

# **Programme: B.Tech Mechanical Engineering**

## **Scheme and Syllabi**

w.e.f. Session 2020-21



# **BUEST**

**SCHOOL OF ENGINEERING & EMERGING TECHNOLOGIES**

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**(Common Curriculum for B. Tech I year – All Branches)**

**From session 2020-21 onwards**

**Semester – I**

**(Group-A)**

Sr.	Code	Subject	L	T	P	Credit
1	UMA-101	Engineering Mathematics I	3	1	0	3.5
2	UPH-101	Engineering Physics	3	1	2	4.5
3	UCS-101	Fundamentals of Computer & C programming	3	1	2	4.5
4	UHU-101	Communication & Professional skills in English	3	0	2	4.0
5	UEC-105	Principles of Electronics Engineering	3	1	2	4.5
6	UME-105	Principles of Mechanical Engineering	3	1	2	4.5
7	UPD-101	Seminar/PDP	2	0	0	2.0
		<b>Total</b>	<b>20</b>	<b>5</b>	<b>10</b>	<b>27.5</b>

**Total Hours: 35**

**(Group-B)**

Sr.	Code	Subject	L	T	P	Credit
1	UMA-101	Engineering Mathematics I	3	1	0	3.5
2	UCH-101	Engineering Chemistry	3	1	2	4.5
3	UCS-101	Fundamentals of Computer & C programming	3	1	2	4.5
4	UEE-105	Principles Electrical Engineering	3	1	2	4.5
5	UEG-101	Engineering Graphics Drawing	0	0	6	3.0
6	UEN-101	Environmental Science	3	0	0	3.0
7	UWP-110	Workshop Practice	0	0	3	1.5
		<b>Total</b>	<b>15</b>	<b>4</b>	<b>15</b>	<b>24.5</b>

**Total Hours: 34**



**(Common Curriculum for B. Tech I year – All Branches)**

**From session 2020-21 onwards**

**Semester - II**

**(Group-A)**

Sr.	Code	Subject	L	T	P	Credit
1	<b>UMA-102</b>	Engineering Mathematics II	3	1	0	3.5
2	<b>UCH-101</b>	Engineering Chemistry	3	1	2	4.5
3	<b>UCS-102</b>	Advanced C Programming	3	1	2	4.5
4	<b>UEE-105</b>	Principles of Electrical Engineering	3	1	2	4.5
5	<b>UEG-101</b>	Engineering Graphics Drawing	0	0	6	3.0
6	<b>UEN-101</b>	Environmental Science	3	0	0	3.0
7	<b>UWP-110</b>	Workshop Practice	0	0	3	1.5
		<b>Total</b>	<b>15</b>	<b>4</b>	<b>15</b>	<b>24.5</b>

**Total Hours: 34**

**(Group-B)**

Sr.	Code	Subject	L	T	P	Credit
1	<b>UMA-102</b>	Engineering Mathematics II	3	1	0	3.5
2	<b>UPH-101</b>	Engineering Physics	3	1	2	4.5
3	<b>UCS-102</b>	Advanced C Programming	3	1	2	4.5
4	<b>UHU-101</b>	Communication & Professional skills in English	3	0	2	4.0
5	<b>UEC-105</b>	Principles of Electronics Engineering	3	1	2	4.5
6	<b>UME-105</b>	Principles of Mechanical Engineering	3	1	2	4.5
7	<b>UPD-101</b>	PDP	2	0	0	2.0
		<b>Total</b>	<b>20</b>	<b>5</b>	<b>10</b>	<b>27.5</b>

**Total Hours: 35**

**SUMMER BREAK**

Sr.	Code	Subject	L	T	P	Credit
1.	UTR- 201	Industrial Training	0	0	0	4

**SEMESTER -III**

Sr.	Course No.	Course name	L	T	P	Credit
1	UMA-201	Numerical Analysis and Computer Programming	3	1	2	4.5
2	UMG-200	Principles of Engineering Economics & Management	3	1	0	3.5
3	UME-201	Applied Thermodynamics-I	3	1	0	3.5
4	UME-202	Strength of Materials-I	3	1	2	4.5
5	UME-203	Machine Drawing	0	0	6	3
6	UME-204	Fluid Mechanics	3	1	2	4.5
7	UTR-201	Industrial Training ( <b>Undertaken During Summer Vacations</b> )	0	0	0	4
8	UPD-201	PDP	2	0	0	2
<b>TOTAL</b>			<b>17</b>	<b>5</b>	<b>12</b>	<b>29.5</b>

**Total Hours: 34****SEMESTER -IV**

Sr.	Course No.	Course name	L	T	P	Credit
1	UME-250	Metrology & Interchangeability.	3	0	2	4
2	UME-251	Manufacturing Technology – I	3	0	0	3
3	UME-252	Strength of Materials-II.	3	1	0	3.5
4	UAM-250	Advanced Mathematics & Computer Programming	3	1	2	4.5
5	UME-254	Applied Thermodynamics-II	3	1	2	4.5
6	UME-255	Material Science & Engineering	3	0	2	4
7	UME-256	Manufacturing Practice	0	0	3	1.5
8	UPD-251	PDP	2	0	0	2
9	UGP-251	General Proficiency	0	0	0	2
<b>TOTAL</b>			<b>20</b>	<b>3</b>	<b>11</b>	<b>29</b>

**Total Hours: 34**

**SUMMER BREAK**

Sr.	Code	Subject	L	T	P	Credit
1.	UTR- 301	Industrial Training	0	0	0	4

**SEMESTER -V**

Sr.	Code	Course name	L	T	P	Credit
1	UME-300	Theory of Machines-I	3	1	2	4.5
2	UME-301	Machine Design-I	2	4	0	4
3	xxx-xxx	<b>Departmental Elective-I</b>	3	1	2	4.5
4	UME-303	Internal Combustion Engines	3	1	2	4.5
5	UME-304	Manufacturing Technology-II	3	0	0	3
6	UMA-300	Operation Research	3	1	0	3.5
7	UTR-301	Industrial Training ( <b>Undertaken during Summer Vaccation</b> )	0	0	0	4
8	UPD-301	PDP	2	0	0	2
<b>TOTAL</b>			<b>19</b>	<b>8</b>	<b>6</b>	<b>30</b>

**Total Hours: 33****SEMESTER-VI**

Sr.	Course No.	Course name	L	T	P	Credit
1	UME-350	Theory of Machines-II	3	1	2	4.5
2	UME-351	Machine Design-II	2	4	0	4
3	xxx-xxx	<b>Departmental Elective-II</b>	3	0	0	3
4	UME-353	Measurement & Controls	3	0	2	4
5	UME-354	Industrial Automation and Robotics	3	0	2	4
6	UME-355	Heat Transfer	3	1	2	4.5
7	UPD-351	PDP	2	0	0	2
8	UGP-361	General Proficiency	0	0	0	2
<b>TOTAL</b>			<b>19</b>	<b>6</b>	<b>8</b>	<b>28</b>

**Total Hours: 33****SUMMER BREAK**

Sr.	Code	Subject	L	T	P	Credit
1.	UTR- 401	Industrial Training	0	0	0	4

**SEMESTER -VII**

<b>Sr.</b>	<b>Code.</b>	<b>Course name</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
1	<b>XXX-XXX</b>	<b>Departmental Elective-III</b>	4	1	0	4.5
2	UME-401	Automobile Engineering	3	1	2	4.5
3	<b>XXX-XXX</b>	<b>Open Elective-I</b>	3	1	0	3.5
4	UME-402	Refrigeration and Air conditioning	3	1	2	4.5
5	UME-403	Mechatronics	3	0	0	3
6	UME-404	Industrial Engineering & Entrepreneurship	3	0	2	4
7	UTR-401	Industrial Training ( <b>Undertaken During Summer Vacations</b> )	0	0	0	4
8	UPD-401	PDP	2	0	0	2
<b>TOTAL</b>			21	4	6	30

**Total Hours: 31****SEMESTER -VIII**

<b>Sr.</b>	<b>Code</b>	<b>Course name</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
1	<b>XXX-XXX</b>	<b>Departmental Elective-IV</b>	3	1	0	3.5
2	<b>XXX-XXX</b>	<b>Departmental Elective-V</b>	3	1	2	4.5
3	<b>XXX-XXX</b>	<b>Open Elective-II</b>	3	1	<b>0</b>	<b>3.5</b>
4	<b>XXX-XXX</b>	<b>Open Elective-III</b>	3	1	<b>0</b>	<b>3.5</b>
5	UEC-417	Major Project /OJT	-	-	9	4.5
6	UGP-451	PDP	2	0	0	2
7	UPD-451	General Proficiency	-	-	-	2
<b>TOTAL</b>			<b>14</b>	<b>4</b>	<b>11</b>	<b>23.5</b>

**Total Hours: 29**

## DEPARTMENTAL ELECTIVES

Departmental Elective-I (Semester-V)																					
S N O	Basket 1		Pre requisi te	L	T	P	C	Basket 2		Pre requisi te	L	T	P	C	Basket 3		Pre requisi te	L	T	P	C
	Course Code	Course Title						Course Code	Course Title						Course Code	Course Title					
1	UME-305	Advanced Welding Technology	UME-251/U ME-308/U ME309	3	1	2	4	UM E- 302	Fluid Machi nes	UME-204	3	1	2	4	UM E- 308	Manufa cturing Process es-III	UME-251,U ME-256	3	1	2	4
2	UME-306	Mechanical Behavior of Materials	UME-255	3	1	2	4	UM E- 305	Advan ced Weldi ng Techn ology	UME-251/U ME-308/U ME309	3	1	2	4	UM E- 309	Advan ce Foundr y Technol ogy	UME-251/U ME-308/U ME309	3	1	2	4

Departmental Elective-II (Semester-VI)																					
S N O	Basket 1		Pre requisi te	L	T	P	C	Basket 2		Pre requisi te	L	T	P	C	Basket 3		Pre requisi te	L	T	P	C
	Course Code	Course Title						Course Code	Course Title						Course Code	Course Title					
1	UM E- 356	Design And Manufac turing of Composi te Material s	UME-306/U ME-308	3	0	0	3	UM E- 359	Cryoge nic Engine ering	UME-201/U ME-402	3	0	0	3	UM E- 352	Mac hine Tool s	UME-251	3	0	0	3
2	UM E- 357	Quality Concepts In Design	UME-305	3	0	0	3	UM E- 358	Renew able Source s Of Energy		3	0	0	3	UM E- 360	Time & work Stud y	UME-251,U ME-256	3	0	0	3



Departmental Elective-III (Semester-VII)																					
S. N O	Basket 1		Pre requisite	L	T	P	C	Basket 2		Pre requisite	L	T	P	C	Basket 3		Pre requisite	L	T	P	C
	Course Code	Course Title						Course Code	Course Title						Course Code	Course Title					
1	UM E-405	Design of Thermal Systems	UME-252/U ME-355	4	1	0	4.5	UM E-400	Mechanical Vibrations	UM A-101, UM A-102, UME-251	4	1	0	4.5	UM E-408	Flexible Manufacturing Systems	UME-305/U ME-356 / UME-359/U ME-360	4	1	0	4.5
2	UM E-406	Material Handling and Plant Layout	UME-251/U ME-203	4	1	0	4.5	UM E-407	Gas Turbines and Jet propulsion	UME-303	4	1	0	4.5	UM E-409	Design Planning And Control of Production System	UME-305/U ME-356 / UME-359/U ME-360	4	1	0	4.5

Departmental Elective-IV (Semester-VIII)																					
S. N O	Basket 1		Pre requisite	L	T	P	C	Basket 2		Pre requisite	L	T	P	C	Basket 3		Pre requisite	L	T	P	C
	Course Code	Course Title						Course Code	Course Title						Course Code	Course Title					
1	UM E-454	Design of Heat Exchangers	UME-201/U ME-355/U ME-402	3	1	0	3.5	UM E-451	Power Plant Engineering	UME-302,U ME-201	3	1	0	3.5	UM E-457	Simulation And Modeling	UMA-201,U ME-354	3	1	0	3.5
2	UM E-455	Machining Tool Design	UME-251	3	1	0	3.5	UM E-456	Design of Air Conditioning Systems	UME-402	3	1	0	3.5	UM E-458	Emerging Automotive Technologies	UME-251,U ME-401	3	1	0	3.5

Departmental Elective-IV (Semester-VIII)																					
S · N O	Basket 1		Pre requi site	L	T	P	C	Basket 2		Pre requi site	L	T	P	C	Basket 3		Pre requi site	L	T	P	C
	Course Code	Course Title						Course Code	Course Title						Course Code	Course Title					
	1	UM E- 467						Modern Manufact uring Processes	UME -251						3	1					
2	UM E- 468	Experi mental Stress Analysis	UME - 305/U ME- 202,U ME- 252	3	1	2	4 .5	UM E- 470	Pumps, Blower s and Compr essors	UME - 302/U ME- 355/U ME- 201	3	1	2	4 .5	U ME - 468	Experi mental Stress Analys is	UME - 305/U ME- 202,U ME- 252	3	1	2	4 .5

## OPEN ELECTIVES

<b>Open Elective-I (Semester-VII)</b>						
<b>S.NO</b>	<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	UCS-480	Software Project Management	3	1	0	3.5
2	UCS-481	Distributed Operating System	3	1	0	3.5
3	UEC-462	Biomedical Instrumentation	3	1	0	3.5
4	UEC-463	Television Engineering	3	1	0	3.5
5	UEE-403	Energy Management	3	1	0	3.5
6	UEE-452	Non- Conventional Electrical Power Generation	3	1	0	3.5
7	UCE-312	Advanced Construction Techniques & Project Management	3	1	0	3.5
8	UCE-365	Advanced Environmental Engineering	3	1	0	3.5
9	UMG-476	Human Values and Professional Ethics	3	1	0	3.5

<b>Open Elective-II (Semester-VIII)</b>						
<b>S.NO</b>	<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	UCS-482	Grid Computing	3	1	0	3.5
2	UCS-483	Software Reliability	3	1	0	3.5
3	UEC-464	Satellite Communication	3	1	0	3.5
4	UEC-465	Digital Signal Processing & Applications	3	1	0	3.5
5	UEE-457	Transformer Engineering	3	1	0	3.5
6	UEE-411	Direct Energy Conversion	3	1	0	3.5
7	UCE-311	Advanced Concrete Technology	3	1	0	3.5
8	UCE-409	Geographic Information System for Resource Management	3	1	0	3.5
9	UMG-450	Entrepreneurship Development & Enterprise Management	3	1	0	3.5

<b>Open Elective-III (Semester-VIII)</b>						
<b>S.NO</b>	<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	UCS-484	E-Commerce & ERP	3	1	0	3.5
2	UCS-485	Data warehousing & Data Mining	3	1	0	3.5
3	UEC-466	Optical Communication	3	1	0	3.5
4	UEC-467	Principles Of Digital Communication	3	1	0	3.5
5	UEE-456	Hydro Power Station Design	3	1	0	3.5
6	UEE-408	Illumination Engineering	3	1	0	3.5
7	UCE-410	Urban Transportation Planning	3	1	0	3.5
8	UCE-476	Disaster Management	3	1	0	3.5
9	UMG-475	Total Quality Management	3	1	0	3.5

# Semester-I&II

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Engineering Mathematics-I**  
**Course Code:- UMA-101**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3.5</b>

### **Unit-I: Calculus of one variable**

**Differential Calculus:** Successive Differentiation, Leibnitz Theorem, Expansion of Function Maclaurin's and Taylor's expansion, Indeterminate forms, Approximation of errors.

### **Unit-II: Calculus of two variables**

Partial Differentiation, Partial Derivatives, Euler's Theorem Total Differentiation, Jacobians and their properties. Maxima and Minima of two variables, Lagrange's Method of Undetermined multipliers. Multiple integrals, Change of order, Area, length, volume and surface area.

### **Unit – III: Vector Calculus**

Gradient, divergence and curl of a vector and their physical interpretations, Line, surface and Volume integrals, statement and Theorem of Green, Stoke and Gauss and their applications.

### **Unit-IV: Complex Analysis**

Brief Review of Complex Number, Functions of Complex Variable, Analytic Functions, Cauchy Reimann Equations, Milne Thompson Method, Singularities, Cauchy Integral Theorem, Cauchy Residue Theorem.

### **Text Book:**

1. P.K. Mittal, "Engineering Mathematics" , Vrinda Prakashan
2. Complex Analysis, R.V. Churchill and Brown, Fifth Edition and Mc Graw Hill Series.

### **Reference Books:**

1. Calculus, Anton, Bivens & Davis, John Wiley & Sons, New York.
2. Advanced Engg. Mathematics, Erwin Kreyszig, John Wiley & Sons, New York.
3. Advanced Engg. Mathematics, Michael D. Greenberg, Pearson Education.
4. Calculus by Thomas and Finney
5. NPTEL lectures

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Engineering Physics****Course Code:- UPY-101**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>1</b>	<b>2</b>	<b>4.5</b>

**Unit-I****Optics:**

Interference: Division of wave front & Division of amplitude – Fresnel’s biprism , Thin film interference & Newton’s rings. Michelson interferometer and its applications to Diffraction: Fresnel and Fraunhofer diffraction, Half period zone, zone plate, diffraction at straight edge, plane transmission grating. dispersive power & resolving power of a grating .

**Fiber Optics:** Introduction ,acceptance angle, numerical aperture, type of optical fiber- step index and graded index fibers, applications of optical fibers in communication:

**Laser:** Spontaneous and stimulated emission of radiation, Population inversion and optical pumping, Principle and production of laser ,three and four level laser, Construction and working of Ruby and He-Ne laser

**Unit-II****Electrostatics and Electrodynamics**

Basic laws of electricity & magnetism, Gradient, Divergence and Curl and their physical meaning , Divergence and Stokes theorems, continuity equation, Maxwell’s equations in integral and differential forms, Electromagnetic wave propagation in free space, Poynting vector.

**Relativistic Mechanics:**

Inertial and non-inertial frames, Galilean transformations, Michelson–Morley experiment , Einstein’s postulates of special theory of relativity, Lorentz transformation equations. Length contraction, time-dilation, Addition of velocities, Variation of mass with velocity and mass-energy relation, Relativistic energy-momentum transformation.

**Unit-III****Quantum Mechanics:**

Quantum theory of light, photoelectric effect, Compton effect, pair production, matter waves and de-broglie hypothesis, particle diffraction, uncertainty principle and applications.

Postulates of quantum mechanics and Schrödinger theory, time dependent and time independent Schrodinger wave equation, wave function, Born interpretation and normalization, expectation values. Applications to particle in a box (infinite potential well) finite potential step and barrier problems, tunneling, linear harmonic oscillator (one dimensional)

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Unit-IV****Statistical physics:**

Classical and Quantum statistics: Maxwell –Boltzmann statistics, Bose- Einstein and Fermi-Dirac statistics, Fermi energy, free electron model and its applications.

**Super conductivity:**

Occurrence,destruction of super conductivity, Meissen effect, type I and type II Superconductors; applications of superconductors.

**Text Books:**

1. Concepts of Modern physics by Beiser (Tata Mc Grow Hill)
2. Fundamentals of Physics by Resnick, Halliday, and Walker (Wiley)
3. Principles of Physics by R.A. Serway and J.W. Jewett (Thomas Asia Pvt. Ltd.)
4. Optics by Jenkins & White.

**Reference Books:**

1. Introduction to special theory of Relativity by Robert Resnick (Wiley)
2. Quantum mechanics by Schiff.
3. Quantum mechanics by Pauling & Wilson.
4. Principle of Optics by B.K. Mathur.
5. Optics by A.G. Ghatak 3<sup>rd</sup> edition (Tata McGrow Hill – 2005)
6. Optics by Brij lal and Subramaniam (S. Chand)
7. Physics part I and II by Resnick, Halliday, and Krane , John Wiley – 2002).
8. Modern Physics by Kenneth Krane, (2<sup>nd</sup> Edition, John Wiley & Sons ) – 1998
9. Physics of the atom by Wehr, Richards and Adair (4<sup>th</sup> Edition, Addison- Weseley)
10. Elements of Electromagnetics by Mathew N.D., Sadiku S.A.D. (Oxford University press)
11. Electrodynamics by D.J. Giriffith.
12. Lasers by O. Svelto.
13. NPTEL lectures

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



**Course Name:- Engineering Physics Lab**  
**Course Code:- UPH-101**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

**Experiments:**

1. To determine the wavelength of monochromatic light by Newto's ring.
2. To determine the wavelength of sodium light by using plane transmission grating.
3. To determine the wavelength of sodium light by using Michelson interferometer.
4. To find the refractive index of a prism by using spectrometer.
5. To determine the attenuation loss of a signal optical fiber.
6. To determine the numerical aperture of an optical fiber.
7. To determine the low resistance of the material of given wire using Carey Foste's bridge.
8. To draw hysteresis curve of a given sample of ferromagnetic material.
9. To find the capacitances of two capacitors (air and dielectric ) by D'sauty Bridge
- 10.To find the frequency of AC mains by using electric vibrator.
- 11.To find the value of high resistance by Substitution method.
- 12.To convert a galvanometer into an ammeter of a given range
- 13.To determine the variation of magnetic field along the axis of a current carrying coil and then to estimate the radius of the coil.
- 14.To study the Hall Effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall-effect set up.
15. To determine the wavelength of He-Ne laser by using single slit experiment

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Fundamentals Of Computer & C Programming**  
**Course Code:- UCS-101**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 2 4.5**

### Unit-I

**An Overview of Computer System:** Anatomy of a digital Computer, various kinds of registers in CPU and their roles, Classification of Computers, Generations of computers, hardware, software, firmware, von Newman and Harvard Architecture.

**Memory:** Classification of memory- Main, Auxiliary memory and Cache memory, Memory Hierarchy.

**Secondary storage devices:** Hard disk, Floppy disk.

**Input Devices:** Keyboard, Mouse, Joystick, etc.

**Output Devices:** Monitors (CRT, TFT, Plasma panels) Printers (Dot-Matrix, Inkjet, Laser), plotters, Optical mark readers

**Radix number system:** Decimal, Binary, Octal, Hexadecimal numbers and their inter-conversions; Representation of information inside the computers.

### Unit-II

**Programming Languages:** Machine, Assembly, and High Level Language, introduction to Assembler, Compiler, Interpreter, seven phases of compilers, symbol Table, Debuggers, Linker and Loader. **Programming fundamentals:** Algorithms, pseudo codes and Flowcharts, Debugging, testing and documentation, structure-programming concepts, top down and bottom-up design approaches. **Operating System Basics:** Introduction and Functions of Operating System, Types of OS and case studies on NT, XP, 2000 and Linux. 13. Operating System: Revision of functions of O.S., Windows installation, NT, 2000, XP and Linux Case Studies.

### Unit-III

**Networking:** Introduction to network, LAN, WAN, MAN, Internet and WWW, Introduction to e-mail. **Introduction:** Structure of a C Program, C Compilers, Editing, Compiling & Running of a C program, Data types, Constants and Variables, Operators and Expressions, Different types of expressions and their Evaluation, Conditional Expression, Assignment statement, Library functions, typecasting.

### Unit-IV

**Decision Control Structure:** Decision making using if, if-else, elseif and switch statements

**Iterative Statements:** Looping using for, while and do-while statements, Transferring Program control using break, continue and goto statements.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Reference Books**

- |    |                                       |  |                           |
|----|---------------------------------------|--|---------------------------|
| 1  | Computer fundamentals                 | P. K. Sinha                                    | BPB<br>IDG Books<br>India |
| 2  | Teach yourself all about computers    | Barry Press and Marcia Press                   | India                     |
| 3  | Spirit of C                           | Mullis Cooper                                  | Jacob<br>Publications     |
| 4  | Let us C                              | Yashwant Kanetkar<br>Kerningham B.W. & Ritchie | BPB                       |
| 5  | The C Programming Language            | D.<br>M  | PHI                       |
| 6  | Programming in C                      | Gotterfied B                                   | Tata McGraw<br>Hill       |
| 7  | C programming a Practical<br>Approach | Ajay Mittal                                    | Pearson Education         |
| 8. | NPTL lectures                         |  |                           |

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Computer Lab**  
**Course Code:- UCS-101**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

**DOS:**

1. Study of internal commands of DOS
2. Study of external commands of DOS.

**C Programming:**

1. Write a program to find the largest of three numbers (if-then-else).
2. Write a program to find the largest number out of ten numbers (for statement).
3. Write a program to find the average male height & average female heights in the class (input is in form of sex code, height).
4. Write a program to find roots of quadratic equation using functions and switch statement.
5. Write a program using arrays to find the largest and second largest no.
6. Write a program to produce ASCII equivalent of given number
7. Write a program to find divisor or factorial of a given number.
8. Write a recursive program for Factorial of a number.
9. WAP to print Fibonacci sequence of numbers is 0, 1, 1, 2, 3, 5, 8.....
10. Write a program that takes two operands and one operator from the user perform the operation and then print the answer
11. WAP to find sum of digits of a number.
12. WAP to find reverse of a number.
13. WAP to check if a number is Armstrong number
14. WAP to check if an entered number is palindrome.
15. Write a program to print the following outputs:

```

1
2 2
3 3 3
4 4 4 4
5 5 5 5 5

```

Note: - Record to be maintained both electronically and hard copy for evaluation

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Communication & Professional Skills In English**  
**Course Code:- UHU-101**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 2 4.5**

### **Unit- I**

#### **Grammar and Reading skills:**

Vocabulary building: parts of speech with usage, phraseology, idioms, one word substitution for a group of words, antonyms, synonyms. Sentence formation, simple sentences of all six types. Clauses. Simple, Multiple and Compound sentences. Verb Forms and Tenses. Active Passive voice. Narration. Reading comprehension.

A text book containing short stories, plays and poems.

Newspaper reading.

### **Unit- II**

#### **Listening skills:**

Familiarization with listening skills. Phonetics: word accent, intonation.

### **Unit- III**

#### **Speaking skills:**

Non Verbal Communications. Phonetics: Consonants and vowel sounds, transcriptions, syllables. Speech presentation, paper reading, extempore, self introduction. Dialogues, debates, role play and quizzes. Group discussion, Interview skills. Public speaking skills.

### **Unit- IV**

#### **Writing Skills:**

Letter writing: personal, official and business and covering letters. Resume writing. Essay writing. Report writing. Story writing.

#### **Text Book:**

1. An Exordium by Zeenat Khan & Akanksha Vashisht.
2. English Grammar by Murphy
3. English Grammar and Composition by Prof. M. Krishna swami.
4. Patterns of English structures by A.S. Hornby. (Macmillian publications recommended)
5. A text book of English Poems, stories & essays (Macmillian publications recommended)
6. High school English Grammar by Wren & Martin.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Language Lab**

**Course Code:- UHU-101**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

**Experiments:**

- 1 Self introduction with one's name, family background, place of residence, one's educational qualifications and experiences and defining one's career objective and projecting ones strengths and skill-sets.
- 2 Interview Skills: Students will participate in mock interviews.
- 3 Presentation skills: Students will make presentations on given topics.
- 4 Group Discussion; Students will participate in group discussions.
- 5 Phonetics: Stress & intonation- Ear Training- Correct pronunciation- Sound recognition exercise-common Errors in English.
- 6 Conversation: Face to Face Conversation – Telephone conversation- Role play activities (Student will take on roles and engage in conversation).
- 7 Reading comprehension and vocabulary. Filling in the blanks- vocabulary building – Reading and answering question – News paper reading
- 8 Listening comprehension: Students will be excerpts of different conversational recordings and questions based on the respective excerpts will be given to them.
- 9 Pronunciation Training: Through language lab software.
- 10 Remedial grammar exercises: Through language lab soft ware.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Principles Of Electronics Engineering**

**Course Code:- UEC-105**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 2 4.5**

### **UNIT-I**

Brief review of Band Theory, Types of Semiconductors, Charge densities in semiconductor. Semiconductor Diode, Reverse and Forward bias conditions, Diode Characteristics and parameter, Equivalent circuit and frequency response, Ideal vs. Practical diode, Temperature Dependence of P-N junction diode, Diode Capacitance, Half and Full wave Rectifiers, Clipping and Clamping circuits, Avalanche diode, Zener Diode and its role as a voltage regulator.

### **UNIT-II**

Bipolar junction transistor (BJT) and their I/P and O/P characteristics in CE, CB mode, Transistor as a switch, Temperature variation of saturation parameters, h parameters. JFET and MOSFET, Equivalent circuit, Enhancement mode and Depletion mode MOSFETS, Unijunction transistor (UJT), its characteristics, parameters and circuit operation, Photo transistor, its characteristics and applications.

### **UNIT-III**

Bias for transistor amplifier: fixed bias, emitter feed back bias. Feedback principles. Types of feedback, Stabilization of gain, reduction of non-linear distortion, change in resistance by negative feedback in amplifier. Amplifiers coupling, types of coupling, Amplifier pass band, RC-Coupled amplifiers at mid, low and high frequencies.

### **UNIT-IV**

Semi conductor processing, active and passive elements, Integrated circuits, bias for integrated circuits. Basic operational amplifier, applications of operational amplifier – adder, subtractor, Integrator, differentiator and comparator.

### **Reference Books:**

- |  |                              |       |
|--|------------------------------|-------|
| 1 Electronic Principles                    | : A.P.Malvino                | : TMH |
| 2 Electronic Fundamentals and Applications | : J.D. Ryder                 | : PHI |
| 3 Electronic Circuits & Devices            | : J.Millman and C.C.Halkias  | : TMH |
| 4 Integrated Circuits & Devices            | : J.Millman & C.C.Halkias    | : TMH |
| 5 Basic Electronic & Linear Circuits       | : N.N.Bhargava & Kulshrestha | : TMH |

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Principles Of Electronics Engineering Lab**

**Course Code:- UEC-105**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

**List of Experiments:**

1. (a) To study the use and scope of using an oscilloscope as a measuring device in an electronic laboratory.
- (b) To study the use and scope of using a multimeter (digital and analog) as a measuring device in an electronics laboratory.
- (c) To study the use and scope of function generator as a signal source in an electronics laboratory.

**Set up an experiment to:**

1. Draw forward bias and reverse bias characteristics of a p-n junction diode and use it as a half wave and full wave rectifier.
2. Draw the characteristics of a Zener diode and use it as a voltage regulator.
3. Draw characteristics of common base configuration of p-n-p transistor.
4. Draw characteristics of common emitter configuration of an npn transistor.
5. Draw characteristics of common drain configuration of a MOSFET.
6. Find the voltage and current gain of single stage common emitter amplifier.
7. Draw the characteristics curve of UJT.
8. Find the voltage gain of single stage voltage series feedback amplifier.
9. Use operational amplifier as:
  - I) Inverting amplifier
  - II) Non-inverting amplifier
  - III) Comparator
10. Use operational amplifier as:
  - I) Integrator
  - II) Differentiator
11. Use operational amplifier as:
  - I) Adder
  - II) Precision amplifier
12. Find the overall voltage gain and current gain of a two stage RC coupled amplifier. Basic electronics should stress on interfacing with real life devices and general-purpose linear units. Emphasis is on system design and not on discrete components, some of the component around which exercises can be built are
  1. SCR as triacs and power control.
  2. Power supplies using zener.
  3. Opto couplers and isolations where photo diode, transistors, leds are used.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



4. Laser diode (laser pointer)
5. Operation amplifiers.
6. Operation amplifiers as instrumentation amplifiers.

**Note:** - Record to be maintained in the laboratory record book for evaluation. Usage of breadboard approach to be encouraged.

**Reference Books :**

1. Basic Electronic & Linear Circuits : N.N.Bhargava & Kulshrestha : TMH
2. Electronic Devices & Circuit Theory : Robert L.Boylestad & Louis Nashelsky : Pearson Edu.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Principles Of Mechanical Engineering**

**Course Code:- UME-105**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 2 4.5**

### **Unit-I**

#### **First Law of Thermodynamics**

Basic concepts of thermodynamics, systems -open and closed, equilibrium, Heat and work Essence and corollaries of the first law, analytical expressions applicable to a process and cycle, internal energy, enthalpy and specific heats, first law analysis of steady flow, applications of steady flow energy equation to engineering devices.

#### **Applications of first law of Thermodynamics:**

Closed and open systems, analysis of non-flow and flow processes for an ideal gas under constant volume (Isochoric), constant pressure (Isobaric), constant temperature (Isothermal), adiabatic and polytropic conditions. Analysis of free expansion and throttling processes. Representation of these processes on P-V charts and analysis of property changes and energy exchange (work and heat) during these processes.

### **Unit-II**

#### **Second Law of Thermodynamics**

Limitations of first law, various statements of second law and their equivalence, application of statements of second law to heat engine, heat pump and refrigerator. Philosophy of Carnot cycle and its consequences. Carnot theorem for heat engines and heat pump. Third law of thermodynamics.

**Refrigeration and Air Conditioning:** Vapour compression refrigeration cycle, working of domestic refrigerator, window type Air conditioner.

### **Unit-III**

#### **Simple Stresses & Strains**

Concept & types of Stresses and strains, Poisson's ratio, stresses and strain in simple and compound bars under axial loading, stress strain diagrams, Hooks law, Elastic constants. Numerical problems.

#### **Shear Force and Bending Moments**

Definitions, SF & BM diagrams for cantilevers, simply supported beams with or without overhang and calculation of maximum BM and SF and the point of contraflexure under (i) concentrated loads, (ii) uniformly distributed loads Numerical Problems.

### **Unit-IV**

**I. C. engines** –basic engine components and nomenclature working principles of 4S and 2S engines, comparison of SI and CI engine, classification of IC engines, applications of IC engines.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Automobile engineering-** components of automobile- the basic structure-Frame, axles, Suspension, wheel {just an overview} transmission system (layout and brief description)

**Fluid Machines:** Impulse and reaction turbines construction and working of Pelton turbine, Francis turbine and Kaplan turbine, construction and working of centrifugal and reciprocating pump

### Text Books

1. Nag, P.K., "Engineering Thermodynamics", Tata McGraw – Hill, New Delhi.
2. Yadav, R., Thermal Science and Engineering, Central Publishing House, Allahabad.
3. Strength of Materials – G.H.Ryder – Third Edition in S I units 1969 Macmillan India.
4. Mechanics of Materials – Dr. Kirpal Singh, Standard Publishers Distributors, New Delhi.
5. Internal Combustion Engines- V Ganeshan (Second addition) Tata McGraw- Hill, New Delhi.
6. Automobile engineering – Dr. Kirpal Singh (vol-1) standard Publishers Distributor, New Delhi.
7. Fluid mechanics & Fluid power Engineering. D. S. Kumar, S. K. Kataria & Sons.
8. Hydraulics and Fluid mechanics- Modi & Seth- Standard book house, Nai sadak Delhi.

### Reference Books

1. Strength of Materials – Popoy, PHI, New Delhi.
2. Strength of Materials – Sadhu Singh, Khanna Publications.
3. Strength of Materials – A Rudimentary Approach – M.A.Jayaram, Revised Ed. 2001, Sapna Book House, Bangalore.
4. Strength of Materials – U.C.Jindal
5. Moran, M.J. and Shapiro, H.N., Fundamentals of Engineering Thermodynamics, John Wiley, New York.
6. Van Wylen, G.J., Fundamental of Classic Thermodynamics, John Wiley, New York.
7. Spalding, D.B. and Cole, E.H., Engineering Thermodynamics, ELBS, New Delhi.
8. Hibbeler, R.C. Engineering Mechanics – Statics, Addison Wesley Longman, New Delhi.
9. NPTL lectures

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Principles Of Mechanical Engineering Lab**  
**Course Code:- UME-105**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

### **LIST OF EXPERIMENTS**

1. To study low-pressure boilers.
2. To study High-pressure boilers.
3. Calibration of thermometers.
4. Calibration of pressure gauges.
5. Study of discharge measuring devices.
6. To determine co-efficient of discharge of orifice meter.
7. To verify the Bernoulli's Theorem.
8. To find Young's Modulus of Elasticity using Searl's apparatus.
9. To find Young's Modulus of Elasticity of a beam with deflection beam apparatus.
10. To find Modulus of rigidity with the help of torsion apparatus.
11. Assembling /Disassembling studies (cycle, bike)
12. Study of various techniques , methods and processes related to machine tools.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Engineering Mathematics-II**

**Course Code:- UMA-102**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3.5</b>

**Unit-I:**

**Linear Algebra**

Rank of a Matrix, consistency and inconsistency of a system of Linear equations, Elementary row and column transformations inverse of matrices, Eigen Values and eigen vectors. Cayley Hamilton Theorem, Diagonalization Vector spaces  $R^n$  over  $R$ , linear transformations  $R^n$  to  $R^m$ .

**Unit – II:**

**Differential Equations:**

Solution of first order and first degree differential equations: variables separable, homogeneous, exact, linear and equation reducible to above types. Linear Differential equations of nth order with constant coefficients. Complementary functions and particular integrals, Ordinary simultaneous equations.

**Unit – III:**

**Laplace Transform**

Laplace transform, existence theorem, Laplace transform of derivatives and integrals, Inverse laplace transform, Unit Step function, Dirac delta function, Laplace transform of periodic function, Convolution Theorem. Applications to solve simple linear and simultaneous diff equations.

**Unit-IV:**

**Fourier Transform**

Fourier series, Euler formulae, half range series, Fourier integral & Fourier Transform.

**Text Book:**

1. P.K. Mittal: Engineering Mathematics, Vrinda Prakashan

**Reference Book:**

1. Calculus, Anton, Bivens & Davis, John wiley & Sons, New York.
2. Advanced Engg. Mathematics, Erwin Kreyszig, John Wiley & Sons, New York.
3. Advanced Engg. Mathematics, Michael D. Greenberg, Pearson Education.
4. NPTEL lectures

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Engineering Chemistry**  
**Course Code:- UCH-101**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 2 4.5**

### Unit-I

**Polymers and Polymerization-** organic polymers, polymerization, various types of polymerization, effect of structure on properties of polymers, preparation properties and technical application of thermo-plastics (PVC, PVA, Polyamides), thermosets (PF,UF), and elastomers (SBR,GR-M), Silicones .

#### **Inorganic Engineering Materials.**

Introduction and applications of glass, cement gypsum, lime, plaster of paris, Composites-classification, advantages & application of composites.

Refractories- Introduction, classification, properties & important refractory materials & applications.

### Unit – II

**Water Chemistry:** Introduction, Sources of water, Impurities, Hardness, Units, Chemical analysis of water-free chlorine, alkalinity, Estimation of hardness by EDTA method, Analysis by EDTA method, Oxidations (BOD & COD), Boiler Corrosion, Carry Over- Priming and foaming, Scales and Sludges, Caustic embrittlement. Sewage & Treatment, Drinking water treatment, Desalination of water, Softening methods and related numerical problems.

**Corrosion -A Threat:** Introduction, Types of corrosions, Electrochemical Theory, Pitting, Water Line, Differential Aeration corrosions, Stress Corrosion, Factors affecting Corrosion, Preventive measures.

### Unit-III

**Lubricants:** Introduction, Functions of Lubricants, Mechanism of Lubrication, Additives, Greases and Emulsions, Properties of Lubricants - Viscosity Index, Fire & Flash point, Pour & Cloud point, Aniline point, saponification number, acid number.

**Fuels and Combustion:** Introduction, class of fuels ( Solid, Liquid and Gases) Coal and its origin, Analysis of Coals, Petroleum fuels, Crude Petroleum and its refining, Cracking, Synthetic petrol, knocking, octane number Reforming Hydro finishing and Diesel, cetane number Kerosene, Gasoline.: Coal gas, Oil Gas, Bio- Gas, Nuclear Fuel.

### Unit - IV

**Stereo Chemistry:** structures, types, applications and stereochemistry of natural products like alkaloids, steroids, quinonoids terpenoides including, allenes and biphenyls

**Soil Chemistry:** Soil pH, Inorganic & organic components in soils, Acid base & Ion exchange reactions in soils, Micronutrients and macronutrients, soil testing, Nitrogen pathways and NPK in soil.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Text Books:**

1. Engineering Chemistry: By P.C.Jain & Monika Jain, Dhanpat Rai and Sons.
2. A Text Book of Engineering Chemistry: By Shashi Chawla, Dhanpat Rai & Sons.
3. Physical Chemistry: By R.P.Verma, Pardeep Publishers Jalandhar.
4. Industrial Chemistry by B.K. Sharma
5. Chemistry in Engineering & Technology, Vol.I & Vol.II, Rajaram, Kuriacose (TMH).
6. Physical Chemistry, P.W.Atkin (ELBS, Oxford Press)
7. Chemistry of Natural products by OP Aggarwal.
8. Engineering Chemistry- by A.K. Tripathi Satya Prakashan, New Delhi.
9. Stereo Chemistry of Organic Compounds by P.S. Kalsi.
10. Environmental Chemistry by A.K. De , New Age International Publishers
11. Organic Chemistry Vol-2 by I.L. Finar.
12. NPTL lectures

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Engineering Chemistry Lab**  
**Course Code:- UCH-101**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

**Experiments:**

1. To determine the solid carbon, volatile matter, ash content and percentage of moisture in given sample of coal by proximate analysis method and classify the coal.
2. To determine the total alkalinity in a given sample of water using a standard acid.
3. To determine the percentage of Chlorine in a given sample of  $\text{CaOCl}_2$  which has been dissolved in one litre of solution.
4. To determine the surface tension of the two given unknown liquids by using Stalpmometer and identify the given liquid.
5. To determine the coefficient of viscosity of the given unknown liquids by using Ostwald's Viscometer and identify the given liquid.
6. To determine the coefficient of viscosity of the given lubricating oil using Red Wood Viscometer
7. To determine the surface tension of the given liquid by drop number method by using Stalpmometer and identify the given liquid.
8. To determine the flash point and fire point of given sample of oil using Pens key Marten's apparatus.
9. To determine the amount of Chlorine in given sample of water approximate N/20 sodium Thiosulphate solution. Ask for your requirement.
10. Estimation of calcium as CaO volumetrically in cement.
11. To determine the chemical oxygen demand of waste water.
12. To prepare phenolformaldehyde resin.
13. To prepare Hexamethylenediamine Adipic acid (Nylon 66) polymer.
14. Determine of total hardness of water by EDTA method.
15. To determine cloud and pour point of lubricating oil.
16. Preparation of Urea Formaldehyde resin

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



**Course Name:- Advanced C Programming**

**Course Code:- UCS- 102**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 2 4.5**

### **Unit-I:**

**Functions:** Introduction to user defined functions, passing values between function, Function prototype and Recursion

**Arrays:** Introduction to arrays, array initialization, array traversal, bound checking, passing array element to functions, passing entire array to a function, operations on arrays.

**Two dimensional Arrays:** creating a 2D array, array operations (addition, subtraction, multiplication, transpose).

### **Unit-II**

**Pointers:** Introduction to pointers, pointer operator, call by value and call by reference, pointer to array and array of pointers.

**Strings:** Introduction to strings, string operations (strlen, strcpy,strupr, strlwr, strcat, strcmp), gets v/s scanf, puts v/s printf.

### **Unit-III**

**Structure:** Use of Structures, Declaring a Structure, Accessing Structure Elements, Storing structure elements, Array of Structures, pointer to structure.

**Union:** Difference between union and structures, Introduction to enumerations.

### **Unit: IV**

**File Handling:** Classification of files, file opening modes, Operations on text and binary files (reading, writing, copying, and concatenation).

### **Reference Books**

1	Computer fundamentals	P. K. Sinha	BPB
2	Teach yourself all about computers	Barry Press and Marcia Press	IDG Books India
3	Spirit of C	Mullis Cooper	Jacob Publications
4	Let us C	Yashwant Kanetkar	BPB
5	The C Programming Language	Kerninghan B.W. & Ritchie D. M	PHI
6	Programming in C	Gotterfied B	Tata McGraw Hill
7	C programming a Practical Approach	Ajay Mittal	Pearson Education

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Computer Lab**  
**Course Code:- UCS-102**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

**Experiment:**

1. Write a C program to enter N natural numbers in ascending order in 1-D array, and apply linear and binary search on it.
2. Reading N integers in 1-D array and sort them using Bubble sort and calculate their mean, median.
3. Write c program to evaluate polynomials like  $p(x)=a*x*x+b*x+c$  etc. using Horner's Rule.
4. Write a program to read two matrices A and B and compute  $A+B$ ,  $A-B$ ,  $A*B$ , A and B transpose.
5. Write a program to demonstrate call by value and call by reference (use swapping of two numbers), write function to calculate square and cube of a number.
6. Write program to read single and strings separated by space (using gets ()), perform strlen, contact,strup,strcmp on them using appropriate functions.
7. Create a Program using structures and Union which reads Name, Age and Salary of employee print them using dot and -> operators.
8. Using enum for name in place of integer values.
9. WAP to open a file and print its content on screen.
10. Write a program to edit and print the content of a pre written file.
11. Reading and Write file in Text and binary modes.
12. Write a program which prints its source code.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Principle Of Electrical Engineering**

**Course Code:- UEE- 105**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 2 4.5**

### **Unit-I**

**D.C. circuits:** Ohm's law, Kirchoff's Laws, Thevenin's, Norton's, superposition theorem, Maximum power transfer theorem, Nodal and Mesh analysis.

**A.C. circuits:** Sinusoidal signal, instantaneous and peak values, RMS and average values, phase angle, polar and rectangular, exponential and trigonometric representations RL and C components, behavior of these components in A.C. circuits, concept of complex power, power factor.

**Transient Response:** transient response RL, RC and RLC circuits with step input.

### **Unit-II**

**Series and Parallel A.C. circuits:** Series and Parallel A.C. circuit, Series and Parallel resonance. Q factor, cut off frequency and bandwidth.

**Three phase circuits:** Phase and line voltages and currents, balanced star and delta circuits, power equation, measurement of power by 2-wattmeter method, importance of earthing.

### **Unit-III**

**Electromagnetism:** Basic concepts of magnetic circuits, Series magnetic circuits, parallel magnetic circuits, series parallel magnetic circuits, analogy between electrical and magnetic circuits, magnetic circuit with air gap, Laws of electromagnetic induction, self inductance, mutual inductance, coefficient of coupling.

Basic concepts of transformers and rotating electrical machines (operating principle, construction and applications).

### **Unit-IV**

**Measuring Instruments:** Voltmeter, Ammeter, Wattmeter, Energy meter.

**Batteries:** Storage batteries:- Types, construction, charging and discharging, capacity and efficiency of Lead-acid batteries.

### **Text Books:**

1. Kothari & Nagarath: Basic Electrical Engg. (2<sup>nd</sup> Edition), TMH.
2. B.L. Theraja & A.K. Theraja, S.Chand: Electrical Technology(Vol-1).
3. Deltoro: Electrical Engg Fundamentals, PHI.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Principle Of Electrical Engineering Lab**  
**Course Code:- UEE-105**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

**Experiments:**

1. To verify KCL and KVL.
2. To study frequency response of series RLC circuit and determine resonance frequency.
3. To study frequency response of parallel RLC circuit and determine resonance frequency.
4. To perform direct load test of transformer and plot efficiency v/s load characteristics.
5. To study and verify Thevenins, Norton's, superposition and maximum power theorems.
6. To perform O.C and S.C test of transformer.
7. To study various types of meters
8. Measurement of power by 3 voltmeter / 3 ammeter method.
9. Measurement of power in 3-phase system by 2-wattmeter method

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Engineering Graphics Drawing**

**Course Code:- UEG- 101**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Drawing Sheet Marks	50
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	25
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>0</b>	<b>0</b>	<b>6</b>	<b>3</b>

### **Unit-I**

#### **Introduction to Conventional Drawing**

Various types of lines, Principles of drawing, Size & Location as per IS code (SP-46) for general engg. Drawing, Dimensioning exercises Conventional exercise of Lettering Techniques, Drawing pertaining to symbols, Free hand lettering techniques (in letters & numerals in 3, 5, 8 & 12mm sizes), Vertical & Inclined Drawing at 75°. Instrumental lettering in single stroke, Linear, Diagonal & Vernier Scale, BIS Conventions. Linear dimensions , plain scale with conversion scale factor.

#### **Computer Aided drawing**

Basic introduction of Computer Aided drawing (CAD), Basic commands and their applications.

### **Unit-II**

#### **Orthographic Projections**

Definition- Planes of Projection, reference lines & conventions employed, Projections of points in all four quadrants, Projections of straight lines ,true and apparent lengths, true & apparent indications to reference planes

#### **Orthographic Projections of Plane Surfaces & Engg. Objects**

Definitions-Projections of plane surfaces-triangle, square rectangle, rhombus, pentagon, hexagon & circle, planes in different positions by change of position method only (No problem on punched & composite plates), Engg. Objects projections.

### **Unit-III**

#### **Projections of Solids**

Definitions-Projections of right regular-tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions

#### **Isometric Projections (Using Isometric scales)**

Isometric scale & projection of simple plane figures, Isometric projections of tetrahedron, hexahedron (cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres & combination of solids

### **Unit-IV**

#### **Sections & Development of lateral surfaces of solids**

Section planes, Sections, Section views, Apparent shapes, & true shapes of sections of regular

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

prisms, pyramids, cylinders and cones resting with base on HP, Sectioning of Engg. Objects, Developments of lateral surfaces of trays, tetrahedrons spheres and transition pieces

**Reference:**

1. P.S. Gill, Engg. Drawing & Engineering Graphics,
2. N.D. Bhatt, Elementary Engg. Drawing
3. A primer on Computer Aided Drawing-2006, Published by VTU, Belgaum
4. Engineering Drawing & Computer Graphics, Published by Dhanpat Rai Publishing Co.
5. NPTL lectures

**Course Name:- Environmental Science**  
**Course Code:- UEN- 101**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 0 0 3**

### **Unit-I**

The Multy disciplinary nature of environmental studies & Definition Scope & importance, Need for public awareness, Inter- relationship of technology growth.

**Natural Resources**-Renewable & Non Renewable resources, Forest resources- use & over exploitation, deforestation, Timber extraction, Dams & their effects on forests & tribal people, Water Resources-Use & over utilization of surface & ground, water, floods, draughts-conflicts over water dams benefits & problems, Mineral Resources- Use & over Exploitation, environmental effects of extracting & mineral resources, Food Resources- world food problems changes caused by agriculture & over grazing effects of modern agriculture fertilizer & pesticide problems, water logging, saliency, Energy Resources growing energy needs, renewable & Non-Renewable energy sources, use of alternate energy, Land resources- land as resource, land degradable, man induced land sleds, Soil erosim & desertifical, individual role in conservation of natural resources, Equatable use of resources for sustainable life style.

### **Unit-II**

**Ecosystems**-Natural Ecosystems- Concept, Structure & Function, Ecological Succession, Flow of energy in Ecosystem, Ecological Succession, Brief Features of Forest, Grass Land, Desert & Aquatic ecosystem.

**Biodiversity**-Different genetic & ecosystem diversity, Biogeography classification in it, Biodiversity at global, National & Local levels, Biosphere cycles, Carbon Dioxide Cycle, Eco-Imbalance system, Principles, effects

### **UNIT-III**

**Environmental Pollution**- Definition, Causes effects & Control measures of Air, Water, Soil, Marine, Thermal pollution, Nuclear Hazards, Industrial Hazard & safety, Solid Waste & E-waste management causes, effects & control measures of urban & industrial, Role of individual to prevent pollution, Disaster Management, Floods, Earthquakes cyclone & landslides, Brief introduction to safely Engineering.

### **Unit-IV**

**Human Population & Environment**-Population growth, Variation among nations, Population Explosion, Environment & Human Health, Human Rights, Value Education, Women Child Welfare, HIV/AIDS-its causes, effects, & control, Role of information Technology in Environment & Human Health, Environment Acts & Social Issues from unsustainable to sustainable development, Urban problems released to energy, water conservation, Rain Water

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

harvesting, watershed management, Resettlement & Rehabilitation of people, its problems & concerns, Environmental Ethics- Issues & possible solutions, Climate change, Global Warming, Acid rain, Ozone layer depletion, Nuclear accidents & holocaust consumerism & waste products, Environment Protection Act Air (Prevention & Control of Pollution) Act-1981 Water (Prevention & Control of Pollution) Act – 1974 Forest Servation Act – 1980 Wildlife protection Act- 1972 , Issue involved in enforcement of environmental legislation.

**Books recommended:**

1	Environment Education	S.S. Randhawa	S.Vikas & Co. Publications
2	E-Waste-Implications, management & regulations in India and current global best practices	Rakesh Johri	TERI (The Energy & Resources Institute), New Delhi
3	Environment Science	Kaushik Kaushik	& New Age International
4	Environmental Science & Engineering	S.K. Dhameja	S.K. Kataria & Sons Publications
5	Environmental Studies	Smriti Sriwastava	S.K. Kataria & Sons Publications
6	Introduction to Environmental Engineering and Science	G. M. Masters	Prentice Hall of India Pvt. Ltd. , 1991
7	Environmental Science	B. J. Nebel	Prentice Hall Inc. , 1987

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



**Course Name:- Workshop Practice**

**Course Code:- UWP-110**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

**Fitting shop** : Study of tools and processes ; One Simple exercise involving fitting work.

3

**Carpentry Shop**: Study of tools and their use , carpentry joints, and Preparation of a half-lap corner joint or mortise and tennon joints. Study of woodworking lathe.

3

**Welding Shop** : Study of tools and their use, Simple butt joint, Lap joint, different welding processes and preparation of any one welding joint.

6

**Sheet metal shop** : Study of tools and operations, Making one job out of the following : funnel complete with soldering / Fabrication of tool box / tray / electrical panel box etc

3

**Machine Shop** : Study and demonstration of tools and operations on Lathe / Shaper / Milling machine / Grinding machine / Drilling machine

6

**Materials** : Study of different materials of engineering use, Ferrous & Non ferrous materials and their constituents, Properties and their applications. Heat treatment of ferrous metals and its importance, Microstructures of carbon steels

6

**Manufacturing Processes** : Study and demonstration of processes such as Rolling, Press working , wire drawing, Shearing and punching,& Plastic molding etc.

3

**Smithy shop & Forging shop**: Study of smithy process and forging process describing different methods of forging. and demonstration of a simple smithy job.

5

**Metal Casting:**

- i) Study of Mold making process and with special emphasis on bench molding .
- ii) Demonstration of Casting process of any simple job.

5

**Reference:**

1. Hajra, Bose, Roy: Workshop Technology Vol 1 & 2, Media Promoters
2. Raghuvanshi B.S.: Workshop Technology, Vol 1 & 2, Dhanpatrai

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

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**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

# Semester-III

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Numerical Analysis And Computer Programmingcourse**  
**Course Code:- UMA – 201**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 2 4.5**

### Unit -I

**Errors:** error in numerical calculations , absolute, relative and percentage errors, round off and truncation errors, error propagation, loss of significant digits, error in series approximation, speed of convergence.

**Finite differences & interpolation:** forward and backward difference operators. Newton's forward and backward interpolation formulae. Central difference interpolation formulae. Gauss's forward and backward interpolation formulae. Lagrange's interpolation formulae and newton's divided difference formulae.

### Unit -II

#### **Solution of algebraic and transcendental eqations:**

Bisection method, method of false position, secant method, iteration method newton-raphson method, generalized newton-raphson method, acceleration of convergence using aitkin's method.

### Unit -III

#### **Solution of simultaneous algebraic equations :**

Jacobi's method, gauss-seidal method, relaxation method, fixed point iteration & its convergence, eigen values by iteration – power and jacobi's method.

#### **Numerical differentiation and integration:**

Formulae for derivatives, trapezoidal rule, simpson's 1/3<sup>rd</sup> and 3/8<sup>th</sup> rules.

### Unit -IV

#### **Numerical methods for differential equations:**

Solution of first order differential equations using taylor's series, euler's, picard's and runge kutta method upto 4th order, predictor- corrector methods (adam's and milne's method ), simultaneous differential equations of first order, differential equations of second order; error analysis, convergence and stability.

#### **Text books:**

1. Numerical methods in engg.& : b.s.grewal : khanna publishers Sciences
2. Numerical methods for scientific:m.k.jain : wilel eastern ltd. & engg. Computations s.r.k.lyengar r.k.jain

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Reference Books:**

1. Computer oriented numerical : U. Rajaramanm : Hall of india methods orebtuce
2. Introduction to numerical : C.E. Froberg : Adison wesley analysis

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Numerical Analysis And Computer Programming Lab**  
**Course Code:- UMA-201**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

**Write Down And Execute Following Programs Using C/C++ Language**

1. To find the roots of non-linear equation using Bisection method/Muller's method.
2. To find the roots of non-linear equation using Newton's method/Muller's method.
3. Curve fitting by least-squares approximations.
4. To solve the system of linear equations using Gauss-Elimination method.
5. To solve the system of linear equations using Gauss-Seidal iteration method.
6. To solve the system of linear equations using Gauss-Jordan method.
7. To solve integral equation numerically using Trapezoidal rule.
8. To solve integral equation numerically using Simpson's rule.
9. Find the largest Eigen value of a matrix by power – method.
10. To find numerical solution of ordinary differential equations by Euler's method.
11. To find numerical solution of ordinary differential equations by Runga-Kutta method.
12. To find numerical solution of partial differential equation/laplace equation/ wave equation/heat equation.
13. To find numerical solution of ordinary differential equations by Milne's method.
14. To solve a given problem using Newton's forward interpolation formula.
15. To solve a given problem using Lagrange's forward interpolation formula.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Principles Of Engineering Economics And Management**

**Course Code:- UMG-200**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3.5</b>

### **Unit-I**

#### **Economics**

Definitions, Nature & scope of Economics, Economics Systems-meaning of Capitalism, Socialism & mixed economy.

#### **Demand and supplies analysis**

Law of demand and supply, exception to the law of demand, Elasticity of demand and supply and their types, Methods of measuring elasticity of demand and supply.

### **Unit-II**

#### **Theory of production**

Scales of production, Law of returns, Break even analysis.

#### **Monetary system**

Monetary policy – Meaning, objectives, methods, Fiscal policy – Meaning & objectives of fiscal policy in a developing country like India, Functions of Reserve Bank of India and commercial banks.

#### **Economics & business environment**

Privatization –Growth of private capitalism in India, Business/Trade Cycles – Meaning, Characteristics & classification, Foreign capital & economic development.

### **Unit-III**

#### **Management principles**

Meaning & types of Management, Concept of Scientific Management, Management by Objectives, System Approach to Management.

#### **Financial management**

Meaning, functional areas of financial management, Sources of Finance, Meaning of financial accounting, accounting principles-concepts & conventions, Importance of final accounts – profit & loss a/c and balance sheet, Need and importance of capital budgeting.

#### **Marketing management**

Introduction to marketing management, Market segmentation, Developing & managing advertising programs, Deciding on media & measuring effectiveness.

### **Unit-IV**

#### **Production management**

Procedure for production planning & Control, Plant Location & Lay-out, Routing, Scheduling, CPM & PERT.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

### **Quality management**

Statistical Quality Control, Introduction, Control Charts, X Charts, R Charts, Control Charts for C (N. of defects per unit), Control chart for P( Fraction Defective), Advantages & Limitations of SQC, Quality Circles:- Structure, functions & Limitations.

### **Text Books:**

1. Business Organisation & Management – B.P.Singh – T.N.Chabra – Dhanpat Rai & Sons.
2. Modern Economic Theory – K .K. Dewett – S.Chand & Co.
3. Marketing Management – Philip Kotler – Prentice Hall of India Pvt. Ltd.
4. Financial Management - I.M. Pandey - Vikas Publishing House Pvt. Ltd.
5. Indian Economic – Ruddar Dutt, K.P.M.Sundaram – S.Chand & Co.
6. Advanced Economic Theory – H.L.Ahuja – S.Chand & Co.
7. Statistical Quality Control – Grant, Leaven worth – Tata Mc. Graw Hill.
8. Personnel Management – Edwin B.Flippo – Tata Mc. Graw Hill.
9. Management – A Global Pererspective – Harold Krontz – Tata Mc. Graw Hill.



**Course Name:- Applied Thermodynamics-I**

**Course Code:- UME-201**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 0 3.5**

### **Unit -I**

Essence and corollaries of the first law, analytical expressions applicable to a process and cycle, internal energy, enthalpy and specific heats, first law analysis of steady flow, applications of steady flow energy equation to engineering devices.

Applications of first law of Thermodynamics: Closed and open systems, analysis of non-flow and flow processes for an ideal gas under constant volume (Isochoric), constant pressure (Isobaric), constant temperature (Isothermal), adiabatic and Polytropic conditions. Analysis of free expansion and throttling processes. Representation of these processes on P-V charts and analysis of property changes and energy exchange (work and heat) during these processes.

### **Unit -II**

Limitations of first law, various statements of second law and their equivalence, application of statements of second law to heat engine, heat pump and refrigerator. Philosophy of Carnot cycle and its consequences. Carnot theorem for heat engines and heat pump. Entropy and its significance Clausius inequality, Availability and irreversibility.

### **Unit -III**

Equation of state for ideal gas, Behaviour of real gases and compressibility factor, Generalized, empirical and theoretical equations of state for real gases, Law of corresponding states and use of generalized compressibility chart. Helmholtz and Gibbs functions, Maxwell's relations, Enthalpy, entropy, internal energy, and specific heat relations, Clausius – Clapeyron's equation, Applications to ideal and real gases. Joule Thompson coefficient.

### **Unit-IV**

Reciprocating Compressors: Introduction, classification & operation of single stage and multistage compressor, work required in single & multistage compressor.

Rotary Compressor: Introduction, classification & operation performance characteristics of rotary compressors, comparison between rotary & reciprocating compressors, centrifugal compressors versus axial flow compressors, velocity vector diagrams for centrifugal compressors.

#### **Text Books:**

1. Nag, P.K., "Engineering Thermodynamics", Tata McGraw – Hill 2nd edition.
2. C.P. Arora, "Engineering Thermodynamics", Tata McGraw – Hill.
3. Cengel, Y.A., & Boles, M.A., "Thermodynamics – An Engineering Approach", McGraw – Hill Inc.

#### **Reference Books**

1. Spalding, D.B. and Cole, E.H., "Engineering Thermodynamics", Edward Arnold.
2. NPTL lectures

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Strength of Materials-I**  
**Course Code:- UME-202**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 2 4.5**

### **Unit-I**

Simple stresses & strain's: Concept & types of Stresses and strains Poisson's ratio, stresses and strain in simple and compound bars under axial loading, stress strain diagrams, Hooks law, elastic constants & their relationships, temperature stress & strain in simple & compound bar under axial loading, Numerical.

Compound stresses & strains: Concept of surface and volumetric strains, two -dimensional stress system, complementary shear stresses at a point on a plane. Principal stresses & strains and principal planes. Mohr's circle of stresses, Numerical problems.

### **Unit-II**

Shear Force & Bending Moments: Definitions, SF & BM diagrams for cantilevers, simple supported beams with or without over-hang and calculation of maximum BM & SF and the point of contraflexure under (i) concentrated loads, (ii) uniformly distributed loads over whole span or a part of it, (iii) combination of concentrated loads and uniformly distributed loads, (iv) uniformly varying loads and (v) application of moments, relation between the rate of loading, the shear force and the bending moments, problems.

### **Unit-III**

Bending & shear Stresses in Beams: Bending stresses in beams with derivation & application to beams of circular, rectangular, I. T. and channel sections composite beams, shear stresses in beams with derivation combined bending torsion & axial loading of beams, Numericals.

Torsion of Circular Members: Torsion of thin circular tube, Solid and hollow circular shafts, tapered shafts & composite circular shafts, combined bending and torsion, equivalent torque effect of end thrust, Numericals.

### **Unit-IV**

Columns & Struts: Columns under axial load, concept of instability and buckling, slenderness ratio. Derivation of Euler's formulae for the elastic buckling load. Euler's, Rankine Gordon's formulae, Johnson's empirical formula for axial loading of columns and their applications, eccentric compression of a short strut of rectangular & circular sections, Numerical problems.

Strain Energy & Impact Loading: Definitions, expressions for strain energy stored in a body when load is applied (i) gradually, (ii) suddenly and (iii) with impact. Strain energy of beams in bending, beam deflections. Strain energy of shafts in twisting. Energy methods in determining pring deflection, Castiglione's & Maxwell's theorems, Numerical problems.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Text Books:**

1. Strengths of Materials – G.H. Ryder- Third Edition in S.I. units 1969 Macmillan India.
2. Mechanics of Materials- Dr. Kirpal Singh, Standard Publishers Distributors, New Delhi.
3. Strengths of Materials-Popov , PHI, New Delhi
4. Strengths of Materials-Sadhu Singh, Khanna Publications
5. Strengths of Materials- A Rudimentary Approach-M.A. Jayaram,
6. Revised Ed. 2001, Sapna Book house, Bangalore.
7. Strengths of Materials- U.C. Jindal
8. Irving Shames “ Introduction to Solid Mechanics”.
9. Beer and Johnston “Mechanics of Materials”

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Strength Of Material Lab**  
**Course Code:- UME-202**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

**List of Experiments:**

1. To study the Brinell hardness testing machine & perform Brinell hardness test
2. To study the Rockwell hardness testing machine & perform the Rockwell hardness test.
3. To study the Vickers hardness testing machine & perform Vickers hardness test
4. To study Erichsen sheet metal testing machine & perform the Erichsen sheet metal test
5. To study the Impact machine and perform the Impact tests ( Izod & Charpy)
6. To study the Universal testing machine and perform the tensile test.
7. To perform compression test on UTM.
8. To perform bending test on UTM.
9. To perform the shear test on UTM.
10. To study the torsion testing machine and perform the torsion test .

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Machine Drawing**

**Course Code:- UME- 203**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Drawing Sheet Marks	50
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	25
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>0</b>	<b>0</b>	<b>6</b>	<b>3</b>

### **Unit -I**

Introduction - Limits, Fits and Tolerance (dimensional and Geometrical tolerance), Surface finish representation. Gear: Gear terminology. I.S convention of assembly of spur gears, helical gear, bevel gears, worm and worm wheel.

### **Unit -II**

Principles of Dimensioning- Sectioning, Riveted joints and Welded joints- IS representations in drawings. Nut & Bolts, Foundation Bolts, Assembly of nut & Bolts, plain couplings

### **Unit-III**

Orthographic view from isometric views of machine parts / components.. Exercises on coupling (Muff, Universal, Flange & Oldham) crankshaft, pulley, piston and connecting rod, cotter and knuckle joints.

### **Unit-IV**

Assembly drawing with sectioning and bill of materials from given detail drawings of assemblies (manual and Auto Cad) : Lathe tail stock, machine vice, Pipe vice, pedestal bearing, Steam stop valve, drill jigs, swivel bearing, spring loaded valve, screw jack.

### **Text Books:**

1. Machine Drawing : By N D Bhat and V M Panchal Pub Charotar Publishing House.
2. A text book of machine drawing : PS Gill Pub. S.K.Kataria & SONS.
3. A text books of machine Drawing: Laxmi narayana and Mathur pub. M/s Jain Brother. New Delhi.
4. Machine Drawing : N Sidheshwar, P Kannaieh, V V S Sastry, Pub. Tata Mc Graw Hill Publishing Ltd.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Fluid Mechanics**

**Course Code:- UME-204**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 2 4.5**

### **Unit-I**

#### **Introduction**

Fluid and flow-definition and types, properties of ideal and real fluids, continuum concept, Lagrangian & Eulerian approach.

#### **Fluid Statics**

General differential equation, manometry, Force on plane and curved surfaces, stability of floating and submerged bodies, Relative equilibrium.

### **Unit-II**

#### **Kinematics of fluid**

Steady flow, uniform flow, stream, streak and path lines, continuity equation, stream function, irrotational flow, velocity potential, flow nets, circulation, simple flows, flow around circular cylinder with and without rotation, lift and drag.

#### **Dynamics of fluids**

Concept of system and control volume, Reynold's transportation theorem, Euler's equation, Bernoulli's equation, Navier Stoke's equation and their application to nozzle, venturimeter, orifices and mouth pieces, time taken in emptying a vessel. Pitot - Prandtl tube.

### **Unit-III**

#### **Flow in pipes**

Laminar flow through pipe, total and hydraulic gradient lines, series and parallel connection of pipes, transmission of power through pipes.

#### **Laminar flow of viscous fluids**

Boundary layer concept, boundary layer thickness, displacement, momentum and energy thickness, integral method, drag on flat plate, flow around an airfoil, boundary layer separation.

### **Unit-IV**

#### **Turbulent flow**

Fluid friction and Reynolds number, Prandtl mixing length hypothesis velocity distribution in pipes, Cole brook formula.

#### **Dimensional analysis**

Buckingham's Pi theorem, Non – dimensional numbers and their application, similitude.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Text Books**

1. Agarwal, “Fluid Mechanics and Machinery”, Tata Mc Graw Hill Publishing Company Ltd., New Delhi.
2. Som, S.K. and Biswas, G. “Introduction To Fluid Mechanics and Fluid Machines”, Tata Mc Graw Hill Publishing Company Ltd., New Delhi.
3. Bansal, Dr. R.K. “A Text Book of Fluid Mechanics and Hydraulic Machines”, Luxmi Publications (P) Ltd., New Delhi.
4. Rajput, R.K. “A Text Book of Hydraulics”, Sultan Chand and Sons, New Delhi.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Fluid Mechanics Lab**

**Course Code:- UME-204**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

**List of Experiments:**

1. To determine the coefficient of discharge of Notch (V and Rectangular types)
2. To determine the friction factor for the pipes.
3. To determine the coefficient of discharge of venturimeter.
4. To determine the coefficient of discharge, contraction & velocity of an orifice.
5. To find critical Reynolds number for a pipe flow.
6. To determine the meta-centric height of a floating body.
7. To determine the minor losses due to sudden enlargement, sudden contraction and bends.
8. To show the velocity and pressure variation with radius in a forced vortex flow.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



# Semester-IV

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Metrology And Interchangeability**  
**Course Code:- UME-250**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>

### Unit-I

**Standards of Measurements :** Line standards, imperial standard yard, standard meter, sub standards and standards, end bars, slip gauges, angular slip gauges, wave length standard.

**Measuring Principles :** Principle for mechanical measuring instruments – Lever method, vernier method, screw & screw nut method. Compound gearing method, helical strip method. Principles of optical measuring instruments. Reflection, refraction interference, optical prism, lenses, optical systems. Principle of electrical measuring instruments. Transformation of energy, variation of electric parameters,- Principles of pneumatic measuring instruments. Construction details of measuring instruments. Abbe principle, graduation lines and scale division, pivot & bearings. Measuring accuracy – dimensional & geometrical accuracy. Types of error, systematic error, compound error, random error.

### Unit-II

**Interchangeability :** Concept and need of interchangeability. Systems of tolerances, system of fits. Limit gauges, Standardisation. Design standardisation. Manufacturing standardisation.

**Linear and Angular Measurement :** Use of slip gauges, dial indicators. Mechanical, optical and electrical comparators, pneumatic gauges, measuring machines, sinebars & angle, gauges, levels, clinometer, auto-collimator, taper gauges.

### Unit-III

**Straightness, Flatness and Squareness testing :** Straight edges, surface plates straightness testing, straight edge methods, level or auto-collimator method. Flatness testing – level or auto – collimator method, optical flatness testing, squareness testing, indicator method, auto – collimator methods, engineer's squares.

**Screw Thread Measurement :** Errors in threads, screw thread gauges, measurement of element of the external and internal threads, thread caliper gauges.

### Unit-IV

**Spur Gear Measurement :** Geometry of spur gear, measurement of spur gear parameters, run out, pitch, profile, lead, backlash, tooth thickness, composite elements.

**Surface Finish Measurement :** Definition measurement of surface, finishaly surf, profilometer, tomilson recorder, compariscope, microscope interference methods.

**Miscellaneous :** Acceptance tests for a lathe. Alignment of bearings

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Text Books:-**

1. Gupta, I.C., “Engineering Metrology”, Dhanpat Rai & Sons, New Delhi, 1994.
2. Hume, K.J., “Engineering Metrology”, Mac Donald & Co. 1963.
3. R. K. Jain “Engineering Metrology”, Khanna publisher, Delhi
4. Kumar, D.S., “Mechanical Measurements and Control”, Metropolitan, New Delhi.
5. Doeblein, E.O., “Measurement Systems, Application Design”, Mc Graw Hill, 1990.
6. Beckwith Thomas G., “Mechanical Measurements”, Narosa Publishing House, N.Delhi

**Course Name:- Metrology And Interchangeability Lab**  
**Course Code:- UME-250**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

**List of Experiments:**

1. To measure a gap gauge with slip gauges.
2. To measure the height of a circular spigot.
3. To calibrate a micrometer.
4. To measure a plug screw gauge.
5. To check a straight edge.
6. To check an engineer square.
7. To measure the angle of taper plug with sine bar.
8. To check a form gauge by projections including the construction of the projections drawing.
9. To check a sine bar.
10. To measure the pitch error of a screw gauge (plug or Ring).
11. To measure the form and angle of a plug screw gauge by optical methods.
12. To calibrate dial gauge.
13. To compare the two slip gauges using an optical flat.
14. To test the flatness of a surface plate using a block level.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Manufacturing Technology – I**

**Course Code:- UME-251**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **Unit – I**

Introduction to discontinuous and continuous processes, primary processes and secondary processes

Metal Casting Processes: Advantage and limitations, sand mold making procedure, Patterns and Cores. Pattern materials, pattern allowances, types of pattern, colour coding, Molding material, Molding sand composition, and preparation, sand properties and testing type of sand molds.

**Cores:** Types of cores, core prints, chaplets, chills, Gating systems, Gates and gating systems risers, Melting practice, Cupola, charge calculations. Casting cleaning and casting defects Fettling, defects in castings and their remedies, methods of testing of castings fore their soundness.

### **Unit – II**

Special Casting Processes: Shell molding, precision investment casting, permanent mold casting, die casting, centrifugal casting, continuous casting.

Metal forming Processes: Nature of plastic deformation, hot working and cold working. Principles of rolling, rolling mills Forging: Forging operations, smith forging, drop forging, press forging, forging defects.

### **Unit – III**

Extursion and other processes : Extrusion principle, hot extrusion, cold extrusion, wire drawing, swaging, tube making, Sheet metal operation, shearing action, drawing dies, spinning, bending, strech forming, embossing and coining.

Gas and Arc Welding: Classification: Oxy-acetylene welding equipment and techniques. Electric arc welding: Electrodes, manual metal arc welding, inert gas shielding arc welding, tungsten inert gas welding (TIG), metal inert gas wedling (MIG), submerged arc welding (SAW).

### **Unit – IV**

Resistance Welding: Principles, resistance sopt welding, resistance seam welding, upset welding, flash welding.

Other Welding Processes : Introduction thermit welding, electro slag welding, electron beam welding, laser beam welding forge welding, friction welding, diffusion welding, brazing and soldering.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Text Books:**

1. Principles of Manufacturing Materials & Processes – Campbell J.S.Publisher – Mc Graw Hill.
2. Manufacturing Science – Ghosh A.Malik, A.K.Affiliated East-West Press Pvt. Ltd., New Delhi.
3. Foundry Technology – K.P.Sinha, D.B.Goel, Roorkee Publishing House.
4. Welding and Welding Technology, Richard L.Little Tata McGraw Hill Ltd.
5. Principle of Metal casting- Rosenthal, Tata Mc Graw hill, New Delhi.
6. Production Technology – R.K.Jain, Khanna Publication Ltd., N D.
7. Manufacturing Processes and Systems : Ostwald Phillip F., Munoz Jairo, John Wiley & Sons (Asia) Pvt. Ltd.
8. Welding Technology – O.P.Khanna, Dhanpat Rai & Sons, Delhi.
9. Manufacturing Technology – Foundry, Forming and Welding – P.N.Rao, Tata Mc Graw Hill.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Strength of Materials – II**

**Course Code:- UME-252**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3.5</b>

### Unit-I

**Unsymmetrical Bending:** Properties of beam cross section, product of inertia, ellipse of inertia, slope of the neutral axis, stresses & deflections, shear center and the flexural axis, Numerical problems.

**Slope & Deflection :** Relationship between bending moment, slope & deflection, Macaulay's method. Calculations for slope & deflection of (1) cantilevers and (2) simply supported beams with or without overhang, under concentrated loads, uniformly distributed loads or combination of concentrated and uniformly distributed loads. Numerical problems.

### Unit-II

**Thin Walled Vessels:** Derivation of Hoop & Longitudinal stresses & strains in cylindrical & spherical vessels under internal pressure. Change in volume of vessel under pressure, wire wound cylinders, Numerical problems.

**Thick Cylinders & Spheres:** Radial & hoop stresses and strains in thick cylinders and spherical shells. Compound cylinders and spherical shells subjected to internal fluid pressure only, hub shrunk on solid shaft. (Derivation of equation not to be asked in exam.) Numerical problems.

### Unit-III

**Rotating Rims, Discs & Cylinders:** Stresses and strains in (i) rotating rims, neglecting the effect of spokes, (ii) rotating discs, including disc of uniform strength and disc shrunk on hub (iii) turbine rotor (IV) rotating cylinders (solid & hollow). (Derivation of equation not to be asked in exam.) Numerical Problems.

**Theories of Elastic Failure:** Various theories of elastic failure with derivations and graphical representations, applications to problems of two-dimensional stress systems with (i) Combined direct loading and bending and (ii) combined torsional and direct loading. Numerical problems.

### Unit-IV

**Bending of Curved Bars:** Stresses in bars of initial large radius of curvature, bars of initial small radius of curvature. Stresses in crane hooks, rings and chain links of circular & trapezoidal sections. (Derivation of equation not to be asked in exam.) Numerical Problems.

**Springs:** Stresses in closed and open coiled helical springs subjected to axial loads and twisting couples. Leaf springs, flat spiral springs. Numerical Problems.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Text Books:**

1. Strengths of Materials: R. K. Bansal. Laxmi Publication, New Delhi .
2. Mechanics of Materials- Dr. Kirpal Singh, Standard Publishers Distributors, New Delhi.
3. Strengths of Materials-Popov , PHI, New Delhi
4. Strengths of Materials-Sadhu Singh, Khanna Publications
5. Strengths of Materials- A Rudimentary Approach-M.A. Jayaram, Revised Ed. 2001, Sapna Book house, Bangalore.
6. Strengths of Materials- U.C. Jindal
7. Strengths of Materials – G.H. Ryder- Third Edition in S.I. units 1969 Macmillan India

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



**Course Name:- Advanced Maths And Computer Programming**

**Course Code:- UMA-250**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 2 4.5**

### **Unit-I**

Definition of tensor, transformation of coordinates (rotation, translation and orthogonal) contravariant and covariant tensors. Addition and multiplication of tensors, contraction of tensors. Inner product, fundamental tensors, symmetric and anti - symmetric tensors, kronecker delta.

### **Unit-II**

**Inertia tensor :** Definition and application of inertia tensor in Kinetic energy, moment of inertia and radius of gyration. Cartesian tensor: definition and application of Cartesian tensor in stress, strain and Hookes law.

### **Unit-III**

**Introduction to Object-oriented concepts:** Overview, Abstract data types, object, modularization, classes, creating and destroying objects, Garbage collection strategies, verloading, dynamic binding, polymorphism, constants. Inheritance: Class inheritance, Inheriting instance variable, inheriting methods, meta classes, object inheritance, multiple and multilevel inheritance.

### **Unit-IV**

**C++ Programming Language:** Overview: Programming paradigm, support for data abstraction and object-oriented programming, declaration and constants, expression and statements, functions and files.

**Classes and Objects:** Definition of class declaration, data numbers class function definition, member function definition scope resolution operator, private and public member function, nesting of member functions, creating objects, accessing class data members functions, array of objects, objects as function arguments.

**Operator overloading:** Operator function, user-defined typed conversion large object, assignments and initialization and subscripting and function call, referencing, increment and decrement, a string class, friends and members.

### **Text Books:**

1. Vectors and Tensors: Fred A.Hinchey, Wiley Eastern Ltd.
2. Cartesian Tensor: Harold Jeffreys, Cambridge University Press.
3. Cartesian Tensors: A.M.Goodbody, Ellis Horwood Ltd.
4. Matrices and Tensors in Physics, A.W.Joshi, New Age International Publishers Ltd., willey Eastern Ltd.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

5. The C++ Programming Language, Bjarne Stroustrup, Addison Wesley.
6. Objecting Modeling and Design, James, Rumbaugh, Michael Blaha, William Premerlani, Frederick Eddy and William Lorensen, PHI.
7. Object Oriented Programming with C++, Balagurusamy, Tata Mc. Graw Hill Publishing Co. Ltd.
8. Programming with C++, D. Ravichandran, Tata McGraw Hill.
9. Object Oriented Programming in TURBO C++, Robert Lafore, Galgotia Publications Pvt. Ltd.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Advanced Maths And Computer Programming Lab**

**Course Code:- UMA-250**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

**List of exercises:**

1. Raising a number  $n$  to a power  $p$  is the same as multiplying  $n$  by itself  $p$  times. Write a function called `power ()` that takes a double value for an int value for  $p$ , and returns the result as double values. Use a default argument of 2 of  $p$ , so that if this argument is omitted, the number will be squared. Write a `main ()` function that gets values from the user to test this function.
2. A point on the two dimensional plane can be represented by two numbers: an X coordinate and a Y coordinate. For example, (4, 5) represents point 4 units to the right of the origin along the X-axis and 5 units up the Y-axis. The sum of two points can be defined as new point with X and Y coordinates.

Write a program that uses a structure called `point` to model a point. Define three points, and have the user input to two of them. Then set the third point equal to the sum of the other two. And display the value of the new point. Interaction with the program might look like this:

```
Enter coordinates for P1      :      3      4
Enter coordinates for P2     :      5      7
Coordinates of P1 + P2 are   :      8      11
```

3. Create the equivalent of a four function calculator. The program should request the user to enter a number, an operator and another number. It should they carry out the specified arithmetical operation: adding, subtracting, multiplying or dividing the two numbers. (it should use a switch statement to select the operation). Finally, it should display the result. When it finishes the calculation, the program should ask if the user wants to do another calculation. The response can be 'Y' or 'N' some sample interaction with the program might look like this.

Enter first number, operator and second number 12 + 100

Answer = 112

Do another (Y/N) ? N

4. A phone number, such as (212) 767-8900, can be thought of as having three parts: the area code (212), the exchange (767) and the number (8900). Write a program that uses a structure to store these three parts of a phone number separately. Call the structure `phone`. Create two structure displaying both numbers. The interchange might look like this:

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

Enter your area code, exchange and number : 415 555 1212

My number is (415) 555 – 1212

5. Create two classes DM and DB, which store the value of distances. DM stores distances in meters and centimeters and DB in feet and inches. Write a program that can read values for the class objects and one object of DM with another object of DB.

Use a friend function to carry out the addition operation. The object that stores the results may be a DM object or DB object, depending on the units in which the results are required.

The display should be in the format of feet and inches or meters and centimeters depending on the object on display.

6. Create a class rational which represents a numerical value by two double values – NUMERATOR & DENOMINATOR. Include the following public member Functions:

Constructor with no arguments (default). Constructor with two arguments .

Void reduce () that reduces the rational number by eliminating the highest common factor between the numerator and the denominator.

Overload +operator to add two rational number. Overload >>operator to enable input through cin.

Overload <<operator to enable input through count.

Write a main () to test all the functions in the class.

7. Consider the following class definition class father {

Protected : int age;

Public;

Father (int x) {age = x;} Virtual void iam ()

{cout << “ I AM THE FATHER, my age is : “<<age<<end 1:}

Derive the two classes son and daughter from the above class and for each, definite I am to write our similar but appropriate messages. You should also define suitable constructors for these classes.

Now, write a main () that creates objects of the three classes and then call iam () them. Declare pointer to father, successively assign addresses of objects of the two derived classes to this pointer and in each case, call iam () through the pointer to demonstrate polymorphism in action.

8. Write a program that creates a binary file by reading the data from the students for the terminal. The data of each students consist of roll No., name (a string of 30 or lesser No. of Characters) and marks.

9. A hospital wants to create a database regarding its indoor patients. The information to store include :

- Name of the patient.
- Date of admission.
- Disease.
- Date of discharge.

Create a structure to store the date (year, month and date as its members). Create a base class to store the above information. The member function should include functions to enter

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

information and display a list of all the patients in the database. Create a derived class to store the age of the patients. List the information about all to store the age of the patients. List the information about all the pediatric patients (less than twelve years in age).

10. Make a class Employee with name and salary. Make a class Manager inherit from Employee. Add an instance variable, named department, type string. Supply a method to String that prints the manager's name, department and salary. Make a class Executive inherit from information stored in the manager superclass object. Supply a test program that test these classes and methods.
  
11. Imagine a tollbooth with a class called Toll Booth. The two data items are a type unsigned int to hold the total number of cars, and a type double to hold the total amount of money collected. A constructor initializes to these to 0. A member function called paying Car () increments the car total and adds 0.50 to the cash total. Another function, called nopay Car (), increments the car total but adds nothing to the cash total. Finally, a member function called displays the two totals.  
Include a program to test this class. This program should allow the user to push one key to count a paying car, and another to count a non-paying car. Pushing the ESC key should cause the program to print out the total cars and total cash and then exit.
  
12. Write a function called reversit () that reverses a string (an array of Char). Use a for loop that swaps the first and last characters, then the second and next to last characters and so on. The string should be passed to reversit (), and print out the result. Use an input method that allows embedded blanks. Test the program with Napoleon's famous phrase, "Able was I ere I saw Elba)"
  
13. Create some objects of string class, and put them in a Deque-some at the head of the Deque and some at the tail. Display the contents of the Deque using the for Each () function and a user written display function. Then search the Deque for a particular string, using the first That () function and display any strings that match. Finally remove all the items from the Deque using the get left () function and display each item
  
14. Assume that a bank maintains two kinds of accounts for customers. One called as savings account and the other as current account. The saving account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed.

Create a class account that stores customer name, account number and type of account. From this derive the classes cur\_acct and Sav\_acct to make them more specific to their requirements. Include necessary member functions in order to achieve the following tasks:

- a) Accept deposit from a customer and update the balance.
  
- b) Display the balance.
  
- c) Compute and deposit interest.
  
- d) Permit withdrawal and update the balance.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

- e) Check for the minimum balance, impose penalty, necessary and update the balance.
  - f) Do not use any constructor. Use member functions to initialize the class members.
15. Create a base class called shape. Use this class to store two double type values that could be used to compute the area of figure. Derive two specific classes called triangle and rectangle from the base shape. Add to the base class, a member function get data () to initialize base class data members and another members function display area (), to compute and display the area of figures. Make display area () as a virtual function and redefine this function in the derived classes to suit their requirements.

Using these three classes, design a program that will accept dimensions of a triangle or a rectangle interactively and display the area.

Remember the two values given, as input will be treated as lengths of two sides in the case of rectangles and as base and height in the case of triangles and used as follows:

$$\begin{array}{l} \text{Area of rectangle} \quad =x \quad *y \\ \text{Area of Triangle} \quad =1/2 x \quad *y \end{array}$$

Programming of exercises in C++ in the form of projects (based on “Object Oriented Programming in TURBO C++, Robert Lafore, Galgotia Publications Pvt. Ltd., 1994, to be done in consultation with the faculty incharge for the course.)

**Course Name:- Applied Thermodynamics-II**

**Course Code:- UME-254**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 2 4.5**

### Unit-I

**Properties of Steam:** steam and its formation, h-s, t-s, p-v, p-t, diagrams for steam, wet Dry, saturated and Superheated Steam, sensible, Latent heat, Dryness fraction and its determination, Separating and Throttling calorimeter Enthalpy, Entropy and internal energy of steam. Use of steam Table and Mollier Diagram Basic Thermodynamic Processes of Steam in Closed and Open Systems and their representation on p-v and h-s charts.

**Steam Boiler:** Boilers and their classification, comparison between fire tube and water tube boilers, essentials of a good boiler. Constructional and operational details of Locomotive, Babcock-Wilcox, Lancashire Boiler, Benson, Lamont, Loeffler and Velox boilers. Boiler mountings and accessories. Natural draft from chimney, height of chimney, maximum draft and chimney efficiency, forced draft and induced draft, Boiler Heat Balance Sheet.

### Unit-II

**Vapour Power Cycles:** Carnot and Rankine Vapour cycles, effect of operating conditions on thermal efficiency of Rankine cycle, Rankine cycle with superheat, reheat cycle and regenerative feed heating cycle, Binary vapour cycle.

**Flow Through Nozzles:** Velocity and heat drop, mass discharge through a nozzle, critical pressure ratio and its significance, effect of friction and nozzle efficiency, supersaturated flow, nozzles off the design pressure ratio.

### Unit-III

**Steam Turbines:** Classification, flow through impulse blades, velocity diagram, calculation of power output and efficiency, maximum blade efficiency of single stage impulse turbine, blade friction, compounding of impulse turbine. Flow through impulse reaction blades, degree of reaction, velocity diagram, calculations for power output, efficiency and blade height, comparison of impulse and impulse reaction turbines. Losses in steam turbines, stage efficiency overall efficiency and reheat factor. Governing of steam turbines, throttle governing, nozzle control governing and by pass governing. Steam for heating and process work, back pressure turbines and pass out turbines.

**Steam Condensers:** Elements of a condensing plant, types of condensers, comparison of jet and surface condensers. Condenser vacuum, air leakage and loss of vacuum, vacuum efficiency and condenser efficiency, Dalton's law and air vapour mixture, air pumps .

### Unit-IV

**Gas Turbine Systems and Cycles:** System of operations of gas turbines – constant volume and constant pressure gas turbines; thermodynamics of Brayton cycle; regeneration – intercooling.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

Reheating and their combinations; closed cycle and semi closed cycle gas turbines.

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

**Rocket Propulsion:** Operating principle; solid and liquid propellants, performance analysis calculations for specific impulse and propulsive efficiency.

**Text Books:**

1. Thermal Engineering – P L Ballaney, Khanna Publishers.
2. Thermodynamics and Heat Engines vol II - R Yadav, Central Publishing House.
3. Thermal Engineering – A.S.Sarao – S.K.Kataria and Sons.
4. Gas Turbine Theory – Cohen and Rogers.
5. Principle of Jet Propulsion and Gas Turbine – Zucrow M J.
6. Gas Turbines- V. Ganeshan Tata Mc. Graw Hill
7. Applied Thermodynamics for Engineering Technologists – T D Eastop and A McConkey, Pearson Education.
8. Heat Engineering – V P Vasandani and D S Kumar, Metropolitan Book Co Pvt. Ltd.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



**Course Name:- Applied Thermodynamics-II Lab**  
**Course Code:- UME-254**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

**List of Experiments:**

1. To prepare heat balance sheet for given boiler
2. To study the working of impulse and reaction steam turbines.
3. To find dryness fraction of steam by separating and throttling calorimeter.
4. To find power out put & efficiency of a steam turbine.
5. To find the condenser efficiencies
6. To study and find volumetric efficiency of a reciprocating air compressor.
7. To study cooling tower and find its efficiency.
8. To find calorific value of sample of fuel using Bomb calorimeter.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Material Science & Engineering**

**Course Code:- UME-255**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>

### **Unit I**

Crystallography: Review of crystal structure, space lattice, crystal planes and crystal directions, co-ordination number, number of atoms per unit cell, atomic packing factor, numerical problems related to crystallography.

Imperfection in metal crystals: Crystal imperfection and their classifications, point defects, line defects, edge & screw dislocations, surface defects, volume defects, and effects of imperfections on metal properties.

### **Unit II**

Solid solutions and phase diagram: Introduction to single and multiphase solid solutions and types of solid solutions, Importance and objectives of phase diagram, systems, phase and structural constituents, cooling curves, unitary & binary phase diagrams, Gibb's phase rule, Lever rule, eutectic and eutectoid systems, peritectic and peritectoid systems, iron carbon equilibrium diagram and TTT diagram.

Heat Treatment: Principles, purpose, classification of heat treatment processes, annealing normalizing, stress relieving, hardening, tempering, carburizing, nitriding, cyaniding, flame and induction hardening. Allotropic transformation of iron and steel, properties of austenite, ferrite, pearlite, martensite.

### **Unit-III**

Deformation of Metals: Elastic and plastic deformation, mechanism of plastic deformation, twinning; conventional and true stress strain curves for polycrystalline materials, yield point phenomena, strain hardening, age hardening work hardening, Bauschinger effect, season cracking. Recovery, re-crystallization and grain growth.

Alloys and alloying elements. Effect of various alloying elements on the mechanical properties. Properties of important alloys used in mechanical engineering practice.

### **Unit IV**

Failures of metals: Failure analysis, fracture, process of fracture, types of fracture, fatigue, characteristics of fatigue, S-N curve, fatigue limit, mechanism of fatigue, factor affecting fatigue, Miner's law, simple numerical problems on fatigue.

Creep & Corrosion: Definition and concept, creep curve, mechanism of creep, impact of time and temperature on creep, creep fracture, creep testing and prevention against creep.

Corrosion: Mechanism and effect of corrosion, prevention of corrosion.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Text Books :**

1. Mechanical Metallurgy – George E. Dieter Jr. Mc. Graw Hill, International Students Edition.
2. Physical Metallurgy – Lakhtin – Mir Publishers, Moscow.
3. Physical Metallurgy – Bijender Singh – Standard Publishers Distributors, New Delhi.

**Reference Books:**

1. Material Science & Engineering - V.Raghavan, Prentice Hall of India Pvt. Ltd., New Delhi.
2. A Text Book of Material Science & Metallurgy – O.P.Khanna, Dhanpat Rai & Sons.
3. Material Science and Engineering – An Introduction – Callister, W.D.John Wiley & Sons. (ASIA) Pvt. Ltd., New Delhi.
4. Elements of Material Science and Engineering : Van Vlack, Wesley Pub. Comp.
5. Engineering Materials: Kenneth G.Budinski, Prentice Hall of India, New Delhi.
6. Mechanics of materials : Kirpal Singh, Standard Publishers Distributors, New Delhi.
7. Heat Treatment of Metals – Bijender Singh – Standard Publishers Distributors, New Delhi.
8. NPTL lectures

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Material Science & Engineering Lab**  
**Course Code:- UME-255**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

**List of Experiments:**

1. To study crystal structures of a given specimen.
2. To study crystal imperfections in a given specimen.
3. To study micro - structures of metals/alloys.
4. To prepare solidification curve for a given specimen.
5. To study heat treatment processes (hardening and tempering) of steel specimen.
6. To study micro - structure of heat treated steel.
7. To study thermo-setting of plastics.
8. To study the creep behavior of a given specimen.
9. To study the mechanism of chemical corrosion and its protection.
10. To study the properties of various types of plastics.
11. To study Bravais lattices with the help of models.
12. To study crystal structures and crystals imperfections using ball models.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Manufacturing Practice**

**Course Code:- UME-256**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

**List of Experiments:**

1. To make a pattern for a given casting with all the necessary allowances, parting line, running system details. Prepare the mold and make the casting. Investigate the casting defects and suggest the remedial measures.
2. To make a component involving horizontal and vertical welding and study the welding defect and suggests their remedies.
3. To prepare a job on surface grinder/cylindrical grinder and measure the various parameters of the finished piece.
4. To cut external threads on a lathe.
5. Manufacture and assembly of a unit consisting of 2 to 3 components to have the concept of tolerances and fits (shaft and bush assembly or shaft, key and bush assembly or any suitable assembly).
6. Leveling of machine tools and testing their accuracy.
7. Disassembly and assembly of small assemblies such as tail stock, bench vice, screw jack etc.
8. Development and manufacture of complex sheet metal components such as funnel etc.
9. Multi slot cutting on milling machine by indexing.
10. Drilling and boring of a bush.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

# Semester-V

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Theory Of Machines-I**

**Course Code:- UME – 300**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>1</b>	<b>2</b>	<b>4.5</b>

### **Unit-I**

**Belts, and Ropes:** Open- Belt and Crossed- Belt Drives, Velocity Ratio, Slip, Material for Belts and Ropes, Crowing of Pulleys, cone (Stepped) Pulleys, Ratio of friction Tension, Power Transmitted, Centrifugal tension, condition for maximum power transmission, Maximum Power Transmitted by a belt, Initial Tension, Numerical problems included

### **Unit-II**

**Cams:** Classification of cams and followers, disc cam nomenclature, construction of displacement, velocity and acceleration diagrams for different types of follower motions, analysis of follower motions, determination of basic dimension, synthesis of cam profile by graphical approach, cams with specified contours, tangent and circular arc cams. Numerical problems included

### **Unit-III**

**Gears:** fundamental law of gearing, involute spur gears, characteristics of involute action, Interference and undercutting, minimum number of teeth required to avoid. Numerical problems Included.

**Gear Trains:** Synthesis of simple, compound and reverted gear trains, analysis of epicyclic gear trains. Numerical problems included

### **Unit-IV**

**Kinematic synthesis of Mechanisms:** Three position synthesis of four bar and slider crank mechanism by analytical method, Freudenstein's equation, precision position, Chebychev spacing, transmission angle. Numerical problems included

**Flywheel:** Turning moment diagram, of single cylinder four stroke engine, double acting steam engine determination of maximum fluctuation of energy, coefficient of fluctuation of energy, coefficient of fluctuation of speed, energy stored in flywheel, dimensions of the flywheel rim, flywheel in engines. Numerical problems included

### **Text Books:**

1. Theory of Machines: S.S.Rattan, Tata McGraw Hill.
2. Theory of Machines by P.L. Ballaney, Khanna Publishers Delhi.
3. Theory of Machines by Dr. R. K. Bansal, Laxmi publication (P) Ltd.
4. Theory of Mechanism & Machines by Sharma & Publication PH-I learning Pvt. Ltd,
5. Mechanism and Machine Theory: J.S.Rao and R.V.Dukkipati Second Edition New age International.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

6. Theory of Machines and Mechanisms: Joseph Edward Sigley and John Joseph Uicker, Jr. Second Edition McGraw Hill, Inc.
7. Theory of Mechanisms and Machines : Amitabha Ghosh and Ashok Kumar Mallik, Third Edition Affiliated East West Press

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



**Course Name:- Theory Of Machines-I Lab**

**Course Code:- UME – 300**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

**List of Experiments:**

1. To study various types of kinematic links, Pairs, Chains and Mechanisms.
2. To study four Bar Mechanisms, Single and Double slider crank mechanisms.
3. To plot slider Displacement, Velocity and Acceleration against crank rotation of Single Slider Crank mechanism.
4. To find Co-efficient of friction between Belt and Pulley.
5. To study various type of Cam and Follower arrangements.
6. To plot follower displacement vs. cam rotations for various Cam Follower systems.
7. To generate spur gear involute tooth profile using simulated gear shaping process.
8. To study various types of gears : Spur, Helical, Double Helical, Spiral, Rack & Pinion, Worm & Worm Wheel & Bevel gears.
9. To study various types of gear trains, Simple, Compound, Reverted, Epicyclic and Differential.
10. To study the working of Screw Jack and determine its efficiency.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Machine Design – I**

**Course Code:- UME – 301**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
2	4	2	4

### **Unit-I**

Introduction, Scope and meaning of design with special reference to machine design, design process. Concept of tearing, bearing, shearing, crushing, bending etc. Selection of materials, mechanical behaviour of materials, Fabrication characteristics of materials. Stress concentrations, Factor of safety under different loading conditions, stress concentrations factors. Design stresses for variable and repeated loads, endurance limit, and fatigue. Fits, tolerances and surface finish.

### **Unit-II**

Design of Cotters Joints. Design of knuckle joints. Design of Power Screws and Bolts, Preloaded bolts subjected to shear, tension and torque, eccentrically loaded bolted joints.

### **Unit-III**

Design of Welded and Riveted Joints, eccentrically loaded welded and riveted joints. Design of rigid and flexible couplings. Design of Keys

### **Unit-IV**

Design of Shafts. Design of Pipe Joints. Design of connecting Rod, Cylinder and Piston of I.C. Engine.

**Practical or live field assignment is given to all the students in small groups to make sure students can learn the design process of various mechanical components using solid modeling software.**

### **Text Books:**

1. Machine Design Shigle, J.E.; Mischke McGraw Hill, New York, 6<sup>th</sup> edition.
2. Machine Design P.H. Black, McGraw Hill, New York, 1985
3. BOOK: of Machine Design P.C. Sharma & D. K. Aggarwal, S. K. Kataria & Sons, New Delhi, 1997.
4. Machine Design Robert L. Norton Pearson.
5. Machine Design R. C. Behl and V. K. Goel, standard Publishers, Distributors, Delhi,

**Note:** The paper setter will be required to mention in the note in the question paper that the use of only PSG Design Data book by K. Mahadeven, Balaveera Reddy is permitted

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Engines Internal Combustion Engines**

**Course Code:- UME – 303**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 2 4.5**

### **Unit-I**

Introduction: I.C.Engines and their classification, Piston – Cylinder Arrangement and Related Terms, parts and their functions, Cycle of operation of four stroke and two stroke Engines, Applications. Analysis of Air Standard Otto, Diesel and Dual Cycles, Air Standard Efficiency and Mean Effective Pressure, Deviation of Actual Engine Cycle from Ideal Cycle, Valve Timing Diagrams for I.C.Engines, Wankel Engine. Two Stroke Engines: Principle of working, Scavenging and Scavenging Methods, Port Timing Diagram, Merits and Demerits, Applications, Comparison with Four Stroke Engines.

### **Unit-II**

Carburetion and Fuel Ignition Systems: Purpose, Main Requirements and Principle of a Carburetor, Constructional and Operational Details of a Single jet Carburetor, Compensating Devices, Salient Features and Comparative Merits/Demerits of Battery Ignition system and Magneto Ignition System, Timings and Spark Advance, Introduction to Basic Electronic Petrol Injection System, and Multipoint Fuel Injection System.

Fuel Injection in CI Engines: Requirements of Diesel Fuel Injection System, Air Injection and Airless Injection systems, constructional and Operational Details of Fuel Pump and Fuel Atomizer.

### **Unit-III**

Combustion Process: Stages of combustion in S.I.Engines, Flame Ignition and Propagation, Effect of Engine Variables on Flame Speed, Pre-Ignition and Detonation, Engine Variables Affecting Detonation, Theories of Detonation, Highest Useful Compression Ratio and Octane Rating of Fuels. Combustion in CI Engines, Effect of Operating Variables on Delay Period and Diesel Knock, Comparison between Knocking in SI and CI Engines, Rating of Diesel Fuel – Cetane Number and Diesel Index. Types of Combustion chambers.

Cooling and Lubrication Systems: Need for Cooling, Classification of Cooling Systems – Thermo System, Radiator and Air-Cooling Systems. Function of a Lubricating System, Splash and Pressure Lubrication System, Wet and Dry Sump Lubrications, Lubrication of different Engine Parts, S.A.E. Rating of Lubricants.

### **Unit-IV**

Engine Testing and Performance: Purpose of Testing, Performance Parameters: Brake Power, Indicated Power, Mechanical Efficiency, Fuel and Air Consumption. Thermal Efficiency and Specific Fuel consumption. Heat balance Calculations and Performance Maps. Supercharging: Objective, Effects and its limits in SI and CI Engines, Numerical Problems. 06 Engine Pollution

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

and Alternative Fuels: Pollutants from SI and CI Engines, Methods of Emission Control, Alternate Fuels – Alcohol, LPG, Hydrogen, CNG, Biogas, Relative Merits and Demerits of these Fuels, Introduction to Alternate engines

**Text Books:**

1. Internal Combustion Engines – V.Ganeshan, Mc. Graw Hill.
2. Automobile Engg. Vol.-II, Dr. Kirpal singh, Standard Publishers Distributors, Delhi.
3. Internal Combustion Engines – Mathur and Sharma, Dhanpat Rai and Sons.
4. Internal Combustion Engines- Dom Kundwar , Dhanpat Rai and Sons.
5. Internal Combustion Engines – Romalingum, Scitech Publication.
6. IC Engines – Maleev, McGraw Hill.
7. Mechanics of Automotive Engines – Srockan.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Internal Combustion Engines Lab**

**Course Code:- UME – 303**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

**List of Experiments:**

1. To study the constructional details and working principles of two-stroke/four stroke petrol engine.
2. To study the constructional details and working of two-stroke/four stroke diesel engine.
3. Analysis of exhaust gases from single cylinder/multicylinder diesel/petrol engine by Orsat Apparatus.
4. To prepare heat balance sheet on multi-cylinder diesel engine/petrol engine.
5. To find the Indicated Power (IP) 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) BP, IP, FP, vs speed. (ii) Volumetric Efficiency and Indicated Specific Fuel Consumption vs speed.
7. To find FP of a multi-cylinder diesel engine/petrol engine by Willian's line method and by motoring method.
8. To perform constant speed performance test on a single cylinder/multi cylinder diesel engine and draw curves of (i) BP vs fuels rate, air rate and A/F and (ii) BP Vs. mech efficiency and bsfc.
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 / multicylinder diesel engine

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Manufacturing Technology – II**

**Course Code:- UME – 304**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **Unit-I**

Mechanism of Metal Cutting: Deformation of metal during machining, nomenclature of lathe, mechanics of chip formation, built-up edges, mechanics of orthogonal and oblique cutting, Merchant cutting force circle and shear angle relationship in orthogonal cutting, factors affecting tool forces. Cutting speed, feed and depth of cut, surface finish. Temperature distribution at tool chip interface. Numericals on cutting forces and Merchant circle.

### **Unit-II**

Cutting Tool Materials and Cutting Fluids: Characteristics of tool materials, various types of cutting tool materials, coated tools, cutting tool selection, Purpose and types of cutting fluids, basic actions of cutting fluids, effect of cutting fluid on tool life, selections of cutting fluid. Tool Wear and Machinability: Types of tool wear, tool life, factors governing tool life, Machinability: Definition and evaluation, Economics of machining, Numericals on tool life.

### **Unit-III**

Gear Manufacturing: Introduction, methods of manufacture, Gear generation and forming: Gear cutting by milling, single point form tool, gear hobbing and shaping, Gear finishing operations: Gear shaving, gear burnishing, gear grinding, lapping.

Jigs & Fixtures: Introduction, location and location devices, clamping and clamping device, Types of Jigs & Fixtures.

### **Unit-IV**

Unconventional Machining Processes: Abrasive jet machining: Principles, applications, process parameters, Ultrasonic machining: Principles, applications, analysis of process parameters. Electro-chemical machining and grinding: Principles, classifications, choice of electrolytes, applications. Electric discharge machining: Principles, selection of tools materials and dielectric fluid. Electron beam machining: Generation of electron beam, relative merits and demerits. Laser beam machining: Principles and applications. Plasma Arc machining , Hot machining.

### **Text Books:**

1. Manufacturing Technology – Metal cutting and machine Tools: P.N.Rao, Tata McGraw hill, New Delhi.
2. Introduction to Jig and Tool Design : Kempster M.H.A., Hodder & Stoughton, England.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

3. Principles of Machine Tools – F.C.She & A.Bhattacharya, Tata McGraw Hill, New Delhi.
4. Manufacturing Engineering & Technology, Kalpakjian, Scrope Addison – Wesley Publishing Co. New York.
5. Modern Machining Processes: P.C.Pandey &H.S.Shan, Tata McGraw Hill Company, New Delhi.
6. Text Book of Production Engineering: P.C.Sharma, S.Chand & Sons.

**Course Name:- Operations Research**

**Course Code:- UMA – 300**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3.5</b>

### Unit-I

Definition and characteristics of O.R.; Decision making, Scientific decision making, Approach for scientific decision making in O.R.; Need and Limitations of O.R.

**Definition of models:** Classification of models, construction of models, approximations of O.R. models. Types of mathematical models (Brief introduction), Role of computers in O. R Allocation Model: Analysis of Industrial situations to find characteristics like key decision objective, possible alternatives & restrictions – Three categories of allocation type situation to be considered General Mathematical formulation for linear programming feasible and optimal solutions.

### Unit-II

**Linear Programming:** Graphical and simplex techniques to solve linear models, modifications of minimization situation so as to be solvable by simplex method. Duality and degeneracy in simplex method. Applications and limitations of linear optimization models.

**Transportation models,** methods of finding starting solution Vogel's approximation method to find feasible solution in transportation models, methods for finding optimal solution.

**Assignment model:** Hungarian method to find optimal solution in assignment models. Cyclic shortest route models, traveling salesman's problem.

### Unit-III

**Sequencing models:** Situation, Assumption, shortest Processing Time (SPT) rule, Earliest due date rule, Slack time Remaining rule and minimal path problem (Shortest acyclic route).

**Replacement Models:** Maintenance cost increase with time without change in value of money, Maintenance cost increase with time with change in value of money with time.

**Simulation Techniques:** Monto Carlo Simulation, application in various situation.

**Queuing theory:** Elements of a queuing system, characteristics of queuing system Kendall's Notation for modales, model I [ (M/M/I) : (FCFS/8/8)]

### Unit-IV

**Net-work Models :** PERT & CPM: Network situations where PERT & CPM can be applied , planning, scheduling & Control, work-breakdown structure.

- (a) PERT NETWORKS: Events and activities, construction of network, forward & backward planning, Fulkerson's rules, optimistic, pessimistic & most likely time estimates, frequency distribution, Mean, variance and standard deviation, expected

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



- time and latest occurrence time, definitions of slack and critical path.
- (b) CPM NETWORKS: Similarity and differences of CPM and PERT construction of network, earliest event time, float, total float, free float, independent float, contracting the network so as to find an optimum project schedule.
  - (c) cost analysis and crashing the network

**Text Books:**

1. An introduction to operation research by A.H.Taha Mac. Mill. Pub.
2. Operation research by P.K.Gupta and D.S.Hira.

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**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

# ELECTIVE-1

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Fluid Machines**

**Course Code:- UME – 302**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>1</b>	<b>2</b>	<b>4.5</b>

### Unit-I

**Impact of free jets:** Impulse – momentum principle, jet impingement – on a stationary flat plate and on a hinged plate – on a moving flat plate – at the centre of a stationary vane, a moving vane and a series of vanes Jet striking tangentially at the tip of a stationary vane and a moving vane, jet propulsion of ships.

**Impulse Turbines:** Classification – impulse and reaction turbines, water wheels, component parts, construction, operation and governing mechanism of a Pelton wheel, work done, effective head available head and efficiency of a pelton wheel, design aspects, speed ratio, flow ratio, jet ratio number of jets, number of buckets and working proportions, Performance Characteristics, Numerical Problems.

### Unit-II

**Francis Turbines:** Component parts, construction and operation of a Francis turbine, governing mechanism, work done by the turbine runner, working proportions and design parameters, slow medium and fast runners, degree of reaction, inward/outward radial flow reaction turbines, Performance Characteristics.

**Propeller and Kaplan turbines:** Component parts, construction and operation of a Kaplan turbine, differences between the Francis and Kaplan turbines, draft tube – its functions and different forms, Performance Characteristics.

### Unit-III

**Dimensional Analysis and Model Similitude:** Dimensional homogeneity, Rayleigh's method and Buckingham's Pitheorem, model studies and similitude, dimensionless numbers and their significance. Unit quantities, specific speed and model relationships for turbines, scale effect cavitations – its causes, harmful effects and prevention, Thomas cavitation number.

**Hydraulic systems:** Function, construction and operation of: Hydraulic accumulator, hydraulic intensifier, hydraulic crane, hydraulic lift and hydraulic press, Hydraulic ram.

### Unit-IV

**Centrifugal Pumps:** Classification, velocity vector diagrams and work done, hydraulic and manometric efficiency, vane shape, head capacity relationship and pump losses, pressure rise impeller, minimum starting speed, multi-stage pumps, Similarity relations and specific speed, net positive suction head, cavitation and maximum suctions lift, performance characteristics.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Reciprocating Pumps:** Construction and operational details, discharge coefficient, volumetric efficiency and slip, work and power input, effect of acceleration and friction on indicator diagram (pressure Vs stroke length) air vessels and their utility. Centrifugal Vs. Reciprocating pumps.

**Text Books:**

1. Hydraulics and Fluid Mechanics – Modi & Seth, Pub. – Standard Book House, N.Sarak, Delhi.
2. Hydraulic Machines – V.P.Vasandani.
3. Hydraulic Machines – Jagdish Lal.
4. Introduction to Fluid Mechanics and Fluid Machines: S.K.Somand G.Biswas, Tata McGraw Hill.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Fluid Machines**

**Course Code:- UME – 302**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

**List of Experiments:**

1. To study the constructional details of a Pelton turbine and draw its fluid flow circuit.
2. To draw the performance characteristics of Pelton turbine constant head, constant speed and constant efficiency.
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 constructional 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 characteristic curves.
9. To study the constructional details of a Hydraulic Ram and determine its various efficiencies.
10. To study the constructional details of a Centrifugal compressor.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Mechanical Behavior Of Materials**

**Course Code:- UME – 306**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 2 4.5**

### **Unit-I**

Elasticity in metals and polymers– Strengthening mechanisms, work hardening, solid solutioning, grain boundary strengthening, poly phase mixture, precipitation, particle, fibre and dispersion strengthening. Effect of temperature, strain and strain rate on plastic behaviour – Super plasticity – Griffith's theory,– Ductile, brittle transition in steel – High temperature fracture, creep – Larson Miller parameter – Deformation and fracture mechanism maps.

### **Unit- II**

Stress intensity factor and fracture toughness – Fatigue, low and high cycle fatigue test, crack initiation and propagation mechanisms and Paris law.- Safe life, Stresslife, strain-life and fail - safe design approaches -Effect of surface and metallurgical parameters on fatigue – Fracture of non metallic materials – Failure analysis, sources of failure, procedure of failure analysis.

### **Unit- III**

Motivation for selection, cost basis and service requirements – Selection for mechanical properties, strength, toughness, fatigue and creep – Selection for surface durability corrosion and wear resistance – Relationship between materials selection and processing – Case studies in materials selection with relevance to aero, auto, marine, machinery and nuclear applications – Computer aided materials selection.

### **Unit -IV**

Dual phase steels, High strength low alloy (HSLA) steel, Transformation induced plasticity (TRIP) Steel, Maraging steel, Nitrogen steel – Intermetallics, Ni and Ti aluminides – smart materials, shape memory alloys – Metallic glass and nanocrystalline materials. engineering polymers – Advanced structural ceramics, WC, TIC, TaC, Al<sub>2</sub>O<sub>3</sub>, SiC, Si<sub>3</sub>N<sub>4</sub> CBN and diamond – properties, processing and applications.

### **Reference Book:**

1. George E.Dieter, Mechanical Metallurgy, McGraw Hill, 1988
2. Thomas H. Courtney, Mechanical Behavior of Materials, (2nd edition), McGraw Hill, 2000
3. Charles, J.A., Crane, F.A.A. and Fumess, J.A.G., Selection and use of engineering materials, (34d edition), Butterworth-Heiremann, 1997.
4. Flinn, R.A., and Trojan, P.K., Engineering Materials and their Applications, (4th Edition) Jaico, 1999.
5. Metals Hand book, Vol.10, Failure Analysis and Prevention, (10th Edition), Jaico, 1999.
6. Ashby M.F., materials selection in Mechanical Design 2nd Edition, Butter worth.
7. NPTL lectures

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Mechanical Behavior Of Materials Lab**  
**Course Code:- UME – 306**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

### **LIST OF EXPERIMENTS**

1. Perform a tensile test to measure the resistance of a material to a static or slowly applied force.
2. To introduce the principles of indentation hardness testing, emphasizing the limitations and significance of the results.
3. To conduct Charpy V-notch impact test and determine the ductile-brittle transition temperature of steels.
4. To demonstrate how fatigue tests are conducted and how to interpret results
5. To study the structural characteristics or constitution of a metal or an alloy in relation to its physical and mechanical properties.
6. To examine the nature of inhomogeneities and flow lines in a metal by unaided eye or with the aid of a low-powered microscope or magnifying glass.
7. To study hardness as a function of quench rate and investigate the hardenability of steels
8. To gain experience with and understanding of the types, advantages and applications of various NDT methods. To be able to choose the best NDT method for a given part.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



**Course Name:- Advanced Welding Technology**

**Course Code:- UME – 305**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 2 4.5**

### **Unit- I**

Introduction: Importance and application of welding, classification of welding process, Selection of welding process. Review of Conventional Welding Process: Gas Welding, Arc Welding, MIG, TIG Welding, SAW, Resistance Welding, Electro slag Welding, Friction Welding.

### **Unit -II**

Advanced Welding Techniques – Principle and working and application of advanced welding techniques such as Plasma Arc Welding, Laser Beam Welding, Electron beam welding, Ultrasonic Welding etc.

### **Unit- III**

Advanced Welding Techniques – Principle and working and application of advanced welding techniques such as explosive welding/ cladding, Underwater welding, spray welding hard facing. Weld Design: Weld defects and distortion and its remedies, Inspection / testing of welds, Macrostructure & microstructure of welds, HAZ Weld Design, Welding of pipelines and pressure vessels, Life prediction. Techniques for welding of specific materials like steel, copper, Titanium

### **Unit IV**

Thermal and Metallurgical Consideration: Thermal consideration for welding, temperature distribution. Analytical analysis, Metallurgical consideration of Weld, HAZ and Parent metal, structure solidification of weld

### **Text Book:**

1. Welding Hand Book American Welding Society
2. Advanced Welding Techniques by R. S. Parmar.
3. NPTL lectures

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Advanced Welding Technology Lab**  
**Course Code:- UME – 306**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

### **LIST OF EXPERIMENTS**

1. (Arc welding) Fusion run without and with filler rod on M.S. sheet 2 mm thick in flat position.
2. (Arc welding) Edge joint on MS sheet 2 mm thick in flat position with out filler rod.
3. (MIG Welding) Setting up of GMAW welding machine & accessories and Striking an arc
4. (MIG Welding) Depositing straight line beads on M.S Plate Fillet weld
5. (MIG Welding) “T” joint on M.S plate 10mm thick in flat position by Dip transfer
6. (TIG Welding) Fillet weld – “T” joint on Aluminium sheet 1.6 mm thick in flat position.
7. (TIG Welding) Fillet weld – Outside corner joint on Aluminium sheet 2 mm thick in flat position.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Advanced Foundry Technology**

**Course Code:- UME – 309**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>1</b>	<b>2</b>	<b>4.5</b>

### **Unit -I**

**Introduction:** Design advantages of casting, Advantages of casting process, Metallurgical advantage. Technology of pattern making requirement, Pattern material, wood & wood product, plaster, Plastics and rubbers, Polyesters resins waxes, Machines and tools for pattern making machine for wood pattern making, Machines for metal pattern making, Allowance and other Technological considerations – contraction allowance, Machining allowance, Draft or taper allowance, Rapping and shake allowance, Distortion allowance, Core Prints, Core boxes, Use of loose pieces.

### **Unit -II**

**Technology of moulding and core making:** Moulding sands, Principal ingredients of molding sands, Specification and testing of moulding sands, Classification of Moulding sands, Additives to moulding and Core making sands, Mould Dressings. Sand Conditioning, Sand Preparation equipment.

### **Unit -III**

**Moulding processes:** Types of sand moulding, Tools for hand moulding, Characteristics of cores and core sands, Types of cores, Use of chaplets, Machine moulding, Core making machines, Processes based on organic binders

### **Unit -IV**

**Technology of metal mould casting processes:** Permanent mould casting, Types of die casting machines, Centrifugal casting, Continuous casting, Electro slag casting, Gating system, Riser of casting, Economic considerations, Melting equipments for foundries, Defects in casting.

### **Text Books:**

1. Principal of Foundry Technology – P L Jain, Tata Mc Grew Hill
2. NPTL lectures

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Advanced Foundry Technology Lab**

**Course Code:- UME – 309**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

### **LIST OF EXPERIMENTS**

1. Visit to a foundry, layout of foundry shop, report on casting quality control and diagnosis of defects in castings components
2. Preparation of sand moulds using a simple pattern, selection of parting line, location of sprue, runner, ingates & risers.
3. Inspection of finished mould, determination of mould hardness
4. To melt and pour iron metal into the mold. (a)
5. To melt and pour iron metal into the mold. (b)
6. To melt and pour iron metal into the mold. (c)
7. To melt and pour iron metal into the mold. (d)
8. Study of all the castings prepared

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Manufacturing Processes-III**

**Course Code:- UME – 308**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 2 4.5**

### **Unit- I**

Types of cutting tools, tool materials-HSS(including heat treatment)ceramics, cements, CBN &PCD ,tool geometry and nomenclature ,selection of tool materials and tool life,, tool wear and mach inability.

### **Unit -II**

Mechanics of chip formation ,types of chips and conditions conducive for the formation of each type Built-up edge, its effects Orthogonal Vs oblique cutting- merchant's force circle diagram. Force and velocity relationship, shear plane angle. Energy consideration in machining-Ernst Merchant theory of shear angle, relationship-original assumptions and modification made.

### **Unit- III**

Lathe, types of lathes-special purpose lathes-kinematics arrangement of lathe, -work holding devices-types of milling machines-types of milling machine-schematic diagrams,-operations, milling cutters-mounting of cutters-Drilling machines-types-reaming and boring operations

### **Unit-IV**

Schematic diagram of boring machine, shaper, planer, slotting and broaching machine-operations-tools. Grinding and allied finishing process Forces, power consumption in machinery Forces and power consumption in turning,drilling,milling and grinding, forces in up and down milling, chip thickness calculation, specific cutting pressure and horsepower requirement.Tool dynamometer construction and operation.

### **Text Books:**

1. Shaw M.C., " Metal cutting principles ", Oxford, Clarendon Press, 1984.
2. Bhattacharya A. " Metal Cutting Theory and Practice ", New Central Book Agency (p) Ltd., Calcutta, 1984
3. Venkataesh V.C and Chandrasekaran. H " Expermental Techniques in Metal Cutting ", Prentice Hall of India, 1982.
4. Xing Sheng Li & Low.I.M., Editors, " Advanced ceramic tools for machining Applications"
5. Kemster M.H.A, " Introduction to Jigs and tool design ", ELBS EDN, 1976.
6. NPTL lectures

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Manufacturing Processes-III lab**

**Course Code:- UME – 308**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

### **LIST OF EXPERIMENTS**

1. Make a practice on different cutting tools
2. To study the mechanism of chip formation
3. A prepare a job on special purpose lathe
4. To Study the forces in turning, drilling, milling and grinding
5. To study the different types of multipoint cutting tools
6. Study of Merchant force circle diagram practically
7. Study of the different types of finishing operations

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

# Semester-VI

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Theory Of Machines-II**

**Course Code:- UME – 350**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 2 4.5**

### **Unit-I**

**Static and Dynamic Force Analysis:** Static force analysis of planar mechanisms, dynamic force analysis including inertia and frictional forces of planar mechanisms. Numerical problems included Balancing of Rotating Components: Static balance, dynamic balance, balancing of rotating masses, two plane balancing, graphical and analytical methods, balancing machines. Numerical problems included 05

### **Unit-II**

**Dynamics of Reciprocating Engines:** Engine types, indicator diagrams, gas forces, equivalent masses, inertia forces, bearing loads in a single cylinder engine, crankshaft torque, engine shaking forces. Numerical problems included Balancing of Reciprocating Parts: Balancing of single cylinder engine, balancing of multi cylinder; inline, radial and V type engines. Numerical problems included.

### **Unit-III**

**Governors:** Introduction, types of governors, characteristics of centrifugal governors, gravity controlled and spring controlled centrifugal governors, hunting of centrifugal governors. Numerical problems included.

### **Unit-IV**

**Dynamometers:** types of dynamometers, prony brake, rope brake and band brake dynamometers, belt transmission dynamometer, torsion dynamometer, hydraulic dynamometer. Numerical problems included.

Gyroscope: precession angular motion and gyroscopic couple and their effects on aeroplane, ship during steering, rolling and pitching. Stability of four wheel vehicles moving on curved paths. Numerical problems included

### **Text Books:**

1. Theory of Machines: S.S.Rattan, Tata McGraw Hill.
2. Theory of Machines: Dr. R. K. Bansal, Laxmi Publication, New delhi
3. Mechanism and Machine Theory: J.S.Rao and R.V.Dukkipati Second Edition New age International.
4. Theory of Machines and Mechanisms: Joseph Edward Sigley and John Joseph Uicker, Jr. Second Edition McGraw Hill, Inc.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



5. Theory of Mechanisms and Machines : Amitabha Ghosh and Ashok Kumar Mallik, Third Edition Affiliated East West Press.
6. Theory of Machines: V. P. Singh, Dhanpat Ray & Sons, Delhi
7. Theory of Machines: P.L Ballaney, Khanna Publishers, New Delhi

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Theory Of Machines-II lab**

**Course Code:- UME – 350**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

**List of Experiments:**

1. To study function and construction of Porter Governor and Hartnell Governor.
2. To compare actual speed with theoretical speed in case of Porter Governor.
3. To verify that ratio of increase in centrifugal force to increase in radius of rotation is constant in Hartnell Governor.
4. To study gyroscopic effect through models.
5. To verify gyroscopic couple equation on motorized gyroscope.
6. To perform experiment for Static and Dynamic Balancing on Static and Dynamic Balancing Apparatus.
7. To determine the moment of inertia of Connecting Rod by compound pendulum method

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Machine Design-II**

**Course Code:- UME – 351**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>2</b>	<b>4</b>	<b>0</b>	<b>4</b>

### Unit-I

**Gears:** Classification, Selection of gears, Terminology of gears, Force analysis, Selection of material for gears, Beam and wear strength of gear tooth, form or Lewis factor for gear tooth, Dynamic load on gear and Buckingham equation and Design of spur, helical, bevel & worm gear including the consideration for maximum power transmitting capacity, Gear Lubrication, Design Problems.

### Unit-II

**Bearings:** 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, types of lubrication – Boundary, mixed and hydrodynamic lubrication, Design of journal bearings using Raimondi and Boyd's Charts, Lubricants and their properties, Selection of suitable lubricants, Design Problems

### Unit-III

**Clutches & Brakes:** Various types of clutches in use, Design of friction clutches, Disc, Multidisc and Cone type. Various types of brakes, Self energizing condition of brakes, Design of shoe brakes – Internal & external expanding, band brakes.

**Flywheel:** Turning Moment diagram, Coefficient of fluctuation of energy and speed, design of flywheel – solid disk and rimmed flywheels.

### Unit-IV

**Springs:** Types of Springs, Design for helical springs against tension and their uses. Compression and fluctuating loads, Design of leaf springs, Surging phenomenon in springs. Design problem.

**Belt, rope and chain drives:** Design of belt drives, Flat & V-belt drives, Conditions for Transmission of max. Power, Selection of belt, design of rope drives

### Text Books:

1. Machine Design Shigle, J.E.; Mischke McGraw Hill, New York, 6th edition.
2. Machine Design P.H. Black, McGraw Hill, New York, 1985
3. BOOK: of Machine Design P.C. Sharma & D. K. Aggarwal, S. K. Kataria & Sons, New Delhi, 1997.
4. Machine Design Robert L. Norton Pearson.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

5. Machine Design R. C. Behl and V. K. Goel, standard Publishers, Distributors, Delhi, 1982.

**Note: The paper setter will be required to mention in the note in the question paper that the use of PSG and Design Data hand book by K. Mahadevan & K. Balaveera Reddy are permitted.**

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Measurement And Control**

**Course Code:- UME – 353**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>

### Unit-I

**General Concept:** Definition: Measurement and Instrumentation; standards of Measurements: Primary, secondary and working; need and classification of measurements and instruments; Generalized measurements systems and its functional elements. Comparison between Mechanical and electrical/ electronic instruments and factors related to selection of instruments. Static and Dynamic characteristics of Instruments

Static characteristics: Calibration, Static Range and span, accuracy and precision, Repeatability and Reproducibility, Drift, hysteresis, dead zone and Dead time, sensitivity and linearity, threshold and resolution Numericals. Dynamic characteristics: speed of response, lag, fidelity and dynamic error. Standard test signals/inputs: Step, Ramp or Linear and Sinusoidal: derivation of standard form of zero, first and second order systems.

Error in Measurement Concept: Accuracy, error and Correction, Numerical; Sources of errors, systematic and random errors: Statistical analysis of test data; statistical averages, dispersion from mean, Numericals.

### Unit-II

**Functional Elements:** Detector- transducer Electro - mechanical sensors and transducers - Definition and classification; variable resistance, inductance and capacitive type, photo cells and piezo-electric pick-up and application of these elements for measurement of position/displacement, speed/velocity/acceleration, force and liquid level etc.

**Strain Measurements** - Resistances strain gauges, gauge factor, bonded and unbonded gauges, surface preparation and bonding technique, strain gauge circuits signal conditioning and bridge circuits, temperature compensation, Application of strain gauges for direct, bending and torsional loads.

### Unit-III

**Pressure and Flow Measurement:** Bourdon tube, diaphragm and bellows, vacuum measurement – McLeod gauge, thermal conductivity gauge and ionisation gauge, Dead weight gauge tester, Electromagnetic flux meters, ultra-sonic flow meters and hot wire anemometer: Flow visualisation technique

**Temperature Measurement:** Thermal expansion methods – bimetallic thermometers, liquid-in-glass thermometer and filled-in-system thermometers, thermo-electric sensors-common thermo couples, reference junction considerations, special materials and configurations: metal resistance thermometers and thermistors; optical and total radiation pyrometers, calibration standards.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Speed, Force, Torque and Shaft Power Measurement:** Mechanical tachometers, vibration and tachometer and stroboscope; proving ring, hydraulic and pneumatic load cells, torque on rotating shafts, absorption, transmission and driving dynamometers.

#### **Unit-IV**

**Controls:** Control system - open and closed loop system; elements of a control system; servo mechanism, process control and regulators. Transfer function; block diagram and overall transfer function of a multi loop control system, signal flow graph and Mason's Rule, system stability – Routh and Harwitz criteria stability; Time and frequency domain Nyquist plot for stability study.

#### **Text Books**

1. Measurement system: Application and Design by Doebelin E.O., McGraw Hill Publishing Company.
2. Experimental Method for Engineers by Holman J.P., McGraw Hill Publication Company
3. Mechanical Measurement and Control by Kumar D.S., Metropolitan Book Co. Pvt. Ltd., New Delhi.
4. Mechanical Measurement and Instrumentation by R. K. Rajput, S. K. Kataria & Sons, New Delhi
5. Automatic Control System by Kuo B.C., Prentice Hall.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Measurement And Control Lab**  
**Course Code:- UME – 353**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

**List of Experiments:-**

1. Study of the use of a planimeter for area measurement.
2. Calibration of pressure-gauge with the help of a dead weight gauge tester.
3. Preparation of a thermocouple for measurement of temperature and a study of the use of potentiometer in temperature measurement with the help of a thermocouple.
4. Use of a tachometer and stroboscope for measurement of speed of a shaft.
5. Measurement of torque with the help of an absorption dynamometer.
6. Study of the use of a strain gauge for displacement measurement.
7. Measurement of flow with the help of obstruction meters.
8. Use of Pitot tube to plot the velocity profile of a fluid flow through a circular duct.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Industrial Automation & Robotics**

**Course Code:- UME– 354**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>

### **Unit-I**

**Introduction to Automation:** Concept of Automation, reasons for Automating, Arguments for and against Automation, Automation Strategies, Economical Considerations, Low cost Automation, Advantages of Automation.

**Fluid Control Components:** Fluid, power control elements, Hydraulic & Pneumatic valves, Flow and direction control valves, Metering valve, Hydraulic Servo System, Fluid power symbols.

**Control Systems:** Adaptive control, sequence control and programmable controllers, computer process control.

### **Unit-II**

**Transfer Device, Feeders & Material Handling:** Detroit- Type Automation, Analysis of Automated flow lines, Automated assembly System & Automated Material Handling.

**Automated Inspection & Testing:** Automated Inspection, Principles and Methods, sensor technologies for automated inspection, co-ordinate measuring machines, other contact inspection methods, machine vision, optical inspection methods, Non-Contact Inspection Methods.

### **Unit-III**

**Robotics:** Basic Concepts Definition and origin of robotics – different types of robotics – various generation of robots – degrees of freedom – Asimov's laws of robotics – dynamic stabilization of robots.

**Power Sources and Sensors:** Hydraulic, pneumatic and electric drives – determination of HP of motor and gearing ratio – variable speed arrangements – path determination – micro machines in robotics – machine vision – ranging – laser – acoustic – magnetic, fiber optic and tactile sensors.

### **Unit-IV**

**Manipulators, Actuators and Grippers:** Construction of manipulators – manipulator dynamics and force control – electronic and pneumatic manipulator control circuits – end effectors –  $\hat{U}$  various types of grippers – design considerations.

**Industrial Applications:** Applications of Robots: Welding, parts handling / transfer, assembly operations, parts sorting, parts inspection, future applications.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



**Text Book:**

- 1 Automation Production System & Computer Integrated Manufacturing. Mikell P. Grover
- 2 Robotics & Flexible Automation S.R. Deb
- 3 Pneumatic Control and Hydraulic Control S.R. Majundar
- 4 Ghosh, Control in Robotics and Automation: Sensor Based Integration, Allied Publishers, Chennai, 1998.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Industrial Automation & Robotics Lab**  
**Course Code:- UME – 354**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

**List of Experiments:-**

1. Study of different types of hydraulic and pneumatic valves, sensors, actuators and demonstration of their working.
2. Demonstration and working of power steering mechanism.
3. Design and assembly of different hydraulic circuits using different hydraulic control valves.
4. Design and assembly of pneumatic circuits using different pneumatic control valves.
5. Study of reciprocating movement of double acting cylinder using pneumatic direction control valves.
6. Study of robotic arm and its configuration.
7. Study the different types of robotic end effectors.
8. Study of different types of material handling devices used in industry.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Heat Transfer**

**Course Code:- UME- 355**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>1</b>	<b>2</b>	<b>4.5</b>

### **Unit-I**

Steady State Heat Conduction: Introduction, I-D heat conduction through a plane wall, long hollow cylinder, hollow sphere, Conduction equation in Cartesian, polar and spherical coordinate systems. Steady State Conduction with Heat Generation: Introduction, 1 – D heat conduction with heat sources, Extended surfaces (fins), Fin effectiveness 2-D heat conduction.

### **Unit-II**

Transient Heat Conduction: Systems with negligible internal resistance, Transient heat conduction in plane wall, cylinders, spheres with convective boundary conditions, Chart solution, Relaxation Method, Numericals.

Convection: 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 of planes and cylinders.

### **Unit-III**

Thermal Radiation: 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.

### **Unit-IV**

Heat Exchangers: Classification, Performance variables, Analysis of a parallel/counter flow heat exchanger, Heat exchanger effectiveness.

Heat Transfer with change of Phase: Laminar film condensation on a vertical plate, Drop-wise condensation, Boiling regimes, Free convective, Nucleate and film boiling.

### **Text Books:**

- 1 Heat Transfer – J.P.Holman, John Wiley & Sons, New York.
- 2 Fundamentals of Heat and Mass Transfer – Incropera, F.P. & Dewill, D.P.-John Willey & Sons, New York.
- 3 Heat Transfer – D.S.Kumar, Kataria & Sons, Delhi.
- 4 Conduction of Heat in Solids – Carslow, H.S. and J.C.Jaeger – oxford Univ. Press.
- 5 Conduction Heat Transfer – Arpasi, V.S. – Addison – Wesley.
- 6 Engg. Heat Transfer – C.P.Gupa Nem Chand & Brothers, Roorkee.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

- 7 Compact Heat Exchangers – W.M.Keys & A.L.Landon,Mc. Graw hill.
- 8 Thermal Radiation Heat Transfer – Siegel, R. and J.R.Howell, Mc.Gaw Hill.
- 9 Heat Transmission – W.M., Mc. Adams, Mc Graw Hill.
- 10 Heat Mass Transfer – Domkundwar.

**Note:** The paper setter will be required to mention in the note in the question paper that the Use of steam table charts, graphical plots is permitted.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Heat Transfer Lab**  
**Course Code:- UME– 355**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

**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 conditions 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 correlations.
7. To determine the average heat transfer coefficient for a externally heated horizontal pipe under forced convection and plot Reynolds and Nusselt numbers along the length of pipe. Also compare the results with those of the correlations.
8. To measure the emmissivity of the gray body (plate) at different temperature and plot the variation of emmissivity 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 Stefan Boltzman constant for thermal radiation.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

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**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

# ELECTIVE-II

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Quality Concepts In Design**

**Course Code:- UME– 357**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **Unit-1**

Quality Function Deployment -House of Quality-Objectives and functions-Targets-Stakeholders-Measures and Matrices-Design of Experiments –design process- Identification of control factors, noise factors, and performance metrics – developing the experimental plan-experimental design –testing noise factors- Running the experiments –Conducting the analysis-Selecting and conforming factor-Set points reflecting and repeating.

### **Unit -II**

Basic methods: Refining geometry and layout, general process of product embodiment-Embodiment checklist- Advanced methods: systems modeling, mechanical embodiment principles-FMEA method- linking fault states to systems modeling-Case study- computer monitor stand for a docking station.

### **Unit- III**

Design of experiments-Basic methods- Two factorial experiments-Extended methodreduced tests and fractional experiments, orthogonality, base design method, higher dimensional fractional factorial design-Statistical analysis of experiments: Degree of freedom, correlation coefficient, standard error of the residual t-test, ANOVA-ratio test, other indicators-residual plots, Advanced DOE method for product testing- Product applications of physical modeling and DOE, Blender panel display evaluation, coffee grinder experimental optimization-Taguchi method.

### **Unit- IV**

Frequency distributions and Histograms- Run charts –stem and leaf plots- Pareto diagrams-Cause and Effect diagrams-Box plots- Probability distribution-Statistical Process control–Scatter diagrams –Multivariable charts –Matrix plots and 3-D plots.- Reliability-Survival and Failure-Series and parallel systems-Mean time between failure-Weibull distribution.

### **Text Books:**

1. Product Design Techniques in Reverse Engineering and New Product
2. Development, KEVIN OTTO & KRISTIN WOOD, Pearson Education (LPE), 2001.
3. Product Design And Development, KARL T. ULRICH, STEVEN D. EPPINGER,
4. TATA McGRAW-HILL- 3rd Edition, 2003.
5. The Management and control of Quality-6th edition-James R. Evens, William M
6. Lindsay Pub:son south-western(www.swlearning.com)

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



7. Fundamentals of Quality control and improvement 2nd edition, AMITAVA MITRA,
8. Pearson Education Asia, 2002
9. NPTL lectures

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Machine Tools**

**Course Code:- UME- 352**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### Unit-I

**Machine Tools:** Classification of machine tools, generation and forming, methods of generating surfaces, accuracy and finish achievable. Basic elements of machine tools: Support structures, guideways, general work holding methods, fundamentals of machine tool drives (Ray Diagram).

### Unit-II

**Centre Lathe:** Introduction, constructional features of centre lathe, aids for support and location, cutting tools, operations performed on centre lathe, taper turning methods, thread cutting methods, special attachments, machining time and power estimation, Process layouts.

Special Purpose Lathes: Limitations of a centre lathe, capstan and turret lathes, automatic lathes, Reciprocating machine tools: Shaper, planer, slotter.

### Unit-III

**Milling:** Milling Introduction, types of milling machines, types of milling tool milling operations, Milling Tools, dividing head, milling mechanics, machining time estimation, Hole making operations: Introduction, drilling, reaming, boring, tapping and other hole making operations. machining time estimation,

**Abrasive Processes:** Introduction, grinding wheel-designation and selection, types of grinding machines, grinding processes, grinding processes parameters, creep feed grinding, honing, lapping, other finishing processes. Other machine tools: Sawing, Broaching.

### Unit-IV

Numerical Control of Machine Tools: Introduction, numerical control. NC, CNC & DNC machine tools, part programming fundamentals, manual part programming methods, computer aided part programming (CAP).

### Text Books:

1. Manufacturing Technology – Metal cutting and Machine Tools: P.N.Rao, Tata McGraw Hill, New Delhi.
2. Text Book of Production Engineering: P.C.Sharma, S.Chand & Sons.
3. Principles of Machine Tools: G.C.Sen & A.Bhattacharya, Tata McGraw hill, New Delhi.
4. Manufacturing Engineering & Technology – Kalpakjian, Scrope Addison – Wesley Publishing Co. New Delhi.
5. Modern Machining Processes – P.C.Pandey & H.S.Shan, Tata McGraw hill, New Delhi

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Design And Manufacturing Of Composite Materials**

**Course Code:- UME– 356**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **Unit -I**

**Introduction:** Composite materials – Classification advantages and applications – Matrix – Types – Polymer –metal –Ceramics - properties and applications – Fibers –Characteristics - Manufacturing of fibers – Glass – Carbon -Ceramic and Aramid fibers. Fiber Surface Treatments.

### **Unit -II**

**Manufacturing Processes:** Bag Moulding – Compression Moulding – Pultrusion – Filament Winding – Other Manufacturing Processes –Nonautoclave Curing - - Graphite Fiber Treatment - Manufacturing of metal matrix and ceramic matrix composites. - Quality Inspection methods.

### **Unit -III**

**Mechanics and Performance:** Characteristics of Fiber-reinforced Lamina – Laminates – Interlaminar stresses – Static Mechanical Properties –Fatigue and Impact Properties – Environmental effects – Reliability of Composites - Fracture Behavior and Damage Tolerance.

### **Unit -IV**

**Failure Analysis and Design:** Failure Predictions – Failure Theories - Laminate Design Consideration - Classical lamination Theory -Analysis of Laminated Composite Beams – Plates - Shells Vibration and Stability Analysis – Finite Element Method of Analysis - Analysis of Sandwich structures.

### **Text Book:**

1. P. K.Mallick, Fiber –Reinforced Composites: Materials, Manufacturing and Design, Maneel Dekker Inc,2007.
2. J. C.Halpin, Primer on Composite Materials, Analysis, Techomic Publishing Co, 2006.
3. A. K. Kaw, Mechanics of Composite Materials, CRC Press, NY, 2006.
4. F. L.Matthews and R.D.Rawlings, Composite Materials: Engineering and Science, Woodhead Publishing, 2005.
5. A.V.Srinivasan and Michael McFarland, Smart Structures: Analysis and Design, Cambridge University Press, UK, 2001

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Renewable Sources Of Energy**

**Course Code:- UME- 358**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### Unit- I

Elements of hydropower scheme, hydropower development in India. Power house structures and Layout. Hydropower plants classification: Surface and underground power stations, Low-medium-high head plants-layout and components, pumped storage plants. Load and power studies: load curve, load factor, load duration curve, firm capacity, reservoir capacity, capacity factor .

### Unit -II

Hydraulic turbines and types and classification, constructional features, selection, characteristic curves, governing of turbine, drafts tubes-types, hydraulic principles. Gates and valves types. Penstock and surge tanks. Wind machine types, classification, parameters. Wind measurements, data presentation, power in the wind. Wind turbine aerodynamics, momentum theories, basic aerodynamics, airfoils and their characteristics

### Unit -III

Horizontal Axis Wind Turbine (HAWT) - Blade Element Theory, wake analysis, Vertical Axis Wind Turbine (VAWT) aerodynamics. HAWT rotor design considerations, number of blades, blade profile, 2/3 blades and teetering, coning, power regulation, yaw system, tower.

### Unit- IV

Wind turbine loads, aerodynamic loads in steady operation, wind turbulence, static - dynamic - fatigue analysis, yawed operation and tower shadow, WECS control system, requirements and strategies. Wind Energy Conversion System (WECS) siting, rotor selection, Annual Energy Output (AEO). Synchronous and asynchronous generators and loads, integration of wind energy converters to electrical networks, inverters. Testing of WECS.

### Text Books

1. Water Power Engineering: M.M.Desmukh, Dhanpat rai and Sons
2. Wind Energy Conversion Systems, Freris L.L., Prentice Hall 1990.

### Reference Books

1. Water power Development : Mosonyi
2. Hydroelectric hand book: Creagar, W.P. and Justin, J.D., John Wiley & Sons, New York.
3. Davis' Handbook of applied hydraulics : Zipparro, V. J. and Hasen H., Mc-GrawHill.
4. Hydropower structures : R.S.Varshiray, Nem Chand and Bros. Roorkee.
5. Water Power Engineering: M.M.Dandekar and K.N.Sharma, Vikas Pub .

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

6. Spera D.A., Wind Turbine Technology: Fundamental Concepts of Wind Turbine Engineering, ASME Press, NY 1994.
7. Johnson, G.L., Wind Energy Systems, Prentice Hall, 1985.
8. NPTL lectures

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Cryogenic Engineering**

**Course Code:- UME– 359**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **Unit-1**

Introduction: Limitations of vapour compression systems for production of low temperature, multistage systems, cascade system, production of solid carbon dioxide, magnetic cooling. Low Temperature Thermometru: temperature scales gas-vapour pressure thermometry, adiabatic demagnetization.

### **Unit-II**

Cryogenic Gases: Properties of cryogenic fluids-oxygen, nitrogen, air, hydrogen and helium Joule-Thomson effect and liquefaction of gases, liquefaction of air, hydrogen and helium, critical components of liquefiers, reftifier columns, separation of air, separation of helium from natural gas, distillation of liquid hydrogen & purification.

### **Unit-III**

Insulation: Vacuum insulation, gas filled powders and fibrous materials, solid forms, comparison of various insulating materials.

Storage: Types of insulated storage containers, various design considerations, safety aspects-flammability hazards and high pressure gas hazards.

### **Unit-IV**

Transportation: Two phases flow, transfer thorough insulated and uninsulated lines, liquid line indicators, pumps and valves for cryogenic liquids.

Applications: Industrial applications, research and development; Mechanical, thermal and thermoelectric properties of structural material at cryogenic temperatures.

### **Text Books:**

1. Cryogenics and refrigeration Coldin.
2. Experimental techniques in low temperature physics G.K.White, Clayrendon Press, Oxford. 3. Cryogenic research and applications-Marshall Sitting and Stephen and Kid, D.Van Nostrand
3. Company.Inc.USA.
4. Refrigeration and air conditioners-Spark and Dillo.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Time & Work Study**

**Course Code:- UME- 360**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **Unit-1**

Introduction to industrial Engineering, productivity, measurement of productivity

### **Unit-II**

Introduction to work-study. The basic procedure of work-study. Work study for establishing the standard time for a given activity. Method study, procedure for Method study, Principles of motion economy, Filming techniques and micro motion analysis, recording technique. Construction of process chart, Gantt chart, SIMO chart, string chart, Travel chart, Multiple activity chart, Sampling process, Critical examination analysis. Primary, secondary and tertiary stages. Search for alternatives. Steps involved in evaluation of alternatives

### **Unit-III**

Introduction to work measurement, objectives of work measurement, Techniques of work measurement. Basic procedure in time study. Advantages and limitations of time study. Time recording techniques in time study. Performance rating standard allowances, personal allowance, fatigue allowance, production delay allowance. Factors affecting the rating. Synthetic rating method.

### **Unit-IV**

Work sampling, process of work sampling, predetermined motion time systems, standard data system, job evaluation and merit rating. work factor method. Method time measurement system, basic, motion time study system 8. Wages and incentive plans. relationship between wages

### **Text Books:**

1. ILO International labor organization "Introduction to work study" TATA McGraw Hill
2. M.E.Mundel" Motion and Time study"
3. R.M.Barynes "Motion and Time study"
4. E.S.Buffa "Modern production management" TATA McGraw Hill
5. Dr.A.K.Singh "Time and motion study" Jaico publishing houses
6. NPTL lectures

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

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**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



# Semester-VII

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Automobile Engineering**

**Course Code:- UME- 401**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 2 4.5**

### **Unit-I**

**Introduction to Automobiles:** Classification, Components, Requirements of Automobile Body: Vehicle Frame. Types; Front Engine Rear Drive & Front Engine Front Drive Vehicles, Four Wheel Drive Vehicles.

**Clutches:** requirement of Clutches – Principle of Friction Clutch – Wet Type & Dry Types: Single Plate Clutch, Multi plate Clutch, Centrifugal Clutches, Clutch linkages.

### **Unit-II**

**Power Transmission:** Object of the Gear Box; Different types of Gear Boxes; Sliding Mesh, Constant Mesh, Synchromesh Gear Boxes; Drive Lines, Universal Joint, Propeller Shaft, Slip Joint; Front wheel drive; Principle, Function, Construction & Operation of Differential; Rear Axles, Types of load coming on Rear Axles, Full Floating, Three Quarter Floating and Semi Floating Rear Axles.

### **Unit-III**

**Suspension Systems:** Need of Suspension Systems, Types of Suspension; factors influencing ride comfort, leaf springs, shock absorber.

**Steering System:** Front Wheel geometry & Wheel alignment viz. Caster, Camber, King Pin Inclination, Toe-in/Toe-out; Conditions for true rolling motions of Wheels during steering; Different type of Steering Gear Boxes; Steering linkages and layout; Rack & Pinion Power Steering Gear.

### **Unit-IV**

**Automotive Brakes, Tyres & Wheels:** Classification of Brakes; Principle and construction details of Drum Brakes, Disc Brakes; Mechanical, Hydraulic, Pneumatic Brakes; Power Assisted Brakes; Tyres of Wheels; Types of tyre & their constructional details, Tyre rotation; Excessivewear & their causes.

**Automotive Electricals:** Purpose & Operation of lead acid Battery, capacity rating. Purpose and Operations of the Starting System circuit, construction and working of starting motor, solenoid switch, starting switch; Charging system (using alternator )circuit, construction and working alternator.

### **Text Books:**

1. Automobile Engineering by Dr. Kirpal Singh, Standard Publishers Distributors.
2. Automobile Engineering by Anil Chhikara, Satya Prakashan, New Delhi.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

3. Automotive Mechanics – Crouse/Anglin, TMIL.
4. Automotive Technology – H.M.Sethi, TMH, New Delhi.
5. Automotive Mechanics – S.Srinivasan, TMH, New Delhi.
6. Automotive Mechanics – Joseph Heitner, EWP.
7. Motor Automotive Technology by Anthony E. Schwaller – Delmer Publishers. Inc.
8. The Motor Vehicle – Newton steeds Garrett, Butter Worths.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Automobile Engineering**

**Course Code:- UME- 401**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

### List of Experiments

1. To study and prepare report on the constructional details, working principle and operation of the following
  - (a) Single plate clutch.
  - (b) Multi plate Clutch
2. To study and prepare report on the constructional details, working principles and operation of the following
  - (a) Constant mesh Gear Box.
  - (b) Synchromesh Gear Box.
3. To study and prepare report on the constructional details, working principles and operation of the following
  - (a) Rear Wheel Drive Line.
  - (b) Front Wheel Drive Line.
  - (c) Differentials
4. To study and prepare report on the constructional details, working principles and operation of the following
  - (a) Starting System
  - (b) Ignition System
5. To study and prepare report on the constructional details, working principles and operation of the Charging System
6. To study and prepare report on the constructional details, working principles and operation of the following
  - (a) Front Suspension System
  - (b) Rear Suspension System
7. To study and prepare report on the constructional details, working principles and operation of Rack and Pinion Power steering system
8. Adjusting of brake shoes and Bleeding the hydraulic brake system.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Refrigeration And Air Conditioning**

**Course Code:- UME- 402**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 2 4.5**

### **Unit-I**

**Introduction:** Definition of refrigeration & air conditioning; necessity; Methods of refrigeration; Coefficient of Performance(COP); Refrigerants Definition, Classification nomenclature, Desirable properties, Comparative study, secondary refrigerant, introduction to eco-friendly refrigerants; introduction to Cryogenics.

**Air Refrigeration System:** Carnot refrigeration cycle, Brayton refrigeration or the Bell Coleman air refrigeration cycle; Necessity of cooling the aero plane; Boot strap evaporative types, Regenerative type and Reduced Ambient type system, Problems.

### **Unit-II**

**Vapour Compression (VC) Refrigeration System:** (A) Simple V.C. Ref. systems- Limitations of Reversed Carnot cycle with vapour as 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 condition on COP; Comparison of VC cycle with Air Refrigeration Cycle. (B) Multi-stage Ref. System – cooling/ or water inter cooler: Multistage compression with flash intercooling and/ or water intercooling.

### **Unit-III**

**Refrigerationsystem:** Vapour Absorption Refrigeration System, Basic Systems, Actual system, COP of the system, Relative merits and demerits; Properties of aqua ammonia; Electrolux Refrigeration. Lithium- bromide system. Steam Jet Refrigerating System – Introduction, Analysis, Relative merit and demerits, Performance, Applications.

**Cascade Refrigerating Systems-** Necessity Selection of Pairs of refrigerants for the system, Concept of cascade temperature, Analysis, Multistaging, comparison with V.C. systems, Application.

### **Unit-IV**

**Psychrometry of Air & Air Conditioning Processes:** 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., Psychrometric chart: psychrometry of air-conditioning processes, Mixing process, Basic processes in conditioning of air.

**Air- Conditioning Load Calculations:** Outside and inside design conditions: Source of heating load, Sources of cooling load, Electrical application Infiltration and ventilation, Heat generation inside conditioned space: Comfort chart.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Text Books:**

1. Refrigeration & Air Conditioning- R.C. Jordan and G.B. Priester, Prentice Hall of India.
2. Refrigeration & Air Conditioning-C.P.Arora, Tata-McGraw Hill, New Delhi.
3. A course in Refrigeration & Air Conditioning – Arora & Domkundwar, Dhanpat Rai & Sons,1989.
4. Refrigeration & Air Conditioning- W.F. Stockerand J.W. Jones, Tata-McGraw Hill,New Delhi
5. Refrigeration & Air Conditioning- Manohar Parsad Wiley Estern limited, New Delhi

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Refrigeration And Air Conditioning lab**  
**Course Code:- UME– 402**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

**List of Practical:**

1. To study the vapour compression Refrigeration Systems and determine its C.O.P.
2. To study water cooler and find its C.O.P.
3. To study the ice-plant, its working cycle and determine its C.O.P and capacity.
4. To determine the By-pass factor of Heating & Cooling coils
5. To study the cut-sectional models of reciprocating and Rotary Refrigerant compressor
6. To study the various controls used in Refrigerating & Air Conditioning System
7. To study the humidification, heating, cooling and dehumidification processes
8. To study Desert cooler & Window Type Air Conditioner

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Mechatronics**

**Course Code:- UME- 403**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **Unit-I**

Introduction and Basics: What is Mechatronics?: overview & evolution of mechatronics; A Measurement System with its constituent elements; Open and Closed Loop System; Sequential Controllers; Micro-processor Based Controller; The Mechatronic Approach.

### **Unit-II**

Hardware of Measurement Systems; Force Fluid Pressure, Liquid Flow, Liquid Level, Temperature, Light Sensors along with Performance terminology ; Data Presentation Elements: Magnetic Recording; data Acquisition System; Testing & Calibration; Problems. Pneumatic, Hydraulic, Mechanical and Electrical actuation System: Pneumatic and hydraulic System; servo actuation system; Mechanical Systems, Types of Motion Kinematic Chains, Cams, Gear, Trains, Ratchet & Pawl. Belt & Chain Drivers, Bearings.

### **Unit-III**

Digital Logic and Programmable Logic Controller: A review of Number System & Logic Gates; Boolean Algebra; Karnaugh Maps; Sequential Logic; introduction to Programmable Logic Controller.

Microprocessor and Input/Output System: Control, Microcomputer Structure: Microcontroller; Applications; Programming Languages; Instruction Sets; Assembly Language Program; Subroutines.

### **Unit-IV**

Electrical Systems; Mechanical & Solid State Switches; Solenoids; D.C. & A.C. Motors; Stepper Motors; Mechanical aspect of Motor Selection ;Problems.

Design and Mechatronics: Design Process; Traditional and Mechatronics Design: Possible Mechatronics design solutions for Timed Switch, Wind Screen Wiper Motion, A Pick & Place Robot, Automatic Camera, Engine Management System, Autonomous guided vehicle, Drilling machine, hydraulic fingers, industrial robot, car parking barrier, conveyer based material handling system & advanced actuators.

### **Text Books:**

1. Mechatronics by W. Bolton, Published by Addison Wesley.
2. Mechatronics System Design Devdas Shetty and Richard A Kolx Brooks Cole 1997
3. Mechatronics Principle, concept and applications by Nitaigour Premchand Mahalik (TMH publication)

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



**Course Name:- Industrial Engineering & Entrepreneurship echatronics**

**Course Code:- UME- 404**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **Unit-I**

**Introduction and its Development:** Industrial Engineering: Concept; Functions; Fields of application; origin and development of factory system; Effects of Industrial Revolution; Principles of scientific management. Pioneers of Scientific Management- F.W.Taylor, Henry L.Gantt, Frank B. Gilberth, Henri Fayol etc.Administration and Organistion; Organisation Structure; Authority and Responsibility; Types of organization:-Line, Functional, Line and Staff and Committee.

**Wage Incentive Plans:** Concept; Characteristics of good wage incentive plan; Methods of Wage Payment; Classification of Wage Incentive Plans, Factors influencing wage rates.

### **Unit-II**

**Plant Location & Plant Layout:** Factors effecting plant location, selection of plant site, quantitative techniques of plant location decision, plant layout, principles of layout design.

**Product Development and Design:** Product and its classification, Product design considerations, product development, product characteristics, Standardization, Product Simplification and Diversification; value engineering and its role in product design and cost rationalization.\Ergonomics:Role of ergonomics in industry, effect of physical environment on performance.

**Production, Planning and Control:** Concept; Objectives, Need and functions of P.P.C., Functions of planning routing, scheduling, dispatching and follow up and progress report. Production control charts. Route and process charts. Operation charts, machine load charts, Gantt charts, Progress charts; Bar chart.

### **Unit-III**

**Inspection and Quality Control:** Defintion and functions of Inspection; Inspection methods; Definition, objectives and principles of Quality control; Statistical Quality Control (SQC) Economics of Quality Control. Introduction to statistical methods of quality control. Numericals.

**Time and Method Study (Work Study):**Their importance in scientific management. Definition and objectives ; various time estimates, level of performance; Allowances ; time recording techniques, Procedure of method study, Various charts and diagrams, Classification of motion, Therbligs, principles of motion economy.

**Introduction to MRP,JIT and TQM:** Definitions, objectives and benefits.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

#### **Unit-IV**

**Entrepreneurship Development:** Entrepreneurship, Role of entrepreneurship in Indian economy, Characteristics of entrepreneur, Types of entrepreneurs, some myths and realities about entrepreneurship. Role and scope of small scale industries, concept of small scale and ancillary industries undertaking, How to start a small scale industry, Steps in launching own venture. Infrastructure facilities available for entrepreneurship development in India. Preparation of feasibility Project Report: Tools for evolution of techno economic feasibility project report, SWOT analysis.

#### **Text Books:**

1. Industrial Management: Spregiel. John Wiley & Sons. N.York, 1961.
2. Industrial Organisation: Kimball and Kimball. Vakils Feffer & Simsons Pvt. Ltd. Bombay, 1971.
3. Industrial Engineering & Operations Management by Dr. S K Sharma & Mrs Savita Sharma, S.K.Katarial & Sons, New Delhi

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Industrial Engineering & Entrepreneurship Lab**

**Course Code:- UME– 404**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

**List of Practical:**

1. To study various plat layouts and suggest improvements in existing Machines Shop layout.
2. To study and draw organizational structure of a near by industry and suggest changes.
3. To draw X and R charts for a given sample of products to check their acceptance.
4. To draw p chart for a given product lot and verify its acceptance
5. Draw a two handed process chart for a simple process of a job preparation on a lathe.
6. To study various purchase procedures and draw organizational structure of college purchase department.
7. Familiarization to entrepreneurship and its development in India.
8. A market survey and analysis.
9. A “preliminary project report” preparation for any small-scale unit.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

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**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

# ELECTIVE-III

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Mechanical Vibrations**

**Course Code:- UME- 400**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>4</b>	<b>1</b>	<b>0</b>	<b>4.5</b>

### Unit-I

**Basic Concepts:** Importance and scope, definition and terminology, representation of harmonic motions: vector and complex methods introduction to various types of vibrations and types of excitation.

### Unit-II

#### Single Degree of Freedom Systems:

a) **Undamped Free Vibrations:** D Alemberts Principle, Energy method, Rayleigh method, simple applications of these methods, equivalent spring stiffness.

b) **Damped Free Vibrations:** Introduction to different types of damping, viscous damping, sub-critical, critical and overdamping, logarithmic decrement, frequency of damped oscillations.

c) **Forced Vibrations:** Solution for simple harmonic excitation, rotating and reciprocating unbalance, vibration isolation and transmissibility, vibration measuring instruments, whirling of shaft without friction.

### Unit-III

#### Two Degree of Freedom Systems:

a) **Undamped Free Vibrations:** Undamped free vibrations, undamped forced vibrations, Forced harmonic vibrations, control of vibrations.

b) **Applications:** Dynamic vibration absorber, centrifugal pendulum absorber, torsional vibration absorber, un tuned vibration damper.

### Unit-IV

a) **Multi-Degree/Several degree of Freedom Systems:** Influenced Coefficients, Matrix Method and Matrix Iteration Method for determining the natural frequency of the system. Eigenvalues and Eigenvectors. Dunkerleys methods, Rayleigh's Method. Torsional vibration of two, three and multi rotor systems.

b) **Continuous Systems:** Free vibration of the following for various end conditions: Vibration of a string, longitudinal vibrations of bar, transverse vibration of beam, torsion of vibrations of circular shaft.

#### Text Books:

1. Mechanical Vibration by S.S.Rattan.
2. Mechanical Vibration by Grover.
3. Mechanical Vibration by V.P.Singh.
4. NPTL lectures

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Design of Thermal Systems**

**Course Code:- UME- 405**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>4</b>	<b>1</b>	<b>0</b>	<b>4.5</b>

### **Unit- I**

Modeling of Thermal Systems: types of models, mathematical modeling, curve fitting, linear algebraic systems, numerical model for a system, system simulation, methods for numerical simulation.

### **Unit-II**

Acceptable Design of a Thermal System: initial design, design strategies, design of systems from different application areas, additional considerations for large practical systems; Economic Considerations: calculation of interest, worth of money as a function of time, series of payments, raising capital, taxes, economic factor in design, application to thermal systems;

### **Unit-III**

Problem Formulation for Optimization: optimization methods, optimization of thermal systems, practical aspects in optimal design, Lagrange multipliers, optimization of constrained and unconstrained problems, applicability to thermal systems

### **Unit-IV**

search methods: single-variable problem, multivariable constrained optimization, examples of thermal systems; geometric, linear, and dynamic programming and other methods for optimization, knowledge-based design and additional considerations, professional ethics.

### **Text Books:**

1. W.F. Stoecker, Design of Thermal Systems - McGraw-Hill, 1971

### **References Book:**

1. 1 Y. Jaluria, Design and Optimization of Thermal Systems –CRC Press, 2007.
2. Bejan, G. Tsatsaronis, M.J. Moran, Thermal Design and Optimization - Wiley, 1996.
3. R. F. Boehm, Developments in the Design of Thermal Systems – Cambridge
4. NPTL lectures

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Material Handling And Plant Layout**

**Course Code:- UME– 406**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**4 1 0 4.5**

### **Unit-I**

**General :** Concepts and factors governing plant locations economics, rural economics, rural Vs urban plant sites, case studies (i) Selection of a site for software company(ii) Selection of a site for XYZ Company: analysis of alternatives.Introduction of plant layout, principles and objectives of effective layout, advantages of good layout, symptoms of bad layout.Types of plant layout , their features.Applications and comparison, Introduction to group technology: its relevance, application and advantages.

### **Unit-II**

**Planning the layout:** Factors influencing plant layout; material factors, machinery factors, main factors movement factors, waiting factors, service factors, change factors, building factors, workstation design methods of plants and factory layout, plant layout procedure, factory building , building equipments, common problems in plant layout, tool and techniques of layout, operation process chart, flow process chart, flow diagram, string diagram, evaluating alternate layout-various methods.

**Line balancing:** Objective of line balancing problems; constraint in line balancing problem, terminology in assembly line, preventive measures to achieve a balanced production line. Types of line balancing: (a) Assembly line balancing (b) Fabrication line balancing, Heuristic and other method of line balancing, simple numerical problems in line balancing.

### **Unit-III**

**Materials handling :** Objectives of material handling systems, material handling engineering survey, basic features of handling, types of material handling systems, material handling engineering survey, basic features of handling, various materials handling, considerations including combined handling, space for movements, analysis of handling methods, economical and technical considerations of handling equipment, cost analysis of material handling systems.

### **Unit-IV**

**Material handling equipments:** Introduction, types of material handling equipment; selection and maintenance of material handling equipments, characteristics of material handling equipments such as conveyers, cranes, hoist, Amount of equipments required and predicting in process inventory by graphical technique.

**Travel Chart:** Procedure for travel charting, numerical problem on optimum arrangement of various departments of shops under given constraints and to check their effectiveness.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



**Text Books:**

1. Plant Layuot and design – By Moore.
2. Plant Layout and material handling – By Apple.
3. Plant Layout – By Shubhin.
4. Construction Management - Mahesh Verma

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Gas Turbines And Jet Propulsion**

**Course Code:- UME- 407**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**4 1 0 4.5**

### Unit-I

**Compressible Flow:** 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, relations between upstream and downstream flow Parameters.

### Unit-II

**Gas Turbine Systems and Cycles:** System of operations of gas turbines – constant volume and constant pressure gas turbines; thermodynamics of Brayton cycle; regeneration – intercooling. Reheating and their combinations; closed cycle and semi closed cycle gas turbines; gas Vs I.C. engines and steam turbines.

### Unit-III

**Compressors:** Classification – positive displacement and dynamic compressors. Operations of single stage reciprocating compressors, best value of index of compression, isothermal efficiency, effect of clearance and volumetric efficiency, multistage compression, air motors. Centrifugal compressors, static and total head values; velocity vector diagrams; slip factor; pressure coefficient and prewhirl, Axial flow compressors; degree of reactions and polytropic efficiency performance characteristics, surging, choking and stalling.

**Combustion System:** Types, combustion process, combustion intensity efficiency and pressure loss.

### Unit-IV

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

**Rocket Propulsion:** Operating principle; solid and liquid propellants, performance analysis calculations for specific impulse and propulsive efficiency.

### Text Books:

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.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Flexible Manufacturing Systems**

**Course Code:- UME– 408**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**4 1 0 4.5**

### Unit-I

**Automation:** 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:** design for automated assembly, types of automated assembly system, part feeding devices, quantitative analysis of the delivery system operation, analysis of a single-station assembly machine, numericals.

### Unit-II

**Group Technology:** Part families, part classification and coding. Types of classification and coding system, Machine cell design: The composite part concept, types of cell design. Determining the best machine arrangement, benefits of group technology.

**Flexible Manufacturing System:** Components of an FMS, types of system, where to apply FMS technology, FMS work stations. Material handling and storage system: Functions of the handling system, FMS layout configuration, Material handling equipment, Computer control system: Computer function, FMS data file, system reports planning the FMS, analysis method for FMS, application and benefits.

### Unit-III

**Robotic technology:** Joints and links, common robot configuration, work volume, types of robot control, accuracy and repeatability, other specification, and effectors, sensors in robotics.

### Unit-IV

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

**Robot application:** Characteristics of robot applications, robot cell design, types of robot application: Material handling, processing operation, assembly and inspection.

### Text Books:

1. Automation. Production System and Computer Integrated Manufacturing. Groover M.P, Prentice Hall of India.
2. CAD/CAM – Groover M.P. Zimmers E.W, Prentice Hall of India.
3. Approach to Computer Integrated Design and Manufacturing Nanua Singh, John Wiley and Sons, 1998.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

4. Production Management System: A CIM Perspective Browne J, Harhen J, Shivnan J, Addison Wesley, 2nd Ed. 1996.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Design Planning And Control Of Production Systems**  
**Course Code:- UME– 409**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**4 1 0 4.5**

### **Unit -I**

**Introduction to production systems:** Generalized model of production systems, types of production flows and impact on system design. Lifecycle concepts in production systems

### **Unit -II**

**Design of production system:** Facilities location And layout planning, Design of mass production systems, Balanced assembly lines. Material handling activities, objective of material handling, Importance material handling, computation of material handling cost, Material Handling survey check sheet, Methods material handling, Types of materials stages of handling, Materials handling equipments Selection of material handling equipment.

### **Unit -III**

**Production System:** Planning of production, Systems models of aggregate production planning, Batch production system planning. Multistage production inventory system. In process inventory, Sequencing and scheduling models.

### **Unit -IV**

**Materials requirement :**Materials requirement planning. Computerized production control, LOB, element of monitoring and follow up. Basics of Material Requirement Planning, Manufacturing Resource Planning (MRPI),Lot sizing in MRP

### **Text Book:**

1. Production & operation Management, Buffa E S and Sarin R K (wily 1987) 8th Edn
2. Production & operation Management, Concept models & Behavior Adame E E & R J Ebert 5th Edn (PHI) 1993
3. Analysis & Control Of Production System, E A Elsayed & T O Bouchy
4. Production Planning & Inventory, wily 1974
5. Operation Management, S N Cherry, TMHND 1988
6. Elements of Production Planning & Control, Elions
7. Facilities planning & layout, -Topmpkin's & White

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

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**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

# Semester-VIII

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

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**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



# ELECTIVE-IV

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Power Plant Engineering**

**Course Code:- UME-451**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 0 3.5**

### **Unit-I**

**Introduction:** Energy resources and their availability, Types of power plant, selection of the plants, review of basic thermodynamics cycles used in power plant.

**Hydro Electric Power Plants :** Rainfall and run-off measurements and plotting of various curves for estimating power plants, design, construction and operation of different components of hydro-electric power plant, site selection, comparison of other types of power plants.

### **Unit-II**

**Steam Power Plants:** Flow sheet and working of modern-thermal power plants, super critical pressure steam stations, site selection, coal storage, preparation, coal handling systems, feeding and burning of pulverized fuel, ash handling systems, dust collection-mechanical dust collector and electrostatic precipitator.

**Gas Turbine Power Plants:** Types, open and closed gas turbine, work output & thermal efficiency, methods to improve thermal efficiency of gas turbine plant- reheating, inter- cooling regeneration & their combinations, advantage and disadvantages, comparison with steam power plant, problems.

### **Unit-III**

**Nuclear Power Plants:** Principles of nuclear energy, basic nuclear reactions, nuclear power station, trouble shooting and remedies.

**Power Plant Economics:** Effect of plant type on costs, fixed elements, energy elements, customer elements and investor's profit, depreciation and replacement.

### **Unit-IV**

**Non-Conventional Power Generation:** Solar radiation estimation, solar energy collectors OTEC, wind power plants, geothermal resources.

**Direct Energy Conversion Systems:** Fuel cell, MHD power generation-principle thermoelectric power generation, thermionic power generation.

### **Text Books:**

1. Power station Engineering and Economy by Bernhardt G.A. skrotzki and William A. Vopat-Tata McGraw Hill Publishing Company Ltd., New Delhi.
2. Power Plant Engineering: P.K. Nag Tata McGraw Hill second Edition 2001.
3. An Introduction to Power Plant Technology by G.D. Rai-Khanna Publishers, 2-B, Nath Market, Nai Sarak, Delhi-110005

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Design Of Heat Exchangers**

**Course Code:- UME– 454**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3.5</b>

### Unit-I

**Classification of Heat exchanger:** Introduction; Recuperation and regeneration; Transfer processors; Geometry of construction, tubular heat exchangers, plate heat exchangers, extended surface heat exchanges ; Heat transfer mechanisms, Flow arrangements; Selection of heat exchangers.

**Basic design methods of heat exchanges:** introduction; Arrangement of flow path in heat exchangers; basic equations in design; Overall heat transfer coefficient; Log mean temperature difference method for heat exchanger analysis, the –NTU method for heat exchanger analysis, Heat exchanger design calculation, Variable overall heat transfer coefficient, Heat exchange design methodology.

### Unit-II

**Design Correlations for Condensers and Evaporators:** Introduction ; Condensation, Film condensation on a single horizontal tube-laminar film condensation, forced convection, Film condensation in tube bundles-effect of condensate inundation. Effect of vapor shear; Combined effect if inundation and vapor shear, Condensation inside tubes-condensation in vertical tubes, Flow boiling-subcooled, flow pattern, flow boiling correlations.

**Shell-and-tube heat exchanger:** Introduction basic components-shell types, tube bundle types, tubes and tube passes, tube layout, baffle type and geometry, allocation of stream; basic design procedure of a heat exchanger-preliminary estimation of unit size, rating of preliminary design

### Unit-III

**Compact heat exchanger:** Introduction; Plate-fin heat exchanger, tube-fin heat exchangers, Heat transfer, pressure, drop for finned-tube exchangers, pressure drop for plate-fin exchanger.

**Gasketed-Plate heat exchangers:** Introduction; Mechanical features-plate pack and frame, plat types; Operational characteristics-main advantages, performance limits, Passes and flow arrangements, Application-corrosion, maintenance, Heat transfer and pressure, drop calculations-heat transfer area, mean flow channel gap, channel equivalent diameter, heat transfer coefficient, channel pressure drop, port pressure drop, overall heat transfer coefficient, heat transfer surface area, performance analysis , Thermal performance.

### Unit-IV

**Condensers and Evaporators:** introduction; Shell-and-tube condensers-horizontal shell-side condensers, vertical tube-side condensers, horizontal in-tube condensers ; steam turbine exhaust condensers ; Plate condensers ; Air-cooled condensers ; Direct contact condensers ; Thermal design of shell-and-tube condensers.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Text Books:**

1. Heat Exchangers, Sadik kakac, Hongtan, CRC Press.
2. Principals of heat transfer, F.Krieth & M.S. Bohn, Asian Books Pvt. Ltd, Delhi.
3. Heat exchangers, Design and Theory Source Books, N.H. Afgan and Schliinder (Editors). McGraw Hill Book Company.
4. Compact heat Exchanger, W.M. Kays A.L. London, McGraw Hill book Company.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Machine Tool Design**

**Course Code:- UME- 455**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3.5</b>

### **Unit-I**

**Introduction:** Kinematics of Different Types of Machine Tools, Selection of Cutting Conditions and Tools, Calculation of Cutting Force on Single Point and Multipoint Tools, Hole Machining, Calculation of Power, Accuracy Requirements and Standards.

### **Unit-II**

**Design of Fed Drives:** Feed Drive using Feed Boxes, Feed Axes of CNC Drives, DC and AC Servomotors, Types characteristics Controllers and Their Selection, Ball Screws and Friction Screws- Guide Ways, Linear Motion System, Design Calculations of Drives, Closed Loop Operations of Feed Drives, Linear Indexing Drives.

### **Unit-III**

**Design of Machine Tool Structures:** Static and Dynamic Stiffness, Dynamic Analysis of cutting process, Stability, Forced Vibration, Ergonomics and Aesthetics in Machine Tool Design. 09 Design of Spindle and Spindle: Supports : Function of Spindle, Design Requirement Standard Spindle Noses, Design Calculations of Spindles. Bearing Selection and Mounting,

### **Unit-IV**

**Design of Special Purpose Machines:** Modular Design Concepts, Standard Modules Example Design of a Typical SPM with CNC, Transfer Machines.

### **Text Books:**

1. "Machine Tool Design" Tata McGraw Hill Book Co. 1991, Metha, N.K.
2. Design Principal of Cutting Machine Tools : Koenigs bergerf. Pergman Press Oxford.
3. Machine Tool Design", Vol 1 and Vol III, Mir Publishers, Moscow, Macherkan.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Design Of Air Conditioning Systems**

**Course Code:- UME– 456**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 0 3.5**

### **Unit-I**

**Application of air conditioning:** Medium and large sized buildings, industrial air conditioning, residential air conditioning, air conditioning of vehicles and aircrafts.

**Psychrometry:** Psychrometric charts, combined, heat and mass transfer, adiabatic saturation, enthalpy potential.

### **Unit-II**

**Air conditioning Load:** comfort and design conditions, thermal transmission, infiltration and ventilation loads, heating and cooling loads, solar radiation properties, periodic heat transfer through walls and roofs.

**Air conditioning system:** Thermal distribution system, classic single-zone system, outdoor air control, single-zone system design, multiple-zone, terminal reheat system, dual duct or multi zone system, variable air-volume system, hydronic system, unitary system, passive air conditioning system.

### **Unit-III**

**Equipment Design:** Fan and duct system, fan air-distribution in rooms, ventilation system, diffusers and induction, fan coil units. Cooling and dehumidifying coils – Heat and mass transfer, moisture removal, coil performance.

### **Unit-IV**

**Controls:** Pneumatic, electric and electronic controls, thermostats, dampers, outside air control, freeze protection, humidistat, acoustics and noise control.

**Refrigerants:** Primary and secondary refrigerants, halocarbons, azeotropes, ozone depletion, eco friendly refrigerants.

### **Text Books:**

1. Refrigeration and air conditioning-W.F. Stoecker, J.W. Jones, McGraw Hill Book Co.
2. Air conditioning Engineering – W.P. Jones, Edward Arnold.
3. Hand book of air conditioning system design – Carrier Air conditioning Co. McGraw Hill Book Co.
4. Thermal Environmental Engg. – James L. Thelkeld, Prentice Hall, Inc
5. Refrigeration and Air conditioning – C.P Arora, Tata McGraw Hill Pub. Co. Ltd.
6. Refrigeration and Air conditioning – P.L Ballaney, Khanna Publishers

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Simulation And Modeling**

**Course Code:- UME- 457**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L    T    P    Cr**  
**3    1    0    3.5**

### **Unit-I**

**Physical Modeling:** Concept of system and environment, continuous and discrete system, linear and nonlinear system, stochastic activities, static and dynamic models, principles used in modeling, Basic simulation modeling, Role of simulation in model evaluation and studies, Advantages and Disadvantages of simulation. Modeling of Systems, iconic analog. Mathematical Modeling.

### **Unit-II**

**Computer System Simulation:** Technique of simulation, Monte Carlo method, experimental nature of simulation, numerical computation techniques, continuous system models, analog and hybrid simulation, feedback systems, Buildings simulation models of waiting line system, Job shop, material handling and flexible manufacturing.

### **Unit-III**

**Probability Concepts In Simulation:** Stochastic variables, discrete and continuous probability functions, random numbers, generation of random numbers, variance reduction techniques, Determination of the length of simulation runs, Output analysis.

### **Unit-IV**

**System Dynamics Modeling:** Identification of problem situation, preparation of causal loop diagrams and flow diagrams, equation writing, level and rate relationship. Simulation of system.

### **Text Books:**

1. Gordon G., System simulation, Prentice Hall.
2. Payer T., Introduction to system simulation, McGraw Hill.
3. Spriet, Computer Aided Modeling and Simulation, W.I.A.
4. Sushil, System Dynamics, Wiley Eastern Ltd.
5. Shannon R.E., System simulation, Prentice Hall.
6. Allan Carrie, "Simulation and Manufacturing", Jhon Wiley & Sons
7. Simulation & Modelling: Kelton &Law.Mc Graw Hill.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Emerging Automotive Technologies**  
**Course Code:- UME- 458**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 0 3.5**

### Unit-I

**Fuel Cell Technology for Vehicles:** What is fuel cell, Type of fuel cell, Advantage of fuel cell. Current state of the technology. Potential and challenges. Advantages and disadvantages of hydrogen fuel.

### Unit-II

**Latest Engine Technology Features:** Advances in diesel engine technology, Direct fuel injection Gasoline engine. Diesel particular emission control. Throttling by wire. Variable Valve Timing, Method used to effect variable Valve Timing. Electromagnetic Valves. Camless engine actuation.  
**Volt System:** Need, benefits, potentials and challenges. Technology Implications for the Automotive Industry. Technological evolution that will occur as a result of the adoption of 42 volt systems.

### Unit-III

**Electrical and Hybrid Vehicles:** Types of hybrid systems, Objective and Advantages of hybrid systems. Current status, Future developments and prospects of Hybrid Vehicles.  
**Integrated Starter Alternator:** Starts stop operation, Power Assist. Regenerative braking. Advanced lead acid batteries, Alkaline batteries, Lithium batteries, Development of new energy storage systems. Deep discharge and rapid charging ultra capacitors.

### Unit-IV

**X-By Wire Technology:** What is X-By Wire, Advantage over hydraulic systems, Use of Automotive micro controllers, Types of sensors. Use of actuators in an automobile environment.  
**Vehicle Systems:** Constantly Variable Transmission, benefits, Brake by wire, Advantages over power Braking systems. Electrical assist. Steering, Steering by wire, Advantages of steering by wire. Semi-active and fully active suspension system. Advantages of fully active suspension system.

### Text Books:

1. Advanced Vehicle technologies by Heinz Heisler – SAE International Publication.
2. Electric and Hybrid Electric Vehicles by Ronald K.Jurgen – SAE International Publication.
3. Batteries for Electric Vehicles by DAJ Rand, R.Woods and R.M.Dell – SAE International Publication.
4. Electronics Braking, Traction and Stability Control – SAE Hardbound papers.
5. Electronics steering and suspension systems – SAE Hardbound papers.
6. 42 Volt systems by Daniel J. Holt – SAE International Publication.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



# ELECTIVE-V

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Modern Manufacturing Processes**

**Course Code:- UME- 467**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 2 4.5**

### Unit-I

**Mechanical Processes:** Ultrasonic Machining – Elements of process, cutting tool system design, effect of parameters, economic considerations, applications, limitation of the process, advantages and disadvantages. Numerical problem on design of exponential concentrator. Abrasive Jet Machining – Variables in AJM, metal removal rate in AJM. Water Jet Machining – Jet cutting equipments, process details, advantages and applications.

### Unit-II

**Electrochemical and Chemical Metal Removal Processes:** Electrochemical Machining – Elements of ECM process, tool work gap, chemistry of the process, metal removal rate, accuracy, surface finish and other work material characteristics, economics, advantages, applications, limitations. Electrochemical grinding – Material removal, surface finish, accuracy, advantages, applications. Only theory.

### Unit-III

**Thermal Metal Removal Processes:** Electric Discharge Machining (EDM) of spark erosion machining processes, mechanism of metal removal, spark erosion generators, electrode feed control, dielectric fluids, flushing, electrodes for spark erosion, selection of electrode material, tool electrode design, surface finish, machining accuracy, machine tool selection, applications. Wire cut EDM, Laser beam machining (LBM)– Apparatus, material removal, cutting speed and accuracy of cut, metallurgical effects, advantages and limitations. Only theory.

### Unit-IV

**Plasma arc Machining (PAM):** Plasma, non thermal generation of plasma, mechanism of metal removal, PAM parameters, equipments for D.C. plasma torch unit, safety precautions, economics, other applications of plasma jets. Electron beam Machining (EBM) – Generation and control electron beam, theory of electronic beam machining- thermal type only, process capabilities and limitations. Only theory

### Text Books:

1. Modern Machining Processes – P.C.Pandey, H.S.Shan, Tata McGraw Hill Publishing Company Limited.
2. Machining Manufacturing Science – Ghosh and Malik, Affiliated East – West Press.
3. Non Traditional Manufacturing Processes – Benedict G.F. Macel Dekker.
4. Advanced Methods of Machining – Mc Geongh J.A., Chapman and Hall.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Modern Manufacturing Processes Lab**  
**Course Code:- UME- 467**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

### **LIST OF EXPERIMENTS**

1. To study the characteristic features of ECM
2. To study the characteristic features of EDM
3. Demonstration of NC machine tools.
4. To study the parameters of Ultrasonic Machining
5. To study the metal removal rate of AJM
6. To Study the metallurgical effects of LBM
7. To study the mechanism of metal removal of (PAM)

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Experimental Stress Analysis**

**Course Code:- UME- 469**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 2 4.5**

### Unit-I

**Basics:** Basic Laws of Stress transformation, principal stresses and principal planes, Cauchy's stress quads.

**Strain analysis:** strain equations of transformation, Principal strain, Cauchy's strain quadratic, stress – Strain relationship. Two dimensional Photoelasticity: stress optic law, optics of polarcope, plane and circular polariscopes, dark and light field arrangements fringe multiplication fringe sharp ending, compensation techniques, commonly employed photoelastic materials.

### Unit-II

**Three Dimensional Photo Elasticity:** Neuman's strain optic relationship, stress freezing in models materials for three dimensional photo elasticity, shear difference method of stress separation.

**Birefringent Coatings:** Sensitivity, reinforcing effects and thickness of birefringent coatings.

### Unit-III

**Electric Resistance strain Gauges:** Gauges construction and installation, temperature compensation, gauge sensitiveness, gauge factor, corrections for transverse strain effects. Factors affecting gauge relation. Rosettes Rosette analysis potentiometer and wheatstone bridge circuits for strain measurements.

### Unit-IV

**Brittle Coatings:** Introduction, coatings stresses and failure theories, different types of crack patterns, crack detection. Composition of brittle coating, coating cure, influence of atmospheric conditions, effect of biaxial stress field.

### Text Book:

1. Experimental Stress Analysis – Dally & Riby, McGraw Hill, N.York 1987. 2.Theory of Elasticity & Plasticity – Khanna Publishers, New Delhi 1979.
2. Theory of Plasticity – J. Chakrabarty, McGraw Hill, International Editions, 1987.
3. NPTL lectures

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Experimental Stress Analysis Lab**

**Course Code:- UME- 469**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

**LIST OF EXPERIMENTS:**

- 1 Determination of Principal Stress and Shear Stress Using Strain Rosettes (Star Connected)
- 2 Determination of Principal Stress and Shear Stress Using Strain Rosettes (Delta Connected)
- 3 Thin Walled Pressure Vessel Test Rig (Copper & Aluminium)
- 4 Thin Walled Pressure Vessel Test Rig (Brass & Mild Steel)
- 5 Tensile Test on Flat Plate
- 6 Tensile Test on Rod
- 7 Thin Walled Tubes under Torsion (Copper & Brass)
- 8 Thin Walled Tubes under Torsion (Aluminium & Mild Steel)

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Pumps, Blowers And Compressors**

**Course Code:- UME– 470**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 2 4.5**

### Unit-I

**Pumps:** Theory of centrifugal pump impeller, vortex theory, design of impeller, volute and diffusers, specific speed and design constants.

**Design of Mixed Flow Impellers:** Geometric relationship, axial flow pump, design, use aerofoil data for impeller design, guided vane, pump casting.

### Unit-II

**Fans:** Fan laws, performance coefficient, effect of change in fan speed, density, Series and parallel operation, fan design losses, blade shape, casings.

**Propeller Fans:** Cross flow fans, principal of operation, application, regulation of volume flow, Sources of vibration in fans, noise, and attenuation testing .

### Unit-III

**Blowers:** Types, centrifugal and axial, design procedure, selection, performance, pressure application, control of volume flow.

**Performance Estimation:** Instrumentation test rig layout, measurement of pressure temperature, use of hot wire anemometer, boundary layer probes, measurement of sound.

### Unit-IV

**Compressor:** Centrifugal compressor, multistage arrangement, blade design, types diffusers, performance, series and parallel operation.

**Axial Flow Compressors:** Cascade theory, efficiency, two dimensional cascade, valor triangles and stage loading, stage reactions, losses compressor testing procedure.

### Text Books:

1. Val. S. Lobanoff, and Robert, R. Ross, “Centrifugal Pumps Design and Application”, Publishing House.
2. Allam Wallis, R, “Axial Flow and Ducts”, John Wiley and Sons.
3. Ronald, P. Lapina, “Estimating Centrifugal Compressor Performance”, Gulf Publishing Company.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Pumps, Blowers And Compressors Lab**  
**Course Code:- UME– 470**

<b>Evaluation Components for Practical Courses</b> (Students are required to perform atleast 8 practicals mandatorily from the given list of practicals)	
Lab Performance	10
Lab File Work	10
Viva-Voce	10
<b>Total</b>	<b>30</b>

### **LIST OF EXPERIMENTS**

1. To study the constructional detail of a centrifugal pump and draw its characteristics curve
2. To study the constructional detail of a centrifugal compressor
3. To study the constructional detail of a reciprocating pump and draw its characteristics curve
4. To study different types of blowers
5. To study the coefficient performance of fans
6. To study the two dimensional Cascade theory of compressor
7. To study the blower efficiency with different parameters
8. To study different types of sources occur during the vibration of fan

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

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**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



# OPEN ELECTIVE-I

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Software Project Management****Course Code:- UCS-480**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

L	T	P	Cr
3	1	0	3.5

**Unit-I****Conventional Software Management**

- The waterfall model
- conventional software Management performance.
- Evolution of Software Economics
- Software Economics
- pragmatic software cost estimation
- Improving Software Economics
- Reducing Software product size
- improving software processes
  - improving team effectiveness
  - improving automation
  - Achieving required quality
  - Peerinspections

**Unit-II****The old way and the new**

- The principles of conventional software Engineering
- principles of modern software management
- Transitioningtoaniterativeprocess
- Life cycle phases
- Engineering and production stages
- inception
- Elaboration
- construction
- transitionphases
- Artifacts of the process
- The artifact sets
  - Management artifacts
  - Engineering artifacts
  - programmatic artifacts

**Unit-III****Model based software architectures**

- A Management perspective and technical perspective

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

- Work Flows of the process
  - Software process workflows
  - Iteration workflows
- Checkpoints of the process
- Major mile stones
- Minor Milestones
- Periodic status assessments
- Iterative Process Planning
  - Work breakdown structures
  - planning guidelines
  - cost and schedule estimating
  - Iteration planning process
  - Pragmatic planning
- Project Organizations and Responsibilities
- Line-of-Business Organizations
- Project Organizations
- evolution of Organizations
- Process Automation
- Automation Building blocks
- The Project Environment

#### **Unit-IV**

##### **Project Control and Process instrumentation**

- The seven core Metrics
- Management indicators
- quality indicators
- life cycle expectations
- pragmatic Software Metrics
- Metrics automation.
- Tailoring the Process
- Process discriminants
- Future Software Project Management
- Modern Project Profiles
- Next generation Software economics
- modern process transitions
- Case Study
- The command Center Processing and Display system- Replacement (CCPDS-R)

##### **Text Book:**

1. Course Notes by the Instructor
2. Walker Royce: Software Project Management
3. Bob Hughes and Mike Cotterell: Software Project Management
4. Joel Henry: Software Project Management  
Pankaj Jalote: Software Project Management in practice.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Web Resources :**

1. [http://en.wikipedia.org/wiki/Software\\_project\\_management](http://en.wikipedia.org/wiki/Software_project_management)
2. <https://www.comp.glam.ac.uk/staff/dwfarthi/projman.htm>
3. [http://www.linkedin.com/skills/skill/Software\\_Project\\_Management](http://www.linkedin.com/skills/skill/Software_Project_Management)

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Distributed operating system****Course Code:- UCS-481**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

L	T	P	Cr
3	1	0	3.5

**Unit-I****Distributed computing systems fundamentals**

- o Introduction to Distributed computing systems,
- o Models, Popularity.
- o Distributed Computing system.
- o Design issues of Distributed operating system.
- o Distributed computing environment

**Unit-II****Message Passing**

- o Features of a good Message Passing System.
- o Issues in IPC by Message Passing Synchronization,
- o Buffering, Multi datagram Messages,
- o Encoding and Decoding Message data, Process Addressing,
- o Failure Handling, Group Communication.
- o RPC Model, Transparency of RPC, RPC messages,
- o Marshaling Arguments and Results.
- o Server Management, Parameter Passing semantics,
- o Call semantics, Communication Protocols for RPCs,
- o Client Server Building, Exception handling,
- o Security ,RPC in Heterogeneous Environments, Lightweight RPC.

**Unit-III****Distributed Shared Memory:**

- o General architecture of DSM systems.
- o Design and implementation Issues of DSM,
- o Granularity, Structure of Shared Memory Space. Consistency models,
- o Replacement strategy, Thrashing. Synchronization:
- o Clock Synchronization.
- o Event Ordering, Mutual Exclusion, Deadlock, Election
- o Algorithms.

**Unit-IV****Resource Management**

- o Features of global scheduling algorithm.
- o Task assignment approach,

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

- o Load-Balancing and Load approach.
- o Process Management: Introduction, Process Migration,
- o Threads. Distributed File Systems:
- o Features of good DFS, File models, File Accessing models

**Text Books:**

1. Pradeep Sinha K., “Distributed Operating Systems concepts and design”, PHI learning private limited.
2. Mukesh Singhal, Niranjana G Shivarathri, “Advanced Concepts in Operating
3. systems”, Tata McGraw Hill Ltd.
4. Coulouris.G, Dollimore J & Kindberg T, “Distributed Systems concepts and design”, 4th edition, Pearson Education.
5. Tanenbaum A S, “Modern Operating System”, PHI learning private limited, 3rd edition.

**Course Name:- Biomedical Instrumentation****Course Code:- UEC-462**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

L	T	P	Cr
3	1	0	3.5

**Unit-I**

Introduction to Biomedical Signals Tasks in Biomedical Signal Processing, Computer Aided Diagnosis, Examples of Biomedical signals: ECG, EEG, EMG etc., Review of linear systems, Fourier Transform and Time Frequency Analysis (Wavelet) of biomedical signals, Processing of Random & Stochastic signals, spectral estimation, Properties and effects of noise in biomedical instruments, Filtering in biomedical instruments

**Unit-II**

Cardio-logical Signal Processing Pre-processing, QRS Detection Methods, Rhythm analysis, Arrhythmia Detection Algorithms, Automated ECG Analysis, ECG Pattern Recognition, Heart rate variability analysis.

**Unit-III**

Adaptive Noise Canceling Principles of Adaptive Noise Canceling, Adaptive Noise Canceling with the LMS adaptation, Algorithm, Noise Canceling Method to Enhance ECG Monitoring, Fetal ECG Monitoring.

**Unit-IV**

Neurological Signal Processing Modeling of EEG Signals, Detection of spikes and spindles, Detection of Alpha, Beta and Gamma Waves, Auto Regressive (A.R.) modeling of seizure EEG, Sleep Stage analysis, Inverse Filtering, Least squares and polynomial modeling.

**Reference Books:**

1. D.C.Reddy,—Biomedical Signal Processing: Principles and techniques, Tata McGraw Hill, New Delhi, 2005.
2. Willis J Tompkins, Biomedical Signal Processing, Prentice Hall, 1993
3. R. Rangayan, —Biomedical Signal Analysis, Wiley 2002.
4. Bruce, —Biomedical Signal Processing & Signal Modeling, Wiley, 2001.
5. K. Najarian and R. Splinter, —Biomedical Signal and Image Processing, Second Edition, The CRC Press.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Television Engineering****Course Code:- UEC-463**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

L	T	P	Cr
3	1	0	3.5

**Unit -I**

**Principles of TV:** Picture elements, Theory of line, frame and field frequencies Blanking, Synchronization, interfacing, resolution, vertical resolution, horizontal resolution and video bandwidth, Use of AM in video and FM in audio, Block Diagram of TV Transmitter and Receiver, Construction of composite video signal.

**Unit -II**

**Television cameras and picture tubes:** Spectrum of light and eye response, Image orthicon, plumbicon, vidicon (Principles of operation, Construction and working), TV picture tube details, Modulation system used for sound and picture, VSB working, TV transmitter.

**Unit- III**

**Tv receiver:** Block Diagram of TV Receiver, Tuner Circuits, Choice of IF amplifier, A.M. & F.M. detectors, Receiver sweep circuits, Video Frequency amplifier, synch. Pulse representation, deflection circuits.

**Unit -IV**

**Colour tv:** Hue, Saturation and luminance, Luminance and colour signal generation, Types of colour picture tubes (Basic principles and construction), colour subcarrier and colour triangle, NTPC, PAL, SECAM systems, Colour TV transmission & reception, Block Diagram of digital TV with merits.

**REFERENCE BOOKS:**

- |                           |              |                     |
|---------------------------|--------------|---------------------|
| 1. Monochrome & Colour TV | : R.R Gulati | : New Age Pub.      |
| 2. Basic Television       | : G.M Grob   | : McGraw Hills      |
| 3. T.V. Engg              | : Dhake      | : Tata McGraw Hills |

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



**Course Name:- Energy Management**

**Course Code:- UEE-403**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 0 3.5**

### **Unit-I**

**Introduction:** Review of different Energy Sources Concept of Energy Management, supply side management, demand side management, Energy crisis, Energy Efficiency, Energy Scenario in India and its Conservation program, Computer Aided Energy Management System

**Energy conservation:** Energy Conservation needs and Objectives, Energy conservation in Domestic sector, Energy Conservation in Industrial sector.

### **Unit-II**

**Energy audit :** Need for Energy Audit, Types of Energy Audits, National Energy Plan and its impact on Energy Conservation, Energy audit team, Energy Audit Reporting format, Energy Audit Instruments.

### **Unit-III**

**Energy efficient technology:** Life cycle assessment, Energy efficient Motors, BIS Specifications for Energy Efficient Motors, Energy Efficient lighting sources, Power Quality

### **Unit-IV**

**Energy audits practice :** Energy Audits of building systems, electrical systems, maintenance and Energy Audits.

### **Text Book:**

1. Handbook of Energy Audits by Albert Thuman – Fairman Press Inc.
2. Energy basis for man and nature by Howard T.Odum & Elisbeth C.Odum.
3. Energy Management by Umesh Rathore, Kataria Publications

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Non Conventional Electrical Power Generation**  
**Course Code:- UEE-452**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 0 3.5**

### **Unit-I**

**Energy situation and renewable energy sources:** Global Energy scenario, World Energy consumption, Energy in developing countries, fire wood crisis, Indian energy scene, Non conventional renewable energy sources, potential of renewable energy sources.

### **Unit-II**

**Wind Energy:** Origin of wind, Basic principle of wind energy, conversion, component of wind energy conversion system, type of windmills, Wind electrical Generations in India.

**Solar Energy:** Introduction, solar radiation, solar energy collector, solar thermal power generation, low temperature application of solar energy.

### **Unit-III**

**Geo-thermal Power Plants:** Introduction, Geothermal sources, comparison of Geo thermal energy with other energy forms, development of Geothermal power in India.

**Physical and thermochemical methods of bioconversion:** Introduction, biomass definition and potential, physical method of bio conversion, thermo chemical methods.

### **Unit-IV**

**Wave, Tidal and OTEC:** Introduction, Basic principle of tidal power, Wave energy, component of Tidal power plant, Ocean Thermal Energy Conversions, advantages and disadvantages of tidal power generation.

**Small and Mini Hydro power System:** Introduction, site development, generation and electrical equipment, system of regulation of Hydroelectric Power in India.

### **Text Book:**

1. Renewable Energy Sources by Maheshwar Dyal.
2. Small and mini Hydropower system by Tata Mc Graw Hill.
3. An Introduction to power plant technology by G.D.Rai.
4. Solar Energy by Suhas.P.Sukhatma, Tata Mc Graw Hill.
5. Modern Power Plant Engg. by Joel

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Advance Construction Techniques and Project Management**  
**Course Code:- UCE-312**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 0 3.5**

### **UNIT-I**

#### **Introduction**

- Materials - Modular co-ordination, standardization and tolerances-system for prefabrication.
- Pre-cast concrete manufacturing techniques
- Moulds –construction design, maintenance and repair

### **Unit-II:**

#### **Construction Techniques:**

- Pre-casting techniques - Planning, analysis and design considerations
- Handling techniques-TransportationStorage and erection of structures.

### **UNIT -III**

#### **CPM**

- Introduction
- Network techniques, work break down
- Classification of activities, rules for developing networks, network development-logic of network, allocation of time to various activities
- Fulkerson's rule for numbering events, network analysis ,determination of project schedules, critical path, ladder construction, float in activities, shared float, updating
- Resources allocation, sources smoothing and resources leveling.

#### **PERT**

- Probability concept in network, optimistic time, pessimistic time, most likely time, lapsed time, deviation, variance, standard deviation, slack critical path, probability of achieving completion time, central limit theorem.

### **UNIT-IV**

#### **Cost-Time Analysis:**

- Cost versus time, direct cost, indirect cost, total project cost and optimum duration
- Contracting the network for cost optimization, steps in time cost optimization, illustrative examples.

#### **Inspection & Quality Control:**

- Introduction
- Principles of inspection
- Enforcement of specifications

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

- Stages in inspection
- Quality control and testing of structures
- Statistical analysis.

**Text Book:**

1. Krishnaraju, N., Advanced Concrete Technology, CBS Publishers, 1985
2. Neville, A.M., Concrete Technology, Prentice Hall, Newyork, 1985.
3. Construction Planning & Management by P.S. Gehlot & B.M. Dhir
4. PERT & CPM - Principles & Applications by L.S. Srinath

**Web Resources:**

1. <http://www.wikipedia.ac>
2. [www.sciencedirect.com](http://www.sciencedirect.com)
3. <http://engineeringcivil.com>

**Course Name:- Advance Environmental Engineering**  
**Course Code:- UCE-365**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 0 3.5**

### **Unit-I**

**Advanced wastewater treatment:** Need for advanced wastewater treatment, process selection, granular- medium filtration, micro screening, control of nutrients, combined removal of nitrogen and phosphorus by biological methods, removal of toxic compounds and refractory organics, removal of dissolved inorganic substances, natural treatment systems- floating aquatic plant treatment systems.

### **Unit-II**

**Air and water quality monitoring:** Design of air monitoring survey network, siting criteria, models for monitoring site selection, principles and techniques for ambient and stack sampling, acquisition and analysis of monitored data, BIS methods. Monitoring of water quality, planning sampling networks and schedules, sample collection and analysis, presentation and interpretation of results, methods and instruments for monitoring water pollutants, standards.

### **Unit-III**

**Environmental modelling and simulation:** Principles of modeling and simulation, classification, introduction to air quality models, air pollution meteorology, impact on local and global climate, atmospheric stability, Gaussian models and modifications. Introduction to river, estuaries and lake hydro dynamics, dissolved oxygen models, eutrophication and nutrient-phytoplankton models, toxic substance models, temperature models, models for management applications.

### **Unit-IV**

**Resources and energy recovery from solid waste:** Processing techniques, material recovery systems, recovery of biological conversion products, recovery of thermal conversion products, recovery of energy from conversion products, materials and energy recovery systems.

### **Text Book:**

1. Waste water Engineering- treatment and Reuse (Fourth Edition) : Metcalf & Eddy Inc: Tata McGraw Hill
2. Air Monitoring Survey Design K.E. Noll & T.L. Miller : Ann Arbor Science
3. Air Pollution Control Engineering (Second Edition): N.D. Nevers: McGraw Hill

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Web Resources:**

1. <http://www.wikipedia.ac>
2. [www.sciencedirect.com](http://www.sciencedirect.com)
3. <http://engineeringcivil.com>

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Human Values and Professional Ethics**  
**Course Code:- UMG-476**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 0 3.5**

### UNIT – I

**Introduction –Need, Basic Guidelines and Content:** Understanding the need , basic guidelines, content and process for value Education Self Exploration – What is it? – its content and process: “Natural Acceptance” and Experiential Validation – as the mechanism for self explanation Continuous Happiness and Prosperity – A look at basic Human Aspirations

### UNIT – II

**Process for Value Education:** Right Understanding, Relationship and Physical Facilities – basic requirements for fulfillment of aspirations of every human being with their correct priority Understanding Happiness and prosperity correctly – A critical appraisal of the current scenario Method to fulfill the above human aspirations; understanding and living in harmony at various levels

### UNIT – III

**Understanding Harmony in the Human Being:** Understanding human being as a co-existence of the sentient “I” and the material “Body” Understanding the needs of Self ( “I” ) and “Body” – Sukh and Suvidha Understanding the Body as an instrument of “I” ( I being the doer, seer and enjoyer)

### UNIT – IV

**Harmony in Myself:** Understanding the characteristics and activities of „I“ and harmony in “I” Understanding the harmony of I with the Body: Sanyam and Swasthya: correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya – practice exercises and Case Studies will be taken up in Practice Sessions relationship.

### Reference Books:

1. R R Gaur, R,Sangal, G.P Bagaria, 2009, A Foundation Course in value Education(English)
2. Pradeep Kumar Ramancharla, 2013, A foundation course in value education (Telugu)
3. R R Gaur, R Sangal G P Bagaria, 2009, Teacher’s Manual (English)
4. Pradeep Kumar Ramancharla, 2013, Teacher’s Manual (Telugu)

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

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**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



# OPEN ELECTIVE-II

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Grid Computing****Course Code:- UCS-482**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3.5</b>

**Unit-I****Introduction**

- Grid Computing
- Benefits of Grid Computing
- Virtual Organizations
- Grid Architecture and its relationship to other distributed technologies
- Grid Application Areas,
  - OGSA
  - OGSF
  - Introduction to Semantic Grids.
- Building Blocks for Grid Systems
  - XML
  - SOAP
  - UDDI
  - Service Oriented Architecture
  - Web Services
  - Web Services Architecture
  - WSRF
  - Relationship between Grid and Web Services
  - Grid and Web Services Invocation.

**Unit-II****Data Management**

- Overview of Data Management in GT4
- Data Movement:
  - Grid FTP
  - RFT
  - Data Replication
  - RLS
  - Higher level data services.
- Resource Management and Scheduling
- Generalized Resource Management Framework
- Grid Resource Management Systems
- Scheduling in Grids
- QoS
- Introduction to GRAM

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Unit-III****Security**

- Security Issues in Grids
- Authentication Issues
- Trust and Privacy related Issues
- Authorization Issues
- Grid Security Frameworks
- Standards
- Web Services Security Specifications.
- Monitoring and Discovery Services:
  - Index Services
  - Resource Discovery
  - UDDI
  - Introduction to MDS in GT4

**Unit-IV****Grid Middleware and Programming Model**

- Study of Globus Toolkit 4 Components
- Programming Model
- Singleton and Multiple Resources
- Logging
- Lifecycle Management
- Notifications
- Study of important distributed systems like Legion,
- CRISI

**Preferred Reading:**

1. Grid Computing, First Edition by Joshy Joseph, Craig Fellenstein , Pearson Education
2. The Grid 2: Blueprint for a New Computing Infrastructure, Second Edition, by Ian Foster, Carl Kesselman , Morgan Kaufman
3. Introduction to Grid Computing, First Edition by Bart Jacob, Michael Brown, Kentaro Fukul, Nihar Trivedi , IBM Red Books
4. Grid Resource Management - State of the Art and Future Trends by Zarek Nabrzyski, Jennifer M. Schopf, Jan Weglarz , Kluwer Academic Publishers
5. Grid Computing Security by Anirban Chakrabarti , Springer

**Web Resources:**

1. [en.wikipedia.org/wiki/Grid\\_computing](http://en.wikipedia.org/wiki/Grid_computing)
2. [www.gridcomputing.com/](http://www.gridcomputing.com/)
3. [www.webopedia.com/grid\\_computing.html](http://www.webopedia.com/grid_computing.html)

**Course Name:- Software Reliability**

**Course Code:- UCS-483**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 0 3.5**

### **Unit -I**

**Introduction:** Need and Concepts of Software Reliability, Failure and Faults– Prevention, Removal, Tolerance, Forecast, Dependability Concept– Failure Behavior, Characteristics, Maintenance Policy, Reliability and Availability Modeling, Reliability Evaluation

### **Unit- II**

**Software reliability models :** Introduction (Historical Perspective and Implementation, classification, limitations and issues, Exponential Failure Models – Jelinski(moranda model, Poisson, Musa, Exponential models, Weibull Model, Musa(okumoto Model, Bayseian Model – Littlewood verral Model, Phase Based Model

### **Unit- III**

**Prediction analysis:** Model Disagreement and Inaccuracy – Short & Long Term Prediction, Model Accuracy, Analyzing Predictive Accuracy – Outcomes, PLR, U & Y Plot, Errors and Inaccuracy, Recalibration –Detecting Bias, Techniques, Power of Recalibration, Limitations in Present Techniques, Improvements.

### **Unit- IV**

**The operational profile:** Concepts and Development Procedures – Customer Type, User Type, System Mode, Functional and Operational Profile, Test Selection (Selecting Operations, Regression Test, Special Issues – Indirect Input Variables, Updating, Distributed system, CASE STUDY (Application of DEFINITY & FASTAR, Power Quality Resource System TESTING FOR RELIABILITY MEASUREMENT Software Testing – Types, White and Black Box, Operational Profiles – Difficulties, Estimating Reliability, Time/Structure based software reliability – Assumptions, Testing methods, Limits, Starvation , Coverage, Filtering, Microscopic Model of Software Risk.

### **Reference Books**

1. Patric D. T.O connor, “Practical Reliability Engineering”, 4th Edition, John Wesley & sons, 2003.
2. John D. Musa, “Software Reliability Engineering”, Tata McGraw Hill, 1999.
3. Michael Lyu, “Handbook of Software Reliability Engineering”, IEEE Computer Society Press, ISBN: 0(07(039400(8, 1996.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Satellite Communication**

**Course Code:- UEC-464**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 0 3.5**

### **Unit-I**

Introduction to Satellite Communication Origin, Brief History, Current state and advantages of Satellite Communication, Active & Passive satellite, Orbital aspects of Satellite Communication, Angle of Evaluation, Propagation Delay, Orbital Spacing, System Performance

### **Unit-II**

Satellite Link Design Link design equation, system noise temperature, C/N & G/T ratio, atmospheric & econospheric effects on link design, complete link design, interference effects on complete link design, earth station parameters, Earth space propagation effects, Frequency window, Free space loss, Atmospheric absorption, Rainfall Attenuation, Ionospheric scintillation, Telemetry, Tracking and command of satellites.

### **Unit-III**

Satellite Multiple Access System FDMA techniques, SCPC & CSSB systems, TDMA frame structure, burst structure, frame efficiency, super-frame, frame acquisition & synchronization, TDMA vs FDMA, burst time plan, beam hopping, satellite switched, Erlang call congestion formula, DA-FDMA, DA-TDMA.

### **Unit-IV**

Satellite Services INTELSAT, INSAT Series, VSAT, Weather forecasting, Remote sensing, LANDSAT, Satellite Navigation, Mobile satellite Service.

### **Unit-V**

Laser & Satellite Communication Link analysis, optical satellite link Tx & Rx, Satellite, beam acquisition, tracking & pointing, cable channel frequency, head end equation, distribution of signal, n/w specifications and architecture, optical fibre CATV system.

### **Reference Books:**

1. Trimothy Pratt, Charles W. Bostian, —Satellite Communications, John Wiley & Sons, 1986.
2. Dr. D.C. Aggarwal, —Satellite Communications, Khanna Publishers, 2001.
3. Dennis Roddy, —Satellite Communications, McGraw Hill, 1996.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Digital Signal Processing & Applications**

**Course Code:- UEC-465**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 0 3.5**

### **Unit-I**

Classification of signals, singularity functions, classification of system, manipulation of Discrete time signals: Signal analysis, signal characteristics, typical discrete time signals, operation on signals, properties of linear time-invariant digital systems, sampling of analog signals and sampling rate conversion. Z-transform; Properties of Z-transform. Inverse Z-transform – analysis of discrete time systems, convolution.

### **Unit – II**

System function, difference equation, IIR filter design: Analog filter approximation, Butter worth, Chebyshev and Elliptic filters, Bilinear transformations, Impulse invariance technique, Digital frequency band transformations. FIR filter design: Window technique, Equiripple approximation technique, Frequency sampling technique.

### **Unit – III**

Discrete Fourier Transform (DFT) and Inverse Discrete time Fourier Transform: properties of DFT (circular convolution). Fast Fourier Transform (FFT): Decimation-in-time (DIT) algorithm-decimation-in-frequency algorithm-FFT, Radix-2 DIT and DIF implementation.

### **Unit – IV**

Applications of DSP in Voice, RADAR and Image Processing. TMS320CXX SERIES PROCESSORS: Architecture, Memory, Interrupts, Addressing modes, Assembly language programming.

### **Reference Books:**

1. Digital Signal Processing David.K.Defatta, Joseph G, Lucas &
2. William S.Hodgkiss John Wiley & sons
3. Digital Signal Processing Sanjit K and Mitra Tata McGraw Hill
4. Digital Signal Processing- Principles, Algorithms & Applications John G. Proakis &
5. Dimitris Manolakis Pearson Education
6. Digital Signal Processing A.V.Oppenheim & R.W.Schaffer Prentice Hall

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Transformer Engineering**

**Course Code:- UEE-457**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3.5</b>

### Unit-I

**Introduction to Transformers :** Transformer Types, Transformer Losses, Operating Principles, Instrument Transformers, Transformer Construction, Auto -Transformer, Transformer connections.

**Transformer Maintenance:** Insulation Testing, High Potential Testing, Turns Ratio Testing, Polarity Testing, Power Factor, Excitation Current, DC Winding Resistance, Polarization Recovery, Insulating Fluid, Dielectric, Dissolved Gas Analysis.

### Unit-II

**Materials for Transformers:** Insulating oil, insulating paper, pressboard, and wood, insulated copper conductor for windings, crepe paper, sealing materials, and cold – rolled grain oriented electrical steel sheet.

**Winding and Insulation:** Types of windings, surge voltage, heat transfer, insulation design.

### Unit-III

**Cooling:** Air Cooled Oil-Immersed, Water-Cooled, Forced-Oil Cooling, Self-Cooling with Air Blast Temperature Limits, Transformer loading.

**Magnetic Circuit:** Materials, design of magnetic circuit, optimum design of core.

### Unit -IV

**Tap Changers:** Off - circuit tap changer, on load tap changer, automatic control of tap changer.

**Transformer Auxiliaries:** Buchholz relay, temperature indicators, oil level indicators, oil preservation systems

### Text Book:

1. Transformers by BHEL, Bhopal, Tata McGraw Hill.
2. Transformer Engineering by SV Kulkarni and SA Khaparde Marcel & Dekks Inc.
3. Transformer Engineering design and practices, SV Kulkarni, SA Khaparde, Marcel Dekker Inc New york.
4. Electrical Machines by J. Nagrath & D.P. Kothari, Tata McGraw Hill
5. Electrical Machines by Husain Ashfaq, Dhanpat Rai & Sons
6. Electric Machine and Transformers by Irving L. Kosow, Prentice Hall of India.
7. Fundamentals of Electrical Machines by B.R. Gupta & Vandana Singhal, New Age International
8. The Performance and Design of DC machines by A.E. Clayton, Pitman & Sons
9. The Performance and Design of AC machines by M.G. Say, Pitman & Sons
10. Theory of Alternating Current Machinery by Langsdorf, Tata McGraw Hill.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Direct Energy Conversion**

**Course Code:- UEE-411**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

L	T	P	Cr
3	1	0	3.5

### Unit-I

**Introduction:** Conventional generation (Thermal, Hydro etc) alternative generation processes

**Thermionic generation:** The basic thermionic diode generator and its analysis, Cross held devices, Anode and cathode materials, Experimental thermionic generator.

### Unit-II

**Mhd generation:** Principles of MHD generation, electrical conditions, Faraday generator, Hall generator, comparison of generators, choice of generator parameters, other generator configurations.

**Experimental mhd generation:** Open cycle working, closed cycle operation, Liquid metal systems..

### Unit III

**Thermoelectric generation:** Seeback effect, Peltier effect, Thomson effect, EMF relationship, Generator analysis, Material selection, Experimental thermoelectric generation.

### Unit IV

**Fuel cells:** Principles of fuel cells, Thermodynamics of the fuel cell, Choice of fuels and operating condition, Polarization and its effect, Redox cell, Overall efficiency, Practical Fuel cells – various types.

### Recommended Books:

1. Direct Energy Conversion by R.A.Coombe.
2. Non-Conventional Energy Sources By –S.Rao.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



**Course Name:- Advance Concrete Technology**

**Course Code:- UCE-311**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L    T    P    Cr**  
**3    1    0    3.5**

### **Unit-I**

#### **Introduction:**

- Structure of hydrated Cement
- Special Cements
- Chemical admixtures
- Concept of Green Concrete using Mineral Admixtures
- Corrosion protection
- Fire resistance
- Sulphate attack on concrete
- Diffusion of chlorides in concrete
- Evaluation of concrete strength
- NDT Techniques

### **Unit-II**

#### **Concrete mix design:**

- Principles of Concrete mix design
- Methods of Concrete mix design
- Design of high strength concrete and
- High performance concrete

### **Unit 3**

#### **Properties of concrete:**

- Rheological behavior of fresh Concrete
- Properties of fresh concrete
- Properties of hardened concrete
- Strength
- Elastic properties
- Creep and Shrinkage
- Variability of concrete strength

### **Unit 4:**

#### **Modern Trends in concrete:**

- Modern trends in concrete manufacture
- Placement techniques

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

- Methods of transportation
- Placing of concrete
- Curing Techniques
- Extreme weather concreting
- Special concreting methods
- Vacuum dewatering of concrete
- Under water concreting

**Special concrete:**

- Guniting
- Shotcrete
- Light weight Concrete
- Mass concrete
- Fly-ash Concrete
- Fibre reinforced Concrete
- Polymer Concrete
- Ferro Reinforcement in concrete

**Utilization of waste Material:**

- Epoxy resins and screeds for rehabilitation- properties and application

**Text Book:**

1. Krishnaraju, N., Advanced Concrete Technology, CBS Publishers, 1985.
2. Neville, A.M., Concrete Technology, Prentice Hall, Newyork, 1985.
3. A.R. Santhakumar, :Concrete Technology” Oxford University Press, 2006

**Web Resources:**

1. <http://www.wikipedia.ac>
2. [www.sciencedirect.com](http://www.sciencedirect.com)

**Course Name:- Geographic Information Systems for Resources Management**  
**Course Code:- UCE-409**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 0 3.5**

### **Unit-I**

**Principles of GIS:** Introduction to the basic Components and structure of GIS, Geographic concepts, Geographical Entities and Spatial data formats will be introduced.

### **Unit-II**

**Intorduction to ArcGIS:** Introduction to ArcGIS Software and its Components(ArcMap, ArcCatalog and ArcToolbox).

### **Unit-III**

**Spatial data formats:** Data Types, the differences between raster and vector formats, non-native data formats and metadata. Data analyses and function are highly dependent on these spatial data.

### **Unit-IV**

**Map Projection:** Overview of geographic coordinate systems and Map projections. Essention to geo-reference spatial data and superimpose spatial datasets

**Spatial data Analysis:** An overview of multiple vector-based and raster-based (local, Focal, Zonal, and Global) spatial operations will be provided. Queries, The Field calculator, raster calculator and model maker provide operational tools to conduct spatial analyze within the Arc GIS Environment.

### **Text Book:**

1. Heywood L, Comelius. S and S. Carver (2006) An Introduction to Geographic Information System, Dorling Kinderseley (India) Pvt. Ltd.
2. Burrough P A 2000 P A McDonnell (2000) Principles of Geographic Information Systems, London: Oxford University Press

### **Reference Book:**

1. Lo.C.P., Yeung. K.W Albert(2002) Concepts and Techniques of Geographic Information Systems, Prentice-Hall of India Pvt. Ltd. New Delhi

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Entrepreneurship Development & Enterprise Management**  
**Course Code:- UMG-450**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3.5</b>

### **Unit-1**

Developing Entrepreneurship: Element for a program, Developing Entrepreneurship competencies: Need & process of development, social determinants of Entrepreneurship growth. Entrepreneurship development programs, Entrepreneurship orientation & awareness programme, New enterprise creation programme.

### **Unit-2**

Existing Entrepreneurship programmes for existing enterprising for survival & growth. Evolution of various EDP programme in India, Managing growth & transition, the organization life cycle, chasing Entrepreneurship roles.

### **Unit-3**

Entrepreneurship & new venture opportunities, Planning for new ventures. Concept of planning paradigm – pre-startup, early growth & later growth stage.

### **Unit-4**

Incentive & subsidies available for Entrepreneurship growth. Guidance for project report preparation, Location, Environmental and managerial problems of new enterprise management, Managing family business. Some case studies of family run business in India.

### **Text Books:**

1. Industrial Management: Spriegel. John Wiley & Sons. N.York, 1961.
2. Industrial Organisation: Kimball and Kimball. Vakils Feffer & Simsons Pvt. Ltd. Bombay, 1971.
3. Industrial Engineering & Operations Management by Dr. S K Sharma & Mrs Savita Sharma, S.K.Katarial & Sons, New Delhi

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

# OPEN ELECTIVE-III

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- E-Commerce & Erp**  
**Course Code:- UCS-484**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3.5</b>

### **Unit-I**

#### **Introduction and Concepts:**

1. Networks and commercial transactions – Internet and other novelties;
2. networks and electronic transactions today, Model for commercial transactions;
3. Internet environment – internet advantage, worlds wide web and other internet sales venues
4. Online commerce solutions.

#### **Security Technologies:**

1. Insecurity Internet; A brief introduction to Cryptography;
2. Public key solution; Key distribution and certification;
3. Prominent cryptographic applications.

#### **Electronic Payment Methods:**

1. Updating traditional transactions; secure online transaction models;
2. Online commercial environments; digital currencies and payment systems;
3. Offline secure processing; private data networks.

#### **Protocols for Public Transport of Private Information:**

1. Security protocols; secure protocols; Secure hypertext transfer protocols;
2. Secure sockets layers; Integrating security protocols into the web;
3. Non technical provide.

### **Unit-II**

#### **Electronic Commerce Providers:**

1. On-line Commerce options: Company profiles.
2. **Electronic Payment Systems:** Digital payment systems;
3. First virtual internet payment system; cyber cash model.

#### **On-line Commerce Environments:**

1. Servers and commercial environments; Netscape product line;
2. Netscape commerce server; Microsoft internet explorer and servers; open market.

#### **Digital Currencies:**

1. Optional process of Digicash, Ecash Trail; Using Ecash; Smart cards,
2. Electronic Data Interchange; Its basics;
3. EDI versus Internet and EDI over Internet.

#### **Strategies, Techniques and Tools:**

1. Internet Strategies: Internet Techniques,
2. Shopping techniques and online selling techniques;
3. Internet tools. Electronic Commerce Online Resources and Guide to
4. the CD-ROM.

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Unit-III****ERP**

1. An Enterprise Perspective; Production Finance,
2. Personnel disciplines and their relationship, Transiting environment,
3. MIS Integration for disciplines, Case Study, Information / Workflow,
4. Network Structure, Client Server Integrator System, Virtual

**Enterprise. ERP –**

1. Resource Management Perspective; Functional and Process of Resource. Management,
2. Basic Modules of ERP System-HRD, Personnel Management,
3. Training and Development, Skill Inventory,
4. Material Planning and Control, Inventory, Forecasting, Manufacturing,
5. Production Planning, Production Scheduling,
6. Production Control, Sales and Distribution,
7. Finance, Resource Management in global scenario,
8. dynamic data management in complex global scenario.

**Unit-IV****ERP – Information System Perspective:**

1. Evolution of Application Software Technology Management,
2. EDP, MIS, DBMS, DSS OLAP (Online Analysis and Processing),
3. TP, OAS, KBS, MRP, BPR, SCM, REP, CRM,
4. Information Communication Technology, E-Business, E-Commerce, EDI

**ERP-Key Managerial Issues:**

1. Concept Selling, IT Infrastructure, Implication,
2. ERP Systems on Business Organization, Critical success factors in ERP System,
3. ERP Culture Implementation Issues, Resistance to change,
4. Public Service and Organizations (PSO) Project,
5. ERP Selection issues, Return on Investment, Pre and Post Implementation Issues

**Text Book:**

1. Frontiers of Electronics Commerce by Ravi lalakota, Andrew Whinston
2. Enterprise Resource Planning – Concepts and practice by K. Garg and N.K. Venkita Krishna
3. The SAP/3 Handbook by John Antonio, Fernandz

**Web Resources:**

1. <http://www.practicalecommerce.com/articles/3264-12-Sites-for-Ebook-Publishing>
2. <http://www.ebooksdownloadfree.com/eCommerce/Free-eCommerce-Books-CI49P0.html>
3. <http://blog.publishingtechnology.com/online/ebooks-ecommerc>

**Course Name:- Data Warehousing & Data Mining****Course Code:- UCS-485**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

L	T	P	Cr
3	1	0	3.5

**Unit-I****Introduction to Data Warehousing**

- Data Warehousing
  - Definition and characteristics
  - Need for data warehousing
  - DBMS vs. data warehouse
- OLAP
  - Overall Architecture
- Data Warehouse Database
- Sourcing
- Acquisition
- Cleanup and Transformation Tools
- Metadata Access Tools, Data Marts

**Introduction to Data Mining**

- Data mining
  - Data mining functionalities
  - Kinds of patterns can be mined
  - Classification
  - Major issues
  - Functionalities
  - Classification data mining systems
- Multidimensional data model
  - Data cubes
  - Schemas for multidimensional databases
- OLAP operations
- Metadata

**Unit-II****Data Pre-Processing**

- Data cleaning
- Data Integration and Transformation
- Data Reduction, Discretization and concept hierarchy generation
- Data mining primitives
  - Data mining Task
  - A data mining query language

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



- Architecture of Data mining systems
- Characterization and comparison

### **Concept Description**

- Data mining techniques
  - Concept description attribute oriented induction
  - Analytical characterization
  - Mining class comparisons
  - Mining descriptive statistical measures

### **Unit-III**

#### **Association Rule Mining**

- Mining single dimensional
- Boolean association rules from transactional databases
- Apriori algorithm, efficiency
- Mining rules without candidate generation
  - Mining multilevel association rules from transaction databases mining multidimensional association rules from Relational databases and Data warehouses
  - From association mining to correlation analysis
  - Constraint based association mining

### **Unit-IV**

#### **Applications and Trends in Data Mining**

- Data mining system products and Research prototypes
- Additional themes on Data mining
- Social Impacts of Data Mining
  - Trends in Data mining
  - Realization to data mining using SQL Server
- Case studies in building
  - business environment
- Application of data ware housing
- Data mining in Government
- National Data ware houses and case studies
- Commercial Importance of DW
- Applications of data mining
  - data mining in business process
  - embedded data mining

#### **Preferred Reading:**

1. Course Notes by the Instructor
2. Jiawei Han & Micheline Kamber: Data Mining –Concepts & Techniques
3. Alex Berson : Data Warehousing, Data Mining and OLTP
4. Sam Anahory & Dennis Murray: Data Warehouseing in the Real World
5. Pieter Adrians, Dolf Zantinge: Data Mining

#### **Web Resources:**

1. [http://en.wikipedia.org/wiki/Data\\_warehouse](http://en.wikipedia.org/wiki/Data_warehouse)
2. [http://books.google.co.in/books/about/Data\\_Warehousing](http://books.google.co.in/books/about/Data_Warehousing)
3. <http://www.anderson.ucla.edu/faculty/jason.frand/teacher/technologies>

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Optical Communication**

**Course Code:- UEC-466**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3.5</b>

### **Unit- I**

Need for Fiber Optic Communications System, Role of Fiber Optic communication technology, Basic Block Diagram, Advantages & Disadvantages of Optical Fiber Communication, structure of optical wave guide, light propagation in optical fiber using ray theory, Electromagnetic Mode Theory, Step Index Fiber, Graded Index Fiber, Attenuation- Bending Losses, Scattering, Absorption, Dispersion – Intermodal, Chromatic, limitations & remedies.

### **Unit -II**

Light sources & Transmitters – Light Emitting Diodes, Hetero junction & DH structure, laser diodes, Principle of action, characteristics, efficiency, Block Diagram and typical circuits of Transmitter.

### **Unit- III**

Receivers, Photodiodes -Working, Power relationship, PIN photodiodes, Avalanche photodiode, Block Diagram & typical circuits of receiver.

### **Unit- IV**

Fiber Cable Connection– Splicing, Connectors, components of Fiber Optic Networks, Transceivers, Semiconductor, optical amplifiers - Principle of operation, Gain, Bandwidth, Cross talk, Noise, Applications, Advantages & Disadvantages. Erbium Doped Fiber Amplifiers (EDFAs) - Operation, gain, noise, Components of EDFA module.

### **REFERENCE BOOKS:**

1. Fiber Optic Comm. Systems D.K.Mynbaev Pearson Edu.
2. Optical Fiber Comm. John M.Senior PHI Publications
3. Optical Fiber Comm. G.Keiser TMH

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Principles Of Digital Communication**

**Course Code:- UEC-467**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3.5</b>

### Unit-I

**Pulse modulation:-** Sampling process, pulse – amplitude modulation , other forms of pulse modulation, Bandwidth – noise trade off, quantization process, pulse code modulation, noise considerations in PCM system, ISI & Eye pattern in PCM, Time- division multiplexing, digital multiplexers, differential pulse code modulation , delta modulation, Adaptive Delta Modulation.

### Unit-II

**Digital modulation techniques:** - Binary phase – shift keying, differential phase shift keying, differentially – encoding PSK (DEPSK), Quadrature phase shift keying (QPSK), M-ary PSK, Amplitude shift keying(ASK), Quadrature amplitude shift keying (QASK). Binary frequency shift keying, similarity of BFSK and BPSK, M-ary FSK, Minimum shift keying (MSK)

### Unit-III

**Data transmission:** - A base band signal receiver, probability of error, the optimum filter, white noise: the matched filter, probability of error of the matched filter, coherent reception: correlation, phase shift keying (PSK), frequency shift keying (FSK), Non coherent detection of FSK, differential PSK,).

### Unit-IV

**Spread spectrum modulation:** - Pseudo-noise sequences, direct sequence spread spectrum, processing gain, frequency HOP spread spectrum, Linear Block Codes, Convolution codes.

### REFERENCE BOOKS :-

1. Communication System : Simon Haykins :John Wiley
2. Principles of Communication System: Taub and Schilling :TMH
3. Electronics Communication System : Wayne Tomasi : Pearson Edu.
4. Information Theory Coding and Cryptography : Ranjan Bose : TMH
5. Communication Systems Analog and Digital : Sanjay Sharma : Katson Books

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Hydro Power Station Design**

**Course Code:- UEE-456**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

L	T	P	Cr
3	1	0	3.5

### **Unit-I**

Introduction, Hydrology, Stream flow, Hydrographs, Flow duration curves, Mass curve, Storage, Investigation of site.

### **Unit-II**

Types of dams, arrangement and location of hydro-electric station, types of hydroelectric plants and their fields of use, principle of working of a hydroelectric plant.

### **Unit-III**

Power to be developed, size of plant and choice of units, Types of turbines and their characteristics, Design of main dimensions of turbines.

### **Unit-IV**

Draft tubes, Turbine setting, penstock dimensions, scroll case, preliminary design of penstock, characteristics of generators. Various design aspects of mini and micro hydel plants.

### **Recommended books**

1. Power Station Design by M.V.Deshpande

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Illumination Engineering****Course Code:- UEE-408**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

L	T	P	Cr
3	1	0	3.5

**Unit-I**

Introduction: Laws of illumination - Inverse Square law and Lambert's Cosine law, their application in lighting calculations. brief idea of methods of Lighting calculations. General Principles Of Illumination: Definitions, units of light, definitions of flux, solid angles, luminous intensity and brightness, glare, polar curves.

**Unit-II**

COLOUR: Nomenclature of colour, production of colored light and mixing colours, colours contrast, colour matching. Electric Light Sources: Brief description of characteristics of starting and application of the following lamps: a) Incandescent lamp. b) Sodium Vapour lamp. c) Mercury Vapour lamp d) Fluorescent lamp e) Neon lamp

**Unit-III**

General Illumination Design (LUMEN METHOD): Room index and Utilization factor, Maintenance factor, types of lighting schemes, design of lighting schemes with practical examples. Minimum level of illumination required for:  
(i) Domestic. (ii) Commercial (iii) Educational. (iv) Health (v) Industrial buildings. flood lighting of building, road lighting factory lighting.

**Unit-IV**

Maintenance and Economics: Maintenance of luminaire, luminaire depreciation caused by dust and dirt, Efficient light production, lighting economics. Instruments used in photometric measurements.

**Recommended Books**

1. NPTEL Notes
2. Utilization Of Electric Power and Electric Traction by: J.B.GUPTA

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Urban Transportation Planning**

**Course Code:- UCE-410**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 0 3.5**

### Unit-I

**Introduction:** Role of transportation in the economic development of nations, overview of transport modes, growth trends, National transport policy of India – Case Studies, Transportation Planning in the developing world; and comparative international policies; Fundamental of transportation, Principles of Planning, evaluation, selection, adoption, financing, and implementation of alternative urban transportation systems; formulation of community goals and objectives, inventory of existing conditions; transportation modeling trip generation, distribution, modal choice, assignment

### Unit-II

**Data collection and Inventories:** Collection of data – Organization of surveys and Analysis, Study Areas, Zoning, Types and Sources of data, Road Side Interviews, Home Interviews Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary sources, Economic data – Income – Population – Employment – Vehicle – Owner Ship

### Unit-III

**Travel Demand Issues:** Trends, Overall Planning Process, Long term vs Short Term planning, Demand Function, Independent variables, travel attributes, assumptions in Demand Estimation, Detailed approach on 4step travel demand estimation; Sequential and Simultaneous approaches, Aggregate and Disaggregate Techniques

### Unit-IV

**Demand and Supply Planning:** Planning for Sustainable urban mobility, positive and negative externalities in urban transport, congestion in pricing, parking policy, demand management , urban travel and transportation system characteristics – a systems perspective, Data management and use in making decisions, Demand analysis , Urban activity analysis , supply analysis; Plan Preparation and Evaluation , Travel Forecast to evaluate Alternative Improvements, Impacts of new Development on Transportation facilities , Master plans, Selection of Corridor, Corridor identification, Corridor Deficiency Analysis

### Preferred Reading:

1. Introduction to Transportation Planning – MJ Bruton ; Hutchinson of London Ltd.
2. Introduction to urban system planning –B.G.Hutchinson; Mc Graw Hill.
3. Traffic Engineering and Transport Planning – Kadyali L.R. , Khanna Publishers
4. Lectures notes on UTP- Prof. S. Raghavachari ,REC Warangal

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Web Resources:**

1. [www.wikipedia.org](http://www.wikipedia.org)
2. [www.engineeringcivil.com](http://www.engineeringcivil.com)

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.

**Course Name:- Disaster management**

**Course Code:- UCE-476**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

**L T P Cr**  
**3 1 0 3.5**

### Unit-I

**Understanding Disasters:** Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity–Disaster and Development, Awareness During Disaster, Search and Rescue, needs Assessment and Disaster management.

### Unit-II

#### Types of Disaster and its Control

- Geological Disasters (earthquakes, landslides, tsunami, mining);
- Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves);
- Biological Disasters (epidemics, pest attacks, forest fire); Technological Disasters (chemical, industrial, radiological, nuclear);
- Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters);
- Global Disaster Trends–Emerging Risks of Disasters–Climate Change and Urban Disasters.

### Unit-III

#### Disaster Management in India

- Disaster Profile of India –Mega Disasters of India and Lessons Learnt Disaster Management Act 2005 –Institutional and Financial Mechanism National Policy on Disaster Management, National Guidelines and Plans on Disaster Management;
- Role of Government (local, state and national),
- Non-Government and Inter-Governmental Agencies

### Unit-IV

#### Applications of Science and Technology for Disaster Management

- Geo-informatics in Disaster Management (GIS, GPS and RS)
- Disaster Communication System (Early Warning and Its Dissemination)
- Land Use Planning and Development Regulations Disaster Safe Designs and Constructions in India
- Learning Outcomes: Students will be able to understand,
- Behavior of building during earthquake
- Able to find the critical element of building
- Knowledge of repair of critical element

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.



**Text Book:**

1. Pankaj Aggarwal and Manish Shrikande, "Earthquake resistant design of structures"
2. S.K.Duggal, "Earthquake resistant design of structures", Oxford University Press
3. Ulrich ranke, "Natural Disaster Risk Management: Geosciences and Social Responsibility"
4. Michael Beach , "Disaster Preparedness and Management"
5. Rajesh Anand,N.C.Jana,Sudhir Singh, "Disaster Management and Sustainable Development Emerging issues and concerns"
6. B C Bose, "Introduction to Disaster Management" Relevant codes

**Web Resources:**

1. [http://en.wikipedia.org/wiki/Civil\\_engineering](http://en.wikipedia.org/wiki/Civil_engineering)
2. <http://engineeringcivil.com>

**Course Name:- Total Quality Management**

**Course Code:- UMG-475**

<b>Assessment and Evaluation Components</b>	
Quizzes /Assignments/ Presentation/Class Test/ Open Book Test/ Case Study	25
Mid Term Tests (MTE)	20
Attendance Marks	05
End Term Examination	50
<b>Total</b>	<b>100</b>

L	T	P	Cr
3	1	0	3.5

### **Unit-I**

Introduction to TQM & ISO 9000, Total Quality Control, Customer Focus & Total waste Elimination (TWE), Quality Assurance. 04 Quality of Design & Development, Inspection & Measurement workforce Teams, Benchmarking, TQM for Sales Marketing Management.

### **Unit-II**

Business Process Re-engineering & Information Technology, Quality control SQC/ SPC, Technology & Product Quality, Quality for After Sales Services Technology & Product Quality.

### **Unit-III**

Organization for Quality, Reliability as quality characteristics, Quality leadership, Quality linked productivity, Total Quality, Culture, Quality and environment, Cost of Quality.

### **Unit-IV**

Cost of Quality, Quality Control for Export Units, Quality Maturity and Discipline, Total commitment for Quality, TQM Implementation, ISOm 9000 series of standards, ISO 9000-1, ISO 9000-2, ISO 9000-3. 08

### **Text Books:**

1. TQM & ISO 14000: K.C.Arora.
2. Total Quality Control: Armand V. Feigenbaum.
3. Total Quality Management: Joseph.A.Patrick, Diana.S.Furr.
4. Total Quality Management – Text: Joel E. Ross Cases &Readin
5. Total Quality Control Essentials: Sarv Singh Soin

**Note for End Term Examination:** Attempt five questions in all, selecting one question each from the sections A, B, C and D. Section E is compulsory.