ORDINANCE

FOR

DIPLOMA IN MECHANICAL ENGINEERING (CAD/CAM)

GNA UNIVERSITY

Inspiring Innovation.....

(THIS ORDINANCE HAS BEEN APPROVED IN THE MEETING OF BOARD OF STUDIES HELD ON DATED 27 May, 2022)

APPLICABLE W.E.F. ACADEMIC SESSION 2022-2023

SRI HARGOBINDGARH, PHAGWARA – HOSHIARPUR ROAD,
PHAGWARA 144401, PUNJAB

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ORDINANCE FOR DIPLOMA IN MECHANICAL ENGINEERING (CAD/CAM)

SHORT TITLE AND COMMENCEMENT

I. This Ordinance shall be called the Ordinance for the Diploma in Mechanical Engineering (CAD/CAM) of GNA University, Phagwara.

II. This ordinance shall come into force with effect from academic session 2022-23.

1. Name of Program: Diploma in Mechanical Engineering (CAD/CAM)

2. Name of Faculty: Faculty of Engineering, Design and Automation.

3. Program Outcomes:

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

II) Problem analysis: Identify, formulate, research literature, and analyze engineering problems to arrive at substantiated conclusions using first principles of mathematics, natural, and engineering sciences.

III) Design/development of solutions: Design solutions for complex engineering problems and design system components, processes to meet the specifications with consideration for the public health and safety, and the cultural, societal, and environmental considerations.

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

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

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

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

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

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

X) Communication: Communicate effectively with the engineering community and with society at large. Be able to comprehend and write effective reports documentation. Make effective presentations, and give and receive clear instructions.

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

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

4. Program Specific Outcomes: Total duration of the Program shall be of 3 years and each year will comprise of two semesters. In addition, each semester shall normally have 90 working days. If the student is unable to complete its program in prescribed period then he/she will be given 2 more years to complete the program by paying the tuition fees for each semester.

5. Eligibility for Admission: 10th standard with 50% marks in aggregate (45 % for SC/ST/OBC). The students who passed ITI (in Technical field) 1 year/ 2 years Certificate course after 10th or 2 years Diploma from SLIET or 10+2 Vocational (in Technical field) or 10+2 (Non-Medical) or equivalent from any recognized Board or Council.

6. Admission Process: The centralized admission cell shall make selection for admission to the program. The selection of the candidate shall be strictly on merit basis, subject to fulfillment of eligibility criteria. Candidates are required to fill the prescribed application form and submit the same to the admission cell. The admission cell after verifying the eligibility will forward the form to the Office of Registrar for further processing. If the candidate is selected, he/she is required to deposit the prescribed fee along with the application form and the required documents to the Office of Registrar.

7. Curriculum: The 4 years curriculum has been divided into 8 semesters and shall include lectures/tutorials/laboratory work/field work/outreach activity/project work/vocational training/viva/seminars/presentations/term papers/assignments etc. or a combination of some of these. The curriculum will also include other curricular, co-curricular and extra curricular activities as may be prescribed by the University from time to time.

8. Choice Based Credit System:

The University has adopted Choice Based Credit System (CBCS), which provides an opportunity to the students to choose courses from the offered courses comprising of Core, Elective, Ability Enhancement and Audit Courses. The choice based credit system provides a "flexible" approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning. Following are the types of courses and structure for the program:

Course Categories:

I. BSC:	Basic Science Courses
II. ESC:	Engineering Science Courses
III. HSMC:	Humanities and Social Sciences including Management courses
IV. PCC:	Professional core courses
V. PEC:	Professional Elective courses
VI. OEC:	Open Elective courses
VII. LC:	Laboratory course
VIII.MC:	Mandatory courses (Audit Course)
IX. PROJ:	Project

9. Audit Course

The introduction of two Audit courses covering subjects of developing desired attitude among the learners is on the line of initiatives such as Unnat Bharat Abhiyan, Yoga, Value education, Disaster management, Sanskrit, Pedagogy, Constitution of India, Personality development through Indian culture etc.

Introducing Research Component:

Project work/Dissertation is considered as a special course involving application of knowledge in solving / analysing /exploring a real-life situation / difficult problem. A Project/Dissertation

work may be given in lieu of a discipline specific elective paper.

10. Medium of Instructions:

10.1 The medium of instructions and examination will be English.

10.2 Practical work/Project Work / Project Report / Dissertation / Field Work Report / Training Report etc., if any, should be presented in English.

11. Mode: The program is offered in 'Full Time' mode of study only.

12. Attendance Requirement to be Eligible to Appear in End Semester Examination:

12.1 Every student is required to attend at least 75% of the lectures delivered squaring tutorials, practical and other prescribed curricular and co-curricular activities.

12.2 Dean of Faculty may give a further relaxation of attendance up to 5% to a student provided that he/she has been absent with prior permission of the Dean of the Faculty for the reasons acceptable to him/her.

12.3 Further, relaxation upto 10% may be given by The Vice Chancellor to make a student eligible under special circumstances only.

12.4 No student will be allowed to appear in the end semester examination if he/she does not satisfy the attendance requirements. Further, the attendance shall be counted from the date of admission in the University or commencement of academic session whichever is later.

13.Credit: Each course, except a few special audit courses, has a certain number of credits assigned to it depending upon its lecture, tutorial and/or laboratory contact hours in a week. A letter grade, corresponding to specified number of grade points, is awarded in each course for which a student is registered. On obtaining a pass grade, the student accumulates the course credits as earned credits. A student's performance is measured by the number of credits that he/she has earned and by the weighted grade point average. A minimum number of credits should be acquired to qualify for the programs. The absolute grading system has been followed for awarding grades in a course.

Contact Hours per Week	Credit Assigned
1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
2 Hours Practical (Lab) per week	1 credit

14. Program Structure:

Semester I

S. No.	Pre-Requisites	Course Code	Course Title	Hours per week			Marks Distribution			Credits
				L	T	P	Internal	External	Total	
1.	N.A	DPC101	Chemistry for Engineering	3	0	0	40	60	100	3
2.	N.A	DPM101	Mathematics for Engineering-I	3	0	0	40	60	100	3
3.	N.A	DIP101	Drawing for Engineering	1	0	6	40	60	100	4
4.	N.A	DIP102	Engineering for Fun	0	0	4	60	40	100	2
5.	N.A	COM101	English Communication	2	0	0	40	60	100	2
6.	N.A	DPC121	Chemistry for Engineering Laboratory	0	0	2	30	20	50	1
7.	N.A	COM121	English Communication Laboratory	0	0	2	30	20	50	1
Total										**16**

Semester II

S. No.	Pre-Requisites	Course Code	Course Title	Hours per week			Marks Distribution			Credits
				L	T	P	Internal	External	Total	
1.	N.A	DPP101	Physics for Engineering	3	0	0	40	60	100	3
2.	DPM101	DPM101	Mathematics for Engineering-I	3	0	0	40	60	100	3
3.	N.A	DIP103	Computing for Engineers	3	0	0	40	60	100	3
4.	N.A	DIP104	Basic Workshop Practices	0	0	6	60	40	100	3
5.	N.A	DIP105	Fundamentals of Electronics and Electrical Engineering	3	0	0	40	60	100	3
6.	COM101	COM201	Business Communication	2	0	0	40	60	100	2
7.	N.A	DPP121	Physics for Engineering Laboratory	0	0	2	30	20	50	1
8.	N.A	DIP123	Computing for Engineers Laboratory	0	0	2	30	20	50	1
9.	COM121	COM221	Business Communication Laboratory	0	0	2	30	20	50	1
										20

Semester III

S. No.	Pre-Requisites	Course Code	Course Title	Hours per week			Marks Distribution			Credits
				Lecture	Tutorial	Practical	Internal	External	Total	
1.	NA	DME301	Applied Thermodynamics	3	1	0	40	60	100	4
2.	NA	DME302	Theory of Machine	3	1	0	40	60	100	4
3.	NA	DME303	Materials and Metallurgy	3	0	0	40	60	100	3
4.	NA	DME304	Manufacturing Processes	3	0	0	40	60	100	3
5.	DIP104	DME305	Applied Mechanics	3	0	0	40	60	100	3
6.	DIP101	DCC322	Introduction to AutoCAD	0	0	4	60	40	100	2
7.	NA	DME321	Applied Thermodynamics Laboratory	0	0	2	30	20	50	1
8.	NA	DME322	Theory of Machine Laboratory	0	0	2	30	20	50	1
9.	NA	DME323	Materials and Metallurgy Laboratory	0	0	2	30	20	50	1
10.	NA	DME324	Manufacturing Processes Laboratory	0	0	2	30	20	50	1
Total										**23**

Semester IV

S. No.	Pre-Requisites	Course Code	Course Title	Hours per week			Marks Distribution			Credits
				Lecture	Tutorial	Practical	Internal	External	Total	
1.	NA	DME401	Fluid Mechanics	3	1	0	40	60	100	4
2.	NA	DME402	Strength of Material	3	1	0	40	60	100	4
3.	DIP104	DME403	Production Technology	3	0	0	40	60	100	3
4.	DME301	DME404	Refrigeration and Air Conditioning	3	1	0	40	60	100	4
5.	DCC301	DCC422	Foundation of CAD	0	0	4	60	40	100	4
6.	NA	ENS001	Environmental Studies	2	0	0	40	NA	40	S/US
7.	NA	DME421	Fluid Mechanics Laboratory	0	0	2	30	20	50	1
8.	NA	DME422	Strength of Material Laboratory	0	0	2	30	20	50	1
9.	NA	DME424	Refrigeration and Air Conditioning Laboratory	0	0	2	30	20	50	1
										20

Semester V

S. No.	Pre-Requisites	Course Code	Course Title	Hours per week			Marks Distribution			Credits
				Lecture	Tutorial	Practical	Internal	External	Total	
1.	NA	DME501	Mechanical Measurement	3	0	0	40	60	100	3
2.	NA	DME502	Automobile Engineering	3	0	0	40	60	100	3
3.	DCC401	DCC501	CAM Technology	2	0	0	40	60	100	2
4.	NA	DIP500	Industrial Training and Report	0	0	0	60	40	100	2
5.	NA	DME521	Mechanical Measurement Laboratory	0	0	2	30	20	50	1
6.	NA	DME522	Material Engineering Laboratory	0	0	2	30	20	50	1
7.	NA	DCC521	CAM Technology Laboratory	0	0	4	60	40	100	2
8.	DCC401	DCC523	Advanced Design in CAD	0	0	4	60	40	100	2
9.	NA		Elective-1	3	0	0	40	60	100	3
Total										**19**

Semester VI

S. No.	Pre-Requisites	Course Code	Course Title	Hours per week			Marks Distribution			Credits
				Lecture	Tutorial	Practical	Internal	External	Total	
1.	NA	DCC601	Hydraulics and Pneumatics	3	0	0	40	60	100	3
2.	DCC501 DCC502	DCC602	Tool Design	2	0	0	40	60	100	2
3.	DME302 DME402	DME602	Design of Machine Elements	3	1	0	40	60	100	4
4.	NA	DIP600	Major Project	0	0	4	60	40	100	2

4.	NA	DIP600	Major Project	0	0	4	60	40	100	2
5.	NA	DCC621	Hydraulics and Pneumatics Laboratory	0	0	2	30	20	50	1
6.	NA	DCC622	Tool Design Laboratory	0	0	2	30	20	50	1
7.	NA	DCC623	Advanced Computer Aided Drafting	0	0	4	60	40	100	2
8.	NA		Elective-2	3	0	0	40	60	100	3
Total										**18**

List of Electives

Electives -1							
S. No.	**Pre-Requisites**	**Course Code**	**Course Title**	**Lecture**	**Tutorial**	**Practical**	**Credits**
1.	NA	DME541	Power Plant Engineering	3	0	0	3
2.	NA	DME542	Non-Conventional Energy Resources	3	0	0	3
3.	NA	DME543	STEM Technology	3	0	0	3
Electives -2							
1.	NA	DME641	Industrial Engineering	3	0	0	3
2.	NA	DME642	Production Planning and Control	3	0	0	3
3.	NA	DME643	Non-Destructive Testing	3	0	0	3

15. Examination/Continuous Assessment System (CAS):

For CAS two assessment components are adopted to evaluate student's performance.

15.1 Internal Assessment, which includes attendance, mid semester examination and other components (Assignment, Snap Test, Project, Research Based Assignments, Practical Lab Continuous Assessment, Quiz, Multiple Choice Questions, Case Study, Field Survey/Field Report etc.) carrying a weightage of 40%.

15.2 External Assessment i.e. End Semester Examination, carrying a weightage of 60%.

15.3 Internal assessment of practicals i.e. Practical Lab Continuous Assessment carrying a weightage of 60%.

15.4 External assessment of practicals i.e. Practical Lab External, carrying a weightage of 40%.

15.5 Every student has to score at least 25% marks each in Continuous Assessment and End Semester examination. The minimum pass percentage is 40% in aggregate. In case a student scores more than 25% each in Continuous Assessment and End Semester examination, but overall percentage in the concerned subject remains less than 40% , then student has to repeat End Semester Examination in that subject.

15.6 Internal Assessment of practical's i.e., Practical Lab Continuous Assessment, carrying a weightage of 60%

15.7 External Assessment of practical's i.e., Practical Lab External, carrying a weightage of 40%

16. Grading System: University follows eight letter grading system (A+, A, B+, B, C+, C, D, and F) that have grade points with values distributed on a 10 point scale for evaluating the performance of student. The letter grades and the corresponding grade points on the 10-point scale are as given in the table below.

NB: The CGPA can be converted to percentage by using the given formula:

CGPA x 10 = %

e.g. 7.8 x 10 = 78%

Note: Cumulative Grade Point Average (CGPA), it is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

Academic Performance	Range of Marks	Grades	Grades Points	Remarks
Outstanding	≥90	A+	10	
Excellent	≥80 & <90	A	9	
Very Good	≥70 & <80	B+	8	
Good	≥60 & <70	B	7	
Fair	≥50 & <60	C+	6	
Average	≥40 & <50	C	5	
Minimally Acceptable	40	D	4	
Fail	<40	F	0	
Incomplete		I	-	
Withdrawal		W		
Grade Awaited		GA	-	
Minor Project		**S/US**		S-Satisfactory US-Unsatisfactory

16.1 Acceptance of MOOC courses

Faculty of Faculty of Engineering, Design and Automation accepts the MOOC course available on SWAYAM platform for credit transfer. 40% of the courses can be taken from the available list of MOOCs on SWAYAM.

Instructions for MOOC courses

a) MOOC courses taken for credit transfer must be approved and recommended by Dean Academics and Dean of the Faculty before the start of the semester.

b) The copy of the list of courses taken by the students for any course has to be submitted to the Controller of the Examination.

c) MOOC course should be done from SWAYAM platform as per the guidelines of UGC.

d) To obtain the credit the student needs to complete the assessment of the course and provide the certificate of the course issued by the SWAYAM/NPTEL. After completing the certificate, the student must submit the certificate within a week to the department.

e) The fees (if any) for the registration and / or assessment of the MOOC course must be borne by the student only.

f) The student can opt for a particular online MOOC course if and only if the credit of that course is equivalently mapped with the program structure.

g) If the student obtains the same course credit which mapped with the course, then credit shall be considered for this course and the grade/marks provided by the accessing authority shall be transfer to the student. The result of the MOOC shall be taken on record by the university examination cell and a result declared for these papers.

h) For any particular semester, all results for the MOOC course must be submitted along with the marks of other papers of the same semester by the course coordinator.

I) MOOC course coordinators shall be appointed for each of the course taken by the student.

Contact Hours per Week	Credit Assigned
1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
2 Hours Practical (Lab) per week	1 credit

17. Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester. The grade certificate will display the course details (Course title, number of credits, grade secured) along with SGPA of that semester and CGPA earned till that semester.

18. Re-appear: Student with backlog of one semester will be carried forward to next semester. Re-appear examinations will be conducted twice in a year after ESE of every semester.

19. Improvement of overall Score: A candidate having CGPA < 5.5 and wishes to improve his/her overall score may do so within two academic years immediately after passing the degree program by reappearing into maximum four course(s)/subject(s). The improvement would be considered if and only if the CGPA becomes > 5.5.

20. Program qualifying criteria: For qualifying the Program every student is required to earn prescribed credits (116). If any student fails to earn prescribed credits (116) for the program then he/she will get a chance to complete his/her Program in two more years than the actual duration of degree.

21. Revision of Regulations, Curriculum and Syllabi: The University may revise, amend, change or update the Regulations, Curriculum, Syllabus and Scheme of examinations through the Board of Studies and the Academic Council as and when required.

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DIPLOMA IN MECHANICAL ENGINEERING (CAD/CAM)

FACULTY OF ENGINEERING, DESIGN & AUTOMATION

(Applicable for 2022-2023 onwards)

DPC101: CHEMISTRY FOR ENGINEERING
Credits: 3
LTP 300

Course Description: The purpose of this course is to develop a strong foundation in basic chemistry that will help students to understand and explain scientifically various chemistry related problems in the industry/Engineering field.

Course Outcomes (CO):

After completion of this course, students will be able to:

CO1: Understand chemical equations and formulae of chemistry.

CO2: Recognise and differentiate functional groups.

CO3: Understand different atomic and molecular properties.

CO4: Distinguish different types of polymers.

Unit I

Language of Chemistry: Symbol, formula, empirical and molecular formula, valency and chemical equation, chemical formula of a simple chemical compound. Empirical formula and molecular formula of a chemical compound. Balancing of chemical equation.

Unit II

Atomic Structure: Atom and its constituent particle, Dalton's atomic theory, Rutherford's model, Bohr's model, atomic number, mass number, isotopes, isobars, Atomic orbitals & Shapes of s and p orbitals, quantum numbers, electronic configuration- Aufbau Principal,

Hund's rule and Pauli's Exclusion principal.

Periodic Table: Modern Periodic Law, salient features of Modern Periodic table (Period and Groups).

Unit III

Chemical Bonding: Valency, Electrovalent bond & their properties, Lewis symbols, Covalent bond & their properties, and coordinate bond.

Solutions: Solution, solute and solvent, Types of solutions, Mole concept, Molarity, Normality.

Unit IV

Polymers: Polymerization & its types, Addition & Condensation Polymerization, Plastics & their types, Advantages of plastics over Traditional materials, Preparation of Polythene, PVC , Teflon, Polystyrene ,Urea formaldehyde & their uses.

Classification and Nomenclature of Organic Compound: Homologous series, Functional groups, IUPAC Nomenclature of Hydrocarbons, Alcohols, Aldehydes and Ketones & Carboxylic acids, amines & acid amides.

Recommended Books / Suggested Readings:

1. Dr. Kumar, R & Kumar, Y, 2014, *Applied Chemistry,* 1st edition, Mahalakshmi Publication.

2. Kumar, S.S, 2009, *A Text Book of Applied Chemistry-I;* Tata McGraw Hill, Delhi.

3. Kuriacose, J C&Raja Ram, J, 2007, *Chemistry in Engineering;* Tata McGraw- Hill Publishing Company Limited, New Delhi.

4. Dr.Rabindra, S and Prof. Mishra, B K, 2012, *Engineering Chemistry,* Kumar and Kumar Publishers (P) Ltd.

DPC121: CHEMISTRY FOR ENGINEERING LABORATORY

Credits : 1

LTP 002

Course Description: This course is offered to the students as a fundamental course. The experiments included in the course provide the students a solid foundation in chemistry laboratory with practical implementation of fundamental concepts.

Course Outcomes (CO):

On successful completion of this module, students should be:

CO1: Able to learn to estimate the impurities present in water.

CO2: Able to prepare polymer materials.

CO3: Able to calculate essential properties of liquid.

CO4: Able to calculate strength of solution.

List of practical:

1. Volumetric analysis and study of apparatus used there in. Simple problems on volumetric analysis.
2. To prepare a standard solution of EDTA.
3. Estimate the temporary & total hardness of a sample of water by std. EDTA Solution.
4. Estimation of amount of Dissolved Oxygen (D.O) in given water sample.
5. Determine the viscosity of a given unknown liquid with the help of “Ostwald's viscometer”.
6. Determination of surface tension of unknown liquid by drop number method.
7. To prepare urea-formaldehyde resin.
8. To prepare phenol-formaldehyde resin.
9. Determine the strength of given solution of Sodium hydroxide with the help of a standard solution of Hydrochloric acid.
10. Determine the strength of a given solution of sodium hydroxide with the help of a standard solution of oxalic acid.
11. Estimate the amount of chlorides present in water using silver nitrate solution. (Indicator potassium chromate).

DPM101: MATHEMATICS FOR ENGINEERING-I

Credits : 3

LTP 300

Course Description: The course is aimed at developing the basic Mathematical skills for engineering students that are imperative for effective understanding of engineering subjects. The topics introduced will serve as basic tools for specialized studies in many Engineering fields. The four main sections: Matrix and determinant; trigonometry; complex numbers and plane geometry.

Course Outcomes (CO):

CO1: Solve qualitative problems based on vector matrix and determinant.

CO2: Recognize and use the vocabulary of t-ratios.

CO3: Earn the concept of imaginary numbers and gives awareness about algebra of complex numbers which helps in understanding of engineering problems related to complex numbers

CO4: Impart knowledge about coordinate geometry in two dimensions.

Unit I

Algebra- Determinants and Matrices – expansion of determinants (up to third order), solution of equations (up to 3 unknowns) by Cramer's rule. Definition of matrix, addition, subtraction, multiplication of matrices, minors and co-factors, inverse of a matrix by ad joint method (up to second order).

Unit II

Trigonometry- Review of ratios of some standard angles (0, 30, 45, 60, 90 degrees), T-Ratios of Allied angles (without proof), Sum, difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa).

Unit III

Complex numbers- Definition of complex numbers, real and imaginary parts of a complex number, conjugate of a complex number, modulus and argument of a complex number, addition, subtraction, multiplication and division of a complex number.

Unit IV

Co-ordinate Geometry- Equation of straight line in various standard forms (without proof), intersection of two straight lines, angle between two lines, perpendicular distance formula (without proof).

Suggested Readings:

1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics by Vol. I & II by S Kohli, IPH, Jalandhar
3. Applied Mathematics by Dr. RD Sharma, Dhanpat Rai Publications, Delh
4. Applied Mathematics, Vol. I & II by SS Sabharwal &Sunita Jain, Eagle Parkashan, Jalandhar
5. Comprehensive Mathematics, Vol. I & II by Laxmi Publications, Delhi.

DIP101: DRAWING FOR ENGINEERING

Credits : 4

LTP 106

Course Description: Engineering drawing is said to be the language of engineers and it is essential for every engineer to understand the principles of engineering drawing. So, the course aims at enabling the students to understand basic concepts of engineering drawing and its importance, visualization of geometrical objects and engineering objects.

Course Outcomes (CO):

After completion of this course students will be able to

CO1: Construct a scale, understand, and apply the principles of dimensioning, and learn the use of various types of lines used in engineering drawing.

CO2: Draw orthographic projections of two- and three-dimensional objects.

CO3: Draw sectional views of regular solids like prism, pyramid, cone, cylinder, cube, etc.

CO4: Develop geometrical surfaces and convert orthographic projections into isometric projections.

Course Content

Unit I

Introduction: Drawing Instruments and their uses, Lettering, Dimensioning, scales (plane and diagonal), types of lines.

Unit II

Orthographic Projections of Points, lines and planes: Introduction, Definitions - Planes of projection, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True length and inclination (Rotation Method), Projections of Plane Surfaces (First Angle Projection Only) (regular plane figures), planes in different positions by change of position method only.

Unit III

Projections and sectioning of solids: (First Angle Projection Only) Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders, and cones in different positions. Introduction of Section planes, Sections, Sectional views, apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP.

Unit IV

Development of Surfaces: Development of lateral surfaces of solids using parallel line and radial line methods.

Isometric Projections: Introduction, isometric scale, isometric projections of solids.

Suggested Readings:

1. Engineering Drawing & Computer graphics by P.S.Gill
2. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48thedition, 2005-Charotar Publishing House, Gujarat.
3. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K International Publishing House Pvt. Ltd., New Delhi, 3rdrevised edition- 2006.
4. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005- Prentice-Hall of India Pvt. Ltd., New Delhi.
5. D.M. Kulkarni, A. P. Rastogi, and A. K. Sarkar (2009), Engineering Graphics with AutoCAD,PHI Learning Private Limited, New Delhi.
6. Engineering Drawing & Computer graphics by Harwinder Singh, Dhanpat Rai Publishing Company.
7. Jolhe, Dhananjay (2006), Engineering Drawing: With an Introduction to CAD, Tata Mc GrawHill, India.

DIP102: ENGINEERING FOR FUN

Credits : 2

LTP 004

Course Description: The course aims to bring joy and confidence for the students just entered into the study of engineering by assigning them some project work based on various laws and principles of science and engineering.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to

CO1: Creating the joy of engineering experimentation and skills

CO2: To help students develop problem solving strategies and confidence

CO3: be oriented to the application of theory or principles into engineering roles

Course Content

In this course, the students will be assigned some project work based on the laws and principles of science and engineering. The evaluation of the students will be based on their performance to the assigned project.

COM 101: ENGLISH COMMUNICATION

Credits : 2

LTP 200

Course Description: The course aims to make students capable of using English language in context, and enhance effective reading and writing skills.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: The students will develop a minute practical knowledge about English grammar and its usage.

CO2: The students will develop an understanding of the importance of free expression

Course Content:

1. Reading Skills: Comprehension of Unseen Passage [Reading articles](Intermediate)Summary Paraphrasing, Translation and Precis Writing

2. English Grammar and Usage: Parts of speech, common errors in writing (based on Parts of Speech) Tenses, Change of Voice, Transformation of Sentences

3. Basic Writing Skills and Writing Practices:Paragraph/essay writing, short life story writing, Notice (General like trip, change of name, function) making notes and Letter writing

4. Vocabulary Enhancement: Synonym, Antonym, Idioms and Phrasal verbs.

Recommended Books / Suggested Readings:

1. Practical English Usage. Michael Swan OUP. 1995

2. On Writing Well. William Zinsser. Harper Resource Book. 2001

3. Communication Skills.Sanjay Kumar and PushpLata.Oxford University Press. 2006

4. Exercises in Spoken English. CIEFL, Hyderabad. Oxford University Press

5.https://www.englishgrammar101.com/

6.http://learnenglish.britishcouncil.org/en/english-grammar

7.http://www.englishgrammarsecrets.com/

8.http://www.myenglishpages.com/

9. http://www.english-for-students.com/Homonyms-B.html

COM 121: ENGLISH COMMUNICATION LABORATORY

Credits : 1

LTP 002

Course Description: The course aims to equip the students with focus on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

The course includes description of sights seen in everyday life, pronunciation of different words and its correct usage.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Better understanding of nuances of English language through audio- visual experience and group activities

CO2: Speaking skills with clarity and confidence enhancing their employability skills

CO3: Better comprehension of speech of people of different backgrounds and regions.

CO4: Ability to use English grammar accurately.

Course Content

1. Daily Discourse: Common Everyday Situations: Conversations and Dialogues (Unit 1-6), Monologue (2D/4D/5D/6D), and Communication at workplace.
2. Listening skills on Social Interactions (Unit 1), work and study (Unit 2), daily life (Unit 3), food (Unit 4), Places (Unit 5) and Family (Unit 6)
3. Phonetic Skills: Pronunciation, Intonation, Stress (Unit 1-6) and Rhythm
4. Speaking Skills: Group Discussion / Debate, Role Plays

Recommended Books / Suggested Readings:

1. Cambridge English Empower Elementary Student's Book by Cambridge University Press on Writing Well. William Zinsser. Harper Resource Book. 2001
2. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
3. Study Writing. Liz Hamp-Lyons and Ben Heasly, Cambridge University Press.2006.
4. On Writing Well. William Zinsser. Harper Resource Book. 2001
5. Practical English Usage. Michael Swan. OUP. 1995.

DPP101: PHYSICS FOR ENGINEERING

Credits : 3

LTP 300

Course Description: The course is designed for students in such a way that they can develop deep knowledge of concepts like force and motion, work, power and energy, semiconductor physics etc for engineering concepts.

Course Outcomes (CO):

CO1: Solve qualitative problems based on vector matrix and determinant.

CO2: Recognize and use the vocabulary of t-ratios.

CO3: Earn the concept of imaginary numbers and gives awareness about algebra of complex numbers which helps in understanding of engineering problems related to complex numbers

CO4: Impart knowledge about coordinate geometry in two dimensions.

Unit I

Units and Dimensions - Physical quantities, Fundamental and derived units, Systems of units (CGS, MKS and SI units), Dimensions and dimensional formulae of physical quantities, Principle of homogeneity, Dimensional equations and their applications, conversion from one system of units to other, Limitations of dimensional analysis.

Unit II

Force and Motion- Scalar and vector quantities with examples, representation of vector, statement of triangle law and parallelogram law, Force. Friction, laws of friction, Newton's Laws of motion – momentum and its conservation, impulse, Projectile (horizontal and oblique projections), time of flight, maximum height and horizontal range for oblique projections. Circular motion, Centripetal force and centrifugal force, Banking of roads.

Work, Power, and Energy- Work, Power, Energy, kinetic energy and potential energy, Principle of conservation of mechanical energy, transformation of energy.

Unit III

Electrostatics- Coulombs law, Electric field intensity, Electric field due to point charge, Gauss's Law and its applications, electric potential, straight charged conductor, plane charged sheet and charged sphere (Inside and outside the sphere), Capacitance, capacitance of parallel plate capacitor, series and parallel combination of capacitors, Dielectric, and its effect on

capacitance.

Unit IV

DC Circuits - Concept of electricity (Current, voltage, resistance, Conductance, potential difference and e.m.f, power, electrical energy), Alternating Current and Direct Current, Ohm's law and its applications, specific resistance, effect of temperature on resistance, co-efficient of resistance, series and parallel combination of resistors, Kirchhoff's laws, Wheatstone bridge principle and its applications, Concept of electric power, energy, Examples of DC Circuits

Semiconductor physics- Energy bands, intrinsic and extrinsic semiconductors, p-n junction diode and its characteristics, Diode as rectifier half wave and full wave rectifier, semiconductor transistor pnp and npn (concept only).

Recommended Books / Suggested Readings:

1. Applied Physics Vol. I, TTTI Publication; Tata McGraw Hill, Delhi
2. Basic Applied Physics by RK Gaur; Dhanpat Rai Publication
3. Numerical Problems in Physics-Volume I and II by RS Bharaj; Tata McGraw Hill
4. Simple Course in Electricity and Magnetism by CL Arora; S Chand and Co, New Delhi
5. Fundamental Physics - Volume I and II by Gomber and Gogia; Pardeep Publications, Jalandhar
6. Physics Laboratory Manual by PK Palanisamy, Scitech Publications
7. Fundamentals of Physics by Resnick and Halliday; Asian Books Pvt. Ltd., New Delhi
8. Concepts in Physics by HC Verma; Bharti Bhawan Ltd., New Delhi
9. Text Book of Physics for Class XI (Part-I, Part-II) N.C.E.R.T

DPP121: PHYSICS FOR ENGINEERING LABORATORY

Credits : 01

LTP 002

Course Description: This course is offered to the students of physics as a fundamental course. The experiments included in the course provide the students with broad understanding of physical principles and develop critical thinking.

Course Outcomes (CO):

CO1: Understand the relationship between observation and theory and their use in building the basic concepts of physics in engineering.

CO2: Understand the application engineering physics in application with semiconductors.

List of practical:

1. To find the diameter of wire using a screw gauge
2. To find volume of solid cylinder and hollow cylinder using a vernier callipers
3. To determine the thickness of glass strip and radius of curvature using a spherometer
4. To verify parallelogram law of the atmospheric pressure at a place using Fortin's Barometer
5. To draw characteristics of a p-n junction diode and determine knee and break down voltages
6. To find wave length of He- Ne semiconductor LASER.
7. Use of CRO in plotting AC/DC
8. To verify ohm's laws by drawing a graph between voltage and current.
9. To verify laws of resistances in series and in parallel connection.
10. To find resistance of galvanometer by half deflection method.

DPM201: MATHEMATICS FOR ENGINEERING-II

Credits : 3

LTP 300

Course Description: This course is about the mathematics that is most widely used in the mechanical engineering core subjects: An introduction to linear algebra and differential calculus. The course also covers integral problems and probability and statistics (only basic).

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: How to perform the determinant operations of addition and multiplication and express a system of linear equation in matrix form.

CO2: The comparability and contrast the idea of limit and differentiability.

CO3: How to organise, present and interpret statistical data.

Contents:

Unit I

Algebra: Determinants: Elementary properties of determinants up to 3rd order, consistency of equations, Crammer's rule. Matrix: Algebra of matrices, Inverse of a matrix, matrix inverse method to solve a system of linear equations in 3 variables.

Unit II

Differential Calculus Definition of function; Concept of limits. Lt xn - an, Four standard limits x - a ----------x – a Lt Sin x Lt ax - 1 Lt (1+x)1/x x - 0 -------- , x - 0 ------- , x- 0 x x Differentiation of xn , sin x, cos x, tan x, ex, log ax (Please take one example of differentiation by definition) Differentiation of sum, product and quotient of functions. Differentiation of function of a function, Differentiation of trigonometric inverse functions. Logarithmic differentiation, Exponential differentiation.

Unit III

Integral: Integration as inverse operation of differentiation with simple examples, Simple integration by substitution, by parts and by partial fractions (for linear factors only), Evaluation of definite integrals (simple problems) - π/2 to π /2. Evaluation of ∫ Sin nx. dx, ∫ Cos nx dx, ∫ Sin mx Cos nx dx using formulae without proof (m and n being positive integers only)

Unit IV

Statistics and Probability Measures of Central Tendency: Mean, Median, and Mode with example of daily life. Probability definition and addition law of probability numerical Problems.

Suggested Readings:

1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi.
2. Engineering Mathematics by Vol. I & II by S Kohli, IPH, Jalandhar
3. Applied Mathematics by Dr. RD Sharma
4. Applied Mathematics, Vol. I & II by SS Sabharwal &Sunita Jain, Eagle Parkashan, Jalandhar
5. Comprehensive Mathematics, Vol. I & II by Laxmi Publications

DIP103: COMPUTING FOR ENGINEERS

Credits : 3

LTP 300

Course Description: The course aims to equip the students with knowledge of computers. The course includes basics of computer, networking, internet, Ms-word, Ms-powerpoint, and Ms-excel.

Course Outcomes (CO):

On successful completion of this module, students should be able to

CO1: To impart basic understandings about fundamentals of computer system

CO2: To make them able to work on Word processing, Power Point and Spreadsheet.

CO3: To make them aware about graphical representation of the data.

CO4: To make Business documents by using Word processing and Spreadsheet

Course Content:

Unit I

Computer Basics: Generations of computer, block diagram of a computer, CPU, memory organisation , processing of data, Computers for information storage, information seeking, information processing and information transmission, Number system, computer organization, computer hardware Input devices; keyboard, mouse, scanner, etc; output devices; VDU and Printer(Impact and non-Impact printers), Plotter etc. Primary and Secondary Storage, and software, RAM, ROM, PROM etc. (Auxiliary Storage), Secondary storage; magnetic disks – tracks and sectors, optical disk (CD, CD-RW and DVD Memory).

Unit II

Operating system concepts and networking: Introduction to Operating Systems such as MS-DOS and Windows, difference between DOS and Windows, Basics of Networking – LAN, MAN, WAN, Elements of networking and models, Network topologies, Transmission media, OSI TCP /IP model, Internet basics, Internet services and browsers, Email (steps), FTP, TELNET, WWW.

Unit III

Word Processing Introduction to word processing, Word processing concepts, Use of Templates, Working with word document: Editing text, Find and replace text, Formatting, spell check, Autocorrect, Autotext; Bullets and numbering, Tabs, Paragraph Formatting, Indent, Page Formatting, Header and footer, Tables: Inserting, filling and formatting a table; Inserting Pictures and Video; Mail Merge: including linking with Database; Printing documents.

Unit IV

Preparing Presentations Basics of presentations: Slides, Fonts, Drawing, Editing; Inserting: Tables, Images, texts, Symbols, Media; Design; Transition; Animation; and Slideshow.

Spreadsheet and its Business Applications Spreadsheet concepts, Managing worksheets; Formatting, Entering data, Editing, and Printing a worksheet; Handling operators in formula, Project involving multiple spreadsheets, Organizing Charts and graphs

Generally used Spreadsheet functions: Mathematical, Statistical, Financial, Logical, Date and Time, Lookup and reference, Database, and Text functions

Recommended Books / Suggested Readings:

1. Fundamentals of Computer by E Balagurusamy, Tata McGraw Hill Education Pvt. Ltd, New Delhi.

2. Fundamentals of Computer by V Raja Raman; Prentice Hall of India Pvt. Ltd., New Delhi.

3. Fundamentals of Computer by Sumita Arora by Dhanpat Rai and Co, New Delhi.

4. Computers Today by SK Basandara, Galgotia Publication Pvt Ltd. Daryaganj, New Delhi.

5. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi.

6. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi.

7. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi.

DIP123: COMPUTING FOR ENGINEERS LABORATORY

Credits : 1

LTP 002

Course Description: The course aims to equip the students with knowledge of computers. The course includes basics of computer, networking, internet, Ms-word, Ms-powerpoint, and Ms-excel.

Course Outcomes (CO):

On successful completion of this module, students should be able to

CO1: To make them able to work on Word processing, Power Point and Spreadsheet.

CO2: To make them aware about graphical representation of the data.

CO3: To make Business documents by using Word processing and Spreadsheet

List of practical:

1. Identify and list functions of various components and peripherals of given computer.
2. Exercises on entering text and data (Typing Practice)
3. Create a table of result of students with its roll no, name, subject, marks, and also insert an image of the university using MS-WORD.
4. Create one FrontPage of the book using MS-WORD.
5. Add list of student details in the worksheet also calculate students' total marks and percentage.
6. Create one presentation using PowerPoint.
7. Perform formatting operations in excel.
8. Working with charts and graphics in excel.
9. Use MS-WORD to create lists using bullets.
10. Show different views of viewing slides in power point.

DIP104: BASIC WORKSHOP PRACTICES

Credits : 3

LTP 006

Course Description: The course aims to equip the students with the usage of various tools and their application in smithy, fitting, electrical and welding and to acquaint the students with various skills involved in above workshop practices. To make student aware of various cutting, filling, forging, electric connections and welding/joining processes and to have hands on for the same..

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Perform Cold & Hot forging and prepare molds using different patterns for casting.

CO2: Demonstrate the application of various tools used for fitting and sheet metal work with the skill in making fitting and sheet metal jobs.

CO3: Use one – way, two-way switches, parallel and series connections in house wiring and demonstrate the use and function of various tools and instruments used in carpentry work.

Co4: Demonstrate the practical skill in making various joints of welding and perform various machining operations.

Unit I

Smithy Shop: Introduction; Forging tools and equipment, Hot working process; Cold working process. Forging operations in Smithy shop. Safety measures to be observed in the smithy shop. Introduction to various heat treatment processes e.g annealing, hardening, tempering, normalizing etc.

JOBS

1. To Make A Circular Ring by Cold Forming.
2. To Make A Chisel from Round Bar by Hot Forging.
3. To Forge A Cubical Shape from Round

Foundry shop: Introduction; various terms used in casting, Tools and equipment used in casting shop, Patterns Moulding and Casting processes. Safety precautions.

Unit II

Sheet metal Shop: Introduction; types of sheets, Tools used in sheet metal shop, Sheet metal

operations. Introduction to sheet metal shop, use of hand tools and accessories e.g. different types of hammers, hard and soft mallet, sheet and wire gauge, necessary allowance required during job fabrication, selection of material. Safety measures.

JOBS

1. Practice Bending and Joints

I. HEM, Wired Etc.

2. Make a Stand to Display Workshop Drawing.

3. Make Rectangular Tray or Pen Stand.

Fitting Shop: Introduction to fitting shop tools, common materials used in fitting shop, Identification of materials. (e.g. Steel, Brass, Copper, Aluminium etc.).Identification of various sections of steel such as Flat, Angle, Tee, Channel, Bar Girder, Square, Z-Section, etc. Description and demonstration of various types of work benches. holding devices and files. Safety Precautions while using tools. Description and demonstration of simple operation of hack-sawing, demonstration and description of various types of blades and their specifications, uses and method of fitting the blade. Introduction to various types of threads (internal, external)-single start, multi-start, left hand and right hand threads. Description and demonstration of various types of drills, taps and dies Selection of dies for threading, selection of drills and taps for tapping operations.

JOBS

1. Prepare a template of given size by hacksawing and filing.

2. Prepare a job having internal and external threads.

Unit III

Electric Shop: Introduction; various electrical materials, Tools & Various electrical instruments used in electric shop, Concept of wiring. Introduction to the construction of a Lead-acid battery and its working. Installation of a battery and to connect two or more batteries in series and in parallel, Charging of a battery and testing it with the help of hydrometer and Cell Tester. Importance of three-phase wiring and its effectiveness. Estimating and costing of power connection, Safety Measures during electrical works.

JOBS

1. To Make Series and Parallel Connections.

2. Domestic Wiring – Connecting Lamp and Fan

3. Stair Case Wiring (2way).

4. Charging and Testing of Battery.

Unit III

Electric Shop: Introduction; various electrical materials, Tools & Various electrical instruments used in electric shop, Concept of wiring. Introduction to the construction of a Lead-acid battery and its working. Installation of a battery and to connect two or more batteries in series and in parallel, Charging of a battery and testing it with the help of hydrometer and Cell Tester. Importance of three-phase wiring and its effectiveness. Estimating and costing of power connection, Safety Measures during electrical works

JOBS

1. To Make Series and Parallel Connections.

2. Domestic Wiring – Connecting Lamp and Fan

3. Stair Case Wiring (2way).

4. Charging and Testing of Battery.

Carpentry Shop: Introduction; wood, timber, types of wood, seasoning of wood, Carpentry tool, Wood working machines, Defects in wood. Demonstration, function and use of commonly used hand tools. Care, maintenance of tools and safety measures to be observed, Introduction to various types of wooden joints, their relative advantages and uses. Demonstration of various methods of painting wooden items.

JOBS

1. To Make T-Lap Joint

2. To Make Cross Lap-Joint

Unit IV

Welding Shop: Introduction; Types of welding; introduction to welding equipment e.g. a.c. welding set, d.c. rectifier, Electrode holder, electrodes and their specifications, welding screens and other welding related equipment and accessories. Types of welding joints, Concept of Gas welding; Arc welding; MIG welding; TIG welding; Spot welding, Seam welding, Different welding position, Soldering and Brazing. Safety measures during welding operations.

JOBS

1. Practice Arc Welding.

2. Prepare Lap Joint with Arc Welding.

3. Prepare Butt Joint.

4. Prepare T Joint.

Machine Shop: Introduction; types of machines, Lathe machine; Parts, specifications, operations performed on Lathe, Shaper; Parts, operations performed on Shaper, Drilling machine; Parts, operations performed on Drilling machine, Milling machine; types of milling machines; parts; operations performed on a Milling machine. Safety measures.

JOBS

1. Practice on Lathe for Plain Turning, Facing, Step, Groove, Taper Turning.

2. Prepare a Job as Per Drawing with Above Operations

Recommended Books / Suggested Readings:

1. Workshop Technology Part 1-3 by Chapman W A J , Viva Books Pvt. Ltd, New Delhi

2. Work Shop Technology by Raghuwanshi R S, Dhanpat Rai and Sons, New Delhi

3. Production Technology by Jain R K, Khanna Publishers, New Delhi

DIP 105: FUNDAMENTALS OF ELECTRONICS AND ELECTRICAL ENGINEERING

Credits : 3

LTP 300

Course Description: The course aims to equip the students with the basic concepts of electricity, electrical components, and their applications. Also clear the fundamentals and working principles of various electrical & electronics applications.

The course includes the fundamentals of electronic components, devices and components, principles of Industrial (Power) Electronics, Basic Electronics, Digital Electronics, and electrical circuits which includes SCR, Transformer, magnetic circuits etc.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Students deal with the applications of Electrical Engineering and Electronics Engineering. This knowledge gives them a brief outline of the fundamentals that would be the foundations of today's and tomorrow's technology.

CO2: Students should be able to understand new trends in Electronics and Electrical Engineering.

CO3: Students impart detail knowledge of basic electronics, digital electronic concepts etc.

CO4: Student will get practical knowledge of electronics instruments, components, and their specifications, uses etc.

CO5: Analyze and solve electric and magnetic circuits, Identify functions of CRO, Multimeter, Power Supplies, and various devices in the measurement of physical variables.

Course Content:

Unit I

Fundamentals of AC/DC circuits: Introduction of CRO and multimeter, fundamentals of electricity (current, voltage, inductor, capacitor, resistor), ohm's law, Kirchoffs' current and voltage law. AC circuits (generation, AC values, waveforms), Concept of permeability, reluctance, mmf, susceptace etc. Electrical Principles of Magnetic circuits and transformers. Single phase, three phase, Introduction to Motors & working. Star Delta Connections.

Unit II

Sindustrial Electronics: SCR, DIAC., TRIAC, Thyristor. Components of LT Switchgear: Switch Fuse

Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Rectifiers, power supplies & UPS. Resistors, Capacitors: types, specifications. Standard values, marking, colour coding. Active and Passive components. Elementary calculations for energy consumption.

Unit III

Basics of Electronics: Introduction to Semi-Conductor materials (PN junction diodes, biasing and construction of PN Diode,), Bipolar Junction Transistors (Construction ,Working, configurations of Transistor and Applications). Introduction to Microprocessor, Microcontroller and Ics.

Unit IV

Digital Electronics: Number system and conversion, BCD, GRAY Code, Excess 3 Code, basic logic gates and their truth tables, Flip-Flop's, Half and full adder/ subs tractor, encoder, Decoder.

Recommended Books/ Suggested Readings:

1. B.L THAREJA , Fundamentals of Electrical engineering and electronics, S.CHAND 1st 2013.
2. EARL GATES , Introduction to electronics, DELMAR CENGAGE LEARNING, 6th edition 2013.
3. J.B GUPTA , Basic electrical and electronics engineering, S.K Kataria and sons edition 2013.
4. Basic electrical and electronics engineering DP KOTHARI 4TH EDITION 2013 MC Graw Hill.
5.https://www.scribd.com/doc/90182505/BEEE-Notes
6.http://www.freebookcentre.net/Electronics/Basic-Electronics-Books.html
7.http://www.freeengineeringbooks.com/Electrical/Basic-Electrical-Engineering.php

COM 201: BUSINESS COMMUNICATION

Credits: 2

LTP 200

Course Description: To make students develop business writing etiquette in terms of formats and develop their reading skills and enhance their vocabulary.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: The students will be able to develop effective reading and writing skills.

CO2: The students will learn vocabulary and technical jargons as used in business communication.

Course Content

1. Theory of Communication: Process of Communication, Verbal and Non-verbal communication, Modes of Communication, and Barriers to Communication.
2. Nature and Style of sensible Writing: Memorandum, Notices, Quotations/Tenders, Report Making, Minutes of Meeting, E-Mail, Press Note, Resume, Complaint Letter, Inquiry Letter, Cover Letter, Confirmation Letter, Resignation Letter, Permission Letter and Job Application
3. Vocabulary Building: Words Often Confused and Words Often Misspelt, standard abbreviations, word formation, prefix, suffix, root words from foreign languages, punctuation , phrases and clauses
4. Grammar: Conditional Sentences, and Degrees of Comparison

Recommended Books / Suggested Readings:

1. *Cambridge English Empower Elementary Student's Book by Cambridge University Press*
2. *Exercises in Spoken English.* Parts. I-III. CIEFL, Hyderabad. Oxford University Press
3. Study Writing. Liz Hamp-Lyons and Ben Heasly, Cambridge University Press.2006.
4. *On Writing Well.* William Zinsser. Harper Resource Book. 2001
5. *Practical English Usage.* Michael Swan. OUP. 1995.

COM 221: BUSINESS COMMUNICATION LABORATORY

Credits : 1

LTP 002

Course Description: The course aims to equip the students with business communication principles through creation of effective business and oral presentations. Includes study and application of team communication and use of technology to facilitate the communication.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to

CO1: Acquire in-depth knowledge of principles of business communication.

CO2: Discuss the use of video in business messages

CO3: Deliver high-quality oral presentations

CO4: Nonverbal communication, interview preparation, resume writing

Course Content:

1. Listening Skills: Listening Exercises on Journeys (Unit 7), Fit and healthy (Unit 8), Clothes and shopping (Unit 9), Communication (Unit 10), Entertainment (Unit 11) and Travel (Unit 12)
2. Presentation Skills: Making PPT and Presenting Power Point Presentation
3. Phonological Skills: Pronunciation, syllables and word stress. Vocabulary Enhancement: Synonym, Antonym, Idioms and Phrasal verbs.
4. Speaking Skills: Interview skills.

Recommended Books / Suggested Readings:

1. Cambridge English Empower Elementary Student's Book by Cambridge University PressOn Writing Well. William Zinsser. Harper Resource Book. 2001
2. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
3. Study Writing. Liz Hamp-Lyons and Ben Heasly, Cambridge University Press.2006.
4. On Writing Well. William Zinsser. Harper Resource Book. 2001
5. Practical English Usage. Michael Swan. OUP. 1995.

DME301: APPLIED THERMODYNAMICS

Credits: 4

LTP 310

Course Description: Mechanical Engineers must work with various power producing & power absorbing devices like Boilers, Turbines, and Condensers etc. In order to understand the principles, construction and working of the devices, it is essential to understand the concept of energy, work, heat and conversion between them. The subject is a related to Power Engineering and other related subjects in which the application of fundamental concepts of Thermal Engineering are included.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Identify and apply the fundamental concepts of thermodynamics / ideal gas laws to thermodynamic systems.

CO2: Formulate the law of energy conservation for thermodynamic systems and analyze the change in various forms of energy via heat and work transfer.

CO3: State and apply the various laws of thermodynamics for closed and open systems undergoing different thermodynamic processes in order to analyze and evaluate their performance.

CO4: Determine properties of two-phase system from steam table / mollier charts and solve problems of steam generation.

CO5: Classify and identify various types of boilers, their mountings / accessories, describe their construction/operation and compute efficiencies & other performance characteristics.

Course Content:

Unit I

Fundamentals of Thermodynamics: Concepts of pure substance, types of systems, properties of systems Extensive and Intensive properties, processes and cycles, Quasi-static process, flow and non-flow process, Thermodynamic equilibrium, Point and path function.

Ideal Gases: Concept of Ideal gas- Charle's law, Boyle's law, Avogadro's law, equation of state, characteristic gas constant and universal gas constant. Isobaric, Isochoric, Isothermal, Isentropic, Polytropic, and their representation on P-V and T-S diagram (only simple numerical

based on above).

Unit II

Work, Heat Transfer and Energy. Thermodynamic definition of work & heat, Difference between heat and work. Energy –Potential Energy, Kinetic Energy, Internal Energy, Flow Work, concepts of enthalpy & entropy**.**

Unit III

Laws of Thermodynamics- Zeroth Law, principle of law of conservation of energy First law of Thermodynamics, Second Law of Thermodynamics- Kelvin Planks, Clausius statements and their equivalence, Clausius inequality, Concept of perpetual motion machine of first and second kind. Application of Laws of Thermodynamic – Steady Flow Energy equation and its application to boilers, engine, nozzle, turbine, compressor & condenser. Application of Second law of Thermodynamics to Heat Engine, Heat Pump and Refrigerator.

Unit IV

Steam and Steam Boiler: Generation of steam at constant pressure with representation on various charts such as T-S, H-S. Properties of steam and use of steam table, Dryness fraction, Degree of superheat

Vapour processes: Constant pressure, constant volume, constant enthalpy, constant entropy process (numerical using Mollier chart), Carnot cycle and its limitations, Rankine cycle, methods of improving Rankine efficiency.

Steam Boilers: Classification, Construction and working of - Cochran, Babcock and Wilcox, La-mont and Loeffler boiler. Boiler mountings and accessories, Equivalent evaporation and boiler efficiency.

Recommended Books / Suggested Readings:

1. P.K Nag, “Engineering Thermodynamics”, Tata McGraw Hill, New Delhi.
2. R.K Rajput, Thermal Engineering, Laxmi Publication Pvt. Ltd., New Delhi.
3. G. Rogers and Y. Mayhew, “Engineering Thermodynamics”, Pearson Eduction.
4. B. K. Sarkar Thermal Engineering Tata McGraw –Hill, New Delhi
5. P. L. Ballaney A Course in Thermal Engineering Khanna Publishers.
6. Domkundwar V. M. A Course in Thermal Engineering Dhanpat Rai & Co.
7. P. Chattopadhyay Engineering Thermodynamics Oxford university press.
8. R. Yadav, “Applied Thermodynamics”, Central Publishing House.
9. J.S. Rajadurai, Thermodynamics and Thermal Engineering, New Age International (P) Ltd. Publishers.
10. K. Soman, “Thermal Engineering”, PHI Learning Pvt. Ltd.

DME321: APPLIED THERMODYNAMICS LABORATORY

Credits : 1

LTP 002

Course Description: To make the students aware about the practical concepts of steam, boilers, condensers and compressors. It helps the students to understand the working and industrial application of the equipment.

Course Outcomes (CO):

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

CO1: Calculate dryness fraction of steam experimentally.

CO2: Demonstrate comprehension of construction, operation and performance of specific types of boilers, their mountings and accessories

CO3: Demonstrate comprehension of construction and operation of specific types of steam condensers and cooling towers.

CO4: Calculate experimentally the efficiency of reciprocating / centrifugal compressor.

List of practical:

1. Study of working, construction, mountings and accessories of various types of boilers.
2. To perform a boiler trial to estimate equivalent evaporation and efficiency of a fire tube/ water-tube boiler.
3. Determination of dryness fraction of steam by using separating and throttling calorimeter.
4. Study of construction and operation of various types of steam condensers and cooling towers.
5. To determine the volumetric and isothermal efficiency of two stage air compressor.
6. To study the effect of forward curved, backward curved and radial vanes in a centrifugal compressor and to find out the overall efficiency of the compressor.

Recommended Books / Suggested Readings

1. GNA University's Lab Manual on IC Engine.
2. P.K Nag, “Engineering Thermodynamics”, Tata McGraw Hill, New Delhi.
3. R.K Rajput, Thermal Engineering, Laxmi Publication Pvt. Ltd., New Delhi.
4. G. Rogers and Y. Mayhew, “Engineering Thermodynamics”, Pearson Eduction.
5. B. K. Sarkar Thermal Engineering Tata McGraw –Hill, New Delhi
6. P. L. Ballaney A Course in Thermal Engineering Khanna Publishers.
7. Domkundwar V. M. A Course in Thermal Engineering Dhanpat Rai & Co.
8. P. Chattopadhyay Engineering Thermodynamics Oxford university press.
9. R. Yadav, “Applied Thermodynamics”, Central Publishing House.
10. J.S. Rajadurai, Thermodynamics and Thermal Engineering, New Age International (P) Ltd. Publishers.
11. K. Soman, “Thermal Engineering”, PHI Learning Pvt. Ltd.

DME302: THEORY OF MACHINE

Credits : 4

LTP 310

Course Description: The course aims to equip the students with knowledge of basic mechanism and machine. The course includes basic principle of mechanism and their inversion, Power Transmission, flywheel, and governor etc.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Determine the kinematic chain and mobility and perform the kinematic analysis of the given mechanisms.

CO2: Asses the working principles of power elements (gears, gear trains, Belt and chain drives) and design related problems effectively.

CO3: To compute essential parameters like fluctuation of speed and energy of flywheel in a vehicle.

CO4: Understand the fundamentals of mechanical vibrations

Course Content:

Unit I

Simple Mechanisms: Introduction to link, kinematic pair, lower and higher pair, Kinematic chain, mechanism, Inversions, Different types of mechanisms.

Unit II

Power Transmission: Introduction to Belt and Rope, chain, and gear drives. Concept of velocity ratio, slip and creep, crowning of pulleys. Flat and V belt drive: Ratio of driving tensions, power transmitted, centrifugal tension, and condition for maximum horsepower.

Unit III

Flywheel and Governor: Principle and applications of flywheel, Turning - moment diagram of flywheel for different engines, Fluctuation of speed and fluctuation of energy - Concept only, Coefficient of fluctuation of speed and coefficient of fluctuation of energy, Principal of governor, Simple description and working of Watt, Porter and Hartnel governor (no numerical), Hunting, isochronisms, stability, sensitiveness of a governor.

Unit IV

Vibrations: Types-longitudinal, transverse, and torsional vibrations, dampening of vibrations, Causes of vibrations in machines, their harmful effects and remedies.

Recommended Books / Suggested Readings:

1. Theory of Machines by R.S.Khurmi, (S.Chand and Sons)
2. Theory of Machines by S.S Ratan (McGraw Hill)
3. Theory of Mechanism and Machines by JagdishLal (Metropolitan Publication)
4. Theory of Machines by Shigley, (McGraw Hill)
5. Theory of Machines by Thomas Bevan (PearsonsPublishiers)
6. Theory of Machines by PL Ballaney, (Khanna Publishers)

Web Links:

1.http://nptel.ac.in/courses/116102012/72

2.https://moodlearn.ariel.ac.il/pluginfile.php/837913/mod_resource/content/0/%D7%9E%D7%9E%D7%A1%D7%A8%D7%95%D7%AA.pdf

3.https://www.slideshare.net/dhopsanda/unit-5-dom

4.http://joshikandarp.webs.com/documents/b%20d.pdf

5.http://nptel.ac.in/courses/112106137/pdf/3_7.pdf

6.https://www.slideshare.net/manjunathnr00/belt-rope-and-chain-drives-69566037

7.https://www.slideshare.net/Wahaj94/cams-34903878

DME322: THEORY OF MACHINE LABORATORY

Credits: 1

LTP 002

Course Description: The course aims to equip the students with practical knowledge of machine and mechanism.

The course includes practical application of four bar mechanism and various inversion of kinematic chain

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to

CO1: To demonstrate the different types of kinematic links, pairs, chain, Mechanism and their inversions.

CO2: To draw the displacement, velocity & acceleration diagram of cam follower and its profile.

CO3: To demonstrate the various types of differential gear, dynamometer and clutches.

CO4: To understand the basic principles of various gear and gear train.

CO5: To demonstrate the working of Ackerman's Steering Gear Mechanism.

List of practical:

1. To draw displacement, velocity & acceleration diagram of slider - crank and four bar mechanism.
2. To study the various inversions of kinematic chains.
3. To study inversions of 4 Bar Mechanisms, Single and Double slider crank mechanisms.
4. To study Steering Mechanisms: Davis and Ackerman.
5. To plot slider displacement, velocity and acceleration against crank rotation for Single Slider Crank mechanism.
6. To study the various types of governor.
7. To study various type of Cam and Follower arrangements.
8. To plot follower displacement vs Cam rotations for various Cam Follower systems.
9. To study various types of gears – Helical, worm & bevel gears.
10. To study various types of gear trains – simple, compound, reverted, epi-cyclic and differential.

Recommended Books / Suggested Readings:

1. Theory of Machines by R.S.Khurmi, (S.Chand and Sons)
2. Theory of Machines by S.S Ratan (McGraw Hill)
3. Theory of Mechanism and Machines by JagdishLal (Metropolitan Publication)
4. Theory of Machines by Shigley, (McGraw Hill)
5. Theory of Machines by Thomas Bevan (Pearsons Publishiers)
6. Theory of Machines by PL Ballaney, (Khanna Publishers)

DME303: MATERIALS AND METALLURGY

Credits : 3

LTP 300

Course Description: The course aims to equip the students with knowledge of basic theory and behavior of materials.

The course includes material testing and fracture behavior, strengthening mechanisms and phase diagrams

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: explain mechanical properties of materials and mechanism of deformation of metals.

CO2: explain fracture and its types, purpose and various tests conducted on materials, and the effect of grain size on the properties of materials.

CO3: explain applications and properties of steel and cast iron, phase diagrams, and various heat treatment processes.

CO4: explain different types of non-metallic and modern materials and their applications.

Course Content:

Unit I

Mechanical properties and behavior of materials: Elastic and plastic behavior of metals, mechanism of plastic deformation, deformation of single crystal by slip, stress-strain curve, yield point phenomenon, mechanical properties of materials.

Unit II

Material testing and fracture behavior: Fracture- types of fracture and Griffith theory, fatigue and fatigue testing, impact testing, creep, creep mechanism and creep testing, Hardness testing

Strengthening mechanisms: Refinement of grain size, work hardening, solid solution –strengthening, dispersion strengthening, precipitation hardening.

Unit III

Phase diagrams: Constitution of alloys, phase diagrams, iron-carbon diagram. Classification of steel and cast iron, microstructure, properties and applications, Time–Temperature–Transformation (TTT) diagram.

Unit IV

Nonmetallic materials and modern materials: Polymeric materials – formation of polymer structure, production techniques, composites – types, applications and production techniques, ceramics – types and applications, dual phase alloys, micro alloyed steels, High Strength Low Alloy (HSLA) steel, Transformation Induced Plasticity (TRIP) and nano crystalline materials.

Recommended Books / Suggested Readings:

1. Kenneth G Budinski and Michael K .Budinski, “Engineering Materials” Prentice-Hall of India Private Limited, 4th Indian Reprint, 2002.
2. William D Callister, “Material Science and Engineering”, John Wiley and Sons, 2007.
3. V Raghavan, “Materials Science and Engineering”, Prentice Hall of India Pvt., Ltd., 2007.
4. Sydney H. Avner, “Introduction to Physical Metallurgy”, McGraw Hill Book Company, 2007.
5. G.E Dieter, “Mechanical Metallurgy”, McGraw Hill Book Company, 1988.
6. O.P Khanna., “A text book of Materials Science and Metallurgy”, Khanna Publishers, 2003.
7. M.S Vijaya. and G Rangarajan, “Material Science”, Tata McGraw-Hill, 2007.
8. V.D. Kodgire and S.V Kodgire., “Material science and Metallurgy for Engineers”, Everest Publishing House, Pune, 24th Edition, 2008.
9. Er. R.K. Rajput, “Engineering Materials and Metallurgy”, S. Chand and Company Pvt. Ltd.

DME323: MATERIALS AND METALLURGY LABORATORY

Credits : 1

LTP 002

Course Description: The course aims to equip the students with practical knowledge of preparation of models, annealing the steel specimen, hardenability of steel & specimen preparation.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Learn about crystal structure of metals.

CO2: Understand annealing effect on steel specimen

CO3: Learn about cutting, mounting, polishing and etching processes.

List of practical:

1. Preparation of models/charts related to atomic/crystal structure of metals.
2. Annealing the steel specimen and study the effect of annealing time and temperature on hardness of steel.
3. Hardening the steel specimen and study the effect of quenching medium on hardness of steel.
4. Determination of hardenability of steel by Jominy End Quench Test.
5. Practice of specimen preparation (cutting, mounting, polishing and etching) of mild steel and hardened steel specimens.
6. To study the mechanism of chemical corrosion and its protection.

DME304: MANUFACTURING PROCESSES

Credits : 3

LTP 300

Course Outcomes (CO):

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to

CO1: Discuss different cutting tool materials, tool nomenclature & surface finish.

CO2: Understand the concepts of different metal forming processes.

CO3: Describe the casting process and prepare different types of cast products.

CO4: Describe the Metal Arc, TIG, MIG Welding processes etc. used in manufacturing.

Course Content:

Unit I

Introduction to Metal cutting: Orthogonal and oblique cutting. Classification of cutting tools: single, and multipoint; tool signature for single point cutting tool.

Introduction to basic metal cutting machine tools: Lathe- Parts of lathe machine, accessories of lathe machine, and various operations carried out on lathe.

Milling: Various Milling operations, classification of milling machines.

Drilling: Difference between drilling, boring & reaming, types of drilling machines. Boring operations & boring machines.

Shaping, Planning and Slotting machines- Machining operations and operating parameters.

Grinding: Grinding operation, classification of grinding processes.

Unit II

Mechanical Working of Metals Introduction to metal forming processes & classification of metal forming processes.

Forging: Smith forging, drop forging & press forging. Forging Equipment, Defects in forging.

Rolling: Rolling process, Angle of bite, Types of rolling mills, Variables of rolling process, Rolling defects.

Drawing & Extrusion: Drawing of wires, rods & pipes, Variables of drawing process. Various types of extrusion processes

Unit III

Introduction & basic materials used in foundry: Introduction: Definition, Classification of manufacturing processes. Metals cast in the foundry-classification, factors that determine the selection of a casting alloy.

Introduction to casting process & steps involved:

Patterns: Definition, classification, materials used for pattern, various pattern allowances and their importance.

Sand moulding: Types of base sand, requirement of base sand. Binder, Additives definition, need and types; preparation of sand moulds.

Cores: Definition, need, types. Method of making cores, Concept of gating (top, bottom, parting line, horn gate) and risers (open, blind) Functions and types.

Unit IV

Welding process: Definition, Principles, classification, application, advantages & limitations of welding. Arc welding: Principle, Metal arc welding (MAW), Inert Gas Welding (TIG & MIG) Submerged Arc Welding (SAW).

Special type of welding: Resistance welding principles, Seam welding, Butt welding, Spot welding and Projection welding. Friction welding, Laser welding and Electron beam welding.

Recommended Books / Suggested Readings:

1. SeropeKalpakjianSteu en. R Sechmid., Manufacturing Technology, Pearson Education Asia.
2. Dr.K.Radhakrishna., Manufacturing Process-I, Sapna Book House.
3. Rao P.N., Manufacturing Technology Vol I & II, Tata McGraw Hill Pub. Co. Ltd., New Delhi.
4. Kalpakjian., Manufacturing Engineering and Technology, Addision Wesley Congmen Pvt. Ltd.
5. Chapman W. A. J., Workshop Technology Vol. I and II, Arnold Publisher New Delhi..

DME324: MANUFACTURING PROCESSES LABORATORY

Credits : 1

LTP 002

Course Outcomes (CO)

Upon successful completion of the course, the students should be able to:

CO1: To read working drawings, understand operational symbols and execute machining operations.

CO2: Understand integral parts of lathe, shaping and milling machines and various accessories and attachments used.

CO3: Select cutting parameters like cutting speed, feed, depth of cut, and tooling for various machining operations.

CO4: Demonstrate skills in preparation of forging models involving upsetting, drawing and bending operations.

List of practical:

1. Preparation of at least two fitting joint models by proficient handling and application of hand tools- Vblock, marking gauge, files, hack saw drills etc.
2. Preparation of three models on lathe involving - Plain turning, Step turning, Thread cutting, Facing, Knurling, Drilling, Boring, Internal Thread cutting.
3. Study & Demonstration of power tools like power drill, power hacksaw, portable hand grinding, production air tools, wood cutter, etc., used in Mechanical Engineering.

4. Foundry Practice: Use of foundry tools and other equipment for Preparation of molding sand mixture. Preparation of green sand molds kept ready for pouring in the following cases:

i. Using two molding boxes (hand cut molds).
ii. Using patterns (Single piece pattern and Split pattern).
iii. Incorporating core in the mold.(Core boxes).
iv. Preparation of one casting (Aluminium or cast iron-Demonstration only)

5. Welding Practice: Use of Arc welding tools and welding equipment Preparation of welded joints using Arc Welding equipment L-Joint, T-Joint, Butt joint, V-Joint, Lap joints on M.S. flats.

DME305: APPLIED MECHANICS

Credits: 3

LTP 300

Course Description: The course aims to equip the students with knowledge of two dimensional force systems, friction, centroid and moment of inertia, kinematics and kinetics of rigid body, transmission of power and mechanical vibrations which is required by them for further understanding of other allied subjects. The subject enhances the analytical ability of the students.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Understand the concept of motion, forces, and friction.

CO2: Determine centroid of plain and curve area and moment of inertia of a body about its axis of symmetry.

CO3: Understand kinematics and kinetics of a rigid body.

CO4: Describe power transmission using belt drives and concepts of vibration.

Course Content

Unit I

Two-Dimensional Force Systems: Basic concepts of Laws of motion, Principle of Transmissibility of forces, Transfer of a force to parallel position, Resultant of a force system, Simplest Resultant of Two dimensional concurrent and Non-concurrent Force systems, Distributed force system, Free body diagrams, Equilibrium and Equations of Equilibrium.

Friction: Introduction, Laws of Coulomb Friction, Equilibrium of Bodies involving Dry-friction, Belt friction.

Unit II

Centroid and Moment of Inertia: Centroid of plane, curve area, volume and composite bodies, Moment of inertia of plane area, Parallel Axes Theorem, Perpendicular axes theorems, Principal Moment Inertia, Mass Moment of Inertia of Circular Ring, Disc, Cylinder, Sphere and Cone about their Axis of Symmetry.

Unit III

Kinematics of Rigid Body: Introduction, Plane Motion of Rigid Body, Velocity and Acceleration under Translation and Rotational Motion, Relative Velocity.

Kinetics of Rigid Body: Introduction, Force, Mass and Acceleration, Work and Energy, Impulse and Momentum, Alembert's Principles and Dynamic Equilibrium.

Unit IV

Transmission of Power: Belt Drivers - Open, Crossed and compound belt drives -length of belt - tensions - tight side - slack side - Power transmitted and condition for maximum power.

Mechanical Vibrations: Definitions, Concepts - Simple Harmonic motion - free vibrations - Simple and compound pendulums - torsional vibrations.

Recommended Books / Suggested Readings:

1. Engineering Mechanics, by Ferdinand L.Singer Published by Harper Collins Publishers, Singapore.

2. Engineering Mechanics by S.Timashenko, D.H. Young and J.V. Rao

3.Engineering Mechanics (Statics and Dynamics) by Arthur P.Boresi & Ridhard J.Schmidt Thomson publications 2001.

4. Engineering Mechanics by A.K.Tayal, Umesh Publications

5. Engineering Mechanics - Schaum's series - Mc.Grawhill Publications.

6. Engineering Mechanics by R.C.Hibbeler; Pearson education.

DCC322: INTRODUCTION TO AutoCAD

Credits: 2

LTP 004

Course Description: AutoCAD deals with the designing of software's that are used for creating digital designs of structures. It involves the study of the technicalities, applications, and other aspects of computer-aided design to create drawings and models for engineers, designers, and architects.

Course Outcomes (CO):

1. After completing this course users will be able to:
2. Understand the concept and techniques to draw digital drawings.
3. Create layers to control the objects' visibility.
4. Explain drawing using annotations.
5. Plot or print the drawing by scale.

Course Content

Getting started with AutoCAD overview and history, basic use AutoCAD, keyword shortcut, Unit style

Customization Tool - Gride Mode, Snap mode, Infer Constraints, Dynamic Input, Ortho Mode.

Draw Tool - Line, Polyline, Arc, Circle, Rectangle and Ellipse, Hatch, Gradient, Boundary, Polygon

Modify Tool – Move, Copy, Stretch, Rotate, Mirror, Scale, Extend, Fillet, Chamfer, Erase, Explode, Array - Rectangle Array, Poler Array, Path Array

Dimension Style manager - Dimension Line - Colour, Line type, Line weight, Baseline Spacing, Symbol and arrow setting, Size. Text setting, Primary unit, Alternate unit and Tolerance

Annotation-Text - Multiline text, Single Line, Dimension, Linear, Aligned, Angular, Arc Length, Radius, Diameter, Leader, Add Leader, Remove Leader and Table, Draw Tool- Divide, Ptype, Spline

Layers - New Layer, delete layer, set current layer, Layer on/off, Layer Freeze, Layer Lock, Layer Colour, Line type, Line weight, Plot Style, Plot Table,

Block-Create, block editor, and insert block

Properties -Match Properties, object colour, line weight and line types

Groups-Groups, ungroups, groups edit groups

Utilities - Distance, Radius, Angle, Area, Volume

Insert - Attach, model convert to Pdf, import pdf, export another Format and Add to Block in Tool platter

3D modelling

Modelling - Box, Cylinder, Cone, Sphere, Pyramid, Wedge, Torus, Extrude and Presspul

Solid Editing - Union, Subtract, Interfere, Slice, Thicken, Extract Edges, Extrude Face, Taper Face, Rotate Face and Colour Face.

Coordinates - View, Object, Face, World, Top, Bottom, Left, Right, Front, Back

Modelling-Loft, Revolve, and Sweep

Draw - Helix, 3d polyline

Modify - 3D rotate, 3D moves, 3D Scale, Solid Editing - Shell, Fillet Edge, Chamfer Edge

Materials/ Texture - Materials Brower, Materials Editor

Visual Styles- 2d wireframe, Conceptual, Hidden, Realistic, Shaded, Sketch, X-Ray

List of Experiments:

1. Study introduction of AutoCAD and history of AutoCAD.
2. Practice and exercise of Coordinate systems- Cartesian and Polar (absolute and relative system of measurement) and practice drawing by using Customization tools: Grid, span, O-snap, Dynamic input, Polar tracking, Selection cycling etc.
3. Practice and exercise of AutoCAD software Basics - GUI, limits and units, drawing tools.
4. Practice and exercise of AutoCAD software editing tools.
5. Practice and exercise of AutoCAD software dimensioning toolbar, annotations etc.
6. Practice the implementation of AutoCAD software Layers and its functions.
7. Study and practice how to give the Print/Plot in AutoCAD and also create a page setup in AutoCAD.
8. Practice and exercise of AutoCAD 3D Modelling in Auto CAD software and overview of 3D modelling.

DME401: FLUID MECHANICS

Credits : 4

LTP 310

Course Description: The course aims to equip the students with knowledge of fluid flow. The course includes fluid properties, Fluid pressure and associated measuring devices, Discharge & associated measuring devices, and Flow through pipes.

Course Outcomes (CO): Students will be able

Upon successful completion of the course, the students should be able to:

CO1: Identify and obtain the values of fluid properties and relationship between them

CO2: Measure various properties such as pressure, velocity, flow rate using various instruments

CO3: Compute and analyze hydrostatic forces on submerged bodies.

CO4: Determine minor and major head losses for flows through pipes,

CO5: Apply the principles of Bernoulli's equation in measurement of discharge in fluid-flow related problems.

Course Content:

Unit I

Properties of fluid: The concept of a fluid, the fluid as a continuum, properties of fluid, Density, Specific gravity, Specific Weight, Specific Volume, Dynamic Viscosity, Kinematic Viscosity, Surface tension, Capillarity, Vapour Pressure, Compressibility.

Unit II

Fluid Pressure & Pressure Measurement: Pascal law and its applications, Fluid pressure, Pressure head, Pressure intensity, Concept of vacuum and gauge pressures, atmospheric pressure, absolute pressure, Simple and differential manometers, Bourdan pressure gauge, Concept of Total pressure on immersed bodies, center of pressure, Simple problems on Manometers, Buoyancy & Stability.

Unit III

Fluid Flow: Types of fluid flows, Path line and Streamline, Continuity equation, Bernoulli's theorem, Principle of operation of Venturimeter, Orifice meter and Pitot tube, Borda mouthpiece, Notches (rectangular, V and Trapezoidal) and weirs, Rotameters. Various hydraulic coefficients Discharge, coefficient of discharge and numerical problems.

Unit IV

Flow Through Pipes: Laminar and turbulent flows; Reynolds number, critical velocity, critical Reynolds number, hydraulic diameter, Darcy's equation and Chezy's equation for frictional losses, Minor losses in pipes, flow through pipes in series and parallel, concept of equivalent pipe Hydraulic gradient and total gradient line, Numerical problems to estimate major and minor losses.

Recommended Books / Suggested Readings:

1. Fluid Mechanics & Hydraulic Machines, S.S. Rattan, Khanna Publishing House, New Delhi
2. Hydraulic, fluid mechanics & fluid machines – Ramamrutham S, Dhanpath Rai and Sons, New Delhi.
3. Hydraulics and fluid mechanics including Hydraulic machines – Modi P.N. and Seth S.M., Standard Book House. New Delhi
4. One Thousand Solved Problems in Fluid Mechanics – K. Subramanya, Tata McGraw Hill.
5. Hydraulic, fluid mechanics & fluid machines – S. Ramamrutham, Dhanpat Rai and Sons, New Delhi
6. Fluid Mechanics and Hydraulic Machines – R. K. Bansal, Laxmi Publications, New Delhi

DME421: FLUID MECHANICS LABORATORY

Credits : 1

LTP 002

Course Description: The course aims to equip the students with practical knowledge of fluid flow & related hydraulic machines. The course includes practical application of flow/pressure measuring devices and performance of hydraulic pumps and turbines.

Course Outcomes (CO): Students will be able

Upon successful completion of the course, the students should be able to:

CO1: Measure various properties such as pressure, velocity, flow rate using various instruments

CO2: Verify Bernoulli's theorem

CO3: Determine Coefficient of Discharge for flow measuring devices such as Venturimeter, orifice meter v-notch and rectangular notch.

CO4: Identify the type of Flow through Reynolds Number

CO5: Determine friction factor and minor losses in pipes

List of practical:

1. Determination of metacentric height of a ship model.
2. Verification of Bernoulli's theorem.
3. Determination of coefficient of discharge of a Venturimeter.
4. Determination of coefficient of discharge of an orifice meter and study its variation with the Reynolds number.
5. Determination of coefficient of discharge for flow over v notch (weir)
6. Determination of coefficient of discharge for flow over rectangular notch.
7. Determination of hydraulic coefficient of discharge of a mouth piece.
8. Determination of coefficient of friction of pipes of different diameters.
9. Determination of head loss in a pipe line due to sudden expansion / sudden contraction/ bend.
10. Determination of velocity distribution for pipe line flow with a pitot static probe.

Recommended Books / Suggested Readings:

1. N. Kumara Swamy, Fluid Mechanics and Machinery Laboratory Manual, Charotar Publishing House Pvt. Ltd., ANAND 388 001, Ed. 2008

2. V. P. Gupta, Laboratory Manual of Fluid Mechanics and Machines, CBS Publishers & Distributors Edition: 3rd, 2012

3. B. Shinde, Fluid Mechanics and Machinery: Laboratory Manual, Charotar Publishing House Pvt. Ltd., ANAND 388 001.

DME402: STRENGTH OF MATERIAL

Credits : 4

LTP 310

Course Description: The aim of this course is to enable the student to understand & analyze various types of loads, stresses & strains along with main causes of failure of machine parts.

Course Outcomes (CO): Students will be able

Upon successful completion of the course, the students should be able to

CO1: Understand and distinguish the behavior of simple load carrying members subjected to an axial, shear and thermal Loading.

CO2: Interpret the Variation of moment of inertia for different Mechanical Engineering Sections.

CO3: Assess Bending and shear stresses in beams subjected to different loadings for different machine parts.

CO4: Design simple solid and hallow shaft for power transmission keeping view of Environmental and sustainability aspects.

Course Contents:

Unit I

Simple stresses and strains: Simple stresses & strains viz. tensile, compressive, Shear, Crushing, Thermal stresses, & corresponding strains, Hook's Law –Problems on Direct Stress & Linear Strain- Stress- Strain curve for Ductile material and Brittle material with all parameters, factor of Safety. Elastic Constants - Lateral Strain, Poisson's ratio, Bulk Modulus, Shear Modulus, Volumetric Strain. Relation between elastic constants- Problems on elastic constants. Hoop stress-Longitudinal Stress in thin cylindrical & spherical shells subjected to internal pressure. Problems on thin cylindrical shells.

Unit II

Moment of inertia: Centre of Gravity, Moment of Inertia & its Importance -Parallel & Perpendicular Axis Theorem- C.G of Rectangle, Triangle, Circle, Semi-circle, Trapezium, Cone- Problems on finding CG of T-Section, I-Section, L-Section, Channel-Section. Moment of Inertia of solid & Hollow sections like Rectangle, Triangle, Circle- Moment of Inertia about C.G for I section, T section. L-section and Channel Section.

Unit III

Shear Force and Bending Moment Diagrams: Definition - Shear Force and Bending Moment –Types of beams, types of load acting on beams, Sagging & Hogging Bending Moment and its importance –sign convention to draw SFD and BMD- Concept of Maximum bending moment, Point of Contra flexure & its importance-Drawing S.F & B.M Diagram for Cantilever, Simply Supported Beams subjected to Point Load and U.D.L

Unit IV

Strain energy & Impact Loading and Torsion in circular shaft: Introduction -Strain Energy-Types of loading-Sudden, Gradual & Impact Load-resilience, proof resilience and modulus of resilience-Equation for strain energy stored in a body when the load is gradually applied and suddenly applied, problems on strain energy.

Torsion of circular shaft: Introduction to Torsion, Angle of Twist, Polar Moment of Inertia, Torsion equation- (without derivation)-Assumptions in theory of Torsion -Power Transmitted by a shaft, axle of solid and hollow sections subjected to Torsion - Comparison between Solid and Hollow Shafts subjected to pure torsion- Problems on torsion.

Suggested Books /Suggested Readings:

1. Ramamurtham. S., "Strength of Materials", 14th Edition, Dhanpat Rai Publications.

2. Khurmi R S, "Applied Mechanics and Strength of Materials", 5 Edition, S.Chand and Company.

3. Popov E.P, "Engineering Mechanics of Solids", 2nd Edition, Prentice-Hall of India, New Delhi.

4. Nash W.A, "Theory and problems in Strength of Materials", Schaum Outline Series, McGraw-Hill Book Co., New York.

5. Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi.

6. Ryder G.H, "Strength of Materials", 3rd Edition, Macmillan India Limited.

7. Bansal R. K, "Strength of Materials", Laxmi Publications, New Delhi.

8. Timoshenko S.P, "Elements of Strength of Materials", Tata McGraw-Hill, Delhi.

DME422: STRENGTH OF MATERIAL LABORATORY

Credits : 1

LTP 002

Course Description: The course aims to equip the students with the experience of material testing procedures.

The course includes measuring strength, hardness, toughness, and stresses of material.

Course Outcomes (CO): Students will be able

Upon successful completion of the course, the students should be able to

CO1: Check tensile and compressive strength of material using UTM.

CO2: Test hardness of a material.

CO3: Calculate the torsion strength of materials.

CO4: Calculate the impact strength of the materials.

List of Practical

1. Draw Stress Strain curve for Ductile and Brittle material in tension.
2. Draw Stress Strain curve for Ductile and Brittle material in compression.
3. Draw shear stress, shear strain curve for ductile and brittle material in torsion strength testing
4. To determine the hardness of the given material by Rockwell hardness testing machine.
5. To determine the hardness of the given material by Brinell hardness testing machie.
6. To determine the impact strength by Izod test.
7. To determine the impact strength by Charpy test.

DME403: Production Technology

Credits : 3

LTP 300

Course Description: The course aims to impart basic knowledge and understanding about unconventional machining processes like Laser Beam Machining, Abrasive jet machining, etc., and powder metallurgy and their relevance in current manufacturing industry. To introduce processing methods of plastics, ceramics, and composite materials.

Course Outcomes (CO):

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

CO1: Classify various kinds of manufacturing processes and describe the factors to select a particular manufacturing process.

Co2: Describe the constructional features, advantages, disadvantages, and applications of various unconventional machining processes like EDM, ECM, USM, etc. used in industry.

CO3: Explain different methods of processing of plastics, ceramics, composite materials.

CO4: Describe advantages, disadvantages, and applications of powder metallurgy and explain the importance various surface finishing processes.

Unit I

Introduction – Manufacturing processes and their classification, various kinds of production, Selection of a manufacturing process, cutting tool materials and cutting fluids.

Unit II

Unconventional machining methods: Electric discharge machining (EDM), Electro-chemical machining (ECM), Chemical milling, Ultrasonic machining, Electron beam machining (EBM), Laser beam Machining (LBM), and Abrasive jet machining.

Unit III

Processing of plastics, ceramic, and composite materials: Polymerization, processing of thermoplastics, processing of thermosetting plastics, casting of plastics, machining of plastics, welding of plastics. Processing of ceramics, Forms of glass and their manufacture, finishing of glass, Production of composite structures.

Unit IV

powder metallurgy and surface finishing processes: Introduction, advantages and limitations

of P/M, Manufacture of metal powders, mixing and blending, Compacting, sintering, Surface finishing processes – Grinding, Lapping, Honing, Buffing, Barrel tumbling, Barrel rolling, Super finishing, Burnishing, Powder coating.

Recommended Books / Suggested Readings:

1. Manufacturing Processes for Engineering Materials - Kalpakjian S and Steven R Schmid Pearson Publication, 5th Edition.
2. Manufacturing Technology -Vol I- P.N. Rao- TMH
3. Fundamentals of Modern Manufacturing - Mikell P Groover- Wiley publ – 3 rd Edition.
4. Manufacturing Science – A.Ghosh & A.K.Malik – East West Press Pvt. Ltd.
5. Process and materials of manufacture- Lindberg- PHI
6. Production Technology- R.K. Jain- Khanna
7. Production Technology-P C Sharma-S. Chand
8. Manufacturing Processes- H.S. Shaun- Pearson 6. Manufacturing Processes- J.P. Kaushish- PHI

DME404: REFRIGERATION AND AIR CONDITIONING

Credits : 4

LTP 310

Course Description: The course is designed to give fundamental knowledge of types of refrigeration, refrigeration cycles, refrigerants and behavior under various conditions, different air conditioning terms and load calculation, designing of components of air distribution system.

Course Outcomes (CO):

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

CO1: Understand the basic concepts of refrigeration and air conditioning systems

CO2: Make basic calculation of psychometric properties and process

CO3: Do basic calculations of heating and cooling load requirements of a room

Unit I

Introduction:

Brief history and need of refrigeration and air conditioning, methods of producing cooling, ton of refrigeration, coefficient of performance, types and application of refrigeration and air condensing systems.

Unit II

Refrigerants:

Classification, nomenclature, desirable properties, secondary refrigerants, future industrial refrigerants

Air-conditioning systems:

Classification, system components, all air; all water; and air-water systems, room air conditioners, packaged air conditioning plant, central air conditioning systems, split air conditioning systems

Unit III

Air refrigeration:

Reversed Carnot cycle and its limitation, Bell-Coleman cycle, aircraft refrigeration, working and analysis of Simple; Bootstrap; Reduced ambient and Regenerative air refrigeration systems

Human comfort:

Selection of inside design conditions, thermal comfort, heat balance equation for a human being, factors affecting thermal comfort, Effective temperature, comfort chart and factors governing effective temperature, selection of outside design conditions

Unit IV

Psychrometry:

Dalton's law of partial pressure, Properties of moist air, temperature and humidity measuring instruments, psychrometric chart, psychrometric processes such as sensible heating and cooling, heating and humidification cooling and dehumidification, chemical dehumidification, adiabatic saturation

Duct design and air distribution:

Function; classification and economic factors influencing duct layout, equal friction method of duct design, use of friction chart, dynamic losses and its determination, Requirements of air distribution system, air distribution, grills, outlets, application, location

Recommended Books / Suggested Readings:

1. Refrigeration and Air Conditioning by C P Arora, McGraw-Hill India Publishing Ltd.
2. Refrigeration and Air-conditioning by Ramesh Arora , Prentice Hall of India
3. Refrigeration and Air Conditioning by Manohar Prasad, New Age International Publisher
4. Principles of Refrigeration by Roy. J Dossat, Pearson Education
5. Refrigeration and Air Conditioning by Jordon and Prister, Prentice Hall of India Pvt. Ltd.

DME424: REFRIGERATION AND CONDITIONING LABORATORY

Credits : 1

LTP 002

Course Description: The course aims to equip the students with practical knowledge of Refrigeration and Air Conditioning system.

This course includes practical knowledge and skill covering basic principles of refrigeration and air conditioning is required to be imparted to the students. Moreover, RAC industry is expanding and employment opportunities in this field are good.

Course Outcomes (CO): Students will be able

Upon successful completion of the course, the students should be able to

CO1: Understand the principles and applications of refrigeration systems

CO2: Evaluate performance of Vapour compression refrigeration system.

CO3: Apply working principle of VAR/VCR system to solve numericals based on VCR and VAR system.

CO4: Understand basics of psychrometry, air conditioning processes and different air conditioning systems.

CO5: Analyze different psychrometric processes on general cycle air conditioning trainer.

List of practical:

1. Demonstration of various refrigeration tools and equipment.
2. Practice in cutting, bending, flaring, swaging and brazing of tubes.
3. Study of thermostatic switch, LP/HP cut out overload protector filters, strainers and filter driers.
4. Identify various parts of a refrigerator and window air conditioner.
5. To find COP of Refrigeration system
6. To measure air flow using anemometer.
7. Charging of a refrigerator/ air conditioner.
8. To detect faults in a refrigerator/ air conditioner
9. Visit to an ice plant or cold storage plant or central air conditioning plant.

Recommended Books / Suggested Readings:

1. Refrigeration and Air Conditioning by Domkundwar; Dhanpat Rai and Sons, Delhi.

2. Refrigeration and Air Conditioning by CP Arora; Tata McGraw Hill, New Delhi.

3. Refrigeration and Air Conditioning by R.S Khurmi and J.K. Gupta; S Chand and Company Limited, New Delhi.

DCC422: FOUNDATION OF CAD

Credits : 2

LTP 004

Course Description: This course aims to equip the students with the practical aspects of the Computer Aided Design (CAD) by making the students to work on any of the CAD application software like Creo/Catia/NX-CAD etc. It involves the practicing on creating skectches and solid models of any product.

Course Outcomes (CO): Students will be able

After the competition of this course:

1. The students will be able to identify and suggest the hardware and software requirements of a CAD application software.
2. Apply sketching constraints on digital 2D drawings.
3. Generate 3D models using solid modeling CAD tools.
4. Indent different materials and calculate mass properties of parts.

Course Content:

Basic Concepts: Basic fundamentals of computer hardware and software, discussion about parametric concept, fundamentals of application software, discussion and advantages about CAD/CAM technology.

2D Sketching: Basic of sketching, practice on sketching profile (line, circle, rectangle, arc, spline etc.), practice on editing tool (fillet, chamfer, delete segment, corner, modify), discussion about constraining concepts, discussion about different types of constraints, various dimensioning methods: absolute dimensioning, incremental dimensioning, linear, radial, diameter, angular, slanted dimensions.

Solid Modeling: Discussion about solid modelling, advantage of solid modeling, discussion about finding mass properties, density, volume, density of different engineering materials, various tools used in solid modelling: Extrude, revolve tool, modification tools: Round, chamfer, various types of datum features, rib tool, advantage of draft tool, advantage of shell tool, mirror tool, copy & paste special tool, hole, pattern tool, sweep, blend, swept blend, variable section sweep, helical sweep, product development with Conceptual Design, solidify

tool with its advantages, section tool with its types.

List of Practicals:

1. Create a wireframe in Sketcher for various given exercises.
2. To constrain a wireframe in Sketcher for various given exercises.
3. Editing and modify the geometries for various given exercises.
4. To convert a 2D sketch into 3D object with help of Part modeling tools for the given exercises.
5. To modify the 3D part model with the help of Dress-up features.

ENS001: ENVIRONMENTAL STUDIES

Credits : 0

LTP 200

Course Description: This course deals with the environment components, ecosystems and how to maintain equilibrium in nature, its conservation, and different methods to reduce pollution and maintain our nature.

Course Outcomes (CO): After completion of this course, student will be able to

CO1: Understand about environment, its role and importance for living beings.

CO2: Understand the structure of ecosystem, food chain/ web.

CO3: Understand about the natural resources and their uses.

CO4: Understand about different types of pollution created by human beings and their side effects as well as the methods to reduce these pollutions and their alternatives.

Unit I

Introduction to environmental studies

Multidisciplinary nature of environmental studies: components of environment–atmosphere, hydrosphere, lithosphere, and biosphere.

Scope and importance: Concept of sustainability and sustainable development.

Ecosystems

What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chain, food web and ecological succession. Case studies of the following ecosystems:

a) Forest ecosystem

b) Grassland ecosystem

c) Desert ecosystem

d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit II

Natural Resources: Renewable and Non-renewable Resources

- Land Resources and land use change; Land degradation, soil erosion and desertification.
- Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity, and tribal populations.
- Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state).

- Heating of earth and circulation of air; air mass formation and precipitation.
- Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

Biodiversity and Conservation

- Levels of biological diversity: genetic, species and ecosystem diversity; Biogeography zones of India; Biodiversity patterns and global biodiversity hot spots
- India as a mega-biodiversity nation; Endangered and endemic species of India
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

Unit III

Environmental Pollution

- Environmental pollution: types, causes, effects, and controls; Air, water, soil, chemical and noise pollution
- Nuclear hazards and human health risks
- Solid waste management: Control measures of urban and industrial waste.
- Pollution case studies.

Environmental Policies & Practices

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture.
- Environment Laws : Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; International agreements; Montreal and Kyoto protocols and conservation on Biological Diversity (CBD). The Chemical Weapons Convention (CWC).
- Nature reserves, tribal population and rights, and human, wildlife conflicts in Indian context

Unit IV

Human Communities and the Environment

- Human population and growth: Impacts on environment, human health, and welfares.
- Carbon footprint.
- Resettlement and rehabilitation of project affected persons, case studies.
- Disaster management: floods, earthquakes, cyclones, and landslides.
- Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan.
- Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.
- Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

**** Field work**

- Visit to an area to document environmental assets; river/forest/flora/fauna, etc.
- Visit to a local polluted site – Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds, and basic principles of identification.
- Study of simple ecosystems-pond, river, Delhi Ridge, etc.

Recommended Books / Suggested Readings:

1. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.
2. Gadgil, M., & Guha, R.1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge.
4. Gleick, P.H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J. Gary K. Meffe, and Carl Ronald carroll. Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36-37.
7. McCully, P.1996. Rivers no more: the environmental effects of dams (pp. 29-64). Zed Books.
8. McNeil, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
9. Odum, E.P., Odum, h.T. & Andrews, J.1971. Fundamentals of Ecology. Philadelphia: Saunders.
10. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
11. Rao, M.N. & Datta, A.K. 1987. Wastewater Treatment. Oxford and IBH Publishing Co. Pvt. Ltd.
12. Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. Environment. 8th edition. John Wiley &

Sons.

13. Rosencranz, A., Divan, S., & Noble, M.L. 2001. Environmental law and policy in India. Tripathi 1992.

14. Sengupta, R. 2003.Ecology and economics: An approach to sustainable development. OUP.

15. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.

16. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. Conservation Biology: Voices from the Tropics. John Wiley & Sons.

17. Thapar, V. 1998. Land of the Tiger: A Natural History of the Indian Subcontinent.

18. Warren, C.E. 1971. Biology and Water Pollution Control. WB Saunders.

19. Wilson, E.O. 2006. The Creation: An appeal to save life on earth. New York: Norton.

20. World Commission on environment and Development. 1987. Our Common Future. Oxford University Press.

21. www.nacwc.nic.in

22. www.opcw.org

DME501: MECHANICAL MEASUREMENT

Credits : 3

LTP 300

Course Description: Measurement activities are given prime importance in industry. The diploma technicians often come across measuring different parameters of machined components and the appropriate fitment of interchangeable components in the assemblies. The student has to identify the variables to be measured, decide the accuracy required, select the instrument, investigate reasons for defects and give suggestions, decide whether to accept or reject the jobs. The different methods and instruments which can be used for linear and angular measurements, geometrical parameters. Therefore, this course attempts to impart the necessary knowledge and develop the required abilities so that he can perform his job efficiently and effectively in modern industry.

Course Outcomes (CO): After completion of this course, student will be able to

CO1: Select the relevant instrument for measurement.

CO2: Appreciate the concept of calibration of an instrument.

CO3: Understand the principle of operation of a linear and angular measuring instrument.

CO4: Use different types of comparators and Select gauges, fits and tolerances for machine components.

Course Content:

Unit I

General Concept: Need and classification of measurements and instruments. Definition of metrology, Categories of metrology, scientific metrology, Industrial metrology, Legal metrology.

Need of inspection, Precision, Accuracy Sensitivity, Readability, Calibration, Traceability, and Reproducibility. Sources of errors, Factors affecting accuracy. Selection of instrument, Precautions while using an instrument for getting higher precision and accuracy. Concept of least count of measuring Instrument.

Unit II

Standards and Comparators: Definition and introduction to line Standard, end standard, Wavelength standard and their comparison. Slip gauge and its accessories. Definition and

Requirement of good comparator, Classification, use of comparators. Construction and Working principle of comparators- Dial indicator, Sigma Comparator, Pneumatic comparator-high pressure differential type. Relative advantages and disadvantages.

Linear and Angular Measurement: Concept of linear measurement and its instruments: surface plate, V-block, calipers, combination set, depth gauge, vernier instruments, micrometer instruments, slip gauges. Concept of angular measurement. Instruments for angular Measurements. Use and working of universal bevel protractor, sine bar, spirit level. Principle of Working of Clinometers, Angle Gauges (With Numerical on Setting of Angle Gauges).

Unit III

Limits, Fits, Tolerances and Gauges: Concept of Limits and Fits, deviation, and Tolerances. Basic Terminology, Selective Assembly, Interchangeability. Indian standard (IS 919-1993) Fits, types of fits,Hole and Shaft Basis System, guide for selection of fit. ISO system of limit and fit, (Numerical on finding the limit and tolerances of hole and shaft assembly). Gauges: Limit gauges. Taylors principle design Plug, Ring Gauges.

Unit IV

Screw thread Measurements and Gear Measurement: Screw thread terminology, Errors in threads and Pitch Measurement of different elements such as major diameter, minor diameter, effective diameter, pitch diameter, Best size of wire two wire method. Introduction to Tool Maker's Microscope, applications and working principle. Gear Measurement Analytical and functional inspection of Gear, Measurement of tooth thickness by constant chord method and base tangent Method by Gear Rolling tester /Parkinson's Gear Tester. Measurement of tooth thickness by Gear tooth Vernier.

Geometrical Metrology and Surface Finish: Concepts of form errors; straightness, flatness, roundness errors and their measurements, concept of micro and macro errors, measurement of surface roughness Primary and secondary texture, terminology of surface texture as per IS 3073-1967, CLA, RMS, Rz values and their interpretation, Symbol for designating surface finish on drawing. Introduction to CMM.

Recommended Books / Suggested Readings:

1. Engineering Metrology, R K Jain, Khanna Publication, New Delhi.
2. Metrology and Measurement, A K Bewoor and V A Kulkarni, McGraw Hill Education (India) Pvt Ltd., New Delhi.
3. Engineering Metrology and Measurement, S B Raghvendra and Krishnamurth, Oxford Publication, New Delhi.
4. Measurement and Metrology, R K Rajput, S.K. Kataria and Sons, New Delhi.
5. Engineering Metrology for Engineers, J.F.W. Galyer and C.R. Shotbolt,Prentice Hall Publication, New Delhi,

DME521: MECHANICAL MEASUREMENT LABORATORY

Credits : 1

LTP 002

Course Description: Measurement activities are given prime importance in industry. The course aims to equip the students practically to identify the variables to be measured, decide the accuracy required, select the instrument, investigate reasons for defects and give suggestions, decide whether to accept or reject the jobs.

Course Outcomes:

Upon completion of this course, students should be able to:

CO1: Demonstrate the necessary skills for calibration, measurement and testing using different gauges and instruments.

CO2: Demonstrate the necessary skills to collect data, perform analysis and interpret results to draw valid conclusions through standard test procedures using various metrology instruments.

CO3: Measure various profile by using coordinate measuring machine.

Course Contents:

1. Use of Vernier Caliper for linear measurement.
2. Use of Micrometer for linear measurement.
3. Working and calibration of Dial Gauge.
4. Calibration of Micrometer using slip gauges
5. Use of Bevel Protractor and Sine bar to measure an angle and taper of the given component.
6. Measurement of effective diameter of external threads using two wire method.
7. Measurement of tooth thickness using gear tooth Vernier.
8. Calibration of pressure gauge.
9. Measurement of surface roughness of given jobs.
10. To study different parts and measure the various profile by using CMM.

Recommended Books / Suggested Readings:

1. Engineering Metrology, R K Jain, Khanna Publication, New Delhi.
2. Metrology and Measurement, A K Bewoor and V A Kulkarni, McGraw Hill Education (India) Pvt Ltd., New Delhi.
3. Engineering Metrology and Measurement, S B Raghvendra and Krishnamurth, Oxford Publication, New Delhi.
4. Measurement and Metrology, R K Rajput, S.K. Kataria and Sons, New Delhi.
5. Engineering Metrology for Engineers, J.F.W. Galyer and C.R. Shotbolt, Prentice Hall Publication, New Delhi.

DME502: AUTOMOBILE ENGINEERING

Credits : 3

LTP 300

Course Description: The course aims to understand & apply the knowledge about various systems, subsystems of the automobile & their interrelationships for the manufacturing of advanced automotive techniques.

The course includes automobile engine system, transmission system, control system, wheel & tyres, suspension system and automobile electrical system.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to

CO1: Know the different types of automobiles, basic structure of automobile and their manufacturers in India. Understand the working of engine.

CO2: Understand the transmission of power in automobile.

CO3: Explain the steering and braking system employed in automobiles

CO4: Explain the different suspension system of an automobile and selection of tyres for an automobile

CO5: Explain and diagnose the electrical and ignition system employed in Automobile

Course Contents:

Unit I

Automobile Engine System: Automobile-definition, types of auto mobiles-Major components of automobile-functions of automobile components-manufacturer of motor vehicles in India- automotive vehicles and their historical development. Engine -Main parts of engine-Cylinder block- Cylinder head- Piston- Connecting rod- Crank shaft- Crankcase- Cam shaft- Flywheel-Engine maintenance, dis- mounting of engine-Engine Disassembly-Inspection of engine components-engine reassembly.

Unit II

Transmission system: Clutch- Main parts-types of clutch- construction & working of Single plate clutch - diaphragm spring type clutch-Gear Box- Types of Gear box-construction & working of Sliding mesh Gear box-synchromesh Gear box-Constant mesh Gear box, Transmission devices- Torque converter, Overdrive, Final drive- Propeller shaft, Universal Joint - Differential-necessity-construction & working- Axle- Types of rear axle, front axle & their applications- Automatic Transmission System.

Unit III

Control System, Suspension system, wheels and tyres: Steering system- Functions & Requirement of steering system. Construction and working of steering linkage. Steering gear box –Rack & Pinion Steering Mechanism-Power steering - steering geometry- camber, caster, toe-in, toe-out, Kingpin inclination & their effects. Brake system- Types of brakes- Internal expanding brake - Disc brake- Hydraulic Brake. - Anti-lock braking system (ABS).

Suspension system, wheels and tyres: Suspension system-Need for good suspension system-elements of suspension system-Leaf Springs-Helical Springs - Construction & working of McPherson & wishbone type –Air Suspension System- Construction & working of Telescopic shock absorbers-Types of Automobile wheels, their construction & working-essential requirements of wheels - Construction, working & comparison of radial, cross-ply and tubed, tubeless tyre -Tyre specifications-Factors affecting tyre life-Wheel Alignment and Balancing.

Unit IV

Automobile Electrical systems: Auto electric system-main components of auto electric system-Ignition system- construction & working of electronic ignition system-Battery ignition system- Magneto ignition system, Starting system- Charging system. Lighting system - Power door locks features- Smart Wiper Control System - Air bags features used in automobiles.

Recommended Books / Suggested Readings:

1. Kirpal Singh, Automobile Engineering, Standard Publication.
2. K.K.jain and R.B.Asthana, Automobile Engineering, (Developed at NITTTR, Bhopal), Tata Mc Graw Hill.
3. R. B. Gupta, Automobile engineering, Satya Prakashan, New Delhi.
4. William Crouse, Automobile Mechanics, Tata Mc Graw Hill.
5. Joseph Hitner, Automotive Mechanics, CBS Publishers.
6. G, S. Narang, Automobile Engineering, Khanna publishers.

DME522: AUTOMOBILE ENGINEERING LABORATORY

Credits : 1

LTP 002

Course Description: The course aims to equip the students with the experience of automobile systems their working and diagnosis.

The course includes identification of automobile components, assembly and disassembly of engine, construction and working of gearbox, differential, steering, suspension & braking system and electrical circuits of automobile.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to

CO1: Understand the use of different automobile workshop tools and measuring instruments.

CO2: Identify the different components of two-wheeler and four wheelers.

CO3: Dissemble and assemble of the two stroke and four stroke engines using proper tools and equipment's.

CO4: Service and fault diagnosis of gearbox, differential, steering system, suspension system and braking system.

CO5: Prepare circuits of different electrical systems by understanding wiring diagrams of different vehicles.

List of Practical

1. Identification of tools, special tools, gauges, and equipment's used in Automobile workshop.
2. Identification of major components in two-wheeler and four-wheeler.
3. Practice on dismantling and assembling of Two-stroke single cylinder engine.
4. Practice on dismantling and assembling of Four-stroke single cylinder engine.
5. Overhauling of a Gear-box & calculation of gear ratio w.r.t number of teeth.
6. Overhauling of a Final drive & Differential with backlash adjustment, & calculation of Final drive gear ratio.
7. Overhauling of a Steering gear box with Backlash, End-play adjustment & calculation of steering gear ratio.
8. Overhauling of suspension system.
9. Overhauling of a braking system with free play & brake shoe adjustments.
10. Practice and construction of different automobile electrical system circuits.

DCC501: CAM TECHNOLOGY

Credits : 2

LTP 200

Course Description: This course introduces the concepts and capabilities of computer numerical control machine tools. This course is to teach the students about the growing CNC technology in turning and milling operations. They will learn about the machine parts, their uses and the various controllers and codes.

Course Outcomes (CO):

Upon completion of this subject, student will be able to:

CO1: Upon completion, student will be able to Classify and distinguish NC, CNC and DNC systems.

CO2: Develop manual and APT part programs for 2D complex profiles and test the programs through simulation.

CO3: CNC machine structures and system drives.

CO4: Develop interpolation algorithms for control loops.

Unit I

Introduction to CNC machine tools

Evolution of CNC Technology, principles, features, advantages, applications, CNC and DNC concept, classification of CNC Machines – turning centre, machining centre, grinding machine, EDM, types of control systems, CNC controllers, characteristics, interpolators– Computer Aided Inspection.

Unit II

Tooling and Work Holding Devices

Cutting tool materials for CNC machine tools- hard metal insert tooling- inserts and tool holder classification – qualified – semi qualified and preset tooling – ATC – APC – tooling for machining and turning centre – silent tool – work holding devices for rotating and fixed work parts- use of probes in CNC machines – economics of CNC – maintenance of CNC machines.

Unit III

CNC Lathe: G & M codes in CNC turning, selection of feed speed and depth of cut, tool holder for lathe, process planning and part programming for CNC lathe, program verification, various program cycles in CNC lathe: linear interpolation, turning cycle, taper turning, taper facing, grooving/parting, circular interpolation/filleting, threading cycles, pattern repeating cycles, peck drilling cycle, boring, taper boring, internal grooving.

Unit IV

CNC Milling: G & M codes in CNC milling, selection of feed speed and depth of cut for milling, ATC, various program cycles in CNC milling: linear interpolation, circular interpolation, tool radius compensation, sub program call, mirroring, high speed peck drilling cycle, deep hole peck drilling cycle, tapping cycles, boring cycles, helical interpolation with varying radius and pitch.

Text Books:

1. Pabla B.S, CNC Machines, Adithan M. New Age International, New Delhi, 2014(reprint).

2. Yoram Koren, Computer Control of Manufacturing Systems, McGraw Hill International, Singapore, 2006.

Suggested Reading:

1. John Stenerson and Kelly Curran, Computer Numerical Control: Operation and Programming, PHI, New Delhi, 2009

2. TC Chang, RA Wysk and HP Wang, Computer Aided Manufacturing, PHI, New Delhi, 2009

3. Valention, J., and Goldenberg, J. Introduction to Computer Numerical Control (CNC). NY: Pearson, 2013.

DCC521: CAM TECHNOLOGY LABORATORY

Credits : 2

LTP 004

Course Description: This course is to teach the students about the growing CNC technology in turning and milling operations. They will learn about the machine parts, their uses and the various controllers and codes.

Course Outcomes (CO):

CO1: Develop manual and APT part programs for 2D complex profiles and test the programs through simulation.

CO2: CNC machine structures and system drives.

CO3: Develop interpolation algorithms for control loops

List of experiments:

1. Develop a part program for milling and simulate.
2. Develop a part program for taper turning and simulate
3. Develop a part program for circular interpolation and simulate
4. Develop a part program for multiple turning operation and simulate
5. Develop a part program for thread cutting, grooving and simulate
6. Develop a part program for internal drills, boring and simulate
7. Develop a part program for grooving and simulate on CNC Milling
8. Develop a part program for drilling (canned cycle) and simulate
9. Develop a part program for mirroring with subroutines and simulate
10. Develop a part program for rectangular and circular pocketing and simulate

Suggested Reading:

1. Pabla B.S, CNC Machines, Adithan M. New Age International, New Delhi, 2014(reprint).

2. Yoram Koren, Computer Control of Manufacturing Systems, McGraw Hill International, Singapore, 2006.

DIP500: INDUSTRIAL TRAINING AND REPORT

Credits : 2

LTP 000

Course Description: This course has been designed for the students to have real life experiences to help them prepare for their career. The industry needs skilled and managerial personnel who have technical expertise as well as entrepreneurial qualities to manage the growing industry. Industrial training is a learning opportunity for students. Students should therefore receive feedback on their performance so that they can grow professionally.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Get experience of real-life working environment.

CO2: Analyze problems and find/suggest possible solutions.

CO3: Develop individual confidence to handle various assignments and expose themselves to acquire life skills to meet societal challenges

Course Contents:

- FORMAT OF INDUSTRIAL TRAINING REPORT
- Title page
- Certificate
- Preface
- Acknowledgement
- Index
- Introduction of industry
- Industry lay out
- Hierarchy of industry/organization chart
- Products
- Raw materials
- Types of major equipments/instruments/machines used in industry with their specification, approximate cost, and specific use
- Manufacturing/production process

- Faults and remedies
- Maintenance
- Safety features
- My liking & disliking of work places
- References
- Bibliography

GUIDELINES FOR STUDENTS

- Students must fill the training forms duly sealed and signed by authorities along with training order letter and submit it to training officer in the industry on the first day of training.
- He/she will have to get all the necessary information from the training officer regarding schedule of the training, rules, and regulations of the industry.
- During the training period students will keep record of all the useful information and maintain the weekly diary.
- He/she will prepare a detailed training report about the whole process and will submit it to the department at the time of examination.

SUGGESTED LEARNING RESOURCES

- Students may visit websites as their learning tool during industrial visit. .
- Search videos, animations for preparation of training report during the training period.

DCC522: ADVANCED DESIGN IN CAD

Credits : 2

LTP 004

Course Description: This course is the extension of Computer Aided Design – I Laboratory that aims to equip the students with the Assembly and Drafting and detailing of the various solid models generated.

Course Outcomes (CO):

At the completion of this course the student will be able to

1. Create the assembly and sub-assembly of the complex parts in any of the CAD application software like Creo/Catia/NX-CAD.
2. Create BOM and BOM balloons, exploded views of any part/assembly.
3. Create the detailed drawings of the parts using the drafting techniques of any CAD application, to provide the detailing on the drawing like annotations, dimensioning.
4. Implement GD&T application in production/manufacturing design.

Course Contents:

Assembly: Discussion about assembly, advantages of assembly, types of joints, top up & bottom up assembly, understanding skeleton modeling, constraints used in assembly, creating and managing explode states, animating explode state, understanding and creating assembly cross-sections, setting display styles in assembly, discussion about mechanism, joints used for mechanism.

Drafting and Detailing: discussion about drafting & detailing concepts, basic fundamentals of drawing, exploring drawing ribbon commands, creating drawings using formats & sheets, adding general views, adding projection views, editing drawing views by exploring its properties, editing visible view area, adding detail view, adding 2-d cross-section views, adding assembly exploded views, understandings annotations in drawings, showing, erasing and deleting annotations, adjusting dimensions and detail items, changing dimension display, understanding and configuring dimensional tolerances, understanding, configuring and applying geometric tolerances , adding and editing notes, applying surface finishing symbols, inserting tables, creating BOM table and BOM balloons, using layers in drawings.

Flexible Modeling/Functional Part Design:

List of Practicals:

1. Preparation of 3D Assembly model using Creo Parametric software for Exercise - 1.
2. Preparation of 3D Assembly model using Creo Parametric software for Exercise - 2.
3. Preparation of 3D Assembly model using Creo Parametric software for Exercise - 3**.**

Suggested Readings:

1. J F Douglas, Gasionckw, and J P Swaffield, “Fluid Mechanics”, 3rd Edition Addision Wesley Longman, Inc Pitman (1999)
2. Fox R.W. and McDonald A.T., "Introduction to Fluid Mechanics", Fifth Edition, John Wiley & Sons, Inc. 2001
3. Pao H F Richard, “Fluid Mechanics”, John Wiley and Sons (1995).
4. J A Fay, “Introduction to Fluid Mechanics”, Prentice Hall of India Private Limited, New Delhi (1996)
5. Yunus Cengel& John Cimbala, “Fluid Mechanics: Fundamentals and Applications”, 2nd reprint 2007, Tata McGraw Hill, New Delhi
6. Som & Biswas, Fluid Mechanics, Tata-McGraw Hill, New York

BMA503: IC Engines

Credits : 4

LTP 310

Course Description: This course aims to improve understanding of the automobile engines and their operation and to use them to experience how materials on fluid mechanics, thermodynamics, and heat transfer studied in previous years integrates into a total engineering concept. The course also aims to advance student's problem solving skills such that the basics learned from the course can be used to deal with the real research and engineering challenges. On completion of this course, the students are expected to understand the fundamental principle, operation, performance of IC Engines, auxiliary systems, combustion of SI & CI engines, various fuels used and engine emissions.

Course Outcomes (CO):

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

1. Demonstrate knowledge of the different types of IC engines, their operations and operating cycles
2. Compute indicated/brake/friction power, sfc and efficiency and demonstrate an understanding of mixture preparation in SI & CI engines.
3. Demonstrate the ability to analyze the combustion process in SI and CI Engines.
4. Demonstrate an understanding of environment impacts of wide-spread use of internal combustion Engines, including social impacts of alternative fuels.

Unit I

Introduction to IC Engines: Heat Engine versus Internal combustion Engine, Historical development of IC Engines, Classification and Nomenclature, Applications of IC Engines. Brief review of Air standard cycles: Carnot, Otto, Diesel and Dual Cycle.

Working of IC Engines: Working of 4 stroke SI and CI Engines and their valve timing diagram, working of 2-stroke SI and CI engines and their valve timing diagrams, Comparison of two stroke and four stroke Engines.

Fuel Air Cycles and their analysis: Composition of cylinder gases, variable specific heats, Dissociation, Air standard versus fuel air cycles, Effect of operating variables like compression ratio, fuel air ratio. Actual engine cycles and losses: Comparison between Actual, Fuel- Air

cycle, Air standard cycles for S.I. and C.I engines.

Unit II

Measurement and Testing: Measurement of Friction Power, Brake Power, indicated Power, Measurement of Speed, Air consumption, fuel consumption, heat Balance Sheet for engine, governing of IC Engines. Performance Characteristics of IC Engines: Performance parameters, performance of SI engines, performance of C.I. engines, Engine performance maps.

Mixture Preparation Systems: Fuel supply system and fuel pumps, Simple carburetor and its working, Ideal requirements from an ideal carburetor, limitations of single jet carburetor, Different devices used to meet the requirements of an ideal carburetor, Petrol injection. Fuel Injection systems for CI Engines: Classification of Injection Systems, Injection Pump, Fuel Injector, Nozzle, and Injection in SI Engines.

Unit III

Combustion in SI Engine: Important qualities of SI engine fuels and their ratings. Stages of Combustion in S I Engine, flame front propagation, factors influencing the flame speed, ignition lag and factors affecting the ignition lag, Abnormal combustion and knocking, control and measurement of knock, Anti knock agents, combustion chambers of S I engines.

Combustion in CI Engines: Important qualities of CI engine fuels and their ratings. Stages of combustion, Delay period, factors affecting delay period; detonation and factors affecting detonation; comparison of abnormal combustion in SI &CI engine, rating of IC engine fuels, combustion chambers for IC engines.

Unit IV

Emission and Control: Emission of various pollutants from the engine, NO formation in S.I. engines, NO formation in C.I. engines, Emission of carbon monoxide, HC emission in S.I. engine and hydrocarbon emission in C.I engine, particulate emissions in S I engine, Soot formation fundamentals, Methods of controlling emissions; Catalytic convertors, Thermal reactors, Exhaust gas recirculation, EURO and BHARAT norms. Alternative fuels; Alcohol, Hydrogen, Natural gas and LPG, Biodiesel, biogas, Merits and demerits as fuels.

Text Books:

1. V Ganesan, “Internal Combustion Engine”, Tata McGraw Hill, New Delhi.
2. V. Domkundwar, “A Course In Internal Combustion Engines”, Dhanpat Rai Publishing

Suggested Readings:

1. J B Heywood, “Internal Combustion Engine Fundamentals”, McGraw Hill, Publication, New Delhi (1988).
2. C F Taylor, “The Internal Combustion in Theory and Practice”, Volume I and II, MIT Press, Cambridge, Mass (1968).
3. W WPulkrabek, “Engineering Fundamentals of Internal Combustion Engine”, Pearson Education, New Delhi (2003).
4. R Stone, “Introduction to Internal Combustion Engines”, 2nd Edition, Macmillan (1993).
5. B E Milton, “Thermodynamics, Combustion and Engines”, Champman and Hall (1995).

Web Links:

http://nptel.ac.in/courses/101101001/28
www.iitg.ernet.in/...saha_internal_combustion_engine/
http://nptel.ac.in/courses/103105110/

BMA509: CNC TECHNOLOGY

Credits : 2

LTP 200

Course Description: This course introduces the concepts and capabilities of computer numerical control machine tools. This course is to teach the students about the growing CNC technology in turning and milling operations. They will learn about the machine parts, their uses and the various controllers and codes.

Course Objectives: Upon completion of this subject, student will be able to:

CO1: Upon completion, student will be able to Classify and distinguish NC, CNC and DNC systems.

CO2: Develop manual and APT part programs for 2D complex profiles and test the programs through simulation.

CO3: CNC machine structures and system drives.

CO4: Develop interpolation algorithms for control loops.

Course Contents:

Unit I

Introduction to CNC machine tools

Evolution of CNC Technology, principles, features, advantages, applications, CNC and DNC concept, classification of CNC Machines – turning centre, machining centre, grinding machine, EDM, types of control systems, CNC controllers, characteristics, interpolators– Computer Aided Inspection

Unit II

Tooling and Work Holding Devices

Cutting tool materials for CNC machine tools- hard metal insert tooling- inserts and tool holder classification – qualified – semi qualified and preset tooling – ATC – APC – tooling for machining and turning centre – silent tool – work holding devices for rotating and fixed work parts- use of probes in CNC machines – economics of CNC – maintenance of CNC machines.

Unit III

CNC Lathe: G & M codes in CNC turning, selection of feed speed and depth of cut, tool holder for lathe, process planning and part programming for CNC lathe, program verification, various program cycles in CNC lathe: linear interpolation, turning cycle, taper turning, taper facing, grooving/parting, circular interpolation/filleting, threading cycles, pattern repeating cycles, peck drilling cycle, boring, taper boring, internal grooving.

Unit IV

CNC Milling: G & M codes in CNC milling, selection of feed speed and depth of cut for milling, ATC, various program cycles in CNC milling: linear interpolation, circular interpolation, tool radius compensation, sub program call, mirroring, high speed peck drilling cycle, deep hole peck drilling cycle, tapping cycles, boring cycles, helical interpolation with varying radius and pitch.

Text Books:

1. Pabla B.S, CNC Machines, Adithan M. New Age International, New Delhi, 2014(reprint).

2. Yoram Koren, Computer Control of Manufacturing Systems, McGraw Hill International, Singapore, 2006

Suggested Reading:

1. John Stenerson and Kelly Curran, Computer Numerical Control: Operation and Programming, PHI, New Delhi, 2009

2. TC Chang, RA Wysk and HP Wang, Computer Aided Manufacturing, PHI, New Delhi, 2009

3. Valention, J., and Goldenberg, J. Introduction to Computer Numerical Control (CNC). NY: Pearson, 2013.

BMA506: METROLOGY AND QUALITY CONTROL

Credits : 3

LTP 300

Course Description: This course will facilitate students with the measuring instruments for different type of measurements and able to take decision regarding acceptance and rejection of the components.

Course Objectives: Upon completion of this subject, student will be able to:

1. Identify and select the relevant instrument for measurement.
2. Develop an ability of problem solving and decision making by identifying and analyzing the cause for variation and recommend suitable corrective actions for quality measurements using computer aided measurement techniques.
3. Describe various industrial metrological instruments for screw thread and gear profiles
4. Apply the fundamental principles for measurement of various mechanical quantities like force/torque and pressure etc.

Course Contents:

Unit I

General Concepts Need and classification of measurements and instruments; basic and auxiliary functional elements of a measurement system; Mechanical versus electrical / electronic instruments; primary, secondary and working standards.

Measuring and Gauging Instruments: Mechanical linear and angle measuring instruments, Vernier calipers, micrometers, dial gauges, bevel protectors, sine bars, spirit level, optical instruments autocollimator, tool room microscope. Comparators; principle, types of comparators, mechanical, optical, pneumatic, electrical comparators;

Unit II

Limits, fits and tolerances: Concepts of interchangeability, need for standards system of limits, fits and tolerances, BIS:919:1963 standard system, selection of limits and fits, exercise on limits, fits and tolerances, design principles for limit gauges, Taylor's principles, types of limit gauges, tolerances on limit gauges, Design of limit gauges.

Geometrical Metrology and Surface Finish: Concepts of form errors; straightness, flatness, roundness errors and their measurements using computer aided measurement techniques, concept of micro and macro errors, measurement of surface roughness, stylus method using, mechanical, optical, electrical magnification methods.

Unit III

Screw Threads and Gear Metrology: Elements of screw threads metrology, measurement of major, minor and effective diameters of external and internal screw threads, measurement of pitch and screw thread angle, Elements of gear metrology, measurement of gear tooth thickness, gear profile, pitch and runout for involute gears, gear rolling test;

Unit IV

Transducers: Transducers, types, governing principles of transducers; Examples. Displacement measurement, detailed study of various types of displacement transducers, Velocity measurement, linear and angular, study of velocity transducers;

Force, Torque and Pressure Measurement: Mechanical, pneumatic, and hydraulic load cells; torque measuring devices; dynamometers, types of strain gauges, factors affecting strain measurement; Electrical strain gauges, gauge material, fixing methods, strain gauge circuits, examples, use of strain gauges for the measurement of the force and torque, Pressure measurement, types of pressure transducer; differential pressure measuring devices, performance characteristics; low and high pressure measurement.

Text Books:

1. R.K. Jain, "Engineering Metrology ", S Chand and Company
2. D.S. Kumar, "Mechanical Measurement & Control", Metropolitan Publishers

Suggested Reading:

1. Doeblin, "Mechanical Measurement",Mcgraw Hill
2. Gharam T. smith, "Industrial Metrology" , Springer
3. I.C. Gupta, "Engineering metrology", Dhanpat Rai& sons delhi

Web Links:

1.https://www.slideshare.net/GopinathGuru3/metrology-53006927
2.http://nptel.ac.in/courses/112106179/
3.http://nptel.ac.in/courses/112106138/

BMA507: INDUSTRIAL AUTOMATION

Credits : 4

LTP 300

Course Description: This course aims to equip the students with the knowledge of the fluid power control i.e. hydraulics and pneumatics and also with electrical and electronic controls used for robot. It also includes the automation and brief history of robot and applications.

Course Outcomes (CO):

1. To recognize standard schematic symbols for common fluid power components.
2. To understand and troubleshoot basic fluid power, electro-hydraulic, and electro-pneumatic circuits using schematic diagrams.
3. To get the basic knowledge about the various transfer devices and feeders.
4. To know various different basic types of robots and how to program them.

Course Content

Unit I

Introduction: Concept and scope of automation, Socio economic consideration, Low cost automation.

Fluid Power Control: Fluid power control elements and standard graphical symbols, Construction and performance of fluid power generators, Hydraulic and pneumatic cylinders – construction, design and mounting; Hydraulic and pneumatic valves for pressure, flow and direction control: Servo valves and simple servo systems with mechanical feedback, governing differential equation and its solution for step position input, Basic hydraulic and pneumatic circuits.

Unit II

Pneumatic Logic Circuits: Design of pneumatic logic circuits for a given time displacement diagram or sequence of operations

Fluidics: Boolean algebra, Truth tables, Coanda effect, Fluidic elements – their construction working and performance characteristics: Elementary fluidic circuits

Unit III

Transfer Devices and Feeders: Their Classification: Construction details and application of transfer devices and feeders (Vibratory bowl feeder, reciprocating tube feeder and centrifugal hopper feeder).

Electrical and Electronic Controls: Introduction to electrical and electronic controls such as electromagnetic controllers – transducers and sensors, microprocessors, programmable logic controllers (PLC), Integration of mechanical systems with electrical, electronic and computer systems.

Unit IV

Robotics: Introduction, classification based on geometry, devices, control and path movement, End effectors – types and applications, Sensors – types and applications, Concept of Robotic/Machine vision, Teach pendent.

Industrial Applications of Robots for material transfer, machine loading / unloading, welding, assembly and spray painting operations.

Text Books:

1. A.K Gupta, S.K. Arora, Industrial Automation and Robotics, Laxmi Pubilaction (P) Ltd.
2. S.R. Majumdar, Pneumatic Control, Tata McGraw Hill.

Suggested Readings:

1. Anthony Esposito, Fluid Power with applications, Pearson.
2. S.R. Deb, Robotics and Flexible Automation, Tata mc Graw Hill

Web Links:

1.https://www.scribd.com/doc/237309451/Robotics-and-Industrial-Automation

2.http://nptel.ac.in/courses/108105063/pdf/L-01(SM)(IA&C)%20((EE)NPTEL).pdf

3.http://nptel.ac.in/downloads/112101098/

BMA523: IC ENGINES LABORATORY

Credits : 1

LTP 002

Course Description: This course intends to familiarize the students with practical working of petrol and diesel Internal-combustion Engines and to estimate their performance as well as emission characteristics.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

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

CO1: Calculate the performance characteristics such as Brake horse power (BHP), Mechanical efficiency and Specific fuel consumption (SFC) of a specific 2-stroke/4 stroke, petrol/diesel engine and make heat balance sheet for it.

CO2: Apply the concept of Morse test on SI engine (multi cylinder).

CO3: Draw BHP v/s fuel rate, air rate and A/F and (ii) BHP v/s Mech efficiency & SFC for single cylinder 4-stroke diesel engine.

CO4: Comprehend the effects of emission formation of IC engines.

List of experiments:

1. Dismantle a two stroke petrol and diesel engine. Note the function and material of each part, reassemble the engine.
2. Dismantle four stroke diesel engine. Note the function of each part, reassemble the engine.
3. Determine the brake power, indicated power, friction power and mechanical efficiency of a multi cylinder petrol engine running at constant speed (Morse Test).
4. Performance testing of a diesel engine from no load to full load (at constant speed) for a single cylinder engine in terms of brake power, indicated power, mechanical efficiency and specific fuel consumption. Draw/obtain power consumption curves.
5. To perform constant speed performance test on a single cylinder diesel engine & make the heat balance sheet for the same.
6. Performance testing of a 2-stroke petrol engine from no load to full load (at constant speed) for a single cylinder engine in terms of brake-power, indicated power, mechanical efficiency and specific fuel consumption. Draw/obtain power consumption curves.
7. To perform constant speed performance test on a single cylinder petrol engine & make the heat balance sheet for the same.
8. To measure CO & Hydrocarbons in the exhaust of 2- stroke / 4-stroke petrol engine.

Recommended Books / Suggested Readings

1. GNA University's Lab Manual on IC Engine.
2. Internal Combustion Engine Lab Manual by Mohammad Ali Shariati, Majid Majeed Mohammad and Usman Khan, Lambert Publishing House,2017.

BMA524: COMPUTER AIDED DESIGN – III LABORATORY

Credits : 2

LTP 004

List of Practicals:

Surface Modeling: Importance of surface modeling, various tools in surface modeling: rotational blend tool, fill tool, boundary blend, merge, trim, thicken, copy/publish geometry tool with its advantages, data migration concept with its advantages, merge/inheritance tool with its advantages.

Sheet Metal Modeling: Role and importance of Sheet Metal works Sheet Metal Modelling Fundamentals, Understanding Developed Length, Creating New Sheet Metal Model, Creating Planer Walls, Extruded and Revolved Wall Features, Understanding and Creating Secondary Flat Walls, Relief, Using Flange walls, Extruded Walls, Creating Bend, Unbend, Bend Back, Flat States Features, Creating Die Form Features, Punch Form Features, Rip Features.

List of Practical:

1. Drafting and detailing of Assembly 1 (gear profile).
2. Drafting and detailing of Assembly 2 (blower).
3. Drafting and detailing of Assembly 3 (grinder).
4. Drafting and detailing of pressure die casting component (choke cover).
5. Drafting and detailing of forging component (flange or rottle)
6. Drafting and detailing of blend surfaces.
7. Drafting and detailing of sheet frame.
8. Modeling of a tractor bonnet using sheet metal module.
9. Drafting and detailing of tractor bonnet.

BMA529: CNC TECHNOLOGY LABORATORY

Credits : 1

LTP 002

Course Description: This course is to teach the students about the growing CNC technology in turning and milling operations. They will learn about the machine parts, their uses and the various controllers and codes.

Course Objectives: Upon completion of this subject, student will be able to:

CO1: Develop manual and APT part programs for 2D complex profiles and test the programs through simulation.

CO2: CNC machine structures and system drives.

CO3: Develop interpolation algorithms for control loops

List of experiments:

1. Develop a part program for milling and simulate.
2 Develop a part program for taper turning and simulate
3. Develop a part program for circular interpolation and simulate
4 Develop a part program for multiple turning operation and simulate
5 Develop a part program for thread cutting, grooving and simulate
6 Develop a part program for internal drills, boring and simulate
7 Develop a part program for grooving and simulate on CNC Milling
8 Develop a part program for drilling (canned cycle) and simulate
9 Develop a part program for mirroring with subroutines and simulate
10 Develop a part program for rectangular and circular pocketing and simulate

Suggested Reading:

1. Pabla B.S, CNC Machines, Adithan M. New Age International, New Delhi, 2014(reprint).
2. Yoram Koren, Computer Control of Manufacturing Systems, McGraw Hill International, Singapore, 2006

BMA536: METROLOGY AND QUALITY CONTROL LABORATORY

Credits : 1

LTP 002

Course Description: The objectives of this course are to learn the main principle on which different instruments operate and provide hands on experience on them and generate knowledge and skill in use of precision instruments. Learn a basic understanding of various instruments used in linear and angular.

Course Outcomes :

After completion of the course student will be able to:

1. Develop quality standards of engineering products in industries.
2. Demonstrate work in quality control departments of industries and to ensure quality of products.
3. Analyze the measurement of the surface roughness and perform alignment tests.
4. Develop the ability to apply the principles in instruments and measuring techniques.

List of Experiments:

1. Use of Precision Measuring Instrument (linear and angular) and Gauges
2. Gear parameter measurement, Thread Parameter measurement
3. Calibration of Measuring Instruments
4. Indirect method of measurement using standard balls and rollers
5. Usage of various comparators(mechanical, electrical ,pneumatic etc)
6. Process capability study using mechanical Comparator
7. Various parameter measurement using Computerised profile projector
8. Straightness, flatness measurement using autocollimator
9. Surface roughness measurement
10. Interferometers and measurements using laser.
11. Fundamental measurement using CMM, automatic probing.

BMA537: INDUSTRIAL AUTOMATION LABORATORY

Credits : 1

LTP 002

Course Description: This course offers key practical courses similar to those found in our highly successful Hydraulic and Pneumatic Technology program including advanced programming, automation and process controls.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: The student should be able to design hydraulic and pneumatic circuits.

CO2: The student should be able to design and understand the electro-hydraulic and electro-pneumatic circuits.

CO3: Understand various automation tools and methods in manufacturing industry.

CO4: Implement various control and automation method in process industries.

List of experiments:

1. Design and Validate the circuit a small acting cylinder is to extend and clamp a workpiece when push button is pressed as long as push button is activated the workpiece remains clamped in position if the push button is released the clamp is retracted using an additional start button .
2. Design and Validate the circuit a large single acting cylinder is to extend and clamp a workpiece when the push button is pressed. As long as push button is activated the cylinder should remain clamped position if the push button is released the clamper retracted using an additional start button.
3. Design and Validate the circuit a double acting cylinder is to advanced using 3 band operated valves which are positioned at different locations from the cylinder if any of these push buttons are pressed the cylinder must extend cylinder must be retracted position when push buttons are not pressed
4. The allocating device supplies valve blanks to a machining station by operating a push button. The Piston rod of the single acting cylinder is made in advance after releasing the actuation button the

Piston rod Returns. Design and Validate the circuit.

5. Pneumatic system is designed to operate a door of a public transport vehicle assuming that the opening and closing of the doors are controlled by a two button switch that is on and off when the button is in on position the door will open and close when the off button is pressed. Design and Validate the circuit.

6. Design and Validate the circuit a single cycle operation of a double acting cylinder using limit switch and memory valve .

7. Design and Validate the circuit a Single and multi cycle operation of a double acting cylinder using roller LIver valve and memory valve .

8. Design and Validate the circuit a Single cycle automation of multiple cylinders in the sequence A+ B+ A- B-.

9. Design and Validate the circuit an operation of a single acting cylinder using single solenoid valve with indirect actuation of valve.

10. Design and Validate the circuit an operation of a double acting cylinder using double solenoid valve you separate manual control valve for forward and return stroke.

Recommended Books / Suggested Readings:

1. GNA University's Lab Manual on IC Engine.

2. Lab Manual of Janatics and Festo.

BMA601: ADDITIVE MANUFACTURING

Credits : 3

LTP 300

Course Description: This course will teach the fundamentals of Additive Manufacturing (AM) theory and how AM is being used in industry to accelerate product development and its implications on traditional low-volume and high-volume manufacturing processes.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Understand the working principles and process parameters of additive manufacturing processes.

CO2: Explore different additive manufacturing processes and suggest suitable methods for building a particular component.

CO3: Perform suitable post processing operation based on product repair requirement.

CO4: Design and develop a working model using additive manufacturing Processes.

Course Content:

Unit I

Introduction: Overview – History - Need-Classification -Additive Manufacturing Technology in product development-Materials for Additive Manufacturing Technology – Tooling – Applications.

CAD & Reverse Engineering: Basic Concept – Digitization techniques – Model Reconstruction – Data Processing for Additive Manufacturing Technology.

Unit II

Liquid Based and Solid Based Additive Manufacturing Systems: Classification – Liquid based system – Stereolithography Apparatus (SLA)- Principle, process, advantages and applications - Solid based system –Fused Deposition Modeling - Principle, process.

Unit III

Powder Based Additive Manufacturing Systems: Selective Laser Sintering ,Principles of SLS process - Process, advantages and applications, Three Dimensional Printing - Principle, process, advantages and applications- Laser Engineered Net Shaping (LENS), Electron Beam Melting.

Unit IV

Medical and Bio-Additive Manufacturing: Customized implants and prosthesis: Design and production. Bio-Additive Manufacturing- Computer Aided Tissue Engineering (CATE).

Text Books:

1. Chua C.K., Leong K.F., and Lim C.S., —Rapid prototyping: Principles and applications‖, Third edition, World Scientific Publishers, 2010.

Suggested Readings:

1. Gebhardt A., —Rapid prototyping‖, Hanser Gardener Publications, 2003.

2. Liou L.W. and Liou F.W., —Rapid Prototyping and Engineering applications: A tool box for prototype development‖, CRC Press, 2007.

3. FDM Guide Book

BMA605: TOOL DESIGN

Credits : 3

LTP 300

Course Description: This course aims to teach the students about the design of dies for bending, forming, drawing and forging. This also includes the understanding of the cost accounting methods and the time calculation techniques.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

1. Describe tool design methods and punch and die manufacturing techniques
2. Select material for cutting tools and gages; classify various cutting tools and gages and identify their nomenclature
3. Describe the principles of clamping, drill jigs and computer aided jig design
4. Design fixtures for milling, boring, lathe, grinding, welding; identify fixtures and cutting tools for NC machine tools
5. Explain the principles of dies and moulds design
6. To estimate the cost of die using cost estimation methods.

Unit I

Terminologies and operations: Types of presses, Press Accessories, Computation of press capacity, Material Utilization, Press Work Materials, Center of pressure, Difference between bending, forming and drawing, Types of Bending dies, Ejectors, Variables affecting Metal flow in drawing operations, draw die inserts, Design and development of bending, forming, drawing reverse re-drawing and combination dies.

Unit II

Blank development for axi-symmetric, rectangular and elliptic parts, Single and double action dies, Fundamentals of die-cutting operations, Cutting action in punch and die operations, Die clearance, Blanking and Piercing Die construction, Pilots, Strippers and Pressure Pads, Strip layout, Design of simple progressive and compound die sets, Forging Die, Flow lines, parting lines, open and close die forging

Materials for die block, Bulging, Swaging, Embossing, coining, curling, hole flanging, shaving and sizing, assembly, fine Blanking dies, recent trends in tool design, computer Aids for sheet-

metal forming Analysis, tooling for numerically controlled machines, Single minute exchange of dies.

Unit III

Cost accounting or costing: Elements of cost, Methods of cost estimation, Data requirement for cost estimating, steps in making a cost estimate, Chief factors in cost estimating, Numerical examples, Calculation of machining times.

Unit IV

Jigs and Fixtures: Objectives of jigs and fixtures, Types of Jigs, Post, Turnover, Channel, latch, box, pot, angular post, indexing jigs, General principles of milling, Lathe, boring, broaching and grinding fixtures, Assembly, Inspection and Welding fixtures, Modular fixturing system, Quick change fixtures, Work holding equipment.

Text Books:

1. O.P. Khanna : A Textbook of production Engineering
2. P.C. Sharma : A Textbook of production Engineering, S. Chand Publication, New Delhi, 2nd edition

Suggested Readings:

1. Donaldson : Tool Design, McGraw Hill, New York, 3rd edition, Tata McGraw-Hill
2. Jeff Lantrip, David A. Smith and John G. Nee, (2003) Fundamentals of Tool Design, 5th Edition
3. Cole, C. B. : Tool Design, American Technical Society Pub., Chicago,1963
4. ASTME : Fundamental of Tool Design, Prentice Hall, 3rd edition, Society of Manufacturing

Web Links:

1.http://fritzing.org/media/uploads/publications/Knoerig08_DesignToolsDesign.pdf
2.https://uni.edu/~rao/Mfg%20Tooling%20-04%20Cutting%20tool%20design.pdf
3.http://www.erode-sengunthar.ac.in/dept/lm/MECH/DJF/Design%20of%20dies.ppt

DCC622: TOOL DESIGN LABORATORY

Credits : 1

LTP 002

Course Description: This course aims to teach the students about the design of dies for bending, forming, drawing and forging. This also includes the understanding of the cost accounting methods and the time calculation techniques.

Course Outcomes (CO):

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

CO1: Design and generate core and cavity for sand casting, pressure die casting, and injection molding processes.

CO2: Design and generate core and cavity for forging components.

CO3: Design and generate core and cavity sheet metal work.

List of Practical:

1. Complete core and cavity generation of pressure die casting component (choke cover)
2. Complete core and cavity generation of forging component (flange forging)
3. Complete core and cavity generation of forging component (rottle forging)
4. Complete core and cavity generation of sand-casting component (gear box)
5. Complete core and cavity generation of injection molding componet (grinder middle cover)
6. Complete core and cavity generation of sheet metal (sheet frame)

DME602: DESIGN OF MACHINE ELEMENTS

Credits : 4

LTP 310

Course Description: The course aims to develop an ability to design a system, component, or process to meet desired needs within realistic constraints. Helps to develop an ability to identify, formulate, and solve engineering problems, understand the design methodology for machine elements. It benefits to analyze the forces acting on a machine element and apply the suitable design methodology. To understand the various standards and methods of standardization. It aids to apply the concept of parametric design and validation by strength Analysis

The course includes introduction to design of machines, standardization, design concept, design of fasteners, design of shaft and axles, design of keys and couplings, design of levers and links, design of pipe joints, design of bearings and springs.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Understand the term machine design and its types, general design procedure for a mechanical component, and basic criteria of selection of material.

CO2: Describe manufacturing considerations in machine design and understand the importance of factor of safety.

CO3: Design various types of joints – riveted, welded, cotter and knuckle joints, etc. and shafts for different loading conditions.

CO4: Design keys, splines, various kinds of coupling, and levers.

Course Content

Unit I

Introduction: Meaning of design with special reference to machine design, definition and understanding of various types of design, design process, design and creativity, general design considerations, concept of tearing, bearing, shearing, crushing, bending and fracture.

Standardization: Designation of materials according to Indian standards code, basic criteria of selection of material, mechanical properties of materials.

Unit II

Design Concept: Concept of concurrent engineering in design, introduction to 'Design for X' manufacturing considerations in machine design, stress concentration, factor of safety under different loading conditions, design for static loading, design for variable loading for both limited and unlimited life, concept of fatigue and endurance strength.

Unit III

Design of fasteners: Design of rivets for boiler joints. Design of spigot and socket cotter joint, Gib and cotter joint and knuckle joint. Design of welded joints for various loading conditions.

Design of pipe joints: Stresses in pipe joints, design of pipe joints with oval flange, square flange, design of seals and gaskets.

Design of shaft and axles: Design of solid and hollow shafts for transmission of torque, bending moments and axial forces, Design of shaft for rigidity, Design of axle.

Unit IV

Design of keys and couplings: Design of keys, design of splines, design of sleeve and solid muff coupling, clamp or compression coupling, rigid and flexible flange coupling, design of universal joint.

Design of levers and links: Design of levers (foot lever, hand lever, cranked lever, bell crank lever, safety valve lever and shoe brake lever), design of link.

Recommended Books / Suggested Readings:

1. Mechanical Engineering Design, Joseph E. Shigley, Charles Russell Mischke, Richard Gordon Budynas, McGraw-Hill

2. Fundamentals of machine component design Robert C. Juvinall, Wiley

3. Analysis and design of machine elements V.K Jadon, , I.K. International

4. Design of Machine elements V.B Bhandari, Tata Mc. Hill

5. Design of machine elements-I, S.S Jolly, Dhanpat Rai and Co.

DIP 600: MAJOR PROJECT

Credits : 2

LTP 004

Course Description:

The aim of this course will be students able to think innovatively on the development of components, products, processes, or technologies in the engineering field and apply knowledge gained in solving real life engineering problems.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to

CO1: To apply engineering knowledge in practical problem solving.

CO2: To foster innovation in design of products, processes or systems.

CO3: To develop creative thinking in finding viable solutions to engineering problems.

Course Plan

- Review and finalization of the approach to the problem relating to the assigned topic.
- Preparing a detailed action plan for conducting the investigation, including team work.
- Detailed Analysis/Modeling/Simulation/Design/Problem Solving/Experiment as needed.
- Final development of product/process, testing, results, conclusions, and future directions.
- Preparing a report in the standard format for being evaluated by the dept. assessment board Final project presentation and viva voce by the assessment board including external expert.
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DCC623: ADVANCED COMPUTER AIDED DRAFTING

Credits : 2

LTP 004

Course Description: This course provides introduction about the BIM software for Architects, Interior Designer, Landscape Architects, Structural Engineers, MEP Engineers, Contractors, and more to be used in the different disciplines in the Architecture, Engineering, and Construction (AEC) industry.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Describe building information modeling methodology and its benefits.

CO2: Use different parts of the Revit Architecture user interface and work with different types of architectural elements and families.

CO3: Use the different views listed in the Project Browser, control the visibility and graphical.

Unit I

Introduction: Overview of the Revit, History of Revit, Benefit of Revit, Use in different Company, Interface Revit, Details about BIM (Building Information Modeling), .rvt revit file, .rfa Revit family, .ret Revit Template, .rft Revit Family, CAD.

Build Elements: Wall, Wall property, Create duplicate Wall, Change size of wall, Add layer in wall, Add material in wall like brick work, stone, Wall placement, Center to Center, Core face interior , core face Exterior, Finish face Interior , finish face Exterior.

Unit II

Elements & Properties: Door, Window, Ventilation, Components - Place different components in Projects, Furniture, Lighting, Plumbing, Planting, Entourage, Column – Architecture, Rectangular, Doric Column, Metal Clad Column, Roof By footprint, Ceiling & Floor, Circulation, Curtain Wall and its Types, Room & Area, Opening - by face, Shaft, Wall, Vertical, Dormer

Dimensions: Dimensions, Temporary Dimensions, Permanent Dimensions, Modifying Dimensions, Constraints, Aligned, Linear, Angular, Diameter, Arc Length, Spot Elevation, Spot coordinate, Spot Slope, Create Level – Elevation, Height of another Level, Plan type Pick line or Draw the Level

Unit III

Rendering & Animation: Render - Asian material Texture like Stone, Wall paint, Ceiling, Ceramic, Concrete, Fabric, Flooring, gas and Many more, Set Camera, Quality setting, Lighting, Sun Setting and Background Style, Creating views, Plan views, View range, Plan region, Elevation, Section, 3D Views, Lock 3D view, Background, Cropping View, Visibility or Graphics, Duplicate Views, Filter, Graphic Display Options, Interior View, Exterior view, Walkthrough, Control camera, Set frame, Set View, Than Play, Solar Animation, On Sun path, Show Shadows, Preview Solar Study, Paly.

Unit IV

Documentation: Text Adding, text notes, Modify text, notes Model, text Tag, Tag tools, Applying tag by category, Tag all not tagged, Material Tag, Callout Views, Types of Callouts, Detailing Drafting Views, Set Scale, Add text, Show Mass by view Setting, In-place mass, Place Mass, Curtain System, Roof, Wall, Floor, Topo surface, Parking Component, Building Pad, Family template, Forms, Extrusion, Blend, Revolve, Sweep, Swept Blend, Void Forms, Void Extrusion, Void Blend, Void Revolve, Void sweep, Void Swept Blend, Working with linked models o Link Revit, Import CAD, Export o Exporting to CAD formats, Exporting to dwg/dwf , Exporting to DWF format o Exporting, IFC, Creating Room /Area Report, Exporting to 3D's max.

ELECTIVE COURSES

DME541: POWER PLANT ENGINEERING

Credits : 3

LTP 300

Course Description: The course aims to apply the knowledge of mechanical engineering in power generation systems, their control, and economics in different type of power plants for their operation and maintenance. The course includes introduction and economics of power plant, hydro, thermal, nuclear, Gas turbine, Solar, Wind & Diesel power plant and plant safety and environment impact of power plant.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Analyze economics of power plants and interpret the performance of power plants based on load variations.

CO2: Identify elements their functions and operations in hydro and steam power plants.

CO3: Identify elements, their functions, and operations of nuclear, gas turbine, Solar, wind and diesel power plants.

CO4: Knows the Social and Economic issue of power plants.

Course Content

Unit I

Introduction & Economics of power plant: Power Plant-Introduction, Classification - Location of power plant- Choice of Power plant- Terminology used in power plant: Peak load, Base load, Load factor, Load curve, demand factor- Various factor affecting the operation of power plant- Load sharing- cost of power tariff methods-factors involved in fixing of a tariff.

Unit II

Hydro and thermal power plant: Hydroelectric power plant- Introduction, storage and poundage, Selection of sites for hydroelectric power plant-General layout and essential elements of Hydroelectric power plant and its working-Classification of the hydro plant, Advantages, and disadvantages-limitations of hydroelectric power plant.

Thermal power plant: Thermal power plant -General layout– working-Site Selection–materials required for thermal power plants, working of thermal power plant,

Advantages, and disadvantages-limitations of Thermal power plant.

Unit III

Nuclear, Gas turbine, Solar, Wind and Diesel power plant: Nuclear power plant-introduction-nuclear fuels, nuclear fission and fusion, working of a nuclear power plant, types of reactors, effects of nuclear radiation, different methods for nuclear waste disposal-low, medium and high level waste disposal, Advantages -disadvantages- limitations.

Gas turbine power plant- Schematic diagram & working of open and closed cycle gas turbine power plant, Components of Gas turbine–compressor, combustion chamber, gas turbine, vortex blading, gas turbine fuels, Advantages -disadvantages- limitations of Gas turbine power plant.

Solar, wind and diesel power plant: Solar power plant-introduction-layout, Solar cell fundamentals & classification – maximum power point tracker (MPPT) and solar panel. Wind power plant: introduction, -Factors affecting distribution of Wind energy, Variation of wind speed with height and time - Wind energy conversion system (WECS) advantages and disadvantages-limitations of Wind power plant. Diesel power plant- layout -Components and the working- Advantages -disadvantages- limitations.

Unit IV

Plant safety and environmental impact of power plant: Social and Economic issues of power plant- Oxides of Sulphur- oxides of carbon-oxides of nitrogen, Acid precipitation-Acid rain-acid snow- Dry deposition-acid fog, greenhouse effect, air and water pollution from thermal power plants and its control, Thermal pollution from thermal power plants, noise pollution and its control, natural and artificial radio activity nuclear power and environment- radiations from nuclear power plant effluents- high level wastes- methods to reduce pollution, global warming- its effects and control, standardization for environmental pollution.

Recommended Books / Suggested Readings:

1. Arora and Domkundwar, Power plant engineering, Dhanpat Rai & Co Ltd.
2. P K Nag, Power plant engineering, Tata McGraw Hill.
3. Dr. P C Sharma, Power plant engineering, S. K. Kataria publication.
4. G R Nagpal, Power plant engineering, Khanna Publisher.
5. M M EL Wakil, Power plant technology, McGraw Hill.
6. Bemhardt G A Sarotzki, William A Vopat, Power station engineering & economy, Tata McGraw Hill.
7. James H Rust, Nuclear power plant engineering, Haralson Publishing company.
8. Louis Allen Harding, Steam power plant engineering, J Wiley & sons Inc.
9. Bemhardt G A Sarotzki, William A Vopat, Power station engineering & economy, Tata McGraw Hill.
10. James H Rust, Nuclear power plant engineering, Haralson Publishing company.
11. Louis Allen Harding, Steam power plant engineering, J Wiley & sons Inc.

BME542: NON-CONVENTIONAL ENERGY RESOURCES

Credits : 3

LTP 300

Course Description: The course aims to equip the students with the basic idea about the importance of non-conventional energy sources over conventional sources. Course is intended to provide the students with an overview of global energy resources including bio-fuels, wind energy and solar energy. Objective of this course is to expose students to future energy systems and energy scenarios with a focus on promoting the use of renewable energy resources and technologies.

The course includes exposure to Solar Energy, Wind Energy, Bio-energy, Geothermal Energy, Energy from ocean & Direct Energy conversion systems

Course outcomes (CO):

Upon successful completion of the course, the students should be able to

CO1: Demonstrate the importance of energy conservation and its storage through various methods.

CO2: Estimate the solar energy and comprehend the principles involved in solar energy collection; Wind Energy its use and conversion into electrical energy for various applications.

CO3: Explore the concepts involved in wind, Bio, Geothermal & Tidal energy and mechanisms of their production and applications

CO4: Illustrate the concepts of Direct Energy Conversion systems & their applications.

Course Content

Unit I

Energy Conservation & Storage: Energy- Energy Sources & their Availability - Importance of Renewable Energy Resources - Principles of energy conservation- Energy storage- Necessity of energy storage-Energy storage methods- Mechanical Energy storage -Pumped storage-Compressed air storage Electrical Storage -Lead Acid Battery -Chemical Storage -Energy storage via hydrogen - Electromagnetic energy storage.

Unit II

Solar Energy: Solar constant, Radiation geometry, Solar energy collectors, Concentrated and flat plate, Energy balance and collector efficiency, Solar energy storage, Application to space heating, distillation, cooking and green-house effect.

Wind Energy: Basic principle, site selection, Aerodynamic analysis of blades.

Unit III

Bio-energy: Biomass conversion technology, photosynthesis, Biogas plant, thermal gasification.

Geothermal Energy: Sources, hydrothermal sources, hot dry rock resources, geothermal fossil system, prime movers for geothermal energy.

Energy from ocean: Ocean thermal electric conversion, energy from tides, small scale hydroelectric development.

Unit IV

Direct Energy Conversion System: Thermo - Electric power- Basic Principles-Thermo electric power generator-Thermionic Generation –Introduction-Thermionic emission & work function-Basic Thermionic generator-Chemical Energy Sources-Introduction-Fuel cells – Principles of operation, classification & Types-Applications of fuel cells.

Recommended Books / Suggested Readings:

1. G.D. Rai, Non-Conventional Energy Sources, Khanna Publishers, Delhi.
2. S Rao, B B Parulekar, Energy Technology: Non-Conventional Renewable and Conventional, Khanna Publishers, Delhi.
3. H.P. Garg & Jai Prakash, Solar Energy: Fundamentals and Applications, Tata McGraw Hill, N Delhi.
4. S P Sukhatme, Solar Energy: Principles of Thermal Collection and Storage, Tata McGraw Hill, N Delhi
5. Sutton, Direct Energy Conversion, McGraw Hill Inc., 1966.
6. Duffie and Beckman, Solar Energy Thermal processes, John Wiley, 1974

DME543: STEM TECHNOLOGY

Credits : 3

LTP 300

Course Description: STEM refers to the integration of science, technology, engineering, and mathematics. It enables the people to cultivate their own talent and is a growing career now a days.

Course outcomes (CO):

Upon successful completion of the course, the students should be able to

CO1: Understand the importance and essence of STEM.

CO2: Develop ways to make STEM more accessible and achievable in demographic groups

CO3: Apply components of a rich STEM curriculum to lesson design

CO4: Design assessments that diagnose and measure student learning of STEM

Course Content

Unit I

Introduction: Importance and essence of integration of science, technology, engineering, and mathematics education, Benefits and applications of STEM education, Components of STEM learning.

Unit II

Develop ways to make STEM more accessible and achievable in demographic groups that are underrepresented in STEM education and careers., Analyze barriers to STEM education for underrepresented groups and design programs and ways to overcome the barriers.

Unit III

Design curricula that incorporate STEM education, apply components of a rich STEM curriculum to lesson design. Integrate curriculum components that engage students in STEM education by sparking interest and incorporating relevance, design a unit that is engaging and interesting to students in an effort to attract them to STEM.

Unit IV

Gauge STEM learning using authentic assessments, Design assessments that diagnose and measure student learning of STEM, Compare career paths to STEM fundamentals, Design career exploration programs for students.

DME641: INDUSTRIAL ENGINEERING

Credits : 3

LTP 300

Course Description: The course aims to equip the students with knowledge of various tools and techniques of industrial engineering, Principle of work study, inventory control, material handling, and Quality control.

Course outcomes (CO):

Upon successful completion of the course, the students should be able to

CO1: Describe the role and field of application of an industrial engineer.

Co2: Locate suitable plant location and draw plant layout for different production systems.

CO3: Apply work study techniques for improving production.

CO4: Describe the significance of production planning and control, and quality control and inspection.

Course Content

Unit I

Introduction to Industrial Engineering - Evolution of modern Concepts in Industrial Engineering, Functions of Industrial Engineering, Field of application of Industrial Engineering, Product Development and research, Design function, Objectives of design, Manufacturing vs purchase, Economic aspects, C-V-P analysis, simple problems, Development of designs, prototype, production and testing, Human factors in design, Value Engineering .

Unit II

Plant Layout and Material handling: Definition, factors affecting the site selection of plant Factor affecting plant layout, Types of layout, Techniques in making layout, Types of material handling equipment, Selection and application. Preventive and break-down maintenance.

Unit III

Methods engineering: Analysis of work methods using different types of process chart and flow diagrams, Critical examination, Micro motion study and therbligs - Principles of motion economy, Work measurement, Performance rating. Determination of allowances and standard time. Job evaluation and merit rating, Objectives and principles of job evaluation,

Wages and Incentives, Primary wage systems, Wage incentive plans.

Unit IV

Production planning and control- Importance of planning, Introduction and need for a new product, product life cycle, Functions of production control, Determination of EOQ and reorder level simple problems, Selective inventory control techniques.

Quality control and Inspection- Destructive and non-destructive testing methods, process capability, Statistical quality control, causes of variation in quality- control charts for X and R, Reliability causes of failures, Bath tub curve, System reliability, life testing, Introduction to concepts of, TQM, ISO, Six Sigma and Quality circles (Brief description only).

Recommended Books / Suggested Readings:

1. B. Kumar, Industrial Engineering Khanna Publishers,2013
2. M Mahajan, Industrial Engineering & Production Management, Dhanpat Rai, 2005
3. Martand Telsang, Industrial Engineering & Production Management, S. Chand, 2006 .
4. O. P. Khanna, Industrial Engineering and Management, Dhanpat Rai, 2010
5. E. S. Buffa, Modern Production management, John Wiley, 1983
6. Grant and Ieven Worth, Statistical Quality Control, McGraw Hill, 2000
7. Introduction to work study – ILO, Oxford And IBH Publishing,2008
8. Ralph M Barnes, Motion and Time Study, Wiley, 1980.

DME642: PRODUCTION PLANNING AND CONTROL

Credits : 3

LTP 300

Course Description: The course aims to equip the students with basic knowledge of production planning and control. This course also provides the knowledge of various tools and techniques used for the production planning and inventory control.

Course outcomes (CO):

Upon successful completion of the course, the students should be able to

CO1: Illustrate production planning functions and manage manufacturing functions in a better way

Understand the concept of production process and its preplanning.

CO2: Develop competency in scheduling and sequencing of manufacturing operations

Understand the concept of production planning

CO3: Develop the skills of Inventory Management and cost effectiveness

CO4: Understand the significance of workplace design and working conditions for optimum productivity of a manufacturing system.

Course Content

Unit I

Introduction: Types and characteristics of production systems Objective and functions of Production, Planning & Control, Place of production, Planning in Engineering, manufactures organization.

Preplanning: Forecasting & Market Analysis. Factory Location & Layout, Equipment policy and replacement. Preplanning production, capacity planning.

Unit II

Production Planning: Aggregate Planning, MPS, Material Resource Planning, Selection of material methods, machines & manpower. Routing, Scheduling and Dispatching and its sheets & charts, Production Line Balancing.

Unit III

Production and Inventory Control: Progress control through records and charts. Types of inventories, Inventory Classification. Inventory Control under constraints Economic lot

(batch) size. Trends in purchasing and store keeping, just in time (JIT), Material requirement planning (MRP), comparison of Push & Pull systems, Enterprise resource planning (ERP), CAPPC.

Unit IV

Productivity: Importance, Productivity patterns, productivity measurements & ratios, improvement-maintenance process. Human Factors & Ergonomics: Human abilities, Training & motivation safety programs, workplace design & working conditions.

Recommended Books / Suggested Readings:

1. Elements of Production Planning & Control –Eilon
2. Production Planning & Control – Jain and Agarwal
3. Operations Management – Buffa.
4. Project Management, S.C. Sharma, Khanna Publishing House
5. Production System – J.L. Riggs.

DME643: NON-DESTRUCTIVE TESTING

Credits :3

LTP 300

Course Description: Non – Destructive Testing is a testing and analysis technique used by industry to evaluate the properties of a material, component, structure or system for characteristic differences or welding defects and discontinuities without causing damage to the original part.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to

CO1: understand the need and significance of Non-Destructive testing.

CO2: explain the radiographic examination and its applications in the testing of materials and components.

CO3: understand and explain the scope and applications of magnetic analysis of steel bars and tubing using magnaflux method.

CO4: explain the procedure and applications of Electrical and ultrasonic Methods of testing materials and components.

Course Content

Unit I

Introduction: Classification of techniques of material testing, Need and Significance of Non-Destructive Testing methods, type of Non-Destructive testing methods.

Unit II

Radiographic Examination: Radiant energy and radiography, practical applications, X-ray and Gamma –ray equipment, effect of variables on radiographs, requirement of a good radiograph, interpretation of radiograph, safety precautions, Xeroradiography.

Unit III

Magnaflux methods: Basic principles, scope and applications, magnetic analysis of steel bars and tubing magnetization methods, equipment, inspection medium, preparation of surfaces Fluorescent Penetration inspection, Demagnetization.

Photo elasticity: Concept and applications of Plane and circular polarization, Photo stress, models.

Unit IV

Electrical and ultrasonic Methods: Basic principles, flaw detection in rails and tubes (Sperry Detector), Ultrasonic testing surface roughness, moisture in wood, Detection of defects in ferrous and non-ferrous metals, plastics, ceramics, measurement of thickness, hardness, stiffness, sonic material analyzer, proof tests, concrete test hammer.

Recommended Books

1. H.E. Davies, G.E Troxell and GFW Hauck, The testing of Engineering materials, McGraw Hill.
2. W.H Armstrong, Mechanical Inspection, McGraw Hill.