DAV UNIVERSITY JALANDHAR

Course Scheme & Syllabus

For

B.Tech. in Mechanical Engineering
(Hons./Pass)

1st TO 8th SEMESTER
Examinations 2013–2014 Session

Syllabi Applicable For Admissions in 2013

DAV UNIVERSITY, JALANDHAR

Scheme of Courses

B.Tech. in Mechanical Engineering

Semester 1

S.No	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	MTH152	Engineering Mathematics-II	4	1	0	4	25	25	25	25	100
2	PHY151	Engineering Physics	3	0	0	3	25	25	25	25	75
3	PHY152	Engineering Physics-Lab	0	0	2	2	20			80	50
4	ENG151	Basic Communication Skills	3	0	0	3	25	25	25	25	75
5	ENG152	Basic Communication Skills -Lab	0	0	2	2	20			80	25
6	ELE101	Electrical & Electronics Technology	4	1	0	4	25	25	25	25	100
7	ELE102	Electrical & Electronics Technology -Lab	0	0	2	2	20			80	50
8	SGS102	General knowledge & Current affairs	2	0	0	2	25	25	25	25	50
9	MEC102	Fundamentals of Mechanical Engineering	4	0	0	4	25	25	25	25	100
10	MEC104	Manufacturing Practice	0	0	4	2	20			80	50
			20	**2**	**10**	**28**					**675**

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type & Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type & Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
L: Lectures T: Tutorial P: Practical Cr: Credits

Scheme of Courses

B.Tech. in Mechanical Engineering

Semester 2

S.No	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	MTH151	Engineering Mathematics-I	4	1	0	4	25	25	25	25	100
2	CHE151	Chemistry	3	0	0	3	25	25	25	25	75
3	CHE152	Chemistry-Lab	0	0	2	2	20			80	50
4	CSE101	Basic Computer Trends	4	0	0	4	25	25	25	25	100
5	CSE102	Basic Computer Trends -Lab	0	0	2	2	20			80	50
6	EVS101	Environment Education, Road Safety and Legal Awareness	4	0	0	4	25	25	25	25	100
7	MGT151	Fundamentals of Management	2	0	0	2	25	25	25	25	50
8	MEC101	Engineering Drawing	2	0	4	4	25	25	25	25	100
9	SGS101	Human Values & Ethics	2	0	0	2	25	25	25	25	50
10	SGS104	Shorthand	3	0	0	1	25	25	25	25	25
11	SGS105	Shorthand Lab	0	0	1	1	20			80	25
			24	**1**	**9**	**29**					**725**

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type & Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type & Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks

L: Lectures T: Tutorial P: Practical Cr: Credits

Scheme of Courses

B.Tech. in Mechanical Engineering

Semester 3

S. No	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	MEC201	Kinematics of Machines	4	0	0	4	25	25	25	25	**100**
2	MEC202	Mechanics of Solids - I	4	0	0	4	25	25	25	25	**100**
3	MEC203	Thermodynamics-I	4	0	0	4	25	25	25	25	**100**
4	MEC204	Manufacturing Processes -I	3	0	0	3	25	25	25	25	**75**
5	MEC205	Engineering Materials & Metallurgy	3	0	0	3	25	25	25	25	**75**
6	MEC206	Machine Drawing	2	0	4	4	25	25	25	25	**100**
7	MEC215	Engineering Materials & Metallurgy Lab	0	0	2	1	20			80	**25**
8	MEC212	Mechanics of Solids Lab - I	0	0	2	1	20			80	**25**
9	MEC213	Thermodynamics Lab	0	0	2	1	20			80	**25**
			20	**0**	**12**	**25**					**625**

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type & Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type & Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks

L: Lectures T: Tutorial P: Practical Cr: Credits

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B.Tech. in Mechanical Engineering

Semester 4

S. No	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	MEC251	Dynamics of Machines	4	0	0	4	25	25	25	25	**100**
2	MEC252	Mechanics of Solids - II	4	0	0	4	25	25	25	25	**100**
3	MEC253	I C Engines	4	0	0	4	25	25	25	25	**100**
4	MEC254	Manufacturing Technology	3	0	0	3	25	25	25	25	**75**
5	MEC255	Mechanical Measurement	3	0	0	3	25	25	25	25	**75**
6	MEC256	Production Management	3	0	0	3	25	25	25	25	**75**
7	MEC261	Dynamics of Machines Lab	0	0	2	1	20			80	**25**
8	MEC263	I C Engine Lab	0	0	2	1	20			80	**25**
9	MEC264	Manufacturing Technology Lab	0	0	2	1	20			80	**25**
10	MEC265	Mechanical Measurement Lab	0	0	2	1	20			80	**25**
			21	**0**	**8**	**25**					**625**

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type & Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type & Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks

L: Lectures T: Tutorial P: Practical Cr: Credits

Note: *At the end of the examination of 4th Semester the students will undergo compulsory industrial training for a period of 4 weeks duration in reputed industries. Every student will submit the Training Report within two weeks from the start of teaching for 5th Semester. The marks for this will be included in the 5th semester.*

Scheme of Courses

B.Tech. in Mechanical Engineering

Semester 5

S. No	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	MEC301	Mechanics of Fluids	3	0	0	3	25	25	25	25	**75**
2	MEC302	Design of Machine Elements	3	0	2	4	25	25	25	25	**100**
3	MEC303	Heat Transfer	3	0	0	3	25	25	25	25	**75**
4	MEC304	Manufacturing Processes -II	3	0	0	3	25	25	25	25	**75**
5	MEC305	Industrial Engineering	4	0	0	4	25	25	25	25	**100**
6	MTH256	Numerical Methods	3	0	0	3	25	25	25	25	**75**
7	MEC311	Mechanics of Fluids Lab	0	0	2	1	20			80	**25**
8	MEC313	Heat Transfer Lab	0	0	2	1	20			80	**25**
9	MTH257	Numerical Methods Lab	0	0	2	1	20			80	**25**
10	MEC300	Industrial Training	0	0	0	2	100				**50**
			19	**0**	**8**	**25**					**625**

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type & Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type & Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks

L: Lectures T: Tutorial P: Practical Cr: Credits

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Scheme of Courses

B.Tech. in Mechanical Engineering

Semester 6

S. No	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	MEC351	Fluid Machinery	4	0	0	4	25	25	25	25	**100**
2	MEC352	Optimization Techniques	4	0	0	4	25	25	25	25	**100**
3	MEC353	Automobile Engineering	3	0	0	3	25	25	25	25	**75**
4	MEC354	Inspection and Quality Control	4	0	0	4	25	25	25	25	**100**
5	MEC355	Energy Resources	3	0	0	3	25	25	25	25	**75**
6	MEC356	Refrigeration and Air Conditioning	4	0	0	4	25	25	25	25	**100**
7	MEC361	Fluid Machinery Lab	0	0	2	1	20			80	**25**
8	MEC363	Automobile Engineering Lab	0	0	2	1	20			80	**25**
9	MEC366	Refrigeration and Air Conditioning Lab	0	0	2	1	20			80	**25**
			22	**0**	**6**	**25**					**625**

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type & Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type & Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks

L: Lectures T: Tutorial P: Practical Cr: Credits

Note:

- *Open electives 1, and 2, should be from any one of the following four Elective Groups.*
- *At the end of the examination of 6th Semester the students will undergo compulsory industrial training for a period of 6 weeks duration in reputed industries. Every student will submit the Training Report within two weeks from the start of teaching for 7th Semester. The marks for this will be included in the 7th semester.*

Scheme of Courses

B.Tech. in Mechanical Engineering

Semester 7

S. No	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	MEC401	Robotic and Automation	4	0	0	4	25	25	25	25	**100**
2	MEC402	Mechanical Vibration	4	0	0	4	25	25	25	25	**100**
3	MEC403	Finite Element Analysis	4	0	0	4	25	25	25	25	**100**
4	MEC404	CAD/CAM	3	0	0	3	25	25	25	25	**75**
5		Department Elective -I	3	0	0	3	25	25	25	25	**75**
6	MEC411	Robotic and Automation Lab	0	0	2	1	20			80	**25**
7	MEC412	Mechanical Vibration Lab	0	0	2	1	20			80	**25**
8	MEC414	CAD/CAM Lab	0	0	2	1	20			80	**25**
9	MEC400	Industrial Training	0	0	0	2	100				**50**
10	MEC450	Seminar	0	0	2	2	100				**50**
			16	**0**	**10**	**25**					**625**

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type & Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type & Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
L: Lectures T: Tutorial P: Practical Cr: Credits

Note: *Open electives 1, and 2, should be from any one of the following four Elective Groups.*

Scheme of Courses

B.Tech. in Mechanical Engineering

Semester 8

S. No	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	MEC451	Maintenance and Reliability	3	0	0	3	25	25	25	25	**75**
2	MEC452	Product Design and Development	3	0	0	3	25	25	25	25	**75**
3	MEC453	Industrial Safety	3	0	0	3	25	25	25	25	**75**
4	MEC455	Non Destructive Testing	3	0	0	3	25	25	25	25	**75**
5		Department Elective-II	3	0	0	3	25	25	25	25	**75**
6		Open Elective	4	0	0	4	25	25	25	25	**100**
7	MEC500	Major Project	0	0	8	6	20			80	**150**
			19	**0**	**8**	**25**					**625**

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type & Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type & Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks

L: Lectures T: Tutorial P: Practical Cr: Credits

DEPARTMENT ELECTIVE GROUPS (for Semester 7 and 8)

GROUP (A)

MEC421	TQM
MEC422	Tool Design
MEC423	Material Management
MEC424	Flexible Manufacturing System

GROUP (B)

MEC431	Fracture Mechanics
MEC432	Tribology
MEC433	Cryogenic Technology
MEC434	Gas Dynamics

OPEN ELECTIVE

MGT451	Business Strategy
MGT453	Principles of Marketing
ICE208	Linear Control System
ICE413	Biosensors and MEMS
ELE455	MAT Lab Programming
CSE203	Data Structure Programming Using C
CSE351	Introductions to Computer Networks
CSE352	Software Engineering
CIV204	Theory of Structure

Detailed Syllabus

Course Title: Engineering Mathematics-II
Course Code: MTH-152

L	T	P	Credits	Marks
4	1	0	4	100

Objective:
The objective of the course is to equip the students with the knowledge of concepts of vectors and geometry and their applications. A flavor of pure mathematics is also given to the readers.

NOTE:

- The question paperforend-semesterexamination will have a weightage of 25%. It willconsistof60 objective questions. Allquestionswill becompulsory.
- Two pre-announced test will be conducted having a weightage of 25% each. Each pre-announced test will consistof 20 objective type, 5short questions/problemson the UGC-NET (objective type) pattern as well as one long answer type question. The student is expected toprovide reasoning/solution/workingfortheanswer. Thecandidateswill attemptall question. Choice will be given only in long answer type.Thequestionpaperis expected tocontainproblemstotheextent of40%of totalmarks.
- Four objective/MCQ type surprise test will be taken. Two best out of four objective/MCQ type surprise test will be considered towards final each of 12.5% weightage to the final. Each surprise test will include 20-25 questions.
- The books indicated as text-book(s) are suggestive however, any other book may be followed.

Unit-A **14 HOURS**

Infinite Series: Convergence and divergence of series, Tests of convergence (without proofs): Comparison test, Integral test, Ratio test, Raabe's test, Logarithmic test, Cauchy's root test and Gauss test. Convergence and absolute convergence of alternating series, Uniform Convergence and Power Series.

Unit-B **15 HOURS**

Differential Calculus: Curve tracing: Tracing of Standard Cartesian; Parametric and Polar curves.

Integral Calculus: Rectification of standard curves; Areas bounded by standard curves; Volumes and surfaces of revolution of curves; Applications of integral calculus to find Centre of gravity and moment of inertia.

Multiple Integrals: Double and triple integral and their evaluation, change of order of integration, change of variable, Application of double and triple integration to find areas and volumes.

Unit-C **13 HOURS**

Functions of Complex Variables: Complex Numbers and elementary functions of complex variable De-Moivre's theorem and its applications. Real and imaginary parts of exponential, logarithmic, circular, inverse circular, hyperbolic, inverse hyperbolic functions of complex variables. Summation of trigonometric series. (C+iS method).

Unit-D **15 HOURS**

Vector Calculus: Scalar and vector fields, differentiation of vectors, velocity and acceleration.

Vector differential operators: Del, Gradient, Divergence and Curl, their physical interpretations. Line, surface and volume integrals.

A**pplication of Vector Calculus:** Flux, Solenoidal and Irrotational vectors. Gauss Divergence theorem. Green's theorem in plane, Stoke's theorem (without proofs) and their applications.

References:

1. R K Jain and S R K Iyengar, Advanced Engineering Mathematics, 2nd Ed., Narosa Publishing House, New Delhi (2003).
2. Ravish R. Singh and M. Bhatt*Engineering Mathematics a Tutorial Approach*, McGraw Hill.
3. B.S Grewal, Higher Engineering Mathematics, Khanna Publication, Edition 40th Edition
4. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern Ltd. N.Delhi.Revised Edition 2003.

Course Title: Engineering Physics
Course Code: PHY-151

L	T	P	Credits	Marks
3	1	0	3	75

Course Objectives

- The question paper for end-semester examination will have a weightage of 25%. It will consist of 100 objective questions of equal marks. All questions will be compulsory.
- Two preannounced test will be conducted having a weightage of 25% each. Each preannounced test will consist of 20 objective type, 5 short questions/problems as well as one long answer type question. The student is expected to provide reasoning/solution/working for the answer. The candidates will attempt all question. Choice will be given only in long answer type. The question paper is expected to contain problems to the extent of 40% of total marks.
- Four objective/MCQ type surprise test will be taken. Two best out of Four objective/MCQ type surprise test will be considered towards final each of 12.5% weightage to the final. Each surprise test will include 20-25 questions.
- The books indicated as text-book(s) are suggestive However, any other book may be followed

Unit-1

PHYSICAL OPTICS: (14)

Interference: Division of wave front, Fresnel's biprism, division of amplitude, Newton's rings and applications.

Diffraction: Difference between Fraunhofer and Fresnel diffraction, Fraunhofer diffraction through a slit, plane transmission diffraction grating, its dispersive and resolving power.

Polarization: Polarised and unpolarised light, double refraction, Nicol prism, quarter and half wave plates.

Unit-2 (12)

LASER: Spontaneous and stimulated emission, Laser action, Characteristics of laser beam, concept of coherence, He-Ne laser, Semiconductor lasers and applications

FIBRE OPTICS: Propagation of light in fibres, numerical aperture, single mode and multimode fibres, applications

Unit-3 (9)

DIELECTRICS: Molecular Theory, polarization, displacement, susceptibility, dielectric coefficient, permittivity, relations between electric vectors, Gauss's law in the presence of a dielectric, energy stored in an electric field, behaviour of dielectric in alternating field and Clausius Mosotti equation.

Unit-4 (10)

QUANTUM MECHANICS: Difficulties with Classical physics, Introduction to quantum mechanics-simple concepts, Black Body radiation, Planck's Law of radiation and its limitations, Group velocity and phase velocity, Schrodinger's wave equations and their applications.

SUPER CONDUCTIVITY: Introduction (experimental survey), Meissner effect, Type I and type II superconductors, London equation, Elements of BCS theory, Applications of superconductors.

REFERENCE BOOKS:

1. Electricity and Magnetism – F.W. Sear (Narosa)
2. Physics Vol. 1 & 2 – Resnick & Halliday (Wiley Eastern)
3. A Text Book of Optics – Brij Lal and Subramanyam
4. Physical Optics – Jenkin's and White
5. Electromagnetism – David J. Griffiths
6. Perspective of Modern Physics – Arthur Beiser (TMH)

Course Title: Engineering Physics Lab
Course Code: PHY-152

L	T	P	Credits	Marks
0	0	2	2	50

Objective: The laboratory exercises have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

Note:

- Students are expected to perform at least eightten experiments out of following list. Theexperimentsperformedin firstsemestercannotbe repeatedinsecond Semester.
- Theexaminationforboththecourseswill beof3hoursduration.
- Total marks of practical will include 20% weightage of Continuous Assessment and 80% end semester exam including Notebook / Viva / Performance/ written test**.**

List of Experiments:

Experimental skills: General Precautions for measurements and handling of equipment, representation of measurements, Fitting of given data to a straight line, and Error analysis, Significant figures and interpretation of results

1. To determine the Refractive Index of the Material of a given Prism using Sodium Light.
2. To determine the Dispersive Power and resolving power of the Material of a given Prism using Mercury Light.
2. To determine wavelength of sodium light using Fresnel Biprism.
3. To determine wavelength of sodium light using Newton's Rings.
4. To determination Wavelength of Sodium Light using Michelson's Interferometer.
5. To determine the wavelength of Laser light using Diffraction of Single Slit.
6. To determine the wavelength of (1) Sodium and (2) Mercury Light using Plane Diffraction Grating.
7. To determine the (1) Wavelength and (2) Angular Spread of HeNe Laser using Plane Diffraction Grating.
8. To study the wavelength of spectral lines of sodium light using plane transmission grating.
9. To study the specific rotation of sugar solution Laurent's half shade polarimeter method
10. To study the numerical aperture and propagation losses using HeNe laser Optical fibre set up .
11. To compare the focal length of two lenses by Nodal slide method.
12. To find the unknown low resistance by Carey Foster bridge.
13. To determine the beam divergence of the HeNe laser.
14. To study the Meissner's effect insuperconducting sample.
15. To study the Faraday law of electromagnetic induction.
16. To study the capacitance by flashing/quenching of Neon bulb kit
17. To compare the two unknown capacitances of two capacitors by using DeSauty's bridge.
18. To find our out the unknown inductance by using the Anderson's bridge method.
19. To study the numerical aperture and propagation losses for HeNelaserby using the optical fiber set up for
20. To study the Planck's constant by using photoelectric cell method.

Course Title: Basic Communication Skills
Course Code: ENG151
No. Of Lectures: 45

L	T	P	Credits	Marks
3	1	0	3	70

Course Objective:

- To enhance students' vocabulary and comprehensive skills through prescribed texts.
- To hone students' writing skills.

Learning Outcomes:

Unit – A Applied Grammar (Socio-Cultural Context)

- Parts of Speech: Noun, Pronoun, Adjective, Verb, Adverb, Preposition, Conjunction, Interjection — 4 hours
- Tenses (Rules and Usages in Socio-cultural contexts) — 5 hour
- Modals: Can, Could, May, Might, Will, Would, Shall, Should, Must, Ought to — 4 hours
- Passives — 3 hours
- Reported/Reporting Speech — 3 hour

Unit – B Reading (Communicative Approach to be Followed)

- J M Synge: Riders to the Sea (One Act Play) — 5 hours
- Anton Chekhov : Joy (Short Story) — 4 hours
- Swami Vivekanand : The Secret of Work (Prose) — 5 hours

Unit – C Writing

- Paragraph and Essay Writing — 4 Hours
- Letter Writing: Formal and Informal — 4 hours
- Notice and Email — 4 hours

References:

a. Books

1. Kumar, Sanjay and Pushp Lata. *Communication Skills*. India: OUP, 2012.
2. Vandana, R. Singh. *The Written Word* by. New Delhi: Oxford University Press, 2008.

b. Websites

1. www.youtube.com (to download videos for panel discussions)
2. www.letterwritingguide.com
3. www.teach-nology.com
4. www.englishforeveryone.org
5. www.dailywritingtips.com
6. www.englishwsheets.com
7. www.mindtools.com

NOTE:

- The question paper for end-semester examination will have a weightage of 25%. It will consist of 100 objective questions of equal marks. All questions will be compulsory.
- Two preannounced tests will be conducted having a weightage of 25% each. Each preannounced test will consist of 20 objective type, 5 short questions/problems on the UGC-NET (objective type) pattern as well as one long answer type question. Students are expected to provide reasoning/solution/working for the answer. They

will attempt all questions. Choice will be given only in long answer type. The question paper is expected to contain problems to the extent of 40% of total marks.

- Four objective/MCQ type surprise tests will be taken. Two best out of four objective/MCQ type surprise tests will be considered towards final, each of 12.5% weightage to the final. Each surprise test will include 20-25 questions.

The books indicated as text-book(s) are suggestive However, any other book may be followed.

Course Title: Electrical and Electronics Technology
Course Code: ELE-101

L	T	P	Credits	Marks
4	0	0	4	100

UNIT 1: D.C Circuit Analysis
Voltage source, current source, dependent and independent sources, analysis of D.C circuit by KCL and KVL , Nodal and Mesh analysis, The venin theorem , Norton theorem, superposition theorem, Maximum Power Transfer Theorem

UNIT 2: A.C Circuit Analysis
Review of single phase A.C. circuit under sinusoidal steady state, solution of R.L.C. Series circuit, the j operator, complex representation of impedance, solution of series and parallel circuit, series and parallel resonance, 3 phase A.C. Circuit, star and delta connections, line and phase quantities solution of 3 phase circuits, balance supply voltage and balanced supply voltage and balance load, phasor diagram, measurement of power and power factor by two wattmeter method.

UNIT 3: Magnetic Circuit:
Review of laws of electromagnetism, Flux, MMF and their relation. Comparison of electrical and magnetic circuit, B-H Curve, saturation leakage and fringing. Analysis of series and parallel magnetic circuit, AC Excitation in magnetic circuits, Hysteresis and eddy currents.

UNIT 4: Transformers
Single phase transformer, basic concepts constructional detail, type, voltage current and impedance Transformation, phasor diagram, equivalent circuit, voltage regulation, oc/sc test, losses and efficiency concept of All day efficiency , autotransformer.

UNIT 5: Rotating Electrical Machines
Basic concepts, working principle and general construction of DC machines (motor/generators), torque and EMF expression.

UNIT 6: Basic Electronics:
P-Type and N-Type semiconductor, concept of diode, transistor and their application, introduction to OPAMP, application of op amp as a subtractor , summer, differentiator, integrator, logic gates AND ,OR, NOT, NOR, NAND etc.

Suggested Books:

1. M.S. Sukhija, T.K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford University Press, 2012.
2. Ashfaq Husain, Harsoon Ashfaq, " Fundamentals of Electrical Engineering, 4th Edition, Dhanpat Rai and Co., 2013
3. V.N. Mittle, "Basic Electrical Engineering", 2nd Edition, Tata McGraw Hill Publication.
4. B.L. Theraja, A.K. Theraja, " A Text Book of Electrical Technology, Volume-1, S. Chand Publication
5. Debashisha Jena, "Basic Electrical Engineering", 1st edition, Wiley India Publication, 2012.
6. B.L. Theraja, R.S. Sedha, " Principles of Electric Devices and Circuits", S. Chand Publication, 1st edition, 2006

Course Title: Electrical and Electronics Technology Laboratory
Course Code: ELE-102

L	T	P	Credits	Marks
0	0	2	2	50

List of Experiments

1. To verify Ohm's Law, Kirchhoff's Current Law and Kirchhoff's Voltage Law.
2. To verify Thevenin's and Norton's theorems.
3. To verify Superposition theorem.
4. To verify Maximum Power Transfer theorem.
5. To study frequency response of a series R-L-C circuit and determine resonant frequency and Q-factor for various values of R, L and C
6. To study frequency response of a parallel R-L-C circuit and determine resonant frequency and Q-factor for various values of R, L and C.
7. To perform direct load test of a transformer and plot efficiency versus load characteristics.
8. To perform open circuit and short circuit test on transformer.
9. To perform speed control of DC motor.
10. Measurement of power in a three phase system by two wattmeter method.
11. To plot the V-I characterics of PN-junction diode.
12. To verify the truth table of logic gates.

Course Title: General Knowledge and Current Affairs
Course Code: SGS-102

L	T	P	Credits	Marks
2	0	0	2	50

COURSE OBJECTIVES

The study of General Knowledge and Current Affairs has become even more important today. It is not only a major constituent of most competitive examinations but also aids in acquiring general awareness.

The objectives of this course are:

- To introduce students with the course and contents of various competitive examinations
- To prepare a foundation for appearing in various competitive examinations
- To sensitize the students about the current issues and events of national and international importance
- To provide opportunity to the students to study inter disciplinary subjects like Geography, Science, Economy, Polity, History, International Relations etc.

Unit — A

General Geography

World Geography :

The Universe, The Solar System, The Earth, Atmosphere, The World we live in, Countries rich in Minerals, Wonders of the World, Biggest and Smallest. **2 hours**

Indian Geography :

Location, Area and Dimensions, Physical Presence, Indian States and Union Territories, Important sites and Monuments, Largest-Longest and Highest in India. **2 hours**

General History

Glimpses of India History, Ancient Indian, Medieval India, Modern India, Various Phases of Indian National Movement, Prominent Personalities. **3 hours**

Glimpses of World History

Important Events of World History, Revolutions and Wars of Independence, Political Philosophies like Nazism, Fascism, Communism, Capitalism, Liberalism etc. **2 hours**

Unit — B

General Polity

World Politics – Major Actors and their political relations, UNO and other organizations viz: WTO, EU, SAARC, ASEAN, BRICS, WTO, OIC, OAU, OPEC, GCC etc. **3 hours**

Indian Polity : Constitution of India :

Important Provisions, Basic Structure, Union Government, Union Legislature and Executive, State Government: State Legislature and Executive, Indian Judiciary, The Election Commission, Panachayati Raj System, RTI etc. **3 hours**

General Economy :

The process of liberalization, privatization, globalization and Major World Issues. Indian Economy, Indian Financial System, Major Economic Issues, Economic Terminology. **3 hours**

Unit — C

General Science :

General appreciation and understandings of science including the matters of everyday observation and experience. Inventions and Discoveries. **3 hours**

Sports and Recreation : **3 hours**

The World of Sports and recreation. Who's Who is sports, Major Events, Awards and Honours. Famous personalities, Festivals. Arts and Artists.

Current Affairs :

National and International Issues and Events in News. Governments **3 hours**

Schemes and Policy Decisions.

India and Neighbours:

Current phase relations with China, Pakistan, Bangladesh, Nepal, Sri Lanka and Afghanistan **2 hours**

Unit — D

Miscellaneous Information

Who is who

Books and Authors, Persons in News, Awards and Honours, **2 hours**

Abbreviations and Sports

SUGGESTED READINGS :

Books

- Advance Objective General Knowledge, R. S. Aggarwal, S. Chand Publisher (2013)
- Concise General Knowledge Manual 2013, S. Sen, Unique Publishers,2013
- Encyclopedia of General Knowledge and General Awareness by R P Verma, Penguin Books Ltd (2010)
- General Knowledge Manual 2013-14, Edgar Thorpe and Showick Thorpe, The Pearson, Delhi.
- General Knowledge Manual 2013-14, Muktikanta Mohanty, Macmillan Publishers India Ltd., Delhi.
- India 2013, Government of India (Ministry of Information Broadcasting), Publication Division, 2013.
- Manorama Year Book 2013-14, Mammen Methew, Malayalam Manorama Publishers, Kottayam, 2013.
- Spectrum's Handbook of General Studies – 2013-14, Spectrum Books (P) Ltd., New Delhi
- Unique Quintessence of General Studies – 2013-14, Unique Publishers, New Delhi.

CURRENT AFFAIRS

Magazines

Economic and Political Weekly, Yojna, the Week, India Today, Frontline, Spectrum. Competition Success Review, Competition Master, Civil Services Chronicle, Current Affairs, World Atlas Book

Newspapers

The Hindu, Times of India, The Hindustan Times, The Tribune

Course Title: **Fundamentals of Mechanical Engineering**
Course Code: MEC-102

L	T	P	Credits	Marks
4	0	0	4	100

Total Lectures:

Course Objectives: To impart the basic knowledge of thermodynamic principles, various power producing and power absorbs devices. To impart the knowledge of mechanical devices and manufacturing processes.

Part - A

Fundamental Concepts of Thermodynamics (6)

Introduction, Thermodynamic System and its types, Boundary and its types, Surroundings, Thermodynamic properties, processes and cycles, Working Substance, Units and Dimensions, Mechanical and Thermodynamic work, Equations for work done in various processes, Heat, Pressure, Pressure measurement, Pressure exerted due to a column of fluid, Barometer, Mechanical gauges for pressure measurement: Bourdon tube pressure gauge, Diaphragm pressure gauge, Dead weight pressure gauge, Manometer: Piezometer, Single tube manometer(Numerical), Double tube manometer, Differential manometers

Laws of Thermodynamics (6)

Zero law of Thermodynamics, Thermodynamic property and Thermometers, Principle of temperature measurement, Scale of temperature, Microscopic and Macroscopic point of view, Quasi Static Process, Reversible and Irreversible processes, Energy and Forms of Energy i.e. store and transient, Law of conservation of energy, Joule's Experiment, First law of thermodynamics, Work is a path function and properties are point function, Internal energy, Enthalpy, Specific heat at constant volume, Specific heat at constant pressure, Adiabatic Index, Limitations of first law of thermodynamics

Part - B

Heat Transfer (5)

Introduction, Modes of heat transfer, Thermal Conductivity, Thermal Resistance, Fourier law, Newton's law of cooling, Stefan Boltsmann's Law, Heat Exchangers, Insulation, Properties of insulation, Types of Insulations

Power Producing Devices (6)

Forms of matter, Steam boiler, Classification of boilers, Types of boilers, Advantages of superheating the steam, Essentials of a good boiler, Comparison between Water tube and Fire tube boilers, Steam Turbines, Classification, Advantage, Working of common type of turbines, Hydraulic Turbines, Internal combustion engines, Two and Four stroke SI engines

Part - C

Power Absorbing Devices (5)

Power Absorbing Devices, Difference between Hydraulic pump, Air compressor, Fan, Blower, Classification, Positive displacement and Dynamic, Reciprocating, Rotary, Centrifugal, Axial along with their types, Uses of compressed air.

Principles of Design (5)

Need of design, Stress and Strain and its types, Hooke's law, Poisson's ratio, Stress- Strain Curve, Factor of Safety, Material properties and selection, Factors affecting material selection, Aesthetics.

Part - D

Mechanical Devices (5)

Individual and group drive system, Belt drive, Ropes, Chain drive, Gear drive, Clutches, Brakes

Machine Elements **(5)**

Power transmission shafts, Types of shafts, Shaft material, Application of shafts, Axle, Keys, Coupling and their types, Flanged coupling, Oldham's coupling, Universal coupling, Bearings and their types, Flywheel construction and types, Governor

Reference:

1. Rajan T.S. **"Basic Mechanical Engineering",** New Age Publishers.
2. Dr. Singh Sadhu **"Principles of Mechanical Engineering"**, S Chand Publishers.
3. Shankar V.P., **"Basic Mechanical Engineering"**, Laxmi Publishers.
4. Phthak G. K., **"Basic Mechanical Engineering"**, Rajsons Publications.
5. Kumar Parveen, **"Basic Mechanical Engineering"**, Pearson Education

Course Title: Manufacturing Practice
Course Code: MEC-104

L	T	P	Credits	Marks
0	0	4	2	50

COURSE OBJECTIVES:

1. Know basic workshop processes, Read and interpret job drawing.
2. Identify, select and use various marking, measuring, holding, striking and cutting tools & equipment's.
3. Operate and control different machines and equipment's.

CARPENTRY SHOP

a) Preparation of half lap joint
b) Preparation of Mortise and Tenon Joint
c) Preparation of a Dove & Tail joint
d) To prepare a White board duster

Welding Shop:

a) Preparation of Joint by Arc Welding
b) Preparation of Joint by using Gas Welding
c) Preparation of Joint by MIG/ TIG Welding
d) Preparation of Joint by Spot/ Seam Welding

Smithy Shop

a) To Forge the L – Hook
b) To Forge a Chisel
c) To Forge a Cube from a M.S Round
d) To forge a screw driver

Fitting Shop

a) Filing a dimensioned rectangular or square piece and prepare a sq. fitting
b) Preparation of T fitting male part
c) Preparation of U fitting Female part
d) Internal thread Cutting in Square piece and external thread cutting on a rod and assembling as a paper weight

Foundry Shop:

a) To make a Mould of solid pattern
b) To prepare a mould of sleeve fitting using gating system
c) To make a Mould of Split Pattern using Cope & Drag
d) To check the Hardness of the Mould
To check the Moisture Content in the Molding Sand
To check the Compressive Strength of Molding Sand

Sheet-Metal Shop

a) Preparation of a funnel from G.I. sheet
b) Preparation of a book rack stand from G.I. Sheet
c) Preparation of a leak proof tray with inclined edges from G.I. Sheet
d) Preparation of a square pen stand from G.I. Sheet with riveting at corners

Machine Shop

a) To make a job using step turning and grooving
b) To make a job using knurling and threading
c) To make a multi operation job on a Lathe machine
d) To make V – slot by using shaper machine

Electrical Shop

a) Layout of electrical tube light wiring
b) Layout of stair case wiring using two way switch

c) Testing and rectification of simulated faults in electrical appliances such as 'Electric Iron' Ceiling Fan. Electric kettle
d) To fabricate a circuit for the electrical wiring of, Fan with regulator and Bulb through a main switch and its testing using a series lamp

References:

1. Johl K. C., **"Mechanical Workshop Practice"**, Prentice Hall India, 1st Edition.
2. Bawa H.S., **"Workshop Technology"**, Tata McGraw Hill, 7th Edition.

Course Title: Engineering Mathematics-I
Paper Code: MTH 151

L	T	P	Credits	Marks
4	1	0	4	100

Objective: The aim of this course is to familiarize the students with the theory of matrices which are used in solving equations in mechanics and the other streams. This course also provides a comprehensive understanding of the origin and development of ideas to exhibit the techniques origin and development of ideas to exhibit the techniques of solving ordinary differential equations.

NOTE:

- The question paper for end-semester examination will have a weightage of 25%. It will consist of 60 objective questions. All questions will be compulsory.
- Two preannounced test will be conducted having a weightage of 25% each. Each preannounced test will consist of 20 objective type, 5 short questions and one long answer type question. The student is expected to provide reasoning/solution/working for the answer. The candidates will attempt all question. Choice will be given only in long answer type. The question paper is expected to contain problems to the extent of 40% of total marks.
- Four objective/MCQ type surprise test will be taken. Two best out of Four objective/MCQ type surprise test will be considered towards final each of 12.5% weightage to the final. Each surprise test will include 20-25 questions.
- The books indicated as text-book(s) are suggestive However, any other book may be followed.

UNIT-A **13 HOURS**

Rank of matrices, Inverse of Matrices, Gauss Jordan Method, reduction to normal form, Consistency and solution of linear algebraic system of equations, Gauss Elimination Method Eigen values and Eigen vectors, Diagonalisation of Matrix, Cayley Hamilton theorem. Orthogonal, Hermit ion and unitary matrices.

UNIT-B **14 HOURS**

Concept of limit and continuity of a function of two variables, Partial derivatives, Homogenous Function , Euler's Theorem, Total Derivative, Differentiation of an implicit function, chain rule, Change of variables,Jacobian, Taylor's and McLaurin's series. Maxima and minima of a function of two and three variables: Lagrange's method of multipliers.

UNIT-C **11 HOURS**

Formation of ordinary differential equations, solution of first order differential equations by separation of variables, Homogeneous equations, Reduce to Homogenous, exact differential equations, equations reducible to exact form by integrating factors, equations of the first order and higher degree, clairaut's equation.

UNIT-D **10 HOURS**

Solution of differential equations with constant coefficients: method of differential operators. Non – homogeneous equations of second order with constant coefficients: Solution by method of variation of parameters, Power series method of solution.

Recommended Books

1. R K Jain and S R K Iyengar, Advanced Engineering Mathematics, 2nd Ed., Narosa Publishing House, New Delhi (2003).
2. G. B. Thomas, R. L. Finney : Calculus and Analytic Geometry, 11th Ed., Pearson Education.
3. E. Kreyszig. : Advanced Engineering Mathematics, Ninth Edition, John Wiley.
4. B.S Grewal, Higher Engineering Mathematics, Khanna Publication, Edition 41

Course Title: Chemistry
Course Code: CHE151

L	T	P	Credits	Marks
3	0	0	3	75

Course Objectives:
The objective of the Engineering Chemistry is to acquaint the student with the basic phenomenon/concepts of chemistry for the development of the right attitudes by the engineering students to cope up with the continuous flow of new technology. The student will able to understand the new developments and breakthroughs efficiently in engineering and technology.

Expected Prospective:
This course will equip students with the necessary chemical knowledge concerning the fundamentals as well as new technology in the field of chemistry.

PART A

Spectroscopy and its Applications (12 Hrs)

General Introduction: Introduction, electromagnetic spectrum, absorption and emission spectrum, atomic and molecular spectroscopy, types of molecular spectra, experimental techniques, selection rules, width and intensities of spectral lines.

UV/Visible Spectroscopy: types of electronic Transitions, Chromophores, Auxochromes, Effect of conjugation on Chromophores, Factors affecting λmax and intensity of spectral lines, effect of solvent on λmax, isobestic point, applications.

IR Spectroscopy: Infrared region, fundamental modes of vibrations and types, theory of infrared spectra, vibrational frequency and energy levels, an harmonic oscillator, modes of vibrations of polyatomic molecules, characteristic signals of IR spectrum, finger print region, factors affecting vibrational frequency; applications.

NMR Spectroscopy: Principle and instrumentation, relaxation processes, proton magnetic resonance spectroscopy, number of signals, Chemical shift, Spin-Spin Splitting, coupling constant, applications.

PART B

Water and its treatment (7 Hrs)

Introduction, hardness of water, degree of hardness, units of hardness, boiler feed water: specification, scales and sludge formation; priming & foaming, boiler corrosion, caustic embrittlement, treatment of boiler feed water, internal treatment of water; softening of water by lime-soda, zeolite and ion exchange methods, desalination of water; Water for domestic use: purification of water for domestic use.

Corrosion and its Prevention (7 Hrs)

Introduction; different types of corrosion - wet and dry corrosion; mechanism of wet corrosion; comparison of dry and wet corrosion, Types of electrochemical corrosion: galvanic corrosion, concentration cell corrosion or differential aeration corrosion, waterline corrosion, pitting corrosion, crevice corrosion, stress corrosion, intergranular corrosion; other forms of corrosion: atmospheric corrosion, soil corrosion, microbiological corrosion, erosion corrosion, filiform corrosion, stray current corrosion, passivity, galvanic series, factors influencing corrosion, various methods of corrosion control.

PART C

Chemistry in Nanoscience and Technology (7 Hrs)

Introduction, Materials self-assembly, molecular vs. material self-assembly, hierarchical assembly, self-assembling materials, two dimensional assemblies, mesoscale self assembly,

coercing colloids, nanocrystals, supramolecular structures, nanoscale materials, future perspectives applications, nanocomposities and its applications.

Part D

Polymers and polymerization (7 Hrs)

Introduction, monomer and repeating unit, degree of polymerization, functionality, classification of polymers: based on origin, monomers, structure, method of synthesis, tacticity or configuration, action of heat, chemical composition, ultimate form; types of polymerization, specific features of polymers, regularity and irregularity, tacticity of polymers, average molecular weights and size, determination of molecular weight by number average methods, effect of molecular weight on the properties of polymers, introduction to polymer reinforced composites.

Suggested Books:

1. William Kemp, Organic Spectroscopy, Palgrave Foundations, 1991.
2. D. A. Skoog, F. J. Holler and A. N. Timothy, Principle of Instrumental Analysis, 5th Edition., Saunders College Publishing, Philadelphia, 1998.
3. C. P. Poole, Jr., F. J. Owens, Introduction to Nanotechnology, Wiley Interscience, 2003.
4. L.E. Foster, Nanotechnology, Science Innovation & Opportunity, Pearson Education, 2007.
5. P. Ghosh, Polymer Science and technology (2nd Edition), Tata McGraw Hill, 2008.
6. Wiley Engineering Chemistry, Second Edition, 2013.

Course Title: Chemistry Lab
Course Code: CHE152

L	T	P	Credits	Marks
0	0	1	2	50

Time: 02 Hours
Course Objectives:
This course is intended to learn the basic concepts of Engineering Chemistry Laboratory. The present syllabus has been framed as per the recent research trends in the subject. The various experiments have been designed to enhance laboratory skills of the undergraduate students.

Expected Prospective:
The students will be able to understand the basic objective of experiments in Engineering chemistry, properly carry out the experiments, and appropriately record and analyze the results through effective writing and oral communication skills. They will know and follow the proper procedures and regulations for safe handling and use of chemicals.

List of Practicals:
1. Verify Lambert Beer's law using spectrophotometer and $CoCl_2$ or $K_2Cr_2O_7$ solution.
2. Determine the strength of HCl solution by titrating against NaOH solution conductometerically.
3. Determination of the strength of HCl solution by titrating against NaOH using pH meter.
4. Determination of total hardness of water (tap) using standard EDTA solution and Eriochrome black T indicator.
5. Determination of alkalinity of water.
6. Determination of surface tension of given liquid by using Stalagmometer.
7. Determination of residual chlorine in a water sample.
8. Determination of Flash & Fire point of given a given lubricating oil by Pensky-Marten's apparatus.
9. Determination of the viscosity of given lubricating oil by using Redwood Viscometer.
10. Preparation of a polymer phenol/urea formaldehyde resin.
11. Determination of moisture, volatile matter and ash content in a given sample of coal by proximate analysis.
12. Determination of dissolved oxygen present in given sample of water.

Suggested Books:
1. Levitt, B.P. Findlay's Practical Physical Chemistry, 9th edition, Longman Group Ltd., 1973.
2. Yadav, J.B. Advanced Practical Physical Chemistry.
3. Vogel, A. I. A textbook of Quantitative Inorganic Analysis, Longman Gp. Ltd, 4^{th} edition (2000).

Course Title: Basic Computer Trends
Course Code: CSE-101

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: To get basic knowledge of computers (hardware and software), its components and Operating systems. To acquire programming skills in C, basic knowledge of Internet.

PART-A

Introduction to Computers **(8)**

Define a Computer System, Block diagram of a Computer System and its working, memories, Volatile and non-volatile memory, cache, virtual, secondary storage devices-Magnetic Tape, Hard Disk, CD-DVD, Magnetic Disk, Various input devices including keyboard. Mouse, Joystick, Scanners and Various output devices including Monitors, Printers, Plotters.

Operating Systems **(7)**

Computer Software and its types and Hardware, Operating Systems, their types and functions.

PART-B

Working Knowledge of Computer System **(6)**

Introduction to word processors and its features, creating, editing, printing and saving documents, spell check, mail merge, creating power point presentations, creating spreadsheets and simple graphs.

Fundamentals of Internet Technology **(8)**

Local area networks, MAN and wide area network, Internet, WWW, E-mail, Browsing and Search engines, Internet Connectivity, Network Topology, Hub, Switches, Router, Gateway.

PART-C

Basic Constructs of C **(8)**

Keywords, Identifiers, Variables, Data Types and their storage, Arithmetic Operators, Relational Operators, Logical Operators, Bitwise Operators, Increment & Decrement Operators, Expressions, Conditional Expressions, Assignment Operators and Expressions, External Variables and Scope of Variables, Structure of C Program.

Control Structures **(8)**

Decision making statements: if, nested if, if – else ladder, switch, Loops and iteration: while loop, for loop, do – while loop, break statement, continue statement, goto statement.

PART D

Functions **(6)**

Advantages of using functions, structure of a function, declaring and definingfunctions, return statement, call by value and call by reference, recursion, and storage classes.

Arrays and Strings **(7)**

Declaration of arrays, initialization of array, accessing elements of array, I/O of arrays, passing arrays as arguments to a function, strings, I / O of strings, string manipulation functions (strlen, strcat, strcpy, strcmp).

REFERENCES:

1. V.K. Jain: "Fundamentals of Information Technology and Computer Programming", PHI. Latest Edition.
2. Anita Goel: "Computers Fundamentals", Pearson Publications
3. Brian Kernighan and Dennis M. Ritchie: "The C Programming Language", Prentice Hall, 2nd Edition 2007.
4. K.N.King : "C Programming : A Modern Approach", W.W. Norton Company 2nd edition (2008).
5. Herbert Schildt : "C: The Complete Reference", Tata Mcgraw Hill Publications 4th edition.
6. Gottfired : "Programming in ANSI C, Schaum Series", TMH publications, 2nd Edition (1996).

Course Title: Basic Computer Trends Lab
Course Code: CSE-102

L	T	P	Credits	Marks
0	0	2	2	50

Instruction for Students: The students will be attending a laboratory session of 2 hours weekly and they have to perform the practical related to the following list.

1. Practical know-how of various internal and external Hardware components of a computer (including basic working of peripheral devices).
2. Introduction to Operating Systems; installing Windows; basics of windows.
3. Working knowledge of Internet.
4. Introduction to word processor and mail merge.
5. Introduction to MS-Excel.
6. Working on MS-PowerPoint.
7. Introduction to basic structure of C program, utility of header and library files.
8. Implementation of program related to the basic constructs in C
9. Programs using different data types in C
10. Programs using Loops and Conditional Statements in C
11. Programs using arrays single dimension in C.
12. Programs using functions by passing values using call by value method.
13. Programs using functions by passing values using call by reference method.
14. Program to implement array using pointers
15. Programs related to string handling in C

Course Title: Environment Education, Road Safety and Legal Awareness
Paper Code: EVS101

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This course aims at understanding the students in aspects of environmental problems, its potential impacts on global ecosystem and its inhabitants, solutions for these problems as well as environmental ethics which they should adopt to attain sustainable development.

Unit 1

The multidisciplinary nature of environmental studies **2 Hours**

Definition, scope and importance, Need for public awareness

Natural Resources: Renewable and non-renewable resources: **8 Hours**

Natural resources and associated problems.

(a) **Forest resources:** Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.

(b) **Water resources:** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

(c) **Mineral resources:** Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

(d) **Food resources:** World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

(e) **Energy resources:** Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.

(f) **Land resources:** Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Ecosystem: **4 Hours**

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids
- Introduction, types, characteristic features, structure and function of the following ecosystem:
    a. Forest ecosystem
    b. Grassland ecosystem
    c. Desert ecosystem
    d. Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries)

Unit II

Biodiversity and its conservation **4 Hours**

- Introduction – Definition: Genetic, Species and Ecosystem Diversity
- Bio-geographical classification of India
- Value of biodiversity: Consumptive use, Productive use, Social, Ethical, Aesthetic and Option values
- Biodiversity at global, national and local levels

- India as a mega-diversity nation
- Hot-spots of biodiversity
- Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity, global and national efforts.
- Genetically modified crops
- Cartagena Protocol
- Biodiversity Act

Environmental Pollution **8 Hours**

- Definition, causes, effects and control measures of:
    a. Air pollution
    b. Water pollution
    c. Soil pollution
    d. Marine pollution
    e. Noise pollution
    f. Thermal pollution
    g. Nuclear pollution
- Solid waste management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution
- Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides

Indoor Pollution: **2 Hours**

- Practical tips on how to save the self from self-inflicted pollution.
- Basics of toxicity.
- Problems of lifestyle based diseases.
- Solutions needed for safety.

Unit III

Social Issues and the Environment **7 Hours**

- Population growth, variation among nations, Population explosion – Family Welfare Programmes.
- Environment and human health,
- From unsustainable to sustainable development
- Urban problems and related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- Environmental ethics: Issues and possible solutions
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation
- Consumerism and waste products
- Environmental Laws: The Environment Protection Act, 1986; The Air (Prevention and Control of Pollution) Act, 1981; The Water (Prevention and control of Pollution) Act 1974; The Wildlife Protection Act, 1972; Forest Conservation Act, 1980.
- Issues involved in enforcement of environmental legislation
- Public Awareness

Human Population and Environment **5 Hours**

- Population Growth and Variations among Nations
- Population Explosion
- Human Rights
- Value Education
- HIV / AIDS
- Women and Child Welfare
- Role of Information Technology in Environment and Human Health
- Case Studies

Global environmental issues **5 Hours**

- Stockholm Conference
- Brundtland Commission
- Montreal Protocol
- Kyoto protocol
- Earth Summit
- World Summit

Unit IV

Road Safety **6 Hours**

- Road safety: Concept and its importance.
- Attitude of people towards road safety
- Role of traffic police in road safety
- Traffic rules, Traffic signs, How to obtain driving license, Traffic offences, penalties and procedures,
- Common driving mistakes, Significance of first-aid in road safety
- Role of civil society in road safety and Traffic police-public relationship
- Motor Vehicle Act 1998 (2010)

Legal Awareness **4 Hours**

- Legal literacy
- Child labour
- Domestic Violence
- Right to Education

Field Work **5 Hours**

- Visit to a local area to document environmental assets river/ forest/ grassland/hill/mountain
- Visit to a local polluted site – Urban / Rural / Industrial / Agricultural
- Study of common plants, insects, birds
- Study of simple ecosystems-Pond, river, hill slopes, etc (Field work equal to 5 lecture hours)

Suggested Readings:

1. Odum, E.P. (1983). Basic Ecology. Halt Saundurs, International Edition, Japan.
2. Botkin, D.B. and Kodler, E.A. (2000). Environmental Studies: The Earth as a living planet. John Wiley and Sons Inc., New York.
3. Singh, J.S., Singh, S.P and Gupta S.R., (2006). Ecology, Environment and Resource Conservation, Anamaya Publishers, New Delhi.
4. De, A.K. (1990). Environmental Chemistry. Wiley Eastern Ltd. New Delhi.
5. Sharma, P.D. (2004). Ecology and Environment. Rastogi Publications, Meerut.
6. Uberoi, N.K.: Environmental Management, Excel Books, 2nd Edition, New Delhi.

Course Title: Fundamentals of Management
Course Code: MGT151

L	T	P	Credits	Marks
2	0	2	2	50

Course Objective: The course aims at developing an appreciation about the principles, functions of management and functioning of professional organisations.
Learning Outcomes: After completion of course students will be able to work professionally in organizations. They should be able to apply the principles and theories of management in the work context.

Unit – A

- Introduction to business management- Definition of management, characteristics of management, management as an art, science and profession, universality of management, levels of management, management process, managerial roles and skills, functional areas of management. — 4 hours
- Planning- Introduction, planning and plan, strategy and strategic planning, main components of plan, vision, mission, purpose, objectives, goals and targets, Management by Objectives (MBO), — 3 hours

Unit – B

- Forecasting: Meaning, process and importance, Decision-Making Process and types of decisions. — 3 hours
- Organizing- Definition, characteristics, organizing process, authority, responsibility, power, delegation, decentralization, departmentation, span of control, organization chart and manuals. Forms of Organization Structure — 4 hours

Unit – C

- Staffing- Introduction, factors affecting and qualities of good staffing, manpower planning, recruitment and selection. — 3 hours
- Leadership- Characteristics, importance, style, role, quality and skills of leader. — 2 hours
- Directing and Co-ordination- meaning, Fundamentals of motivation, motivation theories : Maslow's need hierarchy, Herzberg's Two-Factor Theory of Motivation, McGregor's Theory X and Theory Y. — 4 hours

Unit – D

- Communicating- Definition, Characteristics, Communication process, importance and types of communication, barriers to communication. — 4 hours
- Controlling- Meaning, characteristics, scope, control process, types of control, designing effective control systems. — 3 hours

30 hours

Text Book:

1. Rudani Ramesh, Principles of Management, Tata, McGraw-Hill Education, 1st Edition

Reference Books:

1. Koontz H & Weihrich, Essentials of Management, 9th Edition 2013
2. Prasad L M, Principles and Practices of Management, Sultan Chand & Sons, New Delhi
3. Stoner J A F, Freeman R E and Gilbert D R, Management, Pearson Education, 6th Edition

Course Title: **Engineering Drawing**
Course Code: MEC-101
Total Lectures: 90

L	T	P	Credits	Marks
2	0	4	4	100

Course Objectives: Students will get knowledge of various lines and dimension system, knowledge the concepts of orthographic projections, knowledge of developing the surfaces.

Part - A

Drawing Techniques **(12)**

Introduction to drawing instruments, various types of lines, principles of dimensioning, size and location dimensions, symbols, lettering in single stroke as per SP-46 code

Scales **(6)**

Concept of Reduced and Enlarge scale, Construction of plane and diagonal scales

Part - B

Projection of Points **(6)**

Concept of horizontal and vertical planes (Principle planes). First and third angle projections; projection of points in all four quadrants, shortest distance from reference line

Projection of Lines and Planes **(18)**

Projection of line perpendicular to one plane, inclined to one and both the reference planes and their traces. Plane perpendicular to one plane inclined to one and both the reference planes. Profile plane. Auxiliary planes

Part - C

Projection of Solids **(12)**

Right and oblique solids; solids of revolution and polyhedrons etc. and projection of solid with axis perpendicular to one plane and parallel to one or both reference planes. Projection of solid with axis inclined to one or both reference axis.

Sectioning of Solids **(9)**

Theory of sectioning, types of sectioning, and their practice on projection of solids, sectioning by auxiliary planes

Part - D

Interpretation of Views **(9)**

Draw orthographic views from isometric view, Missing line and missing view

Development of Surfaces **(18)**

Method of Development, Development of surfaces (pyramids, prisms, cylinders and cones). Development of oblique solids

Reference:

1. Jolhe, A.J., "**Engineering Drawing**", Tata McGraw-Hill, New Delhi.
2. Gill, P.S., **"Engineering Drawing",** S.K. Kataria and Sons, Ludhiana
3. French, T.E. and Vierck, C.J., **"Graphic Science**", McGraw-Hill, New York
4. Zozzora, F, "**Engineering Drawing"**, McGraw Hill, New York

Course Title: Human Values and Ethics
Course Code: SGS - 101

L	T	P	Credits	Marks
2	0	0	0	50

Course Objectives

- To sensitize students about the role and importance of human values and ethics in personal, social and professional life.
- To encourage students to read and realize the values of enlightened human beings.
- To enable students to understand and appreciate ethical concerns relevant to modern lives.

Learning Outcomes:

Students becoming responsible citizens and better professionals who practise Values and Ethics in every sphere of life.

Unit - A

Human Values

1. **Concept of Human Values:** Meaning, Types and Importance of Values. **2 hours**
2. **Human Values:** Lessons from the lives and teachings of great thinkers. **3 hours**
3. **Value Education :** The content of value education **2 hour**
4. **Value crisis and its red ressal.** **1 hour**

Unit - B

Being Good and Responsible

1. Self Exploration and Self Evaluation **2 hour**
2. Acquiring Core Values for Self Development **2 hour**
3. Living in Harmony with Self, Family, Society and Nature **3 hours**
4. Values enshrined in the Constitution: Liberty, Equality Fraternity and Fundamental Duties. 3 **hours**

Unit - C

Value – based living

1. Vedic values of life **2 hour**
2. Karma Yoga and Jnana Yoga **2 hours**
3. Ashta Marga and Tri-Ratna **2 hours**
4. Truth, Contentment and Wisdom **2 hours**

Unit - D

Ethical Living

1. Personal Ethics **2 hours**
2. Professional Ethics **3 hours**
3. Ethics in Governance **2 hours**
4. Ethics in Education **2 hours**

Total = 35 hours

Suggested Readings:

1. Restoring Values (ed.) E. Sreedharan and Bharat Wakhlu, Sage Publications Ltd., New Delhi 2010.
2. Indian Ethos and Values by Nagarajan K, Tata McGraw Hill, 2011
3. Human Values, A N Tripathi, New Age International Publishers, New Delhi, Third Edition, 2009
4. Indian Ethos and Values in Management, 1st Edition by Sankar, Tata McGraw Hill Education Pvt. Ltd.
5. Values and Ethics, Osula, Asian Books, 2001.
6. Professional Ethics, R. Subramanian, Oxford University Press, New Delhi, 2013.

7. Human Values and Professional Ethics, Rishabh Anand, Satya Prakashan, New Delhi, 2012
8. Human Values and Professional Ethics, Sanjeev Bhalla, Satya Prakashan, New Delhi, 2012.
9. Human Values and Professional Ethics, Ritu Soryan Dhanpat Rai & Co. Pvt. Ltd., First Edition, 2010.
10. Human Values and Professional Ethics by Suresh Jayshree, Raghavan B S, S Chand & Co. Ltd. , 2007.
11. Human Values and Professional Ethics, Dr. R K Shukla, Anuranjan Misra, A B Publication 2010.
12. Human Values and Professional Ethics, Sharma, Vayu Education of India Language publishers, 2012.
13. Human Values and Professional Ethics, S. Kannan, K. Srilakshmi, Taxmann Publication, Pvt. Ltd., 2009
14. Human Values and Professional Ethics, Smriti Srivastava, S K Kataria & Sons, 2001
15. Human Values and Professional Ethics, Yogendra Singh, Ankur Garg, Aitbs publishers, 2011.
16. Human Values and Professional Ethics, Vrinder Kumar, Kalyani Publishers, Ludhiana, 2013.
17. Human Values and Professional Ethics, R R Gaur, R. Sangal, GP Bagaria, Excel Books, New Delhi 2010.
18. Values and Ethics, Dr. Bramwell Osula, Dr. Saroj Upadhyay, Asian Books Pvt. Ltd., 2011.
19. Complete works of Swami Vivekanand, Advaita Ashram, Calcutta – 1931.
20. Indian Philosophy, S. Radhakrishnan, George Allen & Unwin Ltd., New York: Humanities Press INC, 1929.
21. Essentials of Hinduism, Jainism and Buddhism, A N Dwivedi, Books Today, New Delhi – 1979
22. Light of Truth : Satyarth Parkash, Maharishi Dayanand Saraswati, Arya Swadhyay Kendra, New Delhi, 1975.
23. Dayanand : His life and work, Suraj Bhan, DAVCMC, New Delhi – 2001.
24. Moral and Political Thoughts of Mahatma Gandhi, V. Raghavan, N Iyer, Oxford University Press India, New Delhi, 2000.
25. Guru Nanak Dev's view of life, Amplified by Narain Singh, Published by Bhagat Puran Singh All India Pingalwara Society, Amritsar 2010.
26. Esence of Vedas, Kapil Dev Dwivedi, Katyayan Vedic Sahitya Prakashan, Hoshiarpur, 1990.
27. Vedic Concepts, Prof. B B Chaubey, Katyayan Vedic Sahitya Prakashan, Hoshiarpur, 1990.
28. Mahatma Gandhi : Essays and Reflections on his life and work by Saravapalli Radhakrishnan, Zaico Publication, Mumbai, 1977.
29. Lala Har Dayal, Hints for Self Culture, Jaico Publishing House, Mumbai, 1961.
30. Maharishi Swami Dayanand Saraswati, The Light of Truth (The Satyartha Prakashan), available at URL :
    www. aryasamajjamnagar.org/download/satyarth_prakash_eng.pdf
31. Krishnamurti J, The First and Last Freedom, available at URL :
    http://www.jiddu-krishanmurti.net/en/th-first-and-last-freedom/
32. Sri Raman Maharishi, Who Am I, available at URL :
    http://www.sriramanamaharshi.org/resource_centre/publicatins/who-am-i-books/
33. Ramesh S Balsekar, Peace and Harmony in Daily Living, Yogi Impressions; 1st edition

Course Title: Stenography
Course Code: SGS104

L	T	P	Credits	Marks
3	0	0	1	25

Course Objective: The course is to inculcate writing and listening skills among the students. This would act as building blocks for the learner to begin the study of stenography. As the learners are from the senior secondary background the course has been created keeping in mind their requirements for the future.

Learning Outcome:

After going through this course the participant would have understood the basic concepts of shorthand language and would be able to apply them in daily life. Completion of the course will improve their speed of writing and typing. They would be able to pronounce the English words correctly and can use effective English communication.

Unit A 12 hours

I. The Consonants II. The Vowels III. Intervening Vowels and Position Grammalogues, Punctuation IV. Alternative Signs for r and h V. Diphthongs Abbreviated w. VI. Phaseography Tick the VII. Circle s and z—Left and Right Motion VIII. Stroke s and z IX. Large Circles sw and ss or sz X. Loops st and str.

Unit B 12 hours

XI. Initial Hooks to Straight Strokes and Curves XII. Alternative Forms for fr, vr, etc. Intervening Vowels XIII. Circle or Loop Preceding Initial Hook XIV. n and f Hooks XV. Circles and Loops to Final Hooks.XVI The shun hook. XVII. The Aspirate. XVIII. Upward and Downward r.XIX. Upward and downward l and sh. XX. Compound consonants XXI. Vowel indication**.**

Unit C 11 hours

XXII. The halving principle (section 1). XXIII. The halving principle (section 2). XXIV. The Doubling principle. XXV. Diphonic or two vowel signs. XXVI. Medial semicircle. XXVII. Prefixes negative words. XXVIII. Suffixes and terminations. XXIX. Contractions. XXX. Figures, etc .proper names.

Unit D 10 hours

XXXI. Note taking, transcription, etc. XXXII. Essentials vowels. XXXIII. Special contractions. XXXIV. Advanced pharseography. XXXV. Intersections. XXXVI. Business phrases. XXXVIII. Banking and stockbroking phrases. XXXIX. Insurance and shipping phrases. XL. Technical and railway phrases. XLI. Legal phrases. XLIII. Special list of words. XLIV. Shorthand in practice.

Total 45 hours

Text Book:

Pitman Shorthand Instructor and Key ,Pearson publisher.

Course Title: Stenography Lab
Course Code: SGS105

L	T	P	Credits	Marks
0	0	1	1	25

Course Objective: The course is to inculcate writing and listening skills among the students. This would act as building blocks for the learner to begin the study of stenography. As the learners are from the senior secondary background the course has been created keeping in mind their requirements for the future.

Learning Outcome:

After going through this course the participant would have understood the basic concepts of typing and would be able to apply them in daily life. Completion of the course will improve their speed of typing and typing skills.

Unit A 04 hours

Beginner :

Basics-fjdk, sla;, ghty,vmbn,ruei,woqp,cx.

Unit B 03 hours

Shift keys, numeric pad, Digits and symbols

Unit C 04 hours

Intermediate- Syllables and words.

Unit D 04 hours

Expert- Paragraphs and Stories

Total 15 hours

Course Title: Kinematics of Machines
Course Code: MEC-201
Total Lecture: 56

L	T	P	Cr	Marks
4	0	0	4	100

Course Objectives: Students will learn about the basic concepts of machines and mechanisms, about the velocity and acceleration diagrams of all basic mechanisms, about the types of cam & follower, about the types of drives such as: belts, ropes, chains and gears.

Part – A

Basic of Mechanics **(6)**
Link or Element, Kinematic Pair, Degrees of Freedom, Kinematic chain, Mechanism, Mobility of Mechanism, Inversions, Machine, Four bar chain, Single slider crank chain and Double slider crank chain and their inversions.

Velocity and Acceleration analysis **(8)**
Velocity diagram, velocity determination, instantaneous center of velocity, acceleration diagram, acceleration determination.

Part – B

Cams **(8)**
Classification of cams and followers, disc cam nomenclature, construction of displacement, velocity and acceleration diagrams for different types of follower motions, determination of basic dimension, synthesis of cam profile by graphical methods with various motions, cams with specified contours, problems

Friction **(6)**
Concepts of friction, types of friction, laws of dry friction, friction in journal bearing, friction circle and friction axis, pivots and collar friction, uniform pressure and uniform wear.

Part – C

Brakes and Dynamometers **(7)**
Types of brakes, function of brakes, braking of front and rear types of a vehicle. Determination of braking capacity, Types of dynamometers, (absorption, and transmission), torsion dynamometer

Belts , Chain and Rope Drive **(8)**
Open and cross belt drive, velocity ratio, slip, material for belts, crowning of pulleys, length of belts, ratio of tension, centrifugal tension, power transmitted by belts and ropes, initial tension, creep, chain drives, classification of chains, rope drive

Part – D

Gears **(7)**
Terminology, Fundamental law of gearing, involute spur gears, characteristics of involute and cycloidal action, Interference and undercutting, center distance variation, path of contact, arc of contact, nonstandard gear teeth, helical, spiral bevel and worm gears, problems

Gear Trains **(5)**
Synthesis of simple, compound and reverted gear trains, analysis of epicylic gear trains, problems

References:

1. Rattan S.S., "**Theory of Machines"**, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
2. Shigley J.E. and Uicker J.J., **"Theory of Machines and Mechanisms",** Oxford University Press.

3. Ghosh A. and Mallick A.K., **"Theory of Mechanisms and Machines",** Affiliated East-West Pvt. Ltd., New Delhi.
4. Rao J.S. and Dukkipati R.V., **"Mechanism and Machine Theory"**, Wiley-Eastern Ltd., New Delhi.

Course Title: Mechanics of Solids-I
Course Code: MEC-202
Total Lecture: 56

L	T	P	Cr	Marks
4	0	0	4	100

Course Objectives:

To provide the students a clear understanding of the concepts of stress, strains & stress strain diagrams.

1. To impart knowledge about calculation of stresses & strains in various conditions & understanding concepts of principal stresses & strains.
2. To make the students understand the concept of shear force & bending moment diagrams, relationship between slope & deflection, torsional forces.

PART – A

Introduction (4Hrs)
Introduction, Engineering materials, Properties of materials, Free body diagram.

Simple Stresses & Strains (10Hrs)
Stress and Strain and their types, Hook's law, longitudinal and lateral strain, Poisson's ratio, stress-strain diagram for ductile and brittle materials, extension of a bar due to without and with self-weight, bar of uniform strength, stress and elongation in a tapered bar, elastic constants and their significance, relation between elastic constants, Young's modulus of elasticity, modulus of rigidity and bulk modulus. Stresses in a compound bars, Temperature stress and strain calculation due to axial load and variation of temperature in single and compound bars.

PART- B

Compound Stresses & Strains (7Hrs)
Two dimensional stress system, stress at a point on a plane, principal stresses and principal planes, Mohr's circle of stress ellipse of stress and their applications. Generalized Hook's law, principal stresses related to principal strains.

Bending Moment & Shear Force Diagram (7Hrs)
Shear force & Bending moment definitions, Shear force & bending moment diagrams for cantilevers, simply supported beams with or without overhangs and calculation of maximum bending moment and shear force and the point of contra flexure under concentrated loads, uniformly distributed loads over whole span or part of it, combination of uniformly distributed loads and uniformly distributed loads, uniformly varying loads; Relation between rate of loading, shear force & bending moments.

PART – C

Deflection of Beams (8Hrs)
Relationship between Moment, Slope and Deflection, Moment area method, Method of Integration, Macaulay's method – To calculate slope & deflection of cantilevers, simply supported beams with or without overhangs under various load conditions.

Bending Stresses in beams (6Hrs)
Bending stresses in beams with derivation & application to beam of circular, rectangular, I, T and channel sections. Composite/ flitched Beams

PART – D

Torsion (7Hrs)
Torsion of thin circular tubes, solid & hollow circular shafts, tapered shafts. Combined torsion and bending of circular shafts

Columns & Struts (7Hrs)

Columns under axial load, Concept of Instability & Buckling, Slenderness ratio, Effective Length; Euler's Theory of buckling of columns, limitation of Euler's Formula; Rankine formula, Johnson's Parabolic Formula

References:

1. Ramamrutham S., **"Strength of Materials"**, Dhanpat Rai & Sons.
2. Dr. Bansal R. K., **"Strength of Material",**Laxmi Publishers.
3. Shames D.H., **"Introduction to Solid Mechanic"**, Prentice Hall Inc.
4. Gere, **"Mechanics of Materials"**, Cengage Learning.
5. Hibler, **"Mechanics of Materials"**, Pearson Education.

Course Title: Thermodynamics-I
Course Code: MEC-203
Total Lectures: 56

L	T	P	Cr	Marks
4	0	0	4	100

Course Objectives: Students will learn about the basic concepts of thermodynamic, about the properties of steam, about the steam power generation and about steam nozzles and turbines.

Part - A

Law of Thermodynamics (10)

First Law of Thermodynamics, Energy and its Forms, Energy and 1st law of Thermodynamics, Internal Energy and Enthalpy, PMMFK, Steady flow energy equation, 1st Law Applied to Non- flow process, Steady Flow Process and Transient Flow Process, Throttling Process and Free Expansion Process. Problems, Second Law of Thermodynamics, Limitations of First Law, Thermal Reservoir, Heat Source and Heat Sink, Heat Engine, Refrigerator and Heat Pump, Kelvin- Planck and Clausius Statements and their Equivalence, PMMSK. Carnot Cycle, Carnot Heat Engine and Carnot Heat Pump, Carnot Theorem and its Corollaries, Thermodynamic Temperature, Entropy, Clausius Inequality, Principle of Entropy Increase, Temperature Entropy Plot, Entropy Change in Different Processes, Introduction to Third Law of Thermodynamics. Problems

Pure Substance (7)

Pure Substance and its Properties, Phase and Phase Transformation, Vaporization, Evaporation and Boiling, Saturated and Superheat Steam, Solid – Liquid – Vapour Equilibrium, T-V, P-V and P-T Plots During Steam Formation, Properties of Dry, Wet and Superheated Steam, Property Changes During Steam Processes, Temperature – Entropy (T-S) and Enthalpy – Entropy (H-S) Diagrams, Throttling and Measurement of Dryness Fraction of Steam. Problems

Part - B

Gas Power Cycles (6)

Carnot Cycle, Otto Cycle, Diesel Cycle, Dual Cycle, Stirling Cycle, Ericson cycle and Brayton cycle, Problems

Steam Generators (10)

Definition, Classification and Applications of Steam Generators, Working and constructional details of fire-tube and water-tube boilers: (Cochran, Lancashire, Babcock and Wilcox boilers); Merits and demerits of fire-tube and water-tube boilers; Modern high pressure boilers and Super critical boilers, Description of boiler mountings and accessories, Boiler performance: equivalent evaporation, boiler efficiency, boiler trial and heat balance; Types of draught and Calculation of chimney height , Problems

Part - C

Steam Nozzles (11)

Definition, types and utility of nozzles, Flow of steam through nozzles, Condition for maximum discharge through nozzle, Critical pressure ratio, its significance and its effect on discharge, Area of throat and at exit for maximum discharge, Effect of friction, Nozzle efficiency, Convergent and convergent-divergent nozzles; Calculation of Nozzle dimensions, Supersaturated flow through nozzle, Problems

Part - D

Steam Turbines (12)

Introduction, Classification, Impulse versus Reaction turbines. Simple impulse turbine: pressure and velocity variation, Velocity diagrams/triangles, Combined velocity diagram/triangle and calculations for force, axial thrust, work, power, blade efficiency, stage efficiency, maximum work and maximum efficiency, effect of blade friction on velocity

diagram, effect of speed ratio on blade efficiency, condition for axial discharge Compounding of impulse turbines: purpose, types and pressure and velocity variation, velocity diagrams/triangles, combined velocity diagram/triangle and calculations for force, axial thrust, work, power, blade efficiency, stage efficiency, overall efficiency and relative efficiency

Reference:

1. Kumar D.S. and Vasandani V.P., **"Heat Engineering",** Metropolitan Book Co. Pvt. Ltd.
2. Rogers G. and Mayhew Y., **"Engineering Thermodynamics"** , Pearson.
3. Nag P K , **"Engineering Thermodynamics"** , Tata McGraw Hill
4. Rao Y. V.C., **"Theory and Problems of Thermodynamics"** , Wiley Eastern Ltd., New Delhi.
5. Jones and Dugan, **"Engineering Thermodynamics",** PHI, New Delhi.

Course Title: Manufacturing Process -I
Course Code: MEC204
Total Lectures: 45

L	T	P	Cr	Marks
3	0	0	4	100

Course Objectives:

1. To know and identify basic manufacturing processes for manufacturing different Components.

PART – A

Introduction (3Hrs)
General, Classification of manufacturing processes, Various kinds of Production System, Computers in manufacturing, Selection of manufacturing process.

Casting and Moulding Methods (7Hrs)
Introduction, advantages, limitations and applications of casting process, Classification of casting process, Steps involved in casting, Pattern types, Allowances for pattern, pattern, materials, color coding and storing of patterns. Molding methods and Processes, Moulding materials, Molding sands and its ingredients, Properties of moulding sand, Cores, Sand casting defects, Design of castings.

PART – B

Sand Castings Processes and their Inspection (6Hrs)
Pressure die casting, Permanent mould casting, Centrifugal casting, Precision investment casting and its types, Cleaning and finishing of casting, Inspection and testing of casting, Defects in castings.

Foundry Melting Furnaces (4Hrs)
Selection of furnace- Crucibles oil fired furnaces, Electric furnaces, Cupola Furnace.

PART – C

Welding (7Hrs)
Introduction, advantages, disadvantages and its applications. Classification of welding processes, Gas welding- Oxy Acetylene welding, equipment's, flame setting, techniques, filler materials and fluxes, advantage, disadvantage and applications. Arc welding – equipment's, welding electrodes along with designation, Polarity, Electric arc cutting, Arc blow and arc length.

Resistance welding (4Hrs)
Resistance Welding: Classification, Spot welding, Seam welding, Projection welding and Percussion welding, Welding joints and Welding Symbols.

PART – D

Miscellaneous Welding Processes (8Hrs)
Principle, working, advantages, limitations and industrial applications of Tungsten inert gas

(TIG) welding, Principle, working, advantages, limitations and industrial applications of Metal Inert Gas (MIG) welding, Principle, working, advantages, limitations and industrial applications of Thermit welding, Electro slag welding, Principle, working, advantages, limitations and industrial applications Submerged arc welding

Welding Defects and Welding Cost (6Hrs)

Principle of soldering and brazing, Testing and Inspection of Welded Joints, Welding defects, Methods of controlling welding defects, Welding Cost, Design aspects

References:

1. Raghuwanshi B.S., **"A Course in Workshop Technology",** Vol. 1, Dhanpat Rai, 10th Edition 2009.
2. Taylor H.F., M.C &Wulff J., **"Foundry Engineering"**, Wiley Eastern Limited, 1993.
3. Lindberg R.A, **"Processes and Materials of Manufacture"**, Prentice Hall of India (P) Ltd.,1996
4. Serope Kalpak jain, **"Manufacturing engineering and Technology"**, Edition III - Addision Wesley Publishing Co., 1995.
5. William F. Hosford and Robert M. Caddel, **"Metal forming"**, PrenticeHall Publishing Co., 1990.

Course Title: Engineering Materials and Metallurgy
Course Code: MEC204
Total Lectures: 45

L	T	P	Cr	Marks
3	0	0	3	100

Course Objectives:

3. To provide the students a clear understanding of the basic principles engineering materials and metallurgy.
4. To impart knowledge about materials, their properties and different heat treatment processes.
5. To make the students understand the importance of factors effecting the structure-sensitive properties of materials.

PART – A

Crystallography (6Hrs)
Materials and their classification, Mechanical, Chemical, Electrical properties, atomic bonding, Structure of Solids: Crystalline and non-crystalline materials & their properties, crystal structures, crystal structure in metals (body centered cubic, face centered cubic, hexagonal close packed), Crystallographic notation of atomic planes (Miller Indices), polymorphism and allotropy.

Ferrous and Non Ferrous Materials and Alloys (6Hrs)
Classification of Iron, Manufacture of pig iron, wrought iron, Cast iron and steel, Types of Cast Iron: White, malleable, grey and alloy and their usage, Important ores and properties of aluminum, copper, zinc, tin, lead.
Classification of Iron Steels and Alloy Steel, Availability, Properties and usage of steels, Effects of various alloying element of steel like Cr, Ni, Co, Va, W, Si, Mn, S, Use of alloy steels (high speed steel stainless steel, spring steel, silicon steel)

PART – B

Imperfections in Metal Crystal (6Hrs)
Introduction, Classification of Crystal Imperfections, Point defects, Line defects, Surface defects, volume defects. Effect of imperfection on metal properties.

Deformation of metal
Elastic deformation, Plastic deformation, Slip, Twinning, Principal of cold and hot working of metals and their effect on mechanical properties.

Solid Solution (5Hrs)
Introduction and definition, Types of solid solutions, Hume Rothery's Rule, Intermediate phases, Solid solution alloys

PART- C

Equilibrium Diagrams (6Hrs)
System phases and structural constituents, Cooling curves, Phase diagram, Interpretation of phase diagram, Gibb's phase rule, Classification of equilibrium diagrams, Two metals completely soluble in liquid state and solid states, Eutectic system, Two metals completely soluble in liquid state but partly soluble in solid states, Peritectic reaction, Eutectoid transformation, Peritectoid transformation.

Iron-Carbon Systems (6Hrs)
Iron allotropy, Micro Constituents of Iron and steel, Iron and Iron Carbide diagram, Invariant reactions of Iron-Carbon systems, Critical temperatures and critical temperature lines, Time

Temperature Transformation diagrams (TTT Diagrams), Critical cooling rate, The bainite transformation, The martensite transformation, Tempered martensite, Austenite grain size and grain size control, Temper brittleness in steel.

PART – D

Heat Treatment of Steels (5Hrs)

Classification of heat treatment processes, Purpose of heat treatment processes, Annealing, Normalizing, Hardening and Tempering treatments, Factors affecting the hardenability of steels.

Surface Heat Treatment (Case Hardening) Methods (5Hrs)

General features of surface hardening processes, Flame and Induction hardening of steel; Chemical heat treatment of steels: carburizing, nitriding, and cyaniding of steels

References:

1. Raghavan V.,**"Physical Metallurgy: Principlesand Practice"**,PHI Learning.
2. Rajan, T.V., Sharma, C.P. and Sharma, A., **"Heat Treatment: Principles & Techniques"**, Prentice Hall of India, New Delhi (2006).
3. Singh, V., **"Physical Metallurgy"**, Standard Publishers, New Delhi (2002).
4. Hill, R.E.R., **"Physical Metallurgy Principles"**, Affiliated East-West Press, New Delhi (2008).
5. SidneyHAvner,**"Introduction toPhysical Metallurgy"**,Tata McgrawHill Co.

Course Title: Machine Drawing
Course Code: MEC206
Total Lectures: 84

L	T	P	Cr	Marks
2	0	4	4	100

Course Objectives:

1. To make the students understand the principles and requirements of production drawings.
2. To provide the students a clear understanding of assembly and disassembly of important mechanical parts used in major engineering applications.

PART - A

Introduction (15Hrs)
Principles of Drawing, Types of Machine Drawing, Requirements of Production Drawing, Conventional Representation of materials, Dimensioning, Limits, Fits & Tolerances, Symbols of standard tolerances, Machining & Welding Symbol

Fasteners (12Hrs)
Introduction,Temporary & Permanent Fasteners; Types of Rivet Head, Riveting Process, Various types of screw threads, Types of nuts and bolts, Locking Devices, Assembly of Nut, Bolt and Washer,

PART - B

Keys, Cotter & Knuckle Joint (12Hrs)
Types of keys, Saddle Key, Sunk Key, Gib Head Key; Socket & Spigot cotter joint, Sleeve and cotter joint, Gib and Cotter Joint**,** Knuckle Joint

Couplings (14Hrs)
Solid or Rigid Coupling, Protected and Unprotected Type Flange coupling, Pin type flexible coupling, muff coupling, Oldham's & Universal coupling

PART - C

Pipe and Pipe Fittings (12Hrs)
Spigot and socket joint, Union joint, Expansion joint; Pipe Fitting's

Boiler Mountings (12Hrs)
Steam stop valve, Feed check valve, Blow off cock

PART – D

IC Engine Parts (12Hrs)
Piston, connecting rod

Bearings (15Hrs)
Plummer block, footstep bearing, Swivel bearing

Miscellaneous: Screw Jack, Tool Post, Tail Stock, Drilling jig.
References:

1. Gill P.S., **"Machine Drawing"**, S. K. Kataria& Sons.
2. Dhawan R.K., **"Machine Drawing"**, S. Chand & Sons.
3. N. Sidheshwar, P Kannaieh , VVS Sastry, **"Machine Drawing"**, Tata McGraw Hill.

4. K L Natayana, P Kannaiah and K Venkata Reddy, **"Machine Drawing"**, New Age International Publishers.
5. K. Venugopal, **"Machine Drawing",** New Age Publisher.

COURSE TITLE: **Mechanics of Solids Lab** – I
COURSE CODE: MEC212

L	T	P	Cr	Marks
0	0	2	1	25

List of Experiments

1 To conduct a tensile test on mild steel/Cast iron/Aluminum Specimens and determine the following:-
The yield stress, Ultimate stress, breaking stress, Young modulus of elasticity, Percentage elongation, Percentage reduction in Area
2 To perform bending tests and shear test on UTM.
3 To determine the impact strength of a specimen of M.S/Cast Iron by Charpy / Izod test.
4 To Conduct torsion test on Mild steel/Cast iron specimen to find out modulus of rigidity.
5 To determine the Stiffness of the spring and modulus of rigidity of the spring wire.
6 Determination of buckling loads of long columns with different end conditions.
7 To prove Maxwell's theorem of beam deflection

Course Title: Thermodynamic Lab
Course Code: MEC213

L	T	P	Cr	Marks
0	0	2	1	25

List of Experiments:

1. To study the constructional details & working principles of two-stroke/ four stroke petrol engine.
2. To study the constructional detail & working of two-stroke/ four stroke diesel engine.
3. To draw valve Timing diagram of a diesel engine and study of its impact on the performance of an IC engine.
4. Study circuits of carburetor fitted in Indian vehicles
5. Determination of dryness fraction of steam.
6. Study of Babcock-Wilcox boiler (Model).
7. Study of locomotive boiler (Model).
8. Study of Lancashire boiler (Model).
9. To study the Red wood viscometer and measure the viscosity of fluid.
10. To measure the flash point of the given fuel.
11. To study various parts of the vertical steam engine.
12. To study the diesel engine and make a trial on it.

Course Title: Engineering Materials and Metallurgy Lab
Course Code: MEC215

L	T	P	Cr	Marks
0	0	2	1	25

List of Experiments:

1. To prepare microscopic structure for examination & to examine the micro structure of specimens of various metals and alloys (Aluminum, Brass, Copper, Stainless steel, Mild steel etc.).
2. Annealing the steel specimen and study the effect of annealing time and temperature on hardness of steel.
3. Normalizing the steel specimen and study the effect of normalizing time and temperature on hardness of steel.
4. Hardening the steel specimen and study the effect of quenching mediums on hardness of steel.
5. Determination of hardenability of steel by Jominy End Quench Test.
6. Surface hardening of specimen by using Induction hardening method.

Course Title: Dynamics of Machines
Course Code: MEC-251

L	T	P	Cr	Marks
4	0	-	4	100

Total Lecture: 56

Course Objectives: Students will learn about the basic concepts of machines and mechanisms, about the velocity and acceleration diagrams of all basic mechanisms, about the types of cam & follower, about the types of drives such as: belts, ropes, chains and gears.

Part – A

Static Force Analysis **(8)**
Concept of force and couple, free body diagram, condition of equilibrium, static equilibrium of mechanism, methods of static force analysis of simple mechanisms. Power transmission elements, considerations of frictional forces

Dynamic Force Analysis **(8)**
Determination of forces and couples for a crank, inertia of reciprocating parts, dynamically equivalent system, analytical and graphical method, inertia force analysis of basic engine mechanism, torque required to overcome inertia and gravitational force of a four bar linkage.

Part – B

Balancing of Rotating Components **(7)**
Static balance, dynamic balance, balancing of rotating masses, two plane balancing, graphical and analytical methods, balancing of rotors, balancing machines, field balancing

Balancing of Reciprocating Parts **(7)**
Balancing of single cylinder engine, balancing of multi cylinder; inline, radial and V type engines, firing order

Part – C

Flywheels **(6)**
Turning moment and crank effort diagrams for reciprocating machines' Fluctuations of speed, coefficient of fluctuation of speed and energy, Determination of mass and dimensions of flywheel used for engines and punching machines

Governors **(7)**
Introduction, types of governors, characteristics of centrifugal governors, gravity controlled and spring controlled centrifugal governors, hunting of centrifugal governors, inertia governors

Part – D

Gyroscope **(6)**
Concept of gyroscopes, gyroscopic forces and couples, gyroscopic stabilization, ship stabilization, stability of four wheel and two wheel vehicles moving on curved paths.

Kinematics synthesis of Mechanisms **(7)**
function generation, path generation, Freudenstein's equation, two and three position synthesis of four bar and slider crank mechanisms by graphical and analytical methods, , precision positions, structural error; Chebychev spacing, transmission angle.

References:

1. Rattan S.S., "**Theory of Machines"**, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
2. Shigley J.E. and Uicker J.J., **"Theory of Machines and Mechanisms",** Oxford University Press.
3. Ghosh A. and Mallick A.K., **"Theory of Mechanisms and Machines",** Affiliated East-West Pvt. Ltd., New Delhi.
4. Rao J.S. and Dukkipati R.V., **"Mechanism and Machine Theory"**, Wiley-Eastern Ltd., New Delhi.

Course Title: Mechanics of Solids-II
Course Code: MEC-252
Total Lecture: 56

L	T	P	Cr	Marks
4	0	-	4	100

Course Objectives:

1. The students will able to design the machine elements factors like strength, stiffness and stability are important other than manufacturing cost, life, utility, availability and market demand are covered under this subject.
2. They will also be able to design cylinders and springs for various mechanical applications.

Part – A

Strain Energy **(6)**

Strain energy (resilience), strain energy under direct stresses, simple shear, torsion and bending. Energy of distortion and dilation. Castigliano's theorem, Maxwell's theorem of reciprocal deflections.

Theories of Failure **(8)**

Importance of theories of elastic failure. Max. Principal stress theory, Max. Principal strain theory, Max. Shear stress theory, Total strain energy theory, Distortion energy theory, internal friction theory, Two dimensional equations for theories of failure and their graphical representation.

Part – B

Springs **(6)**

Springs: applications, coiled springs, Helical springs under axial couple and pull, spiral spring, Laminated leaf springs.

Thin & Thick cylinders and spheres **(8)**

Stresses in cylinders due to internal pressure, modification due to joints, Applications of theories of failure to thin cylinders, Principal stresses in spherical vessels, wire wound cylinders.Derivation of Lame's Equation, hoop, radial and longitudinal stresses in cylinders, thick spherical vessels, compound cylinders

Part – C

Compound loading **(7)**

Introduction, combined bending and axial loading, torsion combined with shear, bending combined with shear, strain energy under combined loading

Shear stress distribution in thin sections **(8)**

Shear stress distribution and shear Centre for Channel, H, thin 'T', I section, Concept of Shear Center.

Part – D

Bending of curved beams: **(6)**

Calculation of stresses in crane or chain hooks, rings of circular section and trapezoidal section and chain links with straight sided

Rotating Discs **(7)**

Stresses in rotating discs and rims of uniform thickness. Disc of uniform strength

Reference Books:

1. James Barber,Intermediate Mechanics of Materials, McGraw hill publication.
2. Hibbler, Mechanics of Materials (Pearson Education)
3. Nag, strength of materials, Wiley publications
4. Rama Murutham, S., Strength of Materials, Dhanpat Rai& Sons
5. Lehri R.S., Strength of Materials, Kataria& Sons
6. Bansal R.K.,Strength of Material (Laxmi Publishers)
7. D.H Shames, Introduction to Solid Mechanics, Prentice Hall Inc.
8. GH Ryder, Strength of Materials – (MacMillan)
9. Crandall &Dahi,An introduction to Mechanics of Solids – (McGraw Hill)
10. Gere, Mechanics of Materials (Cengage Learning)

Course Title: I.C. Engines
Course Code: MEC253
Total Lecture: 56

L	T	P	Cr	Marks
4	0	-	4	100

Objective of Course
To make understanding of internal combustion engines with their components, working and accessories and also to make students familiar with the impact of I.C. engines on environment so that they can think significant innovations in I.C. engines.

Part A

Air Standard Cycles (8)
Internal and external combustion engines; classification of I.C. Engines, Cycles of operation in four stroke and two stroke I.C. Engines, Wankel Engines, Assumptions made in air standard cycle; Otto cycle; diesel cycle, dual combustion cycle, comparison of Otto, diesel and dual combustion cycles; sterling and Ericsson cycles; air standard efficiency, specific work output, specific weight; work ratio; mean effective pressure; deviation of actual engine cycle from ideal cycle. Problems

Carburetion, fuel Injection and Ignition systems (6)
Mixture requirements for various operating conditions in S.I. Engines; elementary carburetor, Requirements of a diesel injection system; types of inject systems; petrol injection, Requirements of ignition system; types of ignition systems ignition timing; spark plugs. Problems

Part B

Combustion in I.C. Engines (7)
S.I. engines; Ignition limits; stages of combustion in S.I. Engines; Ignition lag; velocity of flame propagation; detonation; effects of engine variables on detonation; theories of detonation; octane rating of fuels; pre-ignition; S.I. engine combustion chambers, Stages of combustion in C.I. Engines; delay period; variables affecting delay period; knock in C.I. engines, Cetane rating; C.I. engine combustion chambers.

Lubrication and Cooling Systems (7)
Functions of a lubricating system, Types of lubrication system; mist, wet sump and dry sump systems; properties of lubricating oil; SAE rating of lubricants, engine performance and lubrication, Necessity of engine cooling; disadvantages of overcooling; cooling systems; air-cooling, water cooling; radiators.

Part C

Engine Testing and Performance (7)
Performance parameters: BHP, IHP, mechanical efficiency, brake mean effective pressure and indicative mean effective pressure, torque, volumetric efficiency; specific fuel consumption (BSFC, ISFC), thermal efficiency; heat balance; Basic engine measurements; fuel and air consumption, brake power, indicated power and friction power, heat lost to coolant and exhaust gases; performance curves. Problems

Air pollution from I.C. Engine and Its remedies (6)

Pollutants from S.I. and C.I. Engines, Methods of emission control; alternative fuels for I.C. Engines; the current scenario on the pollution front

Part D

Rotary Compressors **(7)**

Root and vane blowers; Static and total head values; Centrifugal compressors- Velocity diagrams, slip factor, ratio of compression, pressure coefficient, pre-whirl; Axial flow compressor- Degree of reaction, polytropic efficiency, surging, choking and stalling, performance characteristics, Problems.

Gas Turbines **(7)**

Brayton cycle; Components of a gas turbine plant; open and closed types of gas turbine plants; Optimum pressure ratio; Improvements of the basic gas turbinecycle; multi stage compression with inter-cooling; multi stage expansion with reheating between stages; exhaust gas heat exchanger, Applications of gas turbines.

References

1. Internal Combustion Engines –V. Ganesan, Pub.-Tata McGraw-Hill.
2. Engineering fundamental of the I.C.Engine – Willard W. Pulkrabek Pub.-PHI,India
3. Internal Combustion Engines & Air pollution- Obert E.F, Pub.-Hopper & Row Pub., New York
4. Internal Combustion Engines Fundamentals- John B. Heywood, Pub.-McGraw Hill, New York
5. Fundamentals of Internal Combustion Engines-H.N. Gupta, PHI, New Delhi

Course Title: Manufacturing Technology
Course Code: MEC-254
Total Lecture: 45

L	T	P	Cr	Marks
3	0	0	3	75

Course Objectives: To learn principles, operations and capabilities of various metal machining and metal forming processes. The importance of process variables controlling these processes. Recognize the inter-relationships between material properties and manufacturing processes.

Part – A

Metal Cutting (8)

Introduction to machining processes, classification, Mechanics of chip formationprocess, concept of shear angle, chip contraction and cutting forces in metal cutting, Merchant theory, tool wear, tool life, machinability, Fundamentals of measurement of cutting forces and chip tool interface temperature. Cutting tools: types, geometry of single point cutting tool.

Cutting Tool Materials (6)

high carbon steels, alloy carbon steels, high speed steel, cast alloys, cemented carbides, ceramics and diamonds, and CBN. Selection of machining parameters

Part – B

Tool Wear and Cutting Fluids (6)

Cutting Fluids, Types of Cutting Fluids, Selection of Cutting Fluids, Methods of Applying Cutting Fluids, Kinds of Tool Damage, Tool Wear Equation, Tool Life Equations, Tool Life Tests, Coolants and lubricants: classification, purpose, function and properties

Machine Tool (5)

Lathe: classification, description and operations, kinematic scheme of lathe, and lathe attachments. Shaping and planning machine: classification, description and operations, drive mechanisms. Milling machine: classification, description and operations, indexing devices, up milling and down milling. Drilling machine: classification, description and operations. Boring machine: classification, description and operations. Grinding machines: classification, description and operations, wheel selection, grinding wheel composition and nomenclature of grinding wheels, dressing and truing of grinding wheels. Broaching machine: classification, description and operations. Speed, feed and machining time calculations of all the above machines.

Part – C

Machine tool design and testing (7)

Design of machine toll element, machine body, element of design, guide ways, materials for machine body and guide ways, Slide way design, Spindles and bearings, Materials for Spindle, Design feature of a spindle, machine tool testing

Press Working of Sheet Metal (7)

Types of presses, drives and feed mechanisms; Operations: Shearing, bending, spinning, embossing, blanking, coining and deep drawing; Die materials, stock layout,compound and progressive dies and punches, construction details of die set, auxiliary equipment, safety devices.

Part – D

Automation of Manufacturing Processes **(6)**

Terminology, Fundamental law of gearing, involute spur gears, characteristics of involute and cycloidal action, Interference and undercutting, center distance variation, path of contact, arc of contact, nonstandard gear teeth, helical, spiral bevel and worm gears, problems

Computer Integrated Manufacturing System **(5)**

Introduction, Manufacturing System, Computer Integrated manufacturing ,Group Technology, Flexible manufacturing System, just in time production, Communication Networks in Manufacturing, Artificial Intelligence

References:

1. Raghuwanshi B.S., "**A Course in Workshop Technology**", Vol. 1, DhanpatRai, 10th Edition 2009.
2. Lindberg R.A, "**Processes and Materials of Manufacture**", Prentice Hall of India (P) Ltd.,1996
3. Serope Kalpak jain, "**Manufacturing engineering and Technology**", Edition III - Addision Wesley Publishing Co., 1995.
4. M. P. Groover, **Fundamentals of Modern manufacturing**, Wiley

Course Title: Mechanical Measurement
Paper Code: MEC-255
Total Lecture: 45

L	T	P	Credits	Marks
3	0	0	3	75

Course Objective:

1. To analyse the data obtained from the different measurements processes
2. To understand the basic principles, construction and working of engineering mechanical measurement science.
3. To understand the problems in measurement system and develop the competency to resolve the problems

Part-A

Introduction: Measurement, Significance, method of measurement definitions and concept of accuracy, precision, calibration, threshold, sensitivity, hysteresis, repeatability, linearity, loading effect, system response-times delay, Measurements in design, Factor in selection of measuring instruments, Measurements systems, Time element in measurement

Error in measuring instruments: Classification of error, sources of error, temperature problem, static & dynamic characteristics of measuring instruments, calibration, error

Standard of Measurements: Introduction, legal status, present measurement system & its advantage over previous system, standard of length, mass, time, temp. etc.

Part-B

Displacement & Dimensional Measurement: Problems of dimensional measurement gage block, surface plate, temperature problem etc. Use of different type of comparators, Optical method, optical flats, application of monochromatic light & optical flats, use of optical flats & monochromatic light for dimensional comparison, interferometer.

Surface Testing & Measurement: Surface roughness, definition, various methods to measure surface roughness, Different instruments for measuring surface roughness, roughness standard.

Part-C

Speed Measurement: Introduction, Use of counters, Stroboscope, direct application of frequency standard by comparative methods, calibration of frequency sources, Tachometers, different types- mechanical, electrical, frequency tachometer.

Stress Strain Measurements & Strain Gauges: Introduction, Mechanical strain gauges, Optical strain gauges, Electrical strain gauges, Stress measurement by variable resistance strain gauge, Sensing element materials, Forms of strain gauge sensing elements, Strain gauge adhesive, Protective coating, Strain gauge mounting techniques.

Part-D

Temperature Measurement: Resistance thermometers, thermocouple, law of thermo couple, materials used for construction, pyrometer, optical pyrometer.

Measurement of Force & Torque: Introduction, measuring methods, elastic transducers, strain gauge, load cell, piezo type load cell, hydraulic & pneumatic system, torque measurement, dynamometer, classification, type & characteristics.

Screw Thread Measurements: Errors in threads, screw thread gauges, measurement of elements of the external & internal threads using caliper gauges, various other methods to measure screw thread parameters

Spur Gear Measurement: Geometry of spur gear, measurement of spur gear parameters, run out, pitch, profile, lead, backlash, tooth thickness, composite elements, various other methods to measure spur gear parameters.

Reference books

1. Beckwith Marangoni and Lienhard,Mechanical Measurements, Pearson Education, 6th Ed., 2006.
2. Anand K. Bewoor&Vinay A. Kulkarni, Metrology & Measurement, Tata McGraw Hill Pvt. Ltd., New-Delhi
3. Alsutko, Jerry. D. Faulk, Industrial Instrumentation, Cengage Asia Pvt. Ltd. 2002.
4. Ernest O. Doebelin, Measurement Systems Applications and Design, 5th Ed., McGraw Hill Book Co.
5. R.K. Jain, Engineering Metrology, Khanna Publishers, 1994.
6. Kumar DS, Mechanical Measurement and Control, Metropolitan Book Co Pvt. Ltd., New Delhi

Course Title: Production Management
Paper Code: MEC-256
Total Lecture: 45

L	T	P	Cr	Marks
3	0	0	3	75

Course Objective: Measure the effectiveness, identify likely areas for improvement, develop and implement improved planning and control methods for production systems.

Part-A

Production Management **(4)**

Production Management verses Industrial Engineering, Service verses Goods, Production Management, Functions/Activities of Production Management, Scope of Production Management, Objectives of Production Management, Decisions in Production Management, Organization Structure of Production Management, Production Management Scenario today

Operation Management **(4)**

Operation Management, Environmental and Social concerns of Operations, Objectives in Operation Management, Operation management decisions, History of Operation Management, Scope and Significance of Operation Management

Production and Productivity **(4)**

Introduction, Fabrication, Manufacturing and Production, Productivity, Difference between Production and Productivity, Production Systems, Intermittent System, Project System, Job Order Production, Batch Production, Continuous Production

Part -B

Production Planning and Control **(12)**

Definition and Objectives of PPC, Functions of PPC, Routing, Loading, Scheduling and Dispatching, Control and Follow up Phase, Advantage of better PPC, Principles of Sound PPC. Definition and concept of forecasting, Importance and application for purpose of sales forecasts, Methods of sales forecast, Forecasting for New Products, Forecasting for established Products, Times Series analysis for sale forecasting, Methods of estimating sales trends.

Part -C

Facility Location **(5)**

Need for a suitable location, Urban, Suburban, Systems approach, Factors affecting location, Quantitative method for evaluation of facility location,

Facility Layout **(5)**

Objectives & Principles of plant layout, Different types of layouts viz. Product, Process, Combination, Fixed and Group layouts and their suitability, Software packages for layout analysis.

Part -D

Inventory Control **(6)**

Objectives, Need, Advantages, Disadvantages, Classification and Functions of Inventory control Department, Various level of inventory control, Inventory control techniques.

Cost estimation and Control **(5)**

Objectives of Cost estimation, Estimating Procedure, Elements of cost, Depreciation concept and Methods of calculating depreciation.

Reference books

1. Dr. K. C. Arora, Production and Operation Management, University Presss

2. N.V.S. Raju, Industrial Engineering and Management, Cengage Learning.
3. Dr. Ravi Shankar, Industrial Engineering and Management, Galgotia Publishers
4. Jain and Agarwal, Production Planning & Control, Khanna Publishers
5. Chunawala, Production and Operation Management, Himalaya Publication.

Course Title: Dynamics of Machines Lab
Course Code: MEC-261

L	T	P	Cr	Marks
0	0	2	1	25

List of Experiments:

1. To study inversions of 4 Bar Mechanisms, Single and double slider crank mechanisms.
2. To study various type of cam and follower arrangements.
3. To plot follower displacement vs cam rotation for various Cam Follower systems.
4. Determination of gear- train value of compound gear trains and Epicyclic gear trains.
5. To perform experiment on Watt Governors to prepare performance characteristic Curves, and to find stability & sensitivity
6. To perform experiment on Proell Governor to prepare performance characteristic curves, and to find stability & sensitivity.
7. To perform experiment on Hartnell Governor to prepare performance characteristic Curves, and to find stability & sensitivity.
8. To determine gyroscopic couple on Motorized Gyroscope.
9. To perform the experiment for static balancing on static balancing machine.
10. To perform the experiment for dynamic balancing on dynamic balancing machine.

Course Title: I.C. Engine lab
Course Code: MEC-263

L	T	P	Cr	Marks
0	0	2	1	25

List of Experiments:

1. To study the constructional details & working principles of two-stroke/ four stroke petrol engine.
2. To study the constructional detail & working of two-stroke/ four stroke diesel engine.
3. Analysis of exhaust gases from single cylinder/multi cylinder diesel/petrol engine by Orsat Apparatus.
4. To prepare heat balance sheet on multi-cylinder diesel engine/petrol engine.
5. To find the indicated horse power (IHP) on multi-cylinder petrol engine/diesel engine by Morse Test.
6. To prepare variable speed performance test of a multi-cylinder/single cylinder petrol engine/diesel engine and prepare the curves (i) bhp, ihp,fhp, vs speed (ii) volumetric efficiency & indicated specific specific fuel consumption vs speed.
7. To find fhp of a multi-cylinder diesel engine/petrol engine by Willian's line method & by motoring method.
8. To perform constant speed performance test on a single cylinder/multi-cylinder diesel engine & draw curves of (i) bhpvs fuel rate, air rate and A/F and (ii) bhpvsmep, mech efficiency &sfc.
9. To measure CO & Hydrocarbons in the exhaust of 2- stroke / 4-stroke petrol engine.
10. To find intensity of smoke from a single cylinder / multi-cylinder diesel engine.
11. To draw the scavenging characteristic curves of single cylinder petrol engine.
12. To study the effects of secondary air flow on bhp, sfc, Mech. Efficiency & emission of a two-stroke petrol engine.

Course Title: Mechanical Measurement Lab.
Paper Code: MEC265

L	T	P	Credits	Marks
0	0	2	1	25

List of experiments

1. Measurement with the help of verniercaliper and micrometer.
2. Measurement of an angle with the help of sine bar.
3. Measurement of surface roughness.
4. Measurement of gear elements using profile projector.
5. Three wire method to determine effective diameter of external threads.
6. Measurement of thread element by Tool maker's microscope.
7. Calibration of a pressure gauge with the help of a dead weight gauge tester.
8. Use of stroboscope for measurement of speed of shaft.
9. Measurement of torque with the help of an absorption dynamometer.
10. Preparation of a thermocouple, its calibration and application for temperature measurement

Course Title: Mechanics of Fluids
Course Code: MEC-301
Total Lecture: 46

L	T	P	Cr	Marks
3	0	0	3	75

Course Objectives: This is the first basic course of fluid mechanics. The main objective of this course is to understand the fundamentals of the fluid mechanics such as fluid and flow properties, fluid behavior at rest and in motion and fundamental equations like mass, energy and momentum conservation of the fluid flow. The whole course has been divided in four units as described herein.

Part – A

Introduction: (8)
Physical properties of fluids. Types of fluids. Concept of viscosity, Compressibility and Elasticity, Surface tension and capillarity. Flow Classification, Stream lines, Streak lines, Continuity equation, Velocity, Tangential, Normal, Local and Convective Accelerations, Types of fluid motions, rotation, Circulation, Velocity potential, Stream function, Flow net.

Fluid statics: (6)
Basic equation for pressure field, Measurement of pressure, Hydrostatic forces on immersed plane and curved surfaces, Buoyancy and flotation.

Part – B

Fluid kinematics: (6)
Methods of describing fluid motion, Velocity and acceleration of a fluid particle, Type of fluid flows, Displacement of a fluid particle, Circulation and vorticity, Continuity equation, Velocity potential and stream function.

Fluid kinematics: (6)
Methods of describing fluid motion, Velocity and acceleration of a fluid particle, Type of fluid flows, Displacement of a fluid particle, Circulation and vorticity, Continuity equation, Velocity potential and stream function.

Part – C

Flow measuring devices: (5)
Venturimeter, Orifice meter, Pitot tube, Rota meter, Circular orifice, Current meter, Notches.

Fluid dynamics: (4)
Euler's equation, Bernoulli's equation, Momentum equation, Kinetic energy and momentum correction factors.

Part – D

Flow though pipes: (5)
Energy losses, HGL and TEL, Concept of equivalent pipe, Pipes in series and parallel, Flow through a siphon, Transmission of power.

Open channel flow: (6)
Types of channels, Classification of flows, Uniform flow formulae.Turbines and pumps: Brief description of types and working of turbines and pumps.

Reference Books:
1. YounesCengel, Fluid Mechanics, Tata McGraw Hill.

2. Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics, Standard Book House.
3. Shames I.H., Mechanics of Fluid, McGraw Hill.
4. Fox, R.W. and McDonald, A.T., Introduction to Fluid Mechanics, John Wiley and Sons.
5. Streeter, V.L., Wylie E. B. and Bedford, K.W., Fluid Mechanics, McGraw Hill Book Company

Course Title: Design of Machine Elements
Course Code: MEC302
Total Lecture: 45

L	T	P	Cr	Marks
3	0	2	4	100

Course Objectives: The main objective of this course is to understand the fundamentals of Design of gear, riveted joints, derives, clutches and breaks

Part-A

Design Philosophy (7)

Ergonomic and value engineering considerations in design, Preliminary design, Selection of best possible solution, Detailed design, Selection of Fits and tolerances and analysis of dimensional chains. Variable Loading : Different types of fluctuating/ variable stresses, Fatigue strength considering stress concentration factor, surface factor, size factor, reliability factor etc., Fatigue design for finite and infinite life against combined variable stresses using Goodman and Soderberg's Criterion, Fatigue design using Miner's equation, Problems.

Selection of Materials (5)

Classification of Engg. Materials, Mechanical properties of the commonly used engg. Materials, hardness, strength parameters with reference to stress-strain diagram, Factor of safety.

Part-B

Design of Gears (6)

Classification, Selection of gears, Terminology of gears, Force analysis, Selection of material for gears, Beam & wear strength of gear tooth, Form or Lewis factor for gear tooth, Dynamic load on gear teeth –Barth equation and Buckingham equation and their comparison, Design of spur, helical, bevel & worm gear including the Consideration for maximum power transmitting capacity, Gear Lubrication, Design Problems.

Riveted Joints, Cotter & Knuckle Joints (5)

Design of various types of riveted joints under different static loading conditions, eccentrically loaded riveted joints, design of cotter and knuckle joints.

Part-C

Belt Rope and Chain Drives (5)

Design of belt drives, Flat & V-belt drives, Condition for Transmission of max. Power, Selection of belt, design of rope drives, design of chain drives with sprockets.

Keys, Couplings & Flywheel (6)

Design of Keys – Flat, Kennedy Keys, Splines, Couplings design – Rigid & Flexible coupling, turning Moment diagram, coefficient of fluctuation of energy and speed, design of flywheel – solid disk & rimmed flywheels.

Part-D

Clutches & Brakes: (6)

Various types of clutches in use, Design of friction clutches, Multidisc, Cone & Centrifugal, Torque transmitting capacity. Various types of Brakes, Self energizing condition of brakes, Design of shoe brakes – Internal & external expanding, band brakes, Thermal Considerations in brake designing.

Bearings (5)

design of pivot and collar bearing , Selection of ball and roller bearing based on static and dynamic load carrying capacity using load-life relationship, Selection of Bearings from manufacturer's catalogue, Design of journal bearings using Raimondi and Boyd's Charts, Lubrication, Design Problems.

Reference Books:

1. Mechanical Engg. Design - First Metric Editions: Joseph Edward.
2. Machine Design : S.G. Kulkarni , TMH , New Delhi.
3. Engineering design – George Dieter, MGH, New York.
4. Product Design and Manufacturing , A.K.Chitale and R.C.Gupta, PHI.
5. Design of Machine Elements – V.B. Bhandari – Tata McGraw Hill, New Delhi.

L	T	P	Cr	Marks
3	0	0	4	100

Course Title: Heat Transfer
Course Code: MEC-303
Total Lecture: 45

Course Objectives. The students will understand of various modes of heat transfer and their characteristics along with the study of heat exchanger.

Part A

Basics and Laws **(5)**
Definition of Heat Transfer, Reversible and irreversible processes, Modes of heat flow, Combined heat transfer system and law of energy conservation**.**

Steady State Heat Conduction **(6)**
Introduction, I-D heat conduction through a plane wall, long hollow cylinder, hollow sphere, and Conduction equation in Cartesian, polar and spherical co-ordinate systems, Numerical

Part B

Steady State Conduction with Heat Generation **(5)**
Introduction, 1 – D heat conduction with heat sources, extended surfaces (fins), Fin effectiveness 2-D heat conduction, Numerical.

Transient Heat Conduction **(6)**
Systems with negligible internal resistance, Transient heat conduction in plane walls, cylinders, spheres with convective boundary conditions, Chart solution, Relaxation Method, Numerical.

Part C

Convection **(7)**
Forced convection-Thermal and hydro-dynamic boundary layers, Equation of continuity, Momentum and energy equations, Some results for flow over a flat plate and flow through tube, Fluid friction and heat transfer (Colburn analogy), Free convection from a vertical flat plate, Empirical relations for free convection from vertical and horizontal planes & cylinders, Numerical**.**

Thermal Radiation **(5)**
The Stephen-Boltzmann law, The black body radiation, Shape factors and their relationships, Heat exchange between non black bodies, Electrical network for radiative exchange in an enclosure of two or three gray bodies, Radiation shields, Numerical**.**

Part D

Heat Exchangers **(5)**
Classification, Performance variables, Analysis of a parallel/counter flow heat exchanger, Heat exchanger effectiveness, Numerical

Heat Transfer with Change of Phase **(6)**
Laminar film condensation on a vertical plate, Drop-wise condensation, Boiling regimes, Free convective, Nucleate and film boiling, Numerical.

References:

1. Heat Transfer – J.P. Holman, John Wiley & Sons, New York.
2. Fundamentals of Heat & Mass Transfer–Incropera, F.P. &Dewill, D.P –John Willey New York.
3. Heat Transfer-Principles & Applications-Binay K. Dutta, PHI, New Delhi
4. Heat and mass transfer-R.K. Rajput, S.Chand, New Delhi.

Course Title: Manufacturing Processes - II
Course Code: MEC-304
Total Lecture: 45

L	T	P	Cr	Marks
3	0	0	4	100

Course Objectives: To know and identify basic manufacturing processes for manufacturing different Components.

Part-A

Introduction **(3)**
General, classification of modern machining methods, consideration in process selection.

Mechanical process **(7)**
ultrasonic machining, element of U.S.M., acoustic head & its design, tool feed mechanism, abrasive feed mechanism of cutting, effect of parameter on material removal rate and surface finish, economic consideration, application and limitations, recent development; abrasive jet marching, variable affecting material removal rate, application advantages and limitation; water jet machining, jet cutting equipment process details and practical applications.

Part-B

Electrochemical process **(6)**
Electro-chemical machining: elements of process, electrolytes & their properties, chemistry of process, metal removal rate. Thermal aspect, temperature rise & pressure-flow rate, tool design, accuracy & surface finish, advantages, application & limitations of the process, electrochemical grinding deburring & honing. Chemical machining: Elements of process, resists & enchants, applications and advantages.

Thermal Process **(6)**
Electrical discharge machining, mechanism of metal removal, EDM equipment, Generators & feed control devices, dielectric fluid, selection of electrode material, accuracy and surface finish, application & future trends. Plasma Arc Machining, mechanism of metal removal, PAM parameters, types of torches, accuracy and surface finish, economics and application of plasma jets, plasma arc spraying. Electro-beam machining: generation and control of electron beam, theory of electron beam, process capability and limitations.

Part-C

Laser Beam machining **(6)**
Principles of working, thermal aspect, material removal, cutting speed and accuracy, advantages & limitations.

Emerging Trends in Welding Processes **(4)**
Explosive welding, Cladding etc. Under water welding, Metallising, Plasma arc welding/ cutting etc.

Part-D

Emerging Trends in Forming Processes **(8)**

Principle, working and applications of High energy forming processes such as Explosive Forming, Electromagnetic forming, Electro-Discharge forming, water hammer forming, explosive compaction etc.

Additive Manufacturing **(6)**

Rapid prototyping: Stereo lithography, Fused Deposition Modelling, Selective laser sintering, solid based curing, 3 D printing and laminated object manufacturing

References:

1. Shan H S, "**Modern Machining Processes**", Tata McGraw Hill Publishing Co., 2002.
2. Rao P N, "**Manufacturing Technology**", Tata McGraw Hill Publilishing Company, 2000.
3. Serope Kalpak jain, **"Manufacturing engineering and Technology"**, Edition III - Addision Wesley Publishing Co., 1995.
4. Ghosh Amitabh, "**Manufacturing Processes**", Tata McGraw Hill Publishing Co., 2001.
5. Non-traditional machining methods; ASME.

Course Title: Industrial Engineering
Course Code: MEC-305
Total Lecture: 56

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective:

1. To impart the valuable skills to plan and understand plant layout.
2. To conduct time and motion study to improve the methods/system.
3. To impart the knowledge on Inventory Control and cost estimation

Part-A

Introduction:
Definition and scope of Industrial Engineering, Function and Qualities of an Industrial Engineer in industry, Techniques of Industrial Engineering.

Production and Productivity:
Production, Productivity, Difference between Production and Productivity, Expectations from productivity, Productivity measurement system. Types of Production

Value Engineering & Value Analysis:
Definition, Objectives & use of value analysis, Application & techniques.

Part -B

Facility Location:
Need for a suitable location, Urban, Suburban, Systems approach, Factors affecting location, Quantitative method for evaluation of facility location,

Facility Layout:
Objectives & Principles of plant layout, Different types of layouts viz. Product, Process, Combination, Fixed and Group layouts and their suitability, Software packages for layout analysis.

Inventory Control:
Objectives, Need, Advantages, Disadvantages, Classification, Functions of Inventory control Department, Various level of inventory control, Inventory control techniques.

Part -C

Repair and Maintenance:
Objective and importance of Maintenance, Different type of maintenance, Predictive and Preventive Maintenance Procedure of Preventive Maintenance, Schedules of Preventive Maintenance Nature of maintenance problem,.

Cost estimation and Control:
Objectives of Cost estimation, Estimating Procedure, Elements of cost, Depreciation concept and Methods of calculating depreciation.

Part -D

Work-study:
Areas of application of work study in industry; Components of work study in improving plant productivity and safety.

Method Study:
Objectives and procedure for methods analysis: Select, Record, Examine, Develop, Define, Install and Maintain. Recording techniques: Charts, Diagrams, Motion and Film Analysis, Models and Tempelets. Principles of motion economy

Work Measurement:
Objectives, Work measurement techniques - Time study, Work sampling, Pre-determined motion time standards (PMTS) Determination of time standards. Observed time, Basic time, Normal time and Standard time, Rating factors and Allowances.

Reference books

1. Chunawala, Production and Operation Management, Himalaya Publication.
2. MartandTelsang, Industrial Engineering and Production Management, S Chand & Company.
3. S. Dalela, Mansoor Ali, Industrial Engineering and Management Systems, Standard Publishing Distributors.
4. Philip E Hicks, Industrial Engineering & Management –A new perspective, Mcgraw Hill
5. Dr. Ravi Shankar, Industrial Engineering and Management, Galgotia.
6. Introduction to Work Study : International Labour Organization Geneva

Course Title: Numerical Methods
Course Code: MTH-256
Total Lecture: 36

L	T	P	Credits	Marks
3	0	0	3	75

Course Objectives:

The course is an introductory course on Waveletsso as to enable thestudents to understand further topics related to solution of differential equations. Wavelets are a helpful tool to solve a variety of problems of science and engineering such as image processing, cloud computing etc.

NOTE:

- The question paper for end-semester examination will have a weightage of 25%. It willconsistof60 objective questions. All questions will be compulsory.
- Two pre-announced test will be conducted having a weightage of 25% each. Each pre-announced test will consist of 20 objective type, 5short questions/problems on the UGC-NET (objective type) pattern as well as one long answer type question. The student is expected to provide reasoning/solution/working for the answer. The candidates will attempt all question. Choice will be given only in long answer type. The question paper is expected to contain problems to the extent of40%of total marks.
- Four objective/MCQ type surprise test will be taken. Two best out of four objective/MCQ type surprise test will be considered towards final each of 12.5% weightage to the final. Each surprise test will include 20-25 questions.
- The books indicated as text-book(s) are suggestive however, any other book may be followed.

UNIT-A **15HOURS**

Approximate numbers, Significant figures, rounding off numbers. Error Absolute, Relative and percentage.

Operators: Forward, Backward and Shift (Definitions and some relations among them).

Non-Linear Equations: Bisection, Regula-Falsi, Secant, Newton-Raphson, Muller, Chebshev and General Iteration Methods and their convergence, Aitken Method for acceleration of the

Convergence, Methods for multiple roots, Newton-Raphson and General iteration Methods for System of Non-Linear Equations, Methods for Complex roots and Methods for finding roots of Polynomial Equations

UNIT-B **14 HOURS**

Systems of Simultaneous Linear Equations: Direct methods: Gauss elimination method, Gauss Jordon method, Matrix inversion method; Iterative methods: Jacobi method and Gauss-Seidel method, Successive over relaxation iterative method, iterative method to determine A^{-1}, Eigen values problem: Power method for finding largest/smallest Eigen value.

UNIT-C **13HOURS**

Lagrange's interpolation, Newton Interpolation, Finite Difference Operators, Piecewise and Spline Interpolation, Interpolating Polynomials using Finite Differences and Hermite Interpolation. Least square approximation, Uniform approximation, Rational approximation

Numerical Differentiation, Error in Numerical Differentiation, Cubic Spline method, Maximum and Minimum values of a tabulated function.

UNIT-D **14 HOURS**

Numerical Integration:, Numerical Integration: Trapezoidal Rule, Simpson's 1/3-Rule, Simpson's 3/8-Rule, Boole's and Weddle's Rule, Integration using Cubic Splines, Romberg Integration, Newton Cotes formulae, Adaptive Quadrature, Gaussian Integration, Euler-Maclaurin Sum Formula, Numerical Integration of Singular and Fourier Integrals, Numerical Double Integration.

Numerical solutions to first order ordinary differential equations: Taylor's Series method, Picard's Method, Euler's and modified Euler's methods, RungeKutta methods

References:

1. K.E. Atkinson, **An Introduction to Numerical Analysis**, Wiley, 1989.
2. K. Eriksson, D. Estep, P. Hansbo and C. Johnson, **Computational Differential Equations**, Cambridge Univ. Press, Cambridge, 1996.
3. S.D. Conte and Carl De Boor, **Elementary Numerical Analysis, An Algorithmic Approach,** Tata McGraw Hill, New Delhi, 1981.
   M.K. Jain, **Numerical Analysis for Scientists and Engineers**, S.B.W. Publishers, Delhi, 1971.

Course Title: Mechanics of Fluid Lab
Cource Code: MEC311

L	T	P	Cr	Marks
0	0	2	1	25

List of Experiments:

1. 1 To Find Coefficient of Discharge of Venturimeter.
2. To Find Coefficient of Discharge of Orifice Meter
3. To Find Coefficient of Discharge of Pitot Tube
4. To Find Cd, Cv& Cc of an Orifice
5. To Find Friction Factor of Pipes of Different material & Diameter.
6. To Find Minor Losses with Sudden Enlargement & Contraction.
7. To Find Metacentric Height of Floating Vessel.
8. To Find Reynolds Number.
9. Study Different Notches through Experiment.
10. To Prove Bernoulli's Theorem.
11. To study Free & Forced Vertex.
12. Experiment on Laminar & Turbulent Flow
13. To Find Drag & Lift & Pressure Distribution in Wind Tunnel
14. Flow through Weir Apparatus
15. To find hydraulic jump in given flume.

Course Title: Heat and Mass Transfer lab
Course Code: MEC313

L	T	P	Cr	Marks
0	0	2	1	25

List of Experiments:

1. To determine the thermal conductivity of a metallic rod
2. To determine the thermal conductivity of an insulating powder.
3. To determine the thermal conductivity of a solid by the guarded hot plate method.
4. To find the effectiveness of a pin fin in a rectangular duct natural convective condition and plot temperature distribution along its length.
5. To find the effectiveness of a pin fin in a rectangular duct under forced convective and plot temperature distribution along its length.
6. To determine the surface heat transfer coefficient for a heated vertical tube under natural convection and plot the variation of local heat transfer coefficient along the length of the tube. Also compare the results with those of the correlation.
7. To determine average heat transfer coefficient for a externally heated horizontal pipe under forced convection & plot Reynolds and Nusselt numbers along the length of pipe. Also compare the results with those of the correlations.
8. To measure the emmisivity of the gray body (plate) at different temperature and plot the variation of emmisivity with surface temperature.
9. To find overall heat transfer coefficient and effectiveness of a heat exchange under parallel and counter flow conditions. Also plot the temperature distribution in both the cases along the length of heat of heat exchanger.
10. To verify the Stefen-Boltzmann constant for thermal radiation.
11. To demonstrate the super thermal conducting heat pipe and compare its working with that of the best conductor i.e. copper pipe. Also plot temperature variation along the length with time or three pipes
12. To study the two phases heat transfer unit.
13. To determine the water side overall heat transfer coefficient on a cross-flow heat exchanger.

Course Title: Numerical Methods Lab
Cource Code: MTH257

L	T	P	Cr	Marks
0	0	2	1	25

List of Programs:

1. Write a program to solve a polynomial equation.
2. Write a program to find C (n, r).
3. Write a program to write a tridiagonal matrix.
4. Write a program to solve the system of linear equations
   a) Using Gauss Elimination b) using LU Decomposition.
5. Write a program in Matlab to find the characteristic roots and the characteristic functions
6. WAP on Bisection and False Position Method.
7. WAP on polynomial interpolation.
8. WAP on Taylor Series method.
9. WAP on Runge-Kutta Methods
10. WAP on Finite Difference Methods
11. WAP on Numerical Integration.
12. WAP on Trapezoidal and Simpson's rule.
13. WAP on Gaussian Quadrature.
14. WAP on Spline Interpolation.
15. WAP on Hermite Interpolation.

References:

1. K.E. Atkinson, An Introduction to Numerical Analysis, Wiley, 1989.
2. K. Eriksson, D. Estep, P. Hansbo and C. Johnson, Computational Differential Equations, Cambridge Univ. Press, Cambridge, 1996.
3. G.H. Golub and J.M. Ortega, Scientific Computing and Differential Equations: An Introduction to Numerical Methods, Academic Press, 1992.
4. S.D. Conte and Carl De Boor, Elementary Numerical Analysis, An Algorithmic Approach**,** Tata McGraw Hill, New Delhi, 1981.
5. M.K. Jain, Numerical Analysis for Scientists and Engineers, S.B.W. Publishers, Delhi, 1971.

Course Title: Fluid Machinery
Course Code: MEC-351
Total Lecture: 56

L	T	P	Cr	Marks
4	0	0	4	100

Course Objectives: Fluid machinery is essential to mankind, being found in all walks of life:

- Pumps can send drinking water to your home, feed power station boilers or move chemicals around a process plant
- Compressors can transport gases around distribution systems or through process plants or provide air for power tools. Fans can blow cool air into your office, provide coolant to nuclear reactors or ventilate the Channel Tunnel
- Turbines are used to generate motive power from water, the wind or any process where fluids have energy to spare

Part – A

Basics of Turbo Machinery **(7)**

Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes

Hydroelectric Power Stations **(7)**

Elements of hydroelectric power station, types, concept of pumped storage, plants storage requirements, mass curve (explanation only) estimation of power developed from a given catchment area; heads and efficiencies.

Part – B

Hydraulic Turbines **(7)**

Classification of turbines, impulse and reaction turbines, Palton wheel, Francis turbine and Kaplan turbine- working operations, work done, efficiencies, hydraulic design, draft tube, theory functions and efficiency.

Performance of Hydraulic Turbines **(8)**

Geometric similarity, unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer.

Part – C

Centrifugal Pumps **(8)**

Classification, working, work done- manometric head- losses and efficiencies- specific speed, pumps in series and parallel, performance characteristic curve, NPSH. Reciprocating pumps: working, discharge, slip, indicator diagrams.

Other Machines **(6)**

Hydraulic accumulator, Special duty pumps, Intensifier, Hydraulic press, Lift and cranes, Theory of hydraulic coupling and torque converters, Performance characteristics

Part – D

Water Lifting Devices **(6)**

Hydraulic ram, Jet pumps, Air lift pumps.

Other Hydraulic Devices **(7)**

Hydraulic ram, airlift pump, jet pump, centrifugal jet-pump, fluid coupling, torque converter.

Reference Books:

1. White, F. M., Viscous Fluid Flow, McGraw Hill.
2. Wright, T., Fluid Machinery, CRC Press, USA Jagdish Lal, Hydraulic Machines, Metropolitan book co. Pvt ltd.
3. V.P.Vasandhani, Hydraulic Machines: Theory & Design, Khanna Publication
4. R K Rajput, Hydraulic Machines, S. Chand & co Ltd.
5. D S Kumar, Hydraulic Machines

Course Title: Optimization Techniques
Course Code: MEC-352
Total Lecture: 37

L	T	P	Cr	Marks
4	0	0	4	100

Course Objectives: Students will learn about the basic concepts of optimization techniques and to use them for optimum utilization of resources.

Part – A

Introduction: **(4)**
Origin of OR and its role in solving industrial problems. General approach for solving OR problems. Classification of mathematical models, various decision making environments.

Linear Programming: **(5)**
Formulation of linear mathematical models: Graphical and simplex techniques for solution of linear programming problems, Big M method and two phase method, Introduction to duality theory and sensitivity analysis.

Part – B

Transportation and Assignment Models: **(5)**
Various initial basic feasible solutions methods, Optimization of transportation and assignment using different methods considering the concept of time and cost function.

Dynamic Programming: **(3)**
Introduction to deterministic and probabilistic dynamic programming.

Part – C

Network models: **(6)**
Shortest route and traveling sales - man problems, PERT &CPM introduction, analysis of time bound project situations, construction of networks, identification of critical path, slack and float, crashing of network for cost reduction.

Queuing Theory: **(3)**
Types of queuing situation: Queuing models with Poisson's input and exponential service, their application to simple situations.

Part – D

Replacement Models: **(4)**
Replacement of items that deteriorate, Replacement of items whose maintenance and repair costs increase with time, replacement of items that fail suddenly; replacement of items whose maintenance costs increase with time and value of money also changes, individual replacement policy, group replacement policy.

Optimization Techniques: **(7)**
Introduction, Theory and algorithms, classical method, non-linear optimization-Unconstrained optimization, constrained optimization: Langrangian multiplier method.

References:

1. H.M Wagner, Principles of Operations Research, Prentice Hall.
2. P.K. Gupta and D.S. Hira, Operations Research, S. Chand & Co.
3. F.S. Hiller and G.I. Libermann, Introduction to Operation Research, Holden Ray.

4. Wiest& Levy, A Management Guide to PERT/CPM Prentice Hall
5. Ackoff and Saseini, Fundamental of Operations Research, Wiley Eastern

Course Title: Automobile Engineering
Course Code: MEC-353
Total Lecture: 45

L	T	P	Cr	Marks
3	0	0	3	75

Course Objectives: Students will learn about the basic concepts of automobile, about the ignition, fuel supply, power transmission, breaking, steering and suspension systems of the automobile.

Part – A

Introduction to Automobiles **(6)**

Basic Structure, Components, Type of Automotive Vehicles Requirements of Automobile Body, Vehicle Frame, Front Engine Rear Drive & Front Engine Front Drive Vehicles, Four Wheel Drive Vehicles, Safety considerations, Future trends in automobiles.

Ignition System **(5)**

Battery ignition system, comparison between battery ignition and magnetic ignition system, ignition advance methods, electronic ignition

Part – B

Fuel Supply System **(7)**

Air cleaner and fuel pumps, Simple carburetor, types of carburetor, mixture strength requirements, Modifications in a simple carburetor to meet different starting, running, idling and accelerating conditions; fuel pumps for petrol engines, petrol injections, diesel fuel pump and fuel injector and nozzles for diesel engines. MPFI, CDI, GDI systems,

Clutches **(6)**

Requirement of Clutches – Principle of Friction Clutch – Wet Type & Dry Types; Cone Clutch, Single Plate Clutch, Diaphragm Spring Clutch, Multi plate Clutch, Centrifugal Clutches, Electromagnetic Clutch, Over Running Clutch; Clutch Linkages

Part – C

Power Transmission **(5)**

Requirements of transmission system; General Arrangement of Power Transmission system; Object of the Gear Box; Different types of Gear Boxes; Sliding Mesh, Constant Mesh, Synchro- mesh Gear Boxes; Epi-cyclic Gear Box. Overdrive unit-Principle of Overdrive, Advantage of Overdrive, Universal Joint, and Differential.

Brakes **(6)**

Types of brakes, brake actuating systems; Mechanical, Hydraulic, Pneumatic Brakes, Factors affecting Brake performance, brake torque, minimum stopping distance with front wheel braking, rear wheel braking, wheel braking and heat dissipation.

Part – D

Suspension Systems **(5)**

Need of Suspension System, Types of Suspension; factors influencing ride comfort, Suspension Spring; Shock Absorbs and Stabilizers

Steering System **(6)**

Requirement and steering geometry; castor action, camber and king pin angle, toe-in of front wheels, Different types of Steering; Steering linkages and layout; Power steering – Rack & Pinion Power Steering Gear, Electronics steering.

References:

1. Crouse WH , **"Automotive mechanics"**, McGraw Hill Publishing Co
2. Heitner Joseph, **"Automotive Mechanics**", East West Press
3. Kirpal Singh, **"Automobile Engineering Vol I and II**", Standard Publishers
4. H.M. Sethi, **"Automotive Technology"**, Tata McGraw Hill, New Delhi.

Course Title: Inspection and Quality Control
Course Code: MEC-354
Total Lecture: 45

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: To provide product/service of high quality. To impart the knowledge on various inspections and QC techniques

Part-A

Introduction, Definition and Concept of Inspection, Objectives of inspection, Benefits of Inspection, Inspection Planning, Stages of Inspection, Types of Inspection

Part -B

Introduction, Standardization, Objectives of Standardization, Standards, Complementary Levels of Standards, Types of Standards, Requirements of Standards, Advantages and disadvantages of Standards, Codes, Coding system, National Codes, Working of BIS, Certification by BIS, Certification by BIS, International Codes, Importance of ISI codes, ISO concept, ISO 9000 Series, Requirement, Characteristics, Aim, Need, Obstacles and implementations in ISO9000.

Part -C

Basics of quality, Quality objectives, Quality of Design, Quality of Conformance, Quality of Performance, Quality Assurance, Quality Standards, Quality control, Need of Quality Control, Factors affecting quality, Objectives of Quality control, Advantages of Quality control, Area of application of Quality control, Difference between Quality control and Quality Assurance, Inspection verses Quality Control

Part -D

Quality gurus and their philosophies, Process capability concept, Importance of Process capability, Control charts for variables and attributes.

Acceptance sampling, OC curve, Characteristics of OC curve, Types of sampling Plans

TQM, Quality function deployment, FMEA, Quality circles, Kaizen, 6 Sigma concepts

Reference books

1. Philips J. Ross, Taghuchi techniques for quality engineering, McGraw Hill, New York, 1998.
2. Douglus C. Montgomery, Introduction to statistical quality control, 2nd Edition , Jhon Wiley & sons, 1991

Course Title: Energy Resources
Course Code: MEC-355
Total Lecture: 45

L	T	P	Cr	Marks
3	0	0	3	75

Course Objectives: Students will learn about the conventional and non-conventional energy resources, about the solid flues, liquid fuels, carbonization, and gaseous feels.

Part-A

Introduction (6)

Conventional (fossil energy) and non-conventional (alternative energy) resources & reserves. Global Energy production & consumption pattern. Production &consumption pattern in India

Solid Fuels (6)

Biomass, Wood and Charcoal. Classification & Rank of Coal, Peat ,Lignite, Sub-Bituminous coal, Bituminous coal, Anthracite coal, Cannel &Bog head coal. Physical Properties of coal, Proximate & Ultimate Analysis of Coal, Cleaning, washing & Storage of coal.Theory of coal.

Part-B

Paralysis and Carbonization (5)

Low Temperature Carbonization (LTC), High Temperature Carbonization(HTC), Horizontal & Vertical Gas Retorts, Coke Ovens-Beehive & By product Slot type. Recovery of by products. Details of Structural configuration and Operating principles.

Liquid Fuels (7)

Constitution of petroleum, theory of formation of crude petroleum oil. Characterization of crude oil & petroleum fuels. Operation and flow-sheet of crude distillation plant. Thermal & catalytic cracking and reforming processes, coking, vis breaking, Process of a typical Indian refinery. Parameters and testing logistics of petroleum products—Octane no.; Cetane no.; Aviation fuel, Power no.; Pour point; Smoke point; Char point; Cloud point; Flash point; Fire point; Aniline point and Diesel index.

Part-C

Liquid fuel from coal (10)

Bergius and Fischer Tropsch process.Other Synthetic Liquid fuels.(Benzol,shaleoil,Gashol, power alcohol Colloidal fuel).

Part-D

Gaseous Fuels (11)

Classification of gaseous fuel;Physico-chemical principles, Calorific Value, Wobbes index, and flame speed.Flow sheet &operation of Producer gas, Water gas, Carburetted water gas, oil gas, coke-oven gas, blast furnace gas, Natural Gas and LPG. Coal Bed Methane.

Refrences:

1. Boyle, G. 2004. Renewable energy: Power for a sustainable future. Oxford University press.
2. B H Khan, Non Conventional Energy Resources-The McGraw –Hill Second edition.
3. G. D. Rai, Non conventional energy sources, Khanna Publishers, New Delhi, 2006.
4. Gilbert M. Masters, Introduction to Environmental Engineering and Science, 2nd Edition, Prentice Hall, 2003.

Course Title: Refrigeration and Air Conditioning
Course Code: MEC-356

L	T	P	Cr	Marks
4	0	0	4	100

Total Lecture: 56

Course Objectives. To cover the broad area of refrigeration including refrigeration cycles, refrigeration load calculation, refrigeration control and accessories along with the recent innovation in air conditioning system.

Part A

Introduction (6)

Definition of refrigeration & air conditioning; Necessity; Methods of refrigeration; Unit of refrigeration; Coefficient of performance (COP), Fundamentals of air-conditioning system; Refrigerants- Definition, Classification, Nomenclature, Desirable properties, Comparative study, secondary refrigerants, Introduction to eco-friendly Refrigerants; Introduction to Cryogenics.

Air Refrigeration System (8)

Carnot Refrigeration cycle, Temperature Limitations; Brayton refrigeration or the Bell Coleman air refrigeration cycle; Necessity of cooling the aero plane; Air craft refrigeration systems, Simple cooling and Simple evaporative types, Boot strap and Boot strap evaporative types, Regenerative type and Reduced Ambient type system, Comparison of different systems, problems.

Part B

Vapour Compression Refrigeration Systems (8)

(a) Simple Vapour Compression (VC) Refrigeration systems-Limitations of Reversed Carnot cycle with vapour as the refrigerant; Analysis of VC cycle considering degrees of sub cooling and superheating; VC cycle on p-v, t-s and p-h diagrams; Effects of operating conditions on COP; Comparison of VC cycle with Air Refrigeration cycle.

(b) Multistage Ref. Systems- Necessity of compound compression, Compound VC cycle , Inter-cooling with liquid sub –cooling and / or water inter cooler: Multistage compression with flash inter-cooling and / or water inter-cooling; systems with individual or multiple expansion valves; Individual compression system with individual or multiple expansion valves; Individual compression systems with individual or multiple expansion valves but with and without intercoolers.

Other Refrigeration Systems (6)

(a) Vapour Absorption Refrigeration Systems – Basic Systems, Actual COP of the System, Performance, Relative merits and demerits; Properties of aqua ammonia; Electrolux Refrigeration; Problems.

(b) Steam Jet Refrigerating System- Introduction, Analysis, Relative merits and demerits, Performance Applications, Problems.

(c) Cascade Refrigerating Systems-Necessity Selection of Pairs of refrigerants for the system, Concept of cascade temperature, Analysis, Multistage, Comparison with V.C. systems, Applications, Problems.

Part C

Psychometry of Air & Air Conditioning Processes (8)

Properties of moist Air-Gibbs Dalton law, Specific humidity, Dew point temperature, Degree of saturation, Relative humidity, Enthalpy, Humid specific heat, Wet bulb temp.,

Thermodynamics wet bulb temp., Psychometric chart; Psychometry of air-conditioning processes, Mixing Process, Basic processes in conditioning of air; Psychometric processes in air washer, Problems.

Air-Conditioning Load Calculations (6)

Outside and inside design conditions; Sources of heating load; Sources of cooling load; Heat transfer through structure, Solar radiation, Electrical applications, Infiltration and ventilation, Heat generation inside conditioned space; Apparatus selection; Comfort chart, Problems.

Part D

Air Conditioning Systems with Controls & Accessories (7)

Classifications, Layout of plants; Equipment selection; Air distribution system; Duct systems Design; Filters; Refrigerant piping; Design of summer air-conditioning and Winter air conditioning systems; Temperature sensors, Pressure sensors, Humidity sensors, Actuators, Safety controls; Accessories; Problems.

Refrigeration and Air Conditioning Equipment's (5)

Type of compressors and their performance curves; Types of Condensers, Heat transfer in condensers; Types of expansion devices; types of evaporators, Cooling and Dehumidifying coils, Problems.

References

1. Refrigeration & Air conditioning –R.C. Jordan and G.B. Priester, Prentice Hall of India.
2. Refrigeration & Air conditioning –C.P. Arora, TMH, New Delhi.
3. A course in Refrigeration & Air Conditioning – Arora &Domkundwar, Dhanpat Rai & Sons.
4. Refrigeration & Air conditioning –W.F. Stocker and J.W. Jones, TMH, New Delhi.
5. Refrigeration & Air conditioning- R.K. Rajput, New Delhi

Course Title: Fluid Machinery Lab.
Course Code: MEC-361

L	T	P	Cr	Marks
0	0	2	1	25

List of Experiments:

1. To study the constructional details of a Pelton turbine and draw its fluid flow circuit.
2. To draw the following performance characteristics of Pelton turbine-constant head, constant speed and constant efficiency curves.
3. To study the constructional details of a Francis turbine and draw its fluid flow circuit.
4. To draw the constant head, constant speed and constant efficiency performance characteristics of Francis turbine.
5. To study the construction details of a Kaplan turbine and draw its fluid flow circuit.
6. To draw the constant head, speed and efficiency curves for a Kaplan turbine.
7. To study the constructional details of a Centrifugal Pump and draw its characteristic curves.
8. To study the constructional details of a Reciprocating Pump and draw its characteristics curves.
9. To study the construction details of a Gear oil pump and its performance curves.
10. To study the constructional details of a Hydraulic Ram and determine its various efficiencies.
11. To study the constructional details of a Centrifugal compressor.
12. To study the model of Hydro power plant and draw its layout.

Course Title: Automobile Engineering Lab
Course Code: MEC-363

L	T	P	Cr	Marks
0	0	2	1	25

List of Experiments:

1. To study the constructional details, working principles and operation of the following Carburetors, Diesel Fuel Injection Systems, Gasoline Fuel Injection Systems.
2. To study the constructional details, working principles and operation of different Ignition Systems.
3. To study the constructional details, working principles and operation of the Engine Cooling & Lubricating Systems.
4. To study the constructional details, working principles and operation of the Hydraulic & Pneumatic Brake systems.
5. To study the constructional details, working principles and operation of the Drum Brake System. Disk Brake System, Antilock Brake System.
6. To study the constructional details, working principles and operation of Front Suspension System and Rear Suspension System.
7. Demonstration of steering system and measurement of steering geometry angles and their impact on vehicle performance.
8. To study the constructional details, working principles and operation of Multi-Plate Clutch, Spring Clutch.
9. To study the constructional details, working principles and operation of Differential.
10. To study the constructional details of Automotive Tyres & Wheels.
11. To study the Multi-Point Fuel Injection system and Common Rail Direct Injection System.

Course Title: Refrigeration and Air-Conditioning Lab
Course Code: MEC-366

L	T	P	Credits	Marks
0	0	2	1	25

List of Experiments:

1. To study the vapour compression Refrigeration System and determine its C.O.P. and draw P-H and T-S diagrams.
2. To Study the Mechanical heat pump and find it's C.O.P.
3. To study the Air and Water heat pump and find it's C.O.P.
4. To study the cut- sectional models of Reciprocating and Rotary Refrigerant compressor.
5. To study the various controls used in Refrigerating & Air Conditioning systems.
6. To study the Ice- plant, it's working cycle and determines its C.O.P and capacity.
7. To study the humidification, heating, cooling and dehumidification processes and plot them on Psychometric charts.
8. To determine the By-pass factor of Heating & Cooling coils and plot them on Psychometric charts on different inlet conditions.
9. To determine sensible heat factor of Air on re-circulated air-conditioning set up.
10. To study the chilling plant and its working cycle.

Course Title: Robotic and Automation
Course Code: MEC-401
Total Lecture: 48

L	T	P	Cr	Marks
4	0	0	4	100

Course Objectives: Students will learn about the basic concepts of automation, about the fluid power, about the robotic, about the robotic sensors, end effectors and its programming.

Part – A

Introduction to Robotic **(6)**
Introduction, terminology, laws of robotics, classification based on geometry, machine vision, robot components, degree of freedom, coordinators, reference frames,

Robot Sensors and End Effectors **(7)**
Types of Sensors in robots, exteroceptors, proprioceptors, tactile, proximity, range, velocity and machine vision sensors, robot end-effectors, classification, gripper, gripper mechanism, type of gripper.

Part – B

Robot Programming **(6)**
Robot programming, techniques of programming, robot languages, requirement for a standard robot language, types of languages.

Industrial applications **(5)**
Applications of robots in welding, machine loading, fabrication, spray painting, assembly and unusual applications.

Part – C

Industrial Automation **(5)**
Basic principles of automation; Hard Automation, Flexible Automation, Low Cost Automation Elements of Automation

Fluid Power **(7)**
Fluid power control elements, 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.

Part – D

Logic Circuits **(7)**
Design of pneumatic logic circuits for a given time displacement diagram or sequence of operations

Fluidics **(5)**
Boolean algebra; Truth tables; Conda effect; Fluidic elements – their construction working and performance characteristics

References:

1. Deb SR, **"Robotics and Flexible Automation"**, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
2. Majumdar SR, **"Pneumatic Control"**, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
3. Asfahl CR, **"Robotics and Manufacturing Automation",** Wiley India.
4. Niku SB, **"Introduction to Robotic"**, Wiley India.

Course Title: Mechanical Vibrations
Course Code: MEC-402
Total Lecture: 55

L	T	P	Cr	Marks
4	0	0	4	100

Course Objectives: Students will learn about the basic concepts of machine vibrations. Cause and remedies. This course will enable students to design machine components free from unwanted vibrations so that efficiency can be increased by reducing vibrations.

Part – A

Introduction (6)
Types of vibrations, Simple Harmonic Motion (S.H.M), principle of super position applied to Simple Harmonic Motions. Beats, Fourier theorem and simple problems.

Undamped Free Vibrations (7)
Single degree of freedom systems. Mass Undamped free vibration-natural frequency of free vibration, stiffness of spring elements, effect of mass of spring, Compound Pendulum.

Part – B

Damped Free Vibrations (8)
Single degree freedom systems, different types of damping, concept of critical damping and its importance, study of response of viscous damped systems for cases of under damping, critical and over damping, Logarithmic decrement.

Forced Vibration (7)
Single degree freedom systems, steady state solution with viscous damping due to harmonic force. Solution by Complex algebra, Reciprocating and rotating unbalance, vibration isolation-transmissibility ratio. Due to harmonic excitation and support motion.

Part – C

Vibration Measuring Instruments (7)
Whirling of shafts, Vibrometer meter and accelerometer. Whirling of shafts with and without air damping. Discussion of speeds above and below critical speeds.Combined with shear, strain energy under combined loading.

Systems with Two Degrees of Freedom (7)
Introduction, principle modes and Normal modes of vibration, co-ordinate coupling, generalized and principal co-ordinates, Free vibration in terms of initial conditions. Geared systems. Forced Oscillations-Harmonic excitation. Applications: a) Vehicle suspension. b) Dynamic vibration absorber. c) Dynamics of reciprocating Engines.

Part – D

Continuous systems (5)
Introduction, vibration of string, longitudinal vibration of rods, Torsional vibration of rods, Euler's equation for beams.

Numerical Methods for Multi Degree Freedom Systems (8)
Introduction, Influence coefficients, Maxwell reciprocal theorem, Dunkerley's equation. Orthogonality of principal modes, Method of matrix iteration-Method of determination of all

the natural frequencies using sweeping matrix and Orthogonality principle. Holzer's method, Stodola method.

References:

1. LeonanrdMeirovitch Elements of Vibrations Analysis: , Tata McGraw Hill, Special Indian edition
2. S.S. Rao,Mechanical Vibrations: , Pearson Education
3. S. Graham Kelly,Mechanical Vibrations: Schaum's Outline Series, Tata McGraw Hill, Special Indian edition

Course Title: Finite Element Analysis
Course Code: MEC-403
Total Lecture: 45

L	T	P	Credits	Marks
4	0	0	4	100

Course Objectives: Students will learn about the basic concepts of FEA, about the One, two and Three Dimensional Problems in FEA, about the problems with truss, beams and frames.

Part – A

Introduction **(5)**
Basic concept of the finite element method, Rayleigh-Ritz Method, Galerkin's Method, matrix algebra, Gaussian eliminatioin.

One Dimensional Problems **(7)**
Introduction, coordinates and shape functions, Potential energy approach, Galerkin Approach, Assembly of the global stiffness matrix and load vector, FEM equations and treatment of boundary conditions, quadratic shape functions.

Part – B

Two Dimensional Problems **(7)**
Finite element modeling, Constant-Strain Triangle, problem modelling and boundary conditions

Axisymmetric solids subjected to axisymmetric loadings **(7)**
Axisymmetric formulation, FEM using triangular element, problem using boundary conditions

Part – C

Truss, Beams and Frames **(7)**
Plain and three Dimensional Trusses, Beams on elastic support, Plain and three Dimensional frames, Beams and frames in various different conditions

Three Dimensional Problems in Stress Analysis **(6)**
Stress Calculations, Mesh Preparation, higher order elements, frontal method.

Part – D

Dynamic Analysis **(6)**
Dynamic equation of motion, consistent mass matrix for truss element frame element and triangular plate element, evaluation of eigen values and eigen vectors

References:

1. Chandrupatla T.R. and Belegundu A.D., "**Introduction to finite Elements in Engineering"**, PHI Learning, New Delhi.
2. Cook R.D., Malkus DS, Plesha ME and Witt RJ, **"Concepts and Applications of Finite Element Analysis",** Wiley India.

Course Title: CAD/CAM
Course Code: MEC-404
Total Lecture: 45

L	T	P	Cr	Marks
3	0	0	3	100

Course Objectives: Students will learn about the basic concepts of machines and mechanisms, about the velocity and acceleration diagrams of all basic mechanisms, about the types of cam & follower, about the types of drives such as: belts, ropes, chains and gears.

Part – A

Fundamentals of CAD **(6)**

Introduction, Design Process, Application of computers in design, Creating manufacturing database, benefits of CAD, Software configuration of a graphics system, functions of a graphics package, geometric modeling, Database structure and control, Graphics standard: GKS and IGES.

Geometric Transformations **(3)**

Mathematics preliminaries, matrix representation of 2 and 3 dimensional transformation, Concatenation of transformation matrices. Application of geometric transformations

Part – B

Geometric modeling **(9)**

Need of Geometric Modeling, types of geometric modeling, geometric modeling representation, and geometric modeling techniques and uses. Parametric representation of analytical and synthetic curves.

Part – C

Numerical Control **(5)**

types of NC systems, MCU and other components, NC manual part programming, coordinate systems, G & M codes, Part program for simple parts, computer assisted part programming. Direct numerical control, Adaptive control in machining system, Combined DNC/CNC system.

Group Technology **(4)**

Part families, part classification and coding system, Group technology machine cells, Advantages of GT

Part – D

Flexible Manufacturing Systems **(4)**

Introduction, FMS components, types of FMS, FMS layouts, planning for FMS,

Computer Aided Process Planning **(5)**

Introduction and benefits of CAPP, types of CAPP, Steps in variant process planning, planning for CAPP, machinability data selection systems in CAPP.

References:

1. Groover and Zimmer, **"CAD/ CAM"**, Prentice Hall of India.
2. Zeid I, **"CAD/ CAM Theory and Practice"**, McGraw Hill India
3. D.D. Bedworth, M.R Henderson & P.M. Wolfe, **"Computer Integrated Design and Manufacturing"**, Tata McGraw Hill Pub. Co.

Course Title: Robotic and Automation Lab
Course Code: MEC- 411

L	T	P	Cr	Marks
0	0	2	1	25

List of Experiments:

1. Study of robotic arm and its configuration
2. Study the robotic end effectors
3. Study of different types of hydraulic and pneumatic valves
4. Study of reciprocating movement of double acting cylinder using pneumatic direction control valves
5. Use of direction control valve and pressure control valves clamping devices for jig and fixture
6. Design and assembly of meter in and out circuits.
7. Design and assembly of pneumatic regenerative circuit
8. Design and assembly of pneumatic circuit for sequence operation.

Course Title: Mechanical Vibration Lab
Paper Code: MEC-412

L	T	P	Cr	Marks
0	0	2	1	25

List of Experiments:

1. Vibration lab Apparatus for 10 Experiments
2. Vibrometer to measure Vibrations
3. Study of Trifliar Suspension system
4. Study of Bifliar Suspension system.

Course Title: CAD/CAM Lab
Course Code: MEC- 414

L	T	P	Cr	Marks
-	-	2	1	25

The students will be required to carry out the following exercises using software packages (e.g. 3D modeling package/ Pro Engineer/ I-Deas/ Solid Edge etc.

List of Experiments:

1. Implement simple programmes for the graphics representation of
   (i) Transformation and projections.
   (ii) Conic Sections, cubic splines, and B-splines.
   (iii) Surfaces- Bilinear, Bicubic surface patch and Bezier surface.
2. Part-programming on CNC machines
3. Execution of part program for machining given profile.
4. Construction of simple machine parts and components
5. Modeling of Surface of a Diffuser section, Propeller.
6. Modeling of Gear blank and other mechanical parts.
7. Component assembly in CAD and generating and modifying drawings

Course Title: Maintenance and Reliability
Course Code: MEC-451
Total Lecture: 45

L	T	P	Cr	Marks
3	0	0	3	75

Course Objectives:

1. To understand the functions and design principles of Jigs, fixtures and press tools
2. To gain proficiency in the development of required views of the final design.

Part – A

Traditional and modern concept
(10)

importance, function of Maintenance Engineering, Organizational Setup and Record Keeping in maintenance, Corrosions, Safety in Maintenance, Various hazards and Fault Tree Analysis, House Keeping Practice in Maintenance, Incentive Payments for Maintenance Workers

Part – B

Reliability and Availability of Engineering Systems (7)

Reliability concepts and patterns of failure, reliability Management, reliability, for system effectiveness Computerized Maintenance Information Systems, Total Productive Maintenance, and Maintenance Aspect: Lubrications

Inspection and Testing in Maintenance Engineering (5)

Assets Management; Lean Maintenance and Application of Different Techniques in Maintenance

Part – C

Manpower Planning and Training (9)

Fault Diagnosis and Condition Monitoring, Spare Parts Management and Quality Control in Maintenance, Budgets and Cost Aspect of Maintenance, Maintenance Effectiveness; Performance Evolution and Audit

Part – D

Reliability design (7)

Design for reliability, design process, assessment methodology, reliability allocation, reliability improvement, selection of components to improve system reliability.

Maintenance (7)

Maintenance of Mechanical, Electrical, Process and Service Equipment's, Machine Failure; Development of Preventive Maintenance Schedule; Breakdown Time Distribution and Trouble Shooting.

Reference Books:

1. A. Manna,A Textbook of Reliability and Maintenance Engineering, I.K.Publication
2. Lewis E.E John,Introduction to Reliability Engineering Willey & Sons

Course Title: Production Design and Development
Paper Code: MEC-452
Total Lecture: 45

L	T	P	Cr	Marks
3	0	0	3	100

Course Objective:

1. To facilitate the development of new concepts for innovative products.
2. To relate project activity to the discussion and analysis of social and cultural aspects of contemporary manufacturing.

Part-A

Introduction To product Design (6)

Definition of product Design, Design by Evaluation, Design by Innovation, Essential Factors of Product Design, Production-Consumption Cycle, Flow and Value Addition in the Production-Consumption Cycle, The Morphology of Design (The seven Phase), Primary Design phase and flowcharting , role of Allowance, Process Capability, and Tolerance in Detailed Design and Assembly.

Product Design Practice And Industry (6)

Introduction, Product Strategies, Time to Market, Analysis of the Product, The three S's, Standardization, Renard Series (Preferred Numbers), Simplification, The designer and His Role, The Designer: Myth and Reality, The Industrial Design Organization, Basic Design Consideration, Problems faced by Industrial! Designer, Procedure adopted by Industrial Designers, Types of Models designed by Industrial Designers.

Part -B

Strength Consideration in Product Design (6)

Principal stress Trajectories (Force – Flow Lines), Balanced Design, Criteria and Objective of design, Material Toughness: Resilience, Designing for Uniform Strength, Tension vis-à-vis Compression.

Designing With Plastic, Rubber, Ceramics and Wood (6)

Approach to Design with Plastic, Plastic Bush Bearings, Gears in plastic, Fasteners in plastic, Rubber parts, Design Recommendation for Rubber parts, Distortion in Rubber, Dimensional Effects Tolerances, Ceramics and Glass parts, production Design Factors for Ceramics parts, Special Considerations for Design of Glass parts, Dimensional Factors and Tolerances, Wood.

Part -C

Design of production – Metal Parts (6)

Producibility Requirements in the Design of Machine Components, Forging Design, Pressed Components Design, Casting Design for Machining Ease, The Role of process Engineer, Ease of Location and Clamping, Some Additional Aspects of production Design, Die Casting and Special Casting, Design for Powder Metallurgical Parts, Expended Metal and Wire Forms.

Economic Factors Influencing Design (6)

Product value, Design for Safety, Reliability and Environmental Considerations, Manufacturing operations in relation to Design, Economic Analysis, Profit and Competitiveness, Breakeven Analysis, Economics of a New product Design (Samuel Eilon Model).

Part -D

Human Engineering Considerations In Product Design (4)

Introduction, Human being as Applicator of Forces, Anthropometry: Man as occupant of Space, the Design of Controls, The Design of Displays, Man/Machine Information Exchange.

Modern Approaches To Product Design (2)

Concurrent Design, Quality Function Deployment (QFD).

Value Engineering and product Design (6)

Introduction, Historical perspective, What is value? Nature and Measurement of value, Maximum value, normal Degree of value, Importance of value, The value Analysis job plan, Creative, Steps to problem – solving and value Analysis, value Analysis Test, value Engineering Idea Study on Tap Switch Control Assembly, Material and process Selection in value Engineering. Designer contributes, Role of Aesthetics in product Design, Functional Design Practice.

Reference books

1. A.C. Chitale and R.C. Gupta, Product Design and Manufacturing, PHI.
2. Karl T. Ulrich & Steven D., Epinger, Product Design & Development– Tata- McGraw Hill - 3rd Edition, 2003
3. Product Design- Kevin otto and Kristini - wood Pearson Education - 2004.
4. New product Development- Tim Jones, Butterworth Heinmam, Oxford - UIC -1997.
5. New product Development: Design & Analysis - Roland EngeneKinetovicz - John Wiley and Sons Inc., N.Y. – 1990.
6. Successful Product Design- Bill Hollins, Stwout Pugh, Butterworth - London 1990.
7. Design for Assembly, a Designer,s Hand book - Boothroyod& Dewhurst P. - University of Massachusets, Amherst -1983

Course Title: Industrial Safety
Course Code: MEC-453
Total Lecture: 45

L	T	P	Credits	Marks
3	0	0	3	75

Course Objective: To impart the valuable skills to plan and understand importance of Industrial Safety.

Part-A

Safety management **(5)**

Need for safety, safety and productivity, planning for safety, formulation of safety policy, safety management techniques - job safety analysis, safety sampling technique, incident recall technique, plant safety inspection, safety organizations and its functions.

Accident prevention **(5)**

Nature and causes of accidents, accident proneness, cost of accidents, accident prevention methods, accident reporting and investigation, personal protective equipment's, safety education and training, damage control and disaster control.

Part -B

Operational Safety **(10)**

General safety considerations in material handling – manual and mechanical, safety in machine shop, safety in use of hand and portable (power) tools, safety in use of electricity, safety in welding and cutting, principles of guarding, safety in grinding, safety in heat treatment shop, safety in gas furnace operation

Part -C

Occupational Health and Hygiene **(12)**

Concept and spectrum of health, levels of prevention, functional units of occupational health service, activities of occupational health unit, occupational and work related diseases such as silicosis, asbestosis, lead, nickel, chromium and manganese toxicity, prevention and control, gas poisoning, effects and prevention, hearing conservation programme - physical and chemical hazards - control measures.

Part -D

Fire engineering and explosion control **(12)**

Fire triangle, classification of fires, fire properties of solid, liquid and gas, building evaluation for fire safety, fire load, fire resistance materials and fire testing, structural fire protection, exits and egress - industrial fire protection systems, sprinkler – hydrants, portable extinguishers - fire suppression systems, detection systems, principles of explosion - detonation and blast waves, explosion venting, explosion parameters, explosion suppression systems based on CO2 and halogen.

Reference books

1. Heinrich H. W, "Industrial accident prevention", McGraw Hill Company, New York, 1980
2. Frank P. Lees, "Loss prevention in process industries", Vol. I, II & III, Butterworth, London, 1980
3. Brown D. B, "System analysis and design for safety" Prentice Hall, New Jercy, 1976

4. Derek James, “Fire prevention hand book”, Butter Worths and Company, London, 1986
5. “Accident prevention manual for industrial operations”, National Safety Council, Chicago, 1989
6. Clayton and Clayton, “Patty’s industrial hygiene and toxicology”, Vol. I, II & III, Wiley.

Course Title: Non Destructive Testing
Course Code: MEC-421
Total Lecture: 45

L	T	P	Cr	Marks
3	0	0	3	75

Course Objectives: Non-destructive testing (NDT) relates to the examination of materials for flaws without harming the object being tested. As an industrial test method, NDT provides a cost effective means of testing while protecting the object's usability for its designed purpose.

Part – A

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

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.

Part – B

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.

Part – C

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 nonferrous metals, plastics, ceramics, measurement of thickness, hardness, stiffness, sonic material analyzer, proof tests, concrete test hammer.

Part – D

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

References:

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

Course Title: Total Quality Management
Course Code: MEC-421

L	T	P	Cr	Marks
3	0	0	3	75

Total Lecture: 45

Course Objectives: To know and identify basic manufacturing processes for manufacturing different Components.

Part – A

Statistical process control **(3)**

Introduction, review of statistical concepts, test of normality for a given data, causes of variation, chance and assignable causes, statistical basis for control charts, basic control charting principles.

Control charts and process capability **(7)**

Selection of control limits, Type-1 & Type II errors, effect of sample size on control limits, sample size, frequency of sampling. Revision of control limits. Control charts for mean and range, control charts for mean and standard deviation. Advantages and disadvantages of attributes charts, charts for proportion non-confirming (p-chart) and its derivatives, variable sample size. Charts for number of non-conformities (c chart) and its derivatives, classification of non-conformities. Process capability analysis: Introduction, specification limits and control limits, process capability indices, the Cp index, upper and lower capability indices, the C_{pk} index.

Part – B

Acceptance Sampling **(6)**

sampling inspection, 100% inspection, no inspection, acceptance sampling plans for attributes and variables, advantages and disadvantages of sampling, producer's risk and consumer's risk, operating characteristic curve. Types of sampling plans: single double, multiple and sequential sampling plans. Average outgoing quality, average total inspection, average sample number.

TQM **(5)**

Philosophies and frameworks, pillars of TQM: Leadership, Customer satisfaction, Employee Involvement, Continuous Process Improvement. TQM Tools: Benchmarking, Quality Function Deployment (QFD) – House of Quality, Taguchi Quality Loss Function.

Part – C

Six Sigma **(7)**

Statistical basis for six sigma, DMAIC methodology, project selection for six sigma, tools and techniques.

Quality assurance **(4)**

Definition, characteristics of quality assurance system. ISO-9000: scope, application, terms and definitions, evolution of ISO-9000 series, process approach, PDCA methodology, documentation requirement, guidelines for preparation of quality manual. Steps for certification, implementation schedule for certification, benefits of ISO –9000 implementation.

Part – D

Audit **(8)**

Quality audit: definition, internal audit, second party, third party audit, pre-assessment and compliance audit, procedure of auditing, audit planning, audit execution.

Economics of product Inspection **(6)**

Use of Break-even analysis in decision for selection of economic acceptance plan option. Dodge - Romig Tables, MIL-STD-105D.

References:

1. Grant E L and Leavenworth R S, "Statistical Quality Control", McGraw Hill, Sixth Edition
(2000)
2. Evans & Lindsay, "The Management and control of Quality," Thompson South-Western, Sixth Edition (2005)
3. AmitavMitra, "Fundamentals of Quality Control and Improvement", Pearson Education Asia
4. A. Zaidi, "SPC: Concepts, Methodologies and Tools", Prentice Hall of India, First Edition,(1995)

Course Title: Tool Design
Course Code: MEC-422
Total Lecture: 45

L	T	P	Cr	Marks
3	0	0	4	75

Course Objectives: So it's imperative that you create a design tool - and really turn it into a design experience; so that every customer can get exactly what they want at a price they are willing to pay...

Part – A

Process Planning **(5)**

Product Engineering, Process Engineering, Definition of Process Planning, Contents of Process Plan, Process Operations, Steps of Process Planning, Process Planning Sheet, Planning andTooling for Low Cost Planning.

Jigs and Fixture **(6)**

Principles of jig and fixture design, Principle of degrees of freedoms, methods of locations and clamping, Various devices for location and clamping, indexing devices, Hydraulic and pneumatic actuation of clamping devices, jig bushes, use of standard parts of jig design, type of drilling jigs, milling fixtures, lathe fixture, grinding fixtures and their classification.

Part – B

Die Design **(6)**

Components of die design, design of die blocks, punches and strippers, methods of holdingpunches, sketches of stock stops, Design procedure for progressive dies, compound dies and combination dies for press tool operation forging die design for drop and machine forging parts.

Tool Layout for Turrets **(6)**

Characteristics of Turret lathes, Differences between capstan and turret lathes, methods of holding jobs on the Turret lathe, Universal chucking equipment, universal bar equipment, operation sheet and tool layout.

Part – C

Tool Layout for Automatics **(7)**

Classification of Automatics, Turret type automatic, tool layout procedure, time required for each operation, operation sheet, tool layout, cam layout.

Tooling Costs **(5)**

Estimating cost of a product, estimating costs of tools, Economics of tooling, Breakeven point analysis, minimum cost analysis.

Part – D

Gauges **(5)**

Limits and fits, Plain Gauges, types of Gauges, fundamentals of Gauge Design, Gauge makers tolerance, allowance for wear, Practical application of Taylor's principles of limit gauging, care of Gauges, Limitation of Limit Gauging.

Surface Finish **(5)**

Elements of surface finish, Factors affecting surface finish, Effect of surface quality on Functional properties of machine parts, Evaluation of surface finish, Indian Standards on surface finish. Measurement of surface finish, Relationship of surface finish to the production methods. Finishing operations like honing, lapping, buffing super finishing etc.

References Books:

1. Cole: Tool Design.
2. C. Donaldson, Tool Design, McGraw Hill
3. ASTM, Fundamentals of Tool Design.
4. P.C.Sharma, A Textbook of Production Engineering, S.Chand Publication

Course Title: Material Management
Paper Code: MEC432
Total Lecture: 45

L	T	P	Credits	Marks
3	0	0	3	75

Course Objective: To impart the valuable skills to plan and understand concepts of material management.

Part-A

Introduction **(3)**
Dynamics of Materials Management - Materials Management at Micro-level, Materials Management at Macro-level, Inventories of Materials, Total Concept-Definition - A Brief History of Development: An Overview.

Forecasting **(6)**
Objectives and the Materials Organization: Systems Design, Integral Control of the Flow of Materials, Forecasting and Planning, Forecasting Methods, Objectives of Materials Management - Organization of Materials Management, Environmental Change, Functional Organization Model for Materials Management.

Materials Planning **(3)**
Making the Materials Plan Work, The Materials Cycle and Flow Control System, Materials Budget.

Part-B

Purchasing **(6)**
Purchasing Principles, Procedures and Practices, Fundamental Objectives of Purchasing - Scope, Responsibility and Limitations, Sources of Supply and Supplier Selection, Purchasing Policy and Procedures - Purchase Budgets and Statistics.

Purchasing in Materials Management System Concept **(5)**
Price Determination, Price Forecasting, Price-Cost Analysis, The Learning Curve, Negotiation, Reciprocity, Cost-Plus Contracts, Hedging, Forward Buying, Buying Ethics, Principles and Standards of Purchasing, Make-or-Buy, Information, Documentation and Purchasing Library

Purchasing and Procurement **(3)**
Activities under Materials Management: Supplier Quality Assurance Programme, Buyer-Supplier Relationship.

Part-C

Inventory Management and Control Systems **(6)**
Definition of Inventories, The Need for Inventory Audits Control, Types of Inventories, Inventory Control, Max-Min System, Inventories and Demand Uncertainty, Determining Safety Stock.

Inventory Models **(5)**
Deterministic Inventory Models with numerical examples, Q-system or Quantity Control System or Re-order Point System Effect of Quantity Discounts, P-system or Periodic Review or Periodic Count System or Replenishment System, Optional Replenishment System or "S, s" Policy, ABC Inventory Classification (Selective Inventory Control -

SIC). The Need for a Systems Approach, Materials Planning System (MPS) / Materials Requirement Planning (MRP), Basic Tool.

Part-D

Stores Management and Operation (4)

Storage System, Stores Location and Layout, Development of Storing, Centralization and Decentralization of Stores, Standardization and Variety Reduction, The Systems, Merits and Demerits of Codification.

Materials Management Information System and Computer (4)

MIS - Management and MM, Computer System for MIS and MM, In-process Materials and Management Control.

Reference books

1. Chunawala, Production and Operation Management, Himalaya Publication.
2. Bhagde, Production and materials Management, S.D USG pub.
3. Plossl, G.W &Wright, O.W, Production and inventory control, Prentice Hall
4. Lee Lamber, Purchasing Management

Course Title: Fracture Mechanics
Course Code: MEC-431
Total Lecture: 45

L	T	P	Cr	Marks
3	0	0	3	75

Course Objectives: Students will learn about the basic concepts of designing structural or machine components an important step is the identification of the most likely mode of failure and the application of a suitable failure criterion. Fracture characterized as the formation of new surfaces in the material is one such mode of mechanical failure.

Part – A

Introduction (6)
Historical Review, The Significance of Fracture Mechanics, The Griffith Energy Balance Approach , Irwin's Modification to the Griffith Theory , The Stress Intensity Approach , Crack Tip Plasticity, Fracture Toughness, Elastic-Plastic Fracture Mechanics, Subcritical Crack Growth, Influence of Material Behavior.

Elastic Fracture Mechanics(7)
The Elastic Stress Field ApproachIntroduction,Derivation of the Mode I Elastic Stress Field Equations, Useful Expressions, FiniteSpecimen Width, Two Additional Important Solutions for Practical Use, Superposition ofStress Intensity Factors, Some Remarks Concerning Stress Intensity FactorDeterminations.

Part – B

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Crack Tip Plasticity
Introduction, The Plastic Zone Size According to Irwin, The Plastic Zone Size According to Dugdale; The Strip Yield Model, First Order Approximations ofPlastic Zone Shapes, The State of Stress in the Crack Tip Region, Stress State Influenceson Fracture behavior. (5)

The Energy Balance Approach
Introduction, The Energy Balance Approach, Relationsfor Practical Use, Determination of Stress Intensity Factors from Compliance, TheEnergy Balance for More Ductile Materials, Slow Stable Crack Growth and the R-CurveConcept. (6)

Part – C

Elastic-Plastic Fracture Mechanics
Basic Aspects of Elastic-Plastic FractureMechanics, Introduction, Development of Elastic-Plastic Fracture Mechanics. The JIntegral, Remarks Concerning the J Integral Concept, J as a Stress Intensity Parameter,The Crack Opening Displacement (COD) Approach, Remarks on the COD Approach,Relation Between J and CTOD (7)

Fracture Mechanics Concepts for Crack Growth
Fatigue Crack Growth, Introduction,Description of Fatigue Crack Growth Using the Stress Intensity Factor, The Effects ofStress Ratio and Crack Tip Plasticity: Crack Closure, Environmental Effects, Predictionof Fatigue Crack Growth Under Constant Amplitude Loading, (7)

Part – D

Sustained Load Fracture
Introduction, Time-To-Failure (TTF) Tests, Crack GrowthRate Testing, Experimental Problems, Method of Predicting Failure of a StructuralComponent, Practical Significance of Sustained Load Fracture Testing (7)

Books Recommended

1. Fracture Mechanics, M. Jansen, J Zuidema, K J H Wanhill, Delft Univ Press
2. Fatigue of Metals, Subra Suresh, Cambridge Univ Press
3. Fracture Mechanics, Fundamentals and Applications, Anderson, CRS Press
4. Analytical Fracture Mechanics, David

L	T	P	Cr	Marks
3	0	0	4	100

Course Title: Tribology
Course Code: MEC-432
Total Lecture: 45

Course Objectives: the interest of students in the related topics like friction, wear and lubrication is observed to be very old. Our ancestors invented "the wheel" which can be considered as great achievement to reduce the friction and wear.

Part – A

Introduction:
friction, wear and lubrication, types of engineering contacts: conforming and non-conforming, Types of motion: rubbing, sliding, oscillating, rolling, surface of interaction, elastic and plastic deformations, properties of materials, surface energy and flash temperature theory.

Friction:
Laws of sliding friction, concept of adhesion, Tabor's model of elastic thermo friction, rolling friction, measurement of friction

Part -B

Wear:
Laws of wear.types of wear such as adhesive, declamation, abrasive, corrosive, fretting, erosive and oxidative. Measurement of wear and friction in atmosphere and different environments, Prevention and control of wear and friction in machines, wear of cutting tools and dies, study of abrasion in grading, lapping/ honing

Lubrication:
Mechanism of lubrication, Boundary, squeeze film hydrodynamic and elasto hydrodynamic and hydrostatic lubrication, plasto hydrodynamic lubrication, solution of Reynolds's equation in two and three dimensional flow, pressure distribution load carrying capacity friction forces in oil film and coefficient of friction in journal bearing, Solid, Liquid and Gas lubricants types and their applications

Part -C

Bearing Design:
Design of bearing clearance in journal bearing, minimum film thickness, sommar field number. oil grooves and flow of oil in axial and circumferential grooves cavitation's and turbulence in oil bearings, Heat generation and cooling or bearing hydrostatic and dynamic and their applications in machine tools, Design of air bearings and other gas bearings.

Rolling Friction:
Reynold slip, Heathe cote concept selection of roller bearings and their methods of lubrication design aspects and modes of bearing failures and elasto hydrodynamic lubrication

Part -D

Tests and Instrumentation in Tribology:
Sliding friction and wear abrasion test, rolling contact and fatigue test, solid particle and erosion test, Corrosion test Special instruments for lubricant analysis such as optical and infrared spectroscopy and infra-red spectroscopy, atomic absorption and emission

spectroscopy, mass spectroscopy, NMR spectroscopy, X ray diffraction and chromatographic techniques, Use of transducers and instruments in Tribology- film thickness measurement using modern techniques – Development of test rigs for Tribology research.

Books Recommended

1. Friction, Wear, Lubrication: A text book in Tribology
2. Gwidon W Stachowiah and Gwidon W Engineering Tribology.
3. Bharat Bhusan Principles and Application of Tribology
4. Khonsari and Booser Applied Tribology: Bearing Design and Lubrication.
5. SushilkumarSrivastva Tribology in Industries.
6. BC Majumdar Introduction to Tribology of Bearing.

Course Title: Flexible Manufacturing System
Course Code: MEC-424
Total Lecture: 36

L	T	P	Cr	Marks
3	0	0	3	75

Course Objectives: Students will learn about the basic concepts of automation, about the automated assembly line, about the types of group technology, about the types of robotic technology and programming

Part – A

Automation **(5)**

Types of automation, reasons for automating, automation strategies, Detroit-type automation: Automated flow lines, methods of work part transport, Transfer mechanisms, buffer storage, automation for machining operations

Automated assembly systems **(5)**

Design for automated assembly, types of automated assembly systems, part feeding devices, quantitative analysis of the delivery system operation, analysis of a single-station assembly machine, numericals

Part – B

Group Technology **(5)**

Part families, parts classification and coding, types of classification and coding systems. Machine cell design: The composite part concept, types of cell designs, determining the best machine arrangement, benefits of group technology

Flexible Manufacturing Systems **(6)**

Components of an FMS, types of systems, where to apply FMS technology, FMS work stations. Material handling and storage system: Functions of the handling system, FMS layout configurations. Material handling equipment. Computer control system: Computer function, FMS data file, system reports. Planning the FMS, analysis methods for FMS, applications and benefits

Part – C

Robotic Technology **(8)**

Joints and links, common robot configurations, work volume, types of robot control, accuracy and repeatability, other specifications, end effectors, sensors in robotics

Part – D

Robot programming **(7)**

Types of programming, lead through programming, motion Programming, interlocks, advantages and disadvantages. Robot languages: Motion programming, simulation and off-line programming, work cell control

References:

1. Groover M.P, **"Automation, Production Systems and Computer Integrated Manufacturing",** Prentice Hall of India.
2. Nanua Singh, **"Approach to Computer Integrated Design and Manufacturing"**, John Wiley and Sons.
3. Browne J, Harhen J, Shivnan J, **"Production Management Systems: A CIM Perspective"**, Addison Wesley.

Course Title: Cryogenic Technology
Course Code: MEC-433

L	T	P	Cr	Marks
3	0	0	3	75

Total Lecture: 45

Course Objectives: Students will learn that Cryogenics is low temperature physics: "The branches of physics and engineering that involve the study of very low temperatures, how to produce them, and how materials behave at those temperatures". Cryogenics is important because rocket fuel (oxygen and hydrogen) must be loaded in as liquids at cryogenic temperatures.

Part-A

Introduction & History of cryogenic engineering

Cryogenics and its applications, Properties of cryogenic fluids i.e. Oxygen, Nitrogen and Argon, and Hydrogen, Helium and rare gasesThermal, mechanical and electrical properties ofengineering materials at low temperature.

Superconductivity

Introduction to the phenomenon of superconductivity and its applications.

Part -B

Thermodynamics of ideal liquefaction cycles;

Joule-Thomson effect 3 Linde cycle; precooled linde cycle; exercise, Claude, Heylandt, and kapitza cycles; exercises. Measurement of temperature: gas and vapour pressure Thermometers, thermocouple, RTD and semiconductors ensors.Types of cryogenic insulation: foam, fibre, powder vacuum

Part -C

Liquefaction of hydrogen and helium.

Properties of materials at cryogenic temperature, Gas Liquefaction and Refrigeration Systems, Heat exchangers and definition of effectiveness

1 Coiled tube (hampson type) and brazed Aluminum heat exchangers
2 Cryogenic expansion engines and turbines
3. Principal of binary Distillation
4. linde signal & double column system

Part -D

Gas Separation, Cryocoolers, Cryogenic Insulations, Vacuum Technology, Instrumentation in Cryogenics, Liquid storage and transfer systems, Cryostat design, Dilution Refrigerator and Adiabatic Demagnetization.

Safety in cryogenic systems fir, asphyxiation, cold burns and pressure problems
Liquid cryogen storage vessels and cryogen transfer line

Reference Books:

1. Randall F. Barron, "Cryogenics Systems", Second Edition Oxford Univesity Press New York, Clarendon Press, Oxford, 1985.
2. Timmerhaus, Flynn, "Cryogenics Process Engineering", Plenum Press, New York.
3. Pipkov, "Fundamentals of Vacuum Engineering", Meer Publication.
4. G.M Walker. "Cryocooler-Part 1 Fundamentals" Plenum Press, New York and London.
5. G.M Walker. "Cryocooler-Part 2" Plenum Press, New York and London.

Course Title: Gas Dynamics
Course Code: MEC436
Total Lecture: 45

L	T	P	Cr	Marks
3	0	0	3	75

Objective of Course
To introduce students with gas turbines and its accessories along with rocket propulsion system.

Part A

Introduction **(5)**
Gas turbine, Classification and working of gas turbine cycles-open and closed type

Compressible Flow **(6)**
Wave propagation and sound velocity; Mach number and compressible flow regimes; basic equations for one-dimensional compressible flow, isentropic flow relations; area-velocity relation; normal shock waves, relation between upstream and downstream flow parameters.

Part B

Gas Turbine Systems and Cycles **(6)**
System of operation of gas turbines-constant volume and constant pressure gas turbines; thermodynamics of Brayton cycle; regeneration-inter cooling, reheating and their combinations; closed cycle and semi-closed cycle gas turbines; gas v/s I.C engines and steam turbines.

Compressors **(5)**
Classification-positive displacement and dynamic compressors, Operation of single stage reciprocating compressors; best value of index of compression; isothermal efficiency; effect of clearance and volumetric efficiency; multi-stage compression; air motors.

Part C

Centrifugal compressors **(6)**
Static and total head values; velocity vector diagrams; slip factor; pressure coefficient and pre-whirl. Axial flow compressors; degree reaction and polytropic efficiency Performance characteristics; surging, choking and stalling

Combustion Systems **(5)**
Types, combustion process, combustion intensity efficiency and pressure loss.

Part D

Air-breathing Propulsion Systems **(6)**
Principle of jet propulsion; analysis and performance characteristics of turbojet, turboprop, ramjet and pulsejet; thrust power and propulsion efficiency.

Rocket Propulsion **(6)**
Operating principle; solid and liquid propellants, performance analysis-calculations for specific impulse and propulsive efficiency

References:
1. Gas Turbine Theory – Cohen and Rogers.
2. Principle of Jet Propulsion and Gas Turbine – Zucrow M J
3. Heat Engineering – Vasandani V P and Kumar D S, Metropolitan Book Co Pvt Ltd

Course Title: Business Strategy
Paper Code: MGT451

L	T	P	Cr	Marks
4	0	0	4	100

Course Objective: To develop an understanding of fundamental concepts in strategic management: the role of the general manager, the levels and components of strategy, competitive analysis, and organizational evolution.

Learning Outcomes: The participants will develop essential skills and knowledge peculiar to general management. They will appreciate the inter functional issues in organisation better after undergoing this course.

UNIT-A

Nature of Strategic Management. Dimensions, benefits and risks. The strategic management process, Strategy formulation. Business Vision and Mission, Importance, Characteristics, and Components. Evaluating Mission statements. **11 hours**

UNIT-B

The External Assessment, Porters five Force Analysis. Industry and competitive analysis The Global Environment: Development of a Global Corporation. Complexity of Global Environment , Competitive Strategies for Firms in Global Markets. The Internal Assessment: SWOT Analysis, Strategy and Culture. Value Chain Analysis. Resource Based view of the Firm. Benchmarking. Strategies in Action: The Balanced scorecard, Types of strategies, Integrative, Intensive, Diversification strategies, Defensive Strategies, Porters Generic Strategies. **11 hours**

UNIT-C

Strategy Analysis and Choice: Business level strategies. Cost leadership, Differentiation, Speed and Market Focus. Multi business Strategy: BCG Matrix, GE Nine Cell matrix. Limitations of Portfolio Approaches. The Parenting Framework. Strategy Implementation: Short Term Objectives, Functional Tactics. Empowering Operating personnel. Allocation of Resources, Managing Resource Conflict. **11 hours**

UNIT-D

Structure and Strategy: Improving effectiveness of Traditional Organisational Structures. Creating Agile Virtual Organisations, Modular Organisation. Towards Boundary less Structures. Leadership and Culture: Strategic Intent. Shaping Organisational Culture. Role of Leader in Organisational Culture. Strategy Evaluation :Strategic Evaluation Process **12 hours**

45 hours

Text Book:

1. Strategic Management: Formulation, Implementation and Control. Pearce, Robinson & Mittal , TATA Mc Graw Hill Special Indian Edition

Reference Books:

1. Strategic Management: Concepts and Cases. Fred David. Prentice Hall India
2. Strategic Management: an Integrated Approach, Hill & Jones. Cengage

Course Title: Principles of Marketing
Paper Code: MGT453

L	T	P	Cr	Marks
4	0	0	4	100

Course Objective: This course will enable the students to understand the theories and practices behind the marketing mix variables, to appreciate the holistic role of marketing in a firm, and develop knowledge of and skill in the operating techniques of the marketing management

Learning Outcomes: Students will be able to design the marketing mix for the customers as per their needs and will learn to create product package which sells itself.

UNIT-A

Understanding Marketing Management: Defining Marketing for the 21st Century, Developing Marketing Strategies and Plans, Assessing Market Opportunities and Customer Value: Scanning the Marketing Environment, Forecasting Demand, and Conducting Marketing Research, Creating Customer Value and Customer Relationships, Analyzing Consumer Markets, Analyzing Business Markets **12 hours**

UNIT-B

Choosing Value: Identifying Market Segments and Targets, Competitive Dynamics, Crafting the Brand Positioning, Creating Brand Equity **10 hours**

UNIT-C

Designing and Delivering Value: Setting Product Strategy, Designing and Managing Services, Developing Pricing Strategies and Programs, Designing and Managing Integrated Marketing Channels, Managing Retailing, Wholesaling, and Logistics **12 hours**

UNIT-D

Communicating Value and Sustaining Growth: Designing and Managing Integrated Marketing Communications, Managing Mass Communications, Managing Personal Communications, Introducing New Market Offerings, Tapping into Global Markets, Managing a Holistic Marketing Organization for the Long Run **11 hours**

45 hours

Reference Books:

1. Kotler, Keller, Koshy & Jha. Marketing Management: A South Asian Perspective,14th Edition, Pearson Education
2. Saxena, R. Marketing Management, Tata McGraw-Hill Education, 4th Edition
3. Baines, P. Marketing: Asian Edition, Oxford University Press, 1st Edition
4. Czinkota Michael R, Marketing Management, Cengage Learning, 2nd Edition
5. Chopra, P.K. and Mehra, B. Marketing Management, Wiley

Course Tittle: Linear Control System
Paper Code: ICE208

L	T	P	Cr	Marks
4	0	0	4	100

Course Objective:

- To teach the fundamental concepts of Control systems and mathematical modeling of the System
- To study the concept of time response and frequency response of the system
- To teach the basics of stability analysis of the system

UNIT-I

Introductory Concepts: Plant, Systems, Servomechanism, regulating systems, disturbances, Open loop control system, closed loop control systems, linear and non-linear systems, time variant and invariant, continuous and sampled-data control systems, Block diagrams, some illustrative examples.

Modeling: Formulation of equation of linear electrical, mechanical, thermal, pneumatic and hydraulic system, electrical, mechanical analogies. Use of Laplace transforms, Transfer function, concepts of state variable modeling. Block diagram representation, signal flow graphs and associated algebra, characteristics equation.

12 Hr

UNIT-II

Time Domain Analysis: Typical test – input signals, Transient response of the first and second order systems, Time domain specifications, Dominant closed loop poles of higher order systems, Steady state error and coefficients, pole-zero location and stability, Routh-Hurwitz Criterion.

Frequency Domain Analysis: Frequency response specifications, Closed loop frequency response, Relation between time and frequency response for second order systems, Log, Magnitude versus Phase angle plot.

12 Hr

UNIT-III

Stability Analysis: Absolute and relative stability, Polar plots and Nyquist stability criterion, Bode plots-gain margin & phase margin, M and N loci.

Root Locus Technique: The extreme points of the root loci for positive gain, Asymptotes to the loci, Breakaway points, intersection with imaginary axis, location of roots with given gain and sketch of the root locus plot, criterion for stability.

12 Hr

UNIT-IV

Compensation: Necessity of compensation, series and parallel compensation, compensating networks, applications of lag and lead-compensation.

Control Components: Error detectors – potentiometers and synchros, servo motors, a.c. and d.c. techno generators, Magnetic amplifiers.

12 Hr

Reference Books:

1. K. Ogata, Modern Control Engineering, Pearson
2. Nagrath & Gopal, Control System Engineering. New Age
3. M Gopal, Control Systems- Principles & Design. TMH
4. Roy Choudhury, Modern Control Engineering. PHI

Course Tittle: Bio-Sensors and MEMS
Paper Code: ICE413

L	T	P	Cr	Marks
4	0	0	4	100

Course Objective:

- To introduce the concept of Bioinstrumentation
- T o make the students familiar with Nanotechnology and fabrication technology

UNIT-I

Overview: Overview of biosensors and their electrochemistry: Molecular reorganization: enzymes, Antibodies and DNA, Modification of bio recognition molecules for Selectivity and sensitivity Fundamentals of surfaces and interfaces.

12 Hr

UNIT-II

Bioinstrumentation: Bioinstrumentation and bioelectronics devices: Principles of potentiometry and potentiometric biosensors, principles of amperometry and amperometric biosensors, Optical Biosensors based on Fiber optics, FETs and Bio-MEMS, Introduction to Chemometrics, biosensor arrays; electronic nose and electronic tongue.

12 Hr

UNIT-III

MEMS Technology: MEMS Technology: Introduction Nanotechnology and MEMS, MEMS design, and fabrication technology, Lithography, Etching, MEMS material, bulk micromachining, Surface micromachining, Microactuator, electrostatic actuation Micro-fluidics.

12 Hr

UNIT-IV

Applications: MEMS types and their applications : Mechanical MEMS strain and pressure sensors, accelerometers etc., Electromagnetic MEMS, micromotors, wireless and GPS MEMS etc Magnetic MEMS, all effect sensors, SQUID magnetometers, Optical MEMS, micromachined fiber optic component, optical sensors, Thermal MEMS, thermo-mechanical and thermo-electrical actuators, Peltier heat pumps.

12 Hr

Reference Books:

1. Julian W. Gardner, Vijay Varadan & Osama O. Awadelkarim, Microsensors, MEMS and Smart Devices. Wiley.
2. Chang, Foundation of MEMS. Illinois Ece Series
3. Donald G. Buerk, Biosensors: Theory and Applications, CRC.
4. Xueji Zhang, Huangxian Ju & Joseph Wang, Electrochemical Sensors, Biosensors and their Biomedical Applications. Academic Press

Course: MATLAB Programming
Course Code: ELE455

L	T	P	Credits	Marks
4	0	0	4	100

Unit-A

Introduction to MATLAB Program ming and Environment

MATLAB Windows, Expressions, Constants, Variables and assignment statement, Arrays Basic plotting, Built in functions, Generating waveforms, Sound replay, load and save etc.

Unit-B

Procedures and Functions and Control Statements

Arguments and return values, M-files, Functions, Formatted console input-output, String handling, ,Manipulating Text, Writing to a text file, Reading from a text file, Randomising and sorting a list, Searching a list, Attaching buttons to actions, Getting Input, Setting Output, Variables, Data Types, Control Statements: Conditional program flow, Iteration/ Looping, Conditional statements.

Unit-C

Spectral Analysis and Speech Signal Analysis

Filterbank analysis, Fourier analysis, Spectrograms, Filterbank synthesis, Fundamental of Speech Signal, frequency estimation – frequency domain, Fundamental frequency estimation, time domain, Formant frequency estimation

Unit-D

MATLAB Applications

Math and computation – Algorithm development – Modeling, simulation, and prototyping – Data analysis, exploration, and visualization – Scientific and Engineering graphics – Application development, including graphical user interface building, Working with Sound and Images, Reading and Writing files, Recursion, Compression.

Suggested Books:

1. Agam Kumar Tyagi, MATLAB and Simulink for Engineers, Oxford University Press, USA (2012)
2. Stephen J. Chapman, MATLAB Programming for Engineers, Cengage Learning, 2008

Course Title: Data Structure Programming Using C
Course Code: CSE- 203

L	T	P	Credits	Marks
4	0	0	4	100

Objective :-To impart knowledge of Data Structure and How to design algorithms to solve different types Of problems and to differentiate linear and nonlinear data structure.
Learning outcomes:-After reading data structure, student will be able to explain data structure and its scope in computer science. After completion of data structure, students will be able to find the best solution about specific types logical and mathematical problems.

PART-A

Introduction
Basic terminology, Data structure and their types, Data structure operations Algorithm: Complexity, Time Space Trade off, Control structure and Complexity of algorithm, Big Oh Notation. Introduction

Array
Representation of Linear array in memory, traversing linear array, Searching Techniques: Linear search, Binary Search, Multi-dimensional array: 2D-array, representation of 2D-array in memory. Record, record structure and matrices.

(14Hours)

PART-B

Linked List
Representation of Linear Linked List , Traversing a linked list , operations on linked list , Memory Allocation , Garbage collection , overflow and underflow , Doubly linked list , circular Linked List , Header Linked List , application of linked list**.**

(14Hours)

PART-C

Stacks and Queues
Operation on stack : push , arithmatic expression , polish notation , quick sort : An application of stack , complexity of quick sort , Recursion , Tower of Honoi , representation of queue , Deques , priority queues.

Trees
Basic terminology, Binary tree, complete binary tree, extended binary tree 2-tree, traversing binary tree: Preorder, Inorder and Postorder. Binary search tree, Searching& Inserting in binary search tree.Heap; Heapsort, General tree.

(14Hours)

PART-D

Graphs
Basic terminology, Representation of Graph, Traversing of Graph; BFS, DFS. Applications of Graph.

Sorting
Bubble Sort, Insertion Sort, Selection Sort, Merging. Merge Sort, Hasing; Hash Functions**.**

(14Hours)

REFERENCES:-

1. LipschutzSchaumseries: TataMcGrawHill.
2. Y.Langsam, M.J.Augenstein, A.M.Tanenbaum,Data Structures using C and C++,2nd Edition, Pearson Education
3. R.Kruse, C.L.Tondo,B.Leung,S.Mogalla,Data Structures & Program Design in C.2nd Edition, Pearson Education
4. E.Horowitz, S.Sahni,D.Mehta:Fundamentals of Data Structures in C++, 2nd Edition, Universities Press 2. Donald E. Knuth.

Course Title: Introduction to Computer Networks
Course Code: CSE351

L	T	P	Credits	Marks
4	0	0	4	100

Objective: Thi
s course should provide the knowledge of various networking components, protocols and their working.

Learning Outcomes: After the completion of this course the participants would gain the knowledge of how to implement a network and understand the functioning of the network.

PART-A

Introduction

Introduction to Computer Network and topologies,Broadcast and Point-to-point- LAN-MAN-WAN

Architecture and Reference Models

Layered architecture- OSI reference model, TCP/IP reference model –Internet Protocol Stack – Network Entities in Layers- Connection oriented and Connection less services switching techniques.

ATM

Protocol Architecture, ATM Logical Connections, ATM Cells, Transmission of ATM Cells, ATM Adaptation Layer, Traffic and Congestion Control.

(12Hours)

PART-B

Internetworking

Principles of Internetworking, Connectionless Internetworking, the Internet Protocol, Routing Protocol, IPv6 (IPng), ICMPv6

Distributed Applications

Abstract Syntax Notation One (ASN.l), Network Management-SNMPV2, Electronic Mail-SMTP and MIME, Uniform Resource Locators (URL) and Universal Resource Identifiers (URI), Hypertext Transfer Protocol (HTTP)

(8Hours)

PART-C

Network Layer and Routing

Network Service model – Datagram and Virtual circuit service-Routing principles-Link state routing-distant vector routing-hierarchical routing-multicast routing-IGMP Internet Protocol (IP): IPv4 addressing-routing and forwarding datagram-datagram format-datagram fragmentation- ICMP- DHCP- Network Address Translators (NATs)-IPv6 packet format-transition from IPv4 to IPv6-Mobile IP. Routing in the Internet: Intra Autonomous System Routing: RIP and OSPF-Inter Autonomous System Routing: BGP – Network layer in ATM.

(8Hours)

PART-D

Transport Layer

Introduction to Transport Layer. Connectionless Transport: UDP-Segment structure-Checksum Connection Oriented Transport: TCP-TCP connection-TCP Segment Structure-Round trip Time estimation and Time out-Reliable Data transfer-Flow control-TCP connection Management. Congestion Control: Causes and costs of congestion- Approaches to congestion control- TCP congestion control. **(8Hours)**

Application Layer and Network Security: Application Layer Protocols - WWW and HTTP-File transfer Protocol: FTP Commands and Replies – Domain Name System (DNS)-SMTP - SNMP- multimedia. Remote Procedure Call. Security in Computer Networks: Principles of Cryptography-Symmetric key-Public key-authentication protocols -Digital Signatures – Firewalls. Security in different Layers: Secure E-mail- SSL – IP security.

(6Hours)

REFERENCES:

1. James F. Kurose and Keith W. Ross, Computer Networking – A Top-Down Approach Featuring the Internet, 2/e Pearson Education ,2003
2. S. Keshav, An Engineering Approach to Computer Networking, Pearson education ,2002
3. F. Halsall, Data Communication, Computer Networks and Open Systems, Addison Wesley, 1996
4. Andrew S. Tanenbaum, Computer Networks , 4/e, Pearson education, 2003
5. Behrouz A. Fourouzan ,Data Communications and Networking, 2/e Tat McGrawhill,2000

Course Title: Software Engineering
Course Code: CSE352

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: To understand the basic concepts of software engineering and software development life cycle.

Learning Outcomes: Students will learn about the different activities of software development and about the risk management. They will get aware about the different case tools.

PART – A

Introduction to Software Engineering:
Software Problem, Software Engineering, Approach, Software process, Characteristics of Software Engineering Process.

Process models:
The waterfall model, Incremental process models, Evolutionary process models, The Unified process.

Software Requirements:
Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document.

(12Hours)

PART – B

Planning:
Cost estimation, cost estimation models, Project scheduling, Software Configuration management, Team Structure, Risk Management.

Requirements engineering process:
Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.

System models:
Context Models, Behavioural models, Data models, Object models, structured methods.

Software Design:
Design process and Design quality, Design concepts, the design model.

(12Hours)

PART – C

Creating an architectural design:
Software architecture, Data design, Architectural styles and patterns, Architectural Design.

Object-Oriented Design:
Objects and object classes, An Object-Oriented design process, Design evolution.

Performing User interface design:
Golden rules, User interface analysis and design, interface analysis, interface design steps, Design evaluation.

Testing Strategies:
A strategic approach to software testing, teststrategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging.

Product metrics:
Software Quality, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance.

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(12Hours)

PART – D

Risk management:

Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.

Quality Management:

Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews, Statistical Software quality Assurance, Software reliability, The ISO 9000 quality standards.

(12Hours)

REFERENCES:-

1. Software Engineering- K.K. Agarwal &Yogesh Singh, New Age International Publishers
2. Software Engineering, an Engineering approach- James F. Peters, WitoldPedrycz, John Wiely.
3. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.
4. Software Engineering Approach, By R. S Pressman
5. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition. McGrawHill International Edition.
6. Software Engineering- Sommerville, 7th edition, Pearson education.
7. An Integrated Approach to software Engineering. Pankaj Jalote

Course Title: Theory of Structure-1
Paper Code: CIV204

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: Aim of this paper is to familiarize the students with different types of structures and their analysis methods.
Learning Outcomes: After the completion of this course the participants would gain the knowledge of structural analysis and various types of determinate and indeterminate beams.

Part-A

Introduction: Need of analysis, techniques of structural idealization, basic tools of analysis, reactions in structure, notations and sign conventions, free – body diagrams, static determinacy, stability of structures, principle of superposition, loads on structures. **[6]**

Plane Trusses: Introduction, member arrangement in a truss, stability and determinacy, roof and bridge trusses, analysis of trusses, notations and sign conventions, equations of condition, classification of trusses. **[6]**

Part-B

Deflection of Beams: Introduction, direct integration method, moment – area method, conjugate beam method, Principle of virtual work, unit load method, Betti's law, Maxwell's law, Castigliano's theorem. **[6]**
Rolling Loads Introduction to rolling loads and influence lines, Determination of shear force, bending moment at a section and absolute shear force and bending moment due to single point load, uniformly distributed load, several point loads etc. **[6]**

Part-C

Influence lines: Introduction, moving loads, influence lines, influence lines for reactions, shear force and bending moment, influence lines for beams, girders with floor beams, trusses and arches, absolute maximum B. M. & S. F, Muller Breslau Principle **[6]**

Arches: Introduction, curved beams, arch versus a beam, three hinged arch, moment, shears and normal thrust in three hinged arches **[6]**

Part-D

Cables and Suspension Bridges: Introduction, shape of a loaded cable, cable carrying point loads and UDL, cables with ends at different level, cable subjected to temperature stresses, suspension bridge with two hinged and three hinged stiffening girders, influence lines. **[6]**
Statically determinate space Trusses: Concurrent forces in space, moment of force, constraint of point in space, tension coefficient method, simple space trusses, and method of section **[6]**

REFERENCES:

1 C.S.Reddy ,Basic structural Analysis", Tata McGraw-Hill Education
2 Vazirani & Ratwani "Analysis of Structures Vol- I and Vol.-II", Khanna Publishers
3 C.K.Wang, "Intermediate structural Analysis", McGraw-Hill
4 A.K. Jain, "Advanced Structural Analysis", Nem Chand & Bros., Roorkee.
5 S.P. Gupta & G.S.Pandit, "Theory of Structures, Vol. I", Tata McGraw Hill, New Delhi.
6 "Advanced Structural Analysis",Devdas Menon, Alpha Science International Publisher