6.4 Simple part programming for turning using ISO format having 6.5 Straight turning, taper turning (linear interpolation) and Convex/concave turning (circular interpolation). 6.6 Simple part programming for milling using ISO format. 6.7 Including linear and circular interpolations. 6.8 Macros, fixed cycle, canned cycles, subroutines. 6.9 Features and applications.	**7**

| 7 | **RECENT TRENDS IN CAD/CAM.**
7.1 Adaptive control- Definition, Application
7.2 Direct Numerical Control (DNC)
7.3 Computer Integrated Manufacturing (CIM)- Concept, definition, Areas covered, benefits of it.
7.4 HMC, VMC- 5 Axis Machine
7.5 Additive manufacturing System
7.6 Automated guided vehicle | **7** |

6.10   Automatic Programming.

Reference Books:

2. CAD/CAM Theory and Practice -IbrhimZeid -McGraw Hill international.
3. COMPUTER aided manufacturing - T. K. Kundra
4. CAD/CAM: Computer-Aided Design and Manufacturing-Groover

List of Experiments:

1. 2D Drafting of practice Drawing-1.
2. 2D Drafting of practice Drawing-2.
3. 2D Drafting of practice Drawing-3.
4. 2D Drafting of practice Drawing-4.
5. 2D Drafting of practice Drawing-5.
6. 2D Drafting of practice Drawing-6.
7. 2D Drafting of practice Drawing-7.
8. 2D Drafting of Industrial Drawing -1.
9. 2D Drafting of Industrial Drawing -2.
10. 2D Drafting of Industrial Drawing -3.
11. 2D Drafting of Industrial Drawing -4.
12. 2D Drafting of Industrial Drawing -5.
13. 2D Drafting of Industrial Drawing -6.
14. 2D Drafting of Industrial Drawing -7.
15. 2D Drafting of Industrial Drawing -8.
16. Prepare 3D Drawing-1.
17. Prepare 3D Drawing-2.
18. Prepare tool movement path for turning operation.
19. Prepare Turning cycle for the given Drawing.
20. Prepare Milling Cycle for the given Drawing.

SYLLABUS

Course Title	INDUSTRIAL ENGINEERING & MANAGEMENT	
Course Code	DME511	
Course Credit	Lecture : 3	
	Practical : 1	
	Tutorial : 0	
	Total : 4	

Course Objective

At the completion of the course students should be able to:
- **Understand** concept and importance of productivity and work Study. **(Comprehension)**
- **Understand** Various Types of SIMO Charts, Flow Process Charts and Operation Process Chart. **(Comprehension)**
- **Understand** about Concept Application of Process Capability of X-bar and R-chart, P-charts, C-charts.**(Comprehension)**

Detailed Syllabus

SECTION -I		
Module No.	**Topics**	**No. Of hrs**
1	**INTROUCTIONTO INDUSTRIALENGINEERING.** 1.1 Objectives of IE & M. 1.2 Need, Scope & importance of Industrial Engineering in industries. 1.3 Productivity–Concept, importance and ways to enhance it.	2
2	**TECHNIQUEOFWORKSTUDY.** 2.1 Objectives of method study. 2.2 Steps in method study. 2.3 Methods of recording data for method study. 2.4 Use of questioning technique in analyzing data for method study job. 2.5 Develop and improve the method, based on analysis of Problem. 2.6 Motion economy and its importance. 2.7 Design of efficient workplace layout using motion economy. 2.8 Chart used for analyzing work place about. 2.9 Role and scope of micro motion study techniques. 2.10 Presentation of work elements in to therblings. 2.11 Preparation and use of SIM O chart. 2.12Use of film in micro motion study. 2.13Plant layout: Definition, types, applications, advantages and Limitations.	8

3	**CONTROLSCHARTSFORVARIABLESANDATTRIBUTES.** 3.1 Statistical basis for control charts-Variables and attributes. 3.2 Control charts for variables X-bar, R-chart bar-σ (sigma) chart. 3.3 Concept and applications of process capability.	**6**
4	**STATISTICALTOLERANCING.** 4.1Definitionandprincipleofstatisticaltolerance. 4.2Situationwhichleadstostatisticaltolerance. 4.3Calculationofoverall tolerance from given data of components.	**2**
5	**ACCEPTANCE SAMPLING** 5.1Qualitycontrolofincomingrawmaterial and components. 5.2Conceptsofrandomsampling. 5.3Samplingplans: definition, types (Single, double and multiple).	**3**
	SECTION-II	
6	**INTRODUCTION TO INDUSTRIAL MANAGEMENT** 6.1 Need, scope & importance of Industrial Management in Industries. 6.2 Management- definition & functions. 6.3 Industrial legislations like Factories Act, Minimum Wages Act, and Workmen's Compensation Act. 6.4 Morale & Job Satisfaction- Factors affecting Morale & Job satisfaction, Relationship between morale & productivity.	**6**
7	**MATERIALS MANAGEMENT** 7.1 Materials Management- definition, functions, importance 7.2 Purchase function- objective, purchasing systems, purchasing procedure.	**3**
8	**INVENTORY CONTROL** 8.1 Inventory control- definition, objectives, terms used, 8.2 Models of inventory control (Wilson's inventory model, two bin system). 8.3 EOQ (Calculations), ABC Analysis. 8.4 Material Requirement Planning.	**4**
9	**PRODUCTION PLANNING & CONTROL** 9.1 EBQ- calculation of EBQ 9.2 Gantt Charts 9.3 CPM& PERT – meaning, features, difference, applications, different terms used, types of floats, crashing of network.	**8**

Reference Books:

1. Handbook of Industrial Engineering Gavriel & Salvendy

2. Industrial Engineering R. C. Patel

3. Industrial Engineering Dalale- Mansurali

4. Production & Operations Mangement by K. Ashwatthappa

List of Experiments:

1. Replicate operation process chart for given assembly.
2. Replicate flow process chart and flow diagram for give assembly for OPC.
3. Replicate man and machine chart for given situation.
4. Perform X bar –R chart for given process.
5. Perform P-chart for given process.
6. Perform C-chart for given product.
7. Follow acceptance or rejection of a given lot of particular product using Single sampling or double sampling plan.
8. Follow case of refused overtime & unaccepted orders
9. Follow Case of precision Electronics Company
10. Replicate the network diagram for any small project and calculate the project duration and critical path
11. Perform Analysis of Case Study on application of Various Labour laws in companies
12. Perform the Plant Layout of Machine shop

Course Title	THERMAL POWER ENGINEERING	
Course Code	DME513	
Course Credit	Lecture : 3	
	Practical : 1	
	Tutorial : 0	
	Total : 4	

Course Objective

At end of the course, students will be able to:
- **Understanding** the application of Thermal Science like Boilers, Turbine, Condenser, and Cooling towers, IC Engine, Refrigeration & Air Conditioner and Heat Exchanger. **(Comprehension)**
- **Identify** Various Types of Power Plant conventional as well as non conventional. **(Knowledge)**
- **Differentiate** SI & CI engine. **(Comprehension)**
- Describe the power generation and its control. **(Comprehension)**

Detailed Syllabus

Module No.	Topics	No. Of hrs
	SECTION-I	
1	**BOILERS :** 1.1 Concepts, functions, features and classification 1.2 Boiler mounting and accessories. 1.3 Study of fluidized bed combustion 1.4 Boiler draught system.	4
2	**STEAM PRIME MOVERS:** 2.1 Concept of steam prime mover and Nozzles. 2.2 Impulse and reaction turbines. 2.3 Compounding of impulse steam turbine 2.4 Governing Of turbine.	3
3	**IC ENGINE:** 3.1 Concepts and classification of IC Engine. 3.2 I.C. engines parts and their functions. 3.3 Working of 2S and 4S cycles Spark Ignition (SI) and Compression Ignition (CI) engines. 3.4 Valve timing of I.C. engine and its explanation on PV diagram.	4

4	**REFRIGERATION & AIR CONDITIONER :** 4.1 Introduction, working on PV and TS diagrams and applications of Vapor Compression Refrigeration System. 4.2 Calculation of Coefficient Of Performance and Refrigeration effect. 4.3 Air conditioning- types and its applications 4.4 Psychometric and various Air conditioning processes on Psychometric charts.	4
5	**AIR COMPRESSOR** 5.1 Terminologies. 5.2 Classifications of Air compressor. 5.3 Working principle and performance of Reciprocating Air compressor. 5.4Volumetric Efficiency of Single stage Reciprocating Air compressor.	3
6	**HEAT EXCHANGERS, CONDENSERS & COOLING TOWERS :** 6.1 Introduction, types and applications of heat exchangers. 6.2 Classification and working of condensers. 6.3 Classification and working of cooling towers.	3

SECTION-II		
7.	**INTRODUCTION TO POWER PLANT :** 7.1 Objectives, Need, Scope & importance of PPE in industries 7.2 Sources of energy. 7.3 Power plants-concept, types and energy conversion 7.4 Central and captive power plants.	2
8.	**STEAM POWER PLANT :** 8.1 Power cycles and their importance. 8.2 Simple Rankine cycle. 8.3 Methods of improving Rankine cycle efficiency. 8.4 Reheat cycle and Regenerative cycle.	5
9.	**GAS TURBINE POWER PLANT :** 9.1 Concept of Brayton cycle. 9.2 Classification and application of gas turbine. 9.3 Advantages of gas turbine over diesel engine as prime mover. 9.4 Methods of improving performance of gas turbine plant.	4
10.	**NUCLEAR POWER PLANT :** 10.1 Basic nuclear physics fundamentals. 10.2 Basic elements of a nuclear reactor. 10.3 Classification of nuclear reactor. 10.4 Comparison of nuclear plant with steam power plant. 10.5 Disposal of nuclear waste.	3
11.	**HYDRO POWER PLANT :** 11.1 Purpose of multi-purpose hydro project. 11.2 Advantages and disadvantages of hydro power station considering the economic factor. 11.3 Basic elements of hydro power plant.	3

	11.4 Classification of Hydro-electric power plant. 11.5 Governing of water turbine.	
12.	**NON CONVENTIONAL POWER PLANTS :** 13.1 Wind Energy Power Plant. 13.2 Geothermal Power Plant. 13.3 Biomass Power Plant 13.4 Solar Power Plant 13.5 Municipal Solid Waste (MSW) Power Plant	**4**

Reference Books:

1. Thermal Engineering by R. K. Rajput, Laxmi Publishers.
2. Thermal Engineering by P. K. Nag, Khnna Publisher.
3. Thermal Engineering, by P. L.Ballaney, Khnna Publisher.
4. Power plant engineering by P. C. Sharma, S.K. Kataria & Sons publisher.
5. Power plant Engineering by S. Domkundwar, Dhanpat Rai & Co. (P) Limited.

List of Experiments:

1. Follow the Study of Boilers, Mounting & Accessories.
2. Follow the Study of Layout of Thermal Power Plant.
3. Follow the Study of Diesel Power Plant.
4. Follow the Study of Gas Turbine Power Plant.
5. Follow the Study of Nuclear Power Plant.
6. Follow the Study of Hydro Power Plant.
7. Performance in Heat Transfer by Conduction on Virtual Laboratory.
8. Performance in Heat Transfer by Natural Convection on Virtual Laboratory.
9. Performance in Heat Transfer by Radiation on Virtual Laboratory.
10. Performance of Single Stage Reciprocating Air Compressor.
11. Perform of the 4-Stroke diesel engine and prepare valve timing diagram.
12. Perform on Heat transfer from pin-fin apparatus.
13. Examine the COP of vapour Compression Refrigeration System.

Course Title	**REFRIGERATION AND AIR CONDITIONING SYSTEM**	
Course Code	DME515	
Course Credit	Lecture : 3	
	Practical : 1	
	Tutorial : 0	
	Total : 4	

Course Objective

At the completion of the course students should be able to:
- **Understanding** of different types of refrigeration system. **(Comprehensive)**
- **Understanding** different refrigerant.**(Comprehensive)**
- **Analyze** the COP of VCR system.**(Analysis)**
- **Apply** Psychometric System.**(Application)**

Detailed Syllabus

Module No.	Topics	No. Of hrs
	SECTION-I	
1	**INTRODUCTION.** 1.1 Know the objectives of learning this subject. 1.2 Need, Scope & importance of Refrigeration and Air conditioning (RAC). 1.3 Need of attitude, knowledge & skill required for application of RAC. 1.4 Refrigeration and Air conditioning: Importance, concept, basic principle, cycle of operation, need, classification and definition, Unit used.	2
2	**REFRIGERATION SYSTEMS.** 2.1 Bell- Coleman cycle, representation on P-V and S-T diagram. 2.2 C.O.P. 2.3 Types of refrigeration systems and their applications. 2.4 Simple vapour absorption system, working principle (NH_3- H_2O) and applications. 2.5 Primary and secondary refrigerant. 2.6 Classification. 2.7 Designation 2.8 Need of new refrigerants. 2.9 Desirable properties of refrigerants. 3.0 Properties of R 22, R 134a and R717.	4

3	**VAPOUR COMPRESSION REFRIGERATION SYSTEM (VCRS).** 3.1 Simple, standard vapour compression cycle and its analysis on P-h chart. 3.2 Calculations of refrigerating effect, work done and C.O.P., wet and dry compression, simple examples. 3.3 Effect of different parameters on vapour compression cycle. 3.4 Practical vapour compression system. 3.5 VCRS components, types, their construction, material of construction, specifications, working, common troubles -their causes and remedies , applications, (components include compressor (Reciprocating, Rotary, Screw and scroll),condensers(Air cooled and water cooled),evaporators(Dx type, flooded, shell and tube type) ,expansion devices (Automatic, thermostatic and capillary tube, High side float valve) and others. 3.6 Application of refrigeration and air conditioning in domestic and industrial context. 3.7 Ice Plant, cold storage, water cooler, domestic refrigerator, deep freezer, dessert cooler, window and split air conditioners- cycle and block diagram, components, working, common troubles-their causes and remedies.	**12**
4	**THERMAL INSULATION.** 4.1 Types of Insulation and their applications. 4.2 Salient features of thermocol & fiber glass.	**3**
	SECTION-II	
5	**APPLIED PSYCHOROMETRY.** 5.1 Psychometric properties of air such as Dry Bulb Temperature (DBT),Wet Bulb Temperature(WBT), Dew Point Temperature (DPT), absolute humidity, relative humidity, specific humidity, humidity ratio, degree of saturation, specific volume, enthalpy, familiarization with tables of psychometric properties of air, simple calculations. 5.2 Psychometric charts and their use. 5.3 Psychometric processes-sensible heating, sensible cooling, addition and removal of latent heat, adiabatic mixing of air streams, cooling and dehumidification, heating and humidification, adiabatic saturation, solution of problems using psychometric chart. 5.4 Psychrometry- sensible heat factor(SHF) and its determination with the help of psychometric chart, condition line room apparatus and coil apparatus dew point and their determination with the help of chart, estimation of dehumidified air quantity, bypass and contact factor. 5.5 Human Comfort-body temperature regulation, environmental influence on comfort, effective temperature and factors affecting it. 5.6. Comfort chart and its limitations. 5.7 Instruments for measuring psychometric properties-sling psychrometer	**9**

	dew point psychomotor, organic hygrometer, aspiration psychrometer-working and applications.	
6	**INTRODUCTION TO COOLING LOADS.** 6.1 Types, classification and normal values of cooling loads. 6.2 Design conditions. 6.3 Over all heat transfer co-efficient and its calculation. 6.4 Flywheel effect of building material. 6.5 Effect of wall construction on cooling load. 6.6 Concept of IHG and ICL. 6.7 Heat gain through glass. 6.8 Air infiltration and load due to it.	**3**
7	**AIR CONDITIONING AND AIR HANDLING SYSTEMS.** 7.1 Working principles and working of central plant and packaged plant. 7.2 Air filtration -various types, principles of working of different air filters. 7.3 Fans -classification, types, working, selection method, terminology used in fans, applications. 7.4 Velometer and pitottube : their construction and working. 7.5 Duct design, installation and commissioning- estimation of duct size by equal friction method with the help of charts and tables, estimation of losses in ducts, different material & layouts ,installation and commissioning steps and precautions . 7.6 Air Distribution-importance, terms used, different types of outlets, grill register, diffusers, location of outlets.	**7**
8	**REFRIGERATION AND AIR CONDITIONING SERVICING.** 9.1 Tube operations-service tools and special tools-applications and specifications. 9.2 System operation such as-vacuumization, leak detection, charging the system, pumping down, etc.-process, equipments used and their specifications.	**2**

Reference Books:

1.Refrigeration and Air conditioning Khurmi& Gupta S. Chand, New Delhi
2. Principle of Refrigeration Dossat R.J. Prentice Hall, USA
3. Basic Refrigeration and air conditioning(2nd Edition) P.N. Ananthanarayan Tata McGraw Hill
4. Refrigeration and Air conditioning Domkundwar Dhanpat Rai& Sons
5. Refrigeration and Air conditioning C.P. Arora Tata McGraw Hill

List of Experiments:

1. To understand different components of VCR system and to determine its COP
2. To understand working of Electrolux refrigerator and to determine its COP.
3. To understand construction and working of reciprocating, rotary and centrifugal compressor used for R&AC.
4. To understand various tools used for refrigeration tubing and and to perform various operations like flaring, swaging, bending, brazing etc.

5. To perform different psychometric processes and analyze the same using psychrometric chart.

6. To understand construction and working of window air-conditioner/ split air-conditioner and to determine its capacity.

7. To determine COP and apparatus dew point of an air conditioning test rig.

8. To calculate cooling load of a confined space using table and compare the same with load estimation sheet.

9. Study of domestic refrigerator and to determine % running time at different thermostat settings.

10. To determine (COP)C and (COP)H of heat pump

11. To determine saturation efficiency of air cooler/air washer

12. Study of packaged plant

Course Title	**FABRICATION TECHNOLOGY**	
Course Code	DME516	
Course Credit	Lecture : 3	
	Practical : 1	
	Tutorial : 0	
	Total : 4	

Course Objective

At the completion of the course students should be able to:

- **Understanding** of manufacturing system. **(Comprehension)**
- **Knowledge** about metal joining process. (**Knowledge)**
- **Interpret** different welding, piping & structural symbols. **(Comprehension**)
- **Know** about welding safety. (**Knowledge)**

Detailed Syllabus

Module No.	Topics	No. Of hrs
	SECTION - I	
1	**INTRODUCTION TO FABRICATION PROCESS** 3 To introduce about Fabrication process 4 Need, Scope of Fabrication 5 Material types. 6 Concept of weld ability. 7 Classification of power sources.	6
2	**FABRICATION DRAWING** 8 Welding symbols and standards 9 Piping symbols 10 Structure drawing 11 Interpretation of structure drawing 12 Process equipments. 13 Drawing for process.	4
3	**ADVANCE WELDING PROCESSES.** 14 Introduction 15 Types of welding process 16 Working principle of welding.	8

	17 Equipments used in welding process.	
	18 Non convectional welding process.	
4	**CUTTING PROCESS AND EDGE PREPARATION** 19 Cutting processes-types 20 Working principle for cutting. 21 Importance of edge preparation 22 Equipment	**3**

SECTION - II		
5	**QUALITY CONTROL AND INSPECTION** 23 Common weld defects 24 Codes used in fabrication work 25 Modes of inspection of weld work 26 Testing methods-types, features, standards, working, applications	**5**
6	**WELDING METALLURGY** 27 Welding Metallurgy & its analysis 28 Concept of preheating and post heating. 29 Welding heat flow diagram-concept, importance 30 Thermal distortion-concept, meaning, definition 31 Methods of relieving thermal stresses	**8**
7	**SURFACE FINISHING AND COATING.** 32 Introduction 33 Importance of finishing 34 Importance of coating	**6**
8	**WELDING SAFETY** 35 Need, precautions and safety norms during welding and fabrication process.	**2**

Reference Books:

1. Welding technology, O.P Khanna, DhanpatRai Publications New Delhi-22nd Edition.
2. Welding engineering and technology, Parmar, R.S., Khanna Publishers, New Delhi-1St edition.
3. Metal cutting science and production technology Jain, K.C.; Agrawal L.N. Khanna Publishers, New Delhi-4th edition.

List of Experiments:

1. Interpretation of fabrication drawing: For fabrication / welding drawing.
2. Prepare WPS and WPQ
3. Complex job as mini project work.
4. Prepare SWP and WTP.
5. Liquid penetrate testing.

Course Title	ADVANCE MANUFACTURING TECHNOLOGY		
Course Code	DME517		
Course Credit	Lecture : 3		
	Practical : 1		
	Tutorial : 0		
	Total : 4		

Course Objective

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

- **Understand** concepts of Advanced Manufacturing technology as Well as System.**(Comprehension)**
- **Understand** Various Advanced Manufacturing Process Technology, System, CNC & Non-conventional Processes & Machine. Jig, Fixture, etc.**(Comprehension)**
- **Analyze** and Make models of JIT, FMS, and Process Planning.**(Analysis)**
- **Relate** application of Robotics.**(Knowledge)**

Detailed Syllabus

Module No.	Topics	No. Of Sessions
	SECTION-I	
1	**INTRODUCTION TO ADVANCED MANUFACTURING:** 1.1 Know the objectives of learning this subject. 1.2 Need Scope & importance of ADVANCED MANUFACTURING TECH. 1.3 Recall evolution of transformation & manufacturing systems.	2
2	**NON CONVENTIONAL MACHINING PROCESS :** 2.1 Electrochemical machining 2.2 Electrical discharge machining 2.3 Ultrasonic machining 2.4 Electrochemical Grinding 2.5 Abrasive Jet Machining 2.6 laser machining 2.7 Chemical machining	5
3	**GRINDING & SUPER FINISHING PROCESS :** 3.1 Cutting action of Grinding Wheel. 3.2 Grinding Wheels: Types, materials, nomenclature, selection criteria and applications. 3.3 Terms associated with Grinding wheel operations. 3.4 Grinding operations:	6

	• Surface (rotary and sliding) grinding machines. • Cylindrical (center less, internal, external) grinding machines. • Bench and portable grinder. • Tool and cutter grinding machine. • Profile grinding. 3.5 Super Finishing Process (Honing, Lapping and Super finishing).	
4	**GEAR MANUFACTURING :** 4.1 Generating and forming processes. 4.2 Gear forming methods 4.3 Gear generating methods 4.4 Gear grinding and super finishing	4
5	**BROACHING OPERATIONS:** 5.1 Need, types, constructional features and applications. 5.2 Broaching methods. 5.3 Shapes which can be broached. 5.4 Special features and comparison. 5.5 Need, constructional features, working principle and applications of Broaching.	4
	SECTION II	
6	**JIG AND FIXTURE:** 6.1 Introduction - concept, purpose, definitions, principles and differences of jigs and fixtures. 6.2 Location and clamping- principles, types, features, working, Importance and applications. 6.3 Jig types, working, components&, applications. 6.4 Fixture meaning, types, applications, working, components and application.	3
7	**CELLULAR MANUFACTURING AND GROUP TECHNOLOGY :** 7.1 Concept and definition, application and benefits. 7.2 Part family and cell formation. 7.3 Composite component and key machine concepts. 7.4 Types of cell. 7.5 GT- concept, definition, need, scope &benefits.	4
8	**MANUFACTURING TECHNIQUE :** 8.1 Just In Time -JIT concept, meaning, definition. 8.2 JIT implementation requirement. 8.3 Kanban System 8.4 flexible manufacturing System (FMS)-concept, meaning &benefits, major elements and their role. 8.5 Six Sigma system 8.6 Kaizen system	5

9	**5 S Methodology:** 9.1 Introduction 9.2 5s Implementation requirement. 9.3 Elements of 5S 9.4 Variety of 5s Application 9.5 Advantages and limitations of 5s.	**4**
10	**ROBOTICS :** 10.1 Introduction 10.2 Robots-concept, definition, benefits. 10.3 Robots- types, classification, various terminologies, specification criterion. 10.4 Sensors-types, classifications, working and applications.	**5**

Reference Books:

2. Machine tools technology, G. S. Kandaswami.

3. Metal cutting technology & Experiments, K. G. Chaniramani.

4. Production Technology, HMT.

5. Production Technology by R.K.Jain, Khanna Publication

6. CIM P. Radha Krishnan & S.subranarayan

List of experiments:

1. Follow on Kinematics & Motion transmission cylindrical grinding machine
2. Follow on Kinematics & motion transmission of gear hobbing & gear shaping machine
3. Follow on non-conventional machining process.
4. Follow on grinding various cutting tools angles on tool & cutter grinding machine.
5. Follow on advanced manufacturing system.
6. Follow on flexible manufacturing system with protocols.
7. Follow on 5s methodology with application.
8. Replicate the robotics & its Applications.
9. Perform the simulation of Pick & Place Robot Programming.
10. Follow the design of a jig for a given component.
11. Follow the design of a fixture for a given component.
12. Follow on the Industrial visit of Non Conventional machine manufactures.

RKUNIVERSITY

Course Title	MINI PROJECT	
Course Code	DME518	
Course Credit	Lecture : 00	
	Practical : 01	
	Tutorial : 00	
	Total : 01	

Course Learning Outcomes

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

Project Definition

Project work shall be based on any of the following or other:
- Fabrication of product/ testing setup of an experimentation unit/ apparatus/ small equipment, in a group.
- Experimental verification of principles used in Mechanical **Engineering** Applications.
- Product design and development.
- Design and development of laboratory equipment /test rigs.
- Developing computer programs/software.
- Industry based project.
- Industry need based basic survey or Testing or Analysis etc.

Instructional Method and Pedagogy:

- Your project work carried out in 5th semester.
- Preliminary work of project should be completed within project work like Finalization of topic, literature study, methodology etc.
- Each student should maintain log book for the progress of project work. In this book you will keep a log of your weekly work. You must get this signed (and dated) by your supervisor every week. It will be handed in with your final report, and should cover the following headings:

o Progress (from previous week)
o Problems & Queries,
o Objectives (for next week)
o Date of Meeting
o Sign of Supervisor

- Each student must prepare and submit the Report with CD-R which will consists of doc & .pdf format of report and .ppt format of presentation at the time of final presentation of project.
- One copy of the report should be submitted to Institute/ Department, one copy to Guide and one copy should remain with each student of the project group. The project term work shall be evaluated based on reviews.
- Oral examination shall be conducted along with final presentation of the project.

Report Layout

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

Project Report Preparation Guideline

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

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

Course Title	INDUSTRIAL TRAINING
Course Code	DME601
Total Credits	25

OBJECTIVES

Objectives of the objectives of a program of Industrial Training are:

- Applying acquired knowledge in problem-based exercises in real life industrial projects.
- Ensuring the relevant degree coursework and training programs conducted according to the expectations of the industry, to ensure the subject contents are relevant and up to date.
- Providing opportunity for students to acquire practical skills and experience working on projects alongside industry experts.
- Providing an opportunity for students to acquire interpersonal skills and ability for team work through interaction with professionals in their field of study.
- Learning about ethics in the industry.
- Learning accepted safety practices in the industry.
- Providing an opportunity for students to learn about the industry of their discipline and related environment.
- Providing an opportunity for the industry to identify potential employees and to feedback comments on the degree program at large.
- Providing opportunity to obtain knowledge of how to make optimal decisions to resolve work challenges.
- Overall, students will gain experience in the following:
  - Organizational skills and professional awareness.
  - Ability to work under supervision and directions.
  - Efficiently completing tasks, fostering good relationship with seniors and subordinates.
  - Communication skills and contribution to company.

Learning Outcomes

Upon completion of Industrial Training, learners shall be able to:

- Extend the boundaries of knowledge through research and development.
- Develop significant commitment in the students 'profession/specialization.
- Integrate classroom theory with workplace practice.
- Develop greater clarity about academic and career goals.

- Develop new or advanced skills.
- Develop lifelong learning skills.
- Gain understanding of administrative functions and company culture.
- Appreciate the ethical basis of professional practice in relevant industry.
- Display a capacity for critical reasoning and independent learning.
- Exercise the role of the professional/specialist/manager/supervisor confidently in the relevant industry.
- Write formatted report explaining the work in industrial training and describing the experience.
- Assess the adequacy of training.
- Explore options in career plans and goals.
- Make a gradual transition from academia to career.