



# PM POLYTECHNIC

A Unit of Puran Murti Educational Society  
Approved by AICTE, Ministry of HRD, Govt. of India,  
Affiliated to State Board of Technical Education, Panchkula, Haryana

## SCHEME FOR SECOND SEMESTER (CIVIL ENGINEERING)

Sr. No.	Subject	Study Scheme			EVALUATION SCHEME						Total Marks
					INTERNAL ASSESSMENT		EXTERNAL ASSESSMENT (EXAMINATION)				
					Theory	Practical	Written Paper		Practical		
					Max. Marks	Max. Marks	Max. Marks	Hrs.	Max. Marks	Hrs.	
2.1*	Communication Skills - II	3	-	2	25	25	100	3	50	2	200
2.2*	Applied Mathematics - II	5	-	-	50	-	100	3	-	-	150
2.3*	Applied Physics - II	4	-	2	25	25	100	3	50	3	200
2.4*	Applied Chemistry –II	3	-	2	25	25	100	3	50	3	200
2.5**	Applied Mechanics	3	-	2	25	25	100	3	50	3	200
2.6**	Engineering Drawing - II	-	-	6	-	50	100	3	25 (Viva)	2	175
2.7*	General Workshop Practice - II	-	-	6	-	50	-	-	+100	3	150
# Student Centred Activities		-	-	2	-	25	-	-	-	-	25
<b>Total</b>		<b>18</b>	<b>-</b>	<b>22</b>	<b>150</b>	<b>175</b>	<b>600</b>	<b>-</b>	<b>325</b>	<b>-</b>	<b>1300</b>

\* Common with other diploma programmes

\*\* Common with diploma programme in Civil I Engineering

+ Includes 25 marks for Viva-voce

# Student Centred Activities will comprise of co-curricular activities like extension lectures, library studies, games, hobby clubs e.g. photography, painting, singing, seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, Civil Defence/Disaster Management activities etc.



## SYLLABUS: Polytechnic (AE)

Department: Automobile Engineering – 2<sup>nd</sup> Semester

Subject: Communication skills –II (Theory)

Subject Code: 120021

### Detailed Contents

#### Unit No.1 Grammar and usage

- Topic No.1: Preposition
- Topic No.2: Determiners
- Topic No.3: Pronouns
- Topic No.4: Conjunction
- Topic No.5: Simple present tense
- Topic No.6: Simple past tense
- Topic No.7: Question tags

#### Unit no. 2 Reading Skills

- Topic No. 8: Unseen Comprehension passages

#### Unit No.3 Writing skill

- Topic No.9: Writing notice
- Topic No 10: Writing circular
- Topic No.11: Writing memo
- Topic No.12: Writing agenda for meeting
- Topic No.13: Writing minutes of the meeting
- Topic No.14: Telephonic message

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment			External Assessment (Examination)			
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
3	-	-	25	-	100	3	-	-	125

#### RECOMMENDED BOOKS

1. Communicating Effectively in English, Book-I by Revathi Srinivas; Abhishek Publications, Chandigarh.
2. High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.
3. Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.

#### INSTRUCTIONAL STRATEGY

Looking into the present day needs of effective communication in every field, it is imperative to develop necessary competencies in students by giving practical tips and emphasis on grammar, vocabulary and its usage in addition to practical exercises. The teacher should give report writing assignments, projects etc. while teaching this subject.

#### SUGGESTED DISTRIBUTION OF MARS

Topic No	Time Allotted(Hrs)	Marks Allotted(%)
1	15	30
2	15	35
3	18	35
<b>Total</b>	<b>48</b>	<b>100</b>



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**Subject: Communication skills –II (Practical)**

**Subject Code: 120021(P)**

### List of practical

- 1 Offering-Responding to Offers
- 2 Requesting-Responding to Requests
- 3 Congratulating
- 4 Expressing Sympathy and Condolences
- 5 Expressing Disappointments
- 6 Asking Questions-Polite Responses
- 7 Apologizing, Forgiving
- 8 Complaining
- 9 Persuading
- 10 Warning
- 11 Asking for and Giving Information
- 12 Giving Instructions
- 13 Getting and Giving Permission
- 14 Asking For and Giving Opinions

**NOTE: Students will be tested for their oral and written communication competence making them participate in talks, formal exchanges, narrating people, places etc. They may be asked to infer, interpret selected extracts from audio-books/tracks. Students may also be evaluated through a viva conducted by an external examiner.**

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment		External Assessment (Examination)				
Hrs/week			Theory	Practical	Theory		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
-	-	2	-	25	--	-	50	3	75

### RECOMMENDED BOOKS

1. Communicating Effectively in English, Book-I by Revathi Srinivas; Abhishek Publications, Chandigarh.
2. High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.
3. Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.



## Detailed Contents

### Unit No.1 Differential Calculus

- Topic No.1: Definition of uncton; Concept of limits
- Topic No.2: Differentiation by definition of  $x^n$ ,  $\sin x$ ,  $\cos x$ ,  $\tan x$ ,  $e^x$ ,  $\log x$  only
- Topic No.3: Differentiation of sum, product and quotient of functions. Differentiation of function of a function.
- Topic No.4: Differentiation of inverse Trigonometrical functions, Logarithmic differentiation, Exponential differentiation, Successive differentiation (upto third order only)
- Topic No.5: Applications :(a) Maxima and minima (b) Equation of tangent and normal to a curve (for explicit Functions only) – Simple problems only

### Unit No.2 Integral Calculus

- Topic No.6: Integration as inverse operation of differentiation
- Topic No.7: Simple standard integrals and related problems
- Topic No.8: Simple integration by substitution, by parts and by partial fractions (for linear factors only)
- Topic No.9: Evaluation of definite integrals (simple problems)
- Topic No.10: Numerical integration by Simpson's Rule and Trapezoidal Rule (simple problems only)

### Unit No.3 Ordinary Differential Equations

- Topic No.11: Definition, order, degree, linear and non-linear differential equations
- Topic No.12: Formation of differential equations (upto second order)
- Topic No.13: Solution of first order differential equations by variable separable method only

### Unit No.4 Statistics

- Topic No.14: Measures of Central Tendency: Mean, Median, Mode
- Topic No.15: Measures of Dispersion: Mean deviation, Standard deviation
- Topic No.16: Co-efficient of rank correlation

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment			External Assessment (Examination)			
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
5		-	50	-	100	3	-	-	150

### RECOMMENDED BOOKS

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

### INSTRUCTIONAL STRATEGY

Basic elements of Differential Calculus, Integral Calculus, Ordinary Differential Equations and Statistics can be taught in the light of their applications in the field of engineering and technology. By laying more stress on applied part, teachers can also help in providing continuing education base to the students.

### SUGGESTED DISTRIBUTION OF MARS

Topic No	Time Allotted(Hrs)	Marks Allotted (%)
1	30	40
2	25	30
3	10	10
4	15	20
<b>Total</b>	<b>80</b>	<b>100</b>



## Detailed Contents

### Unit No.1 Waves and Vibrations

Topic No.1: Definition of wave with examples Types of wave motion, transverse and longitudinal wave motion with examples , Relation between velocity of wave, frequency and wave length of a wave ( $v = n\lambda$ )

Topic No.2: Simple harmonic motion: definition, expression for displacement, velocity, acceleration, time period frequency in S.H.M.

Topic No.3: Vibration of spring mass system, cantilever and determination of their time period. Free, forced and Resonant vibrations with examples

### Unit No.2 Applications of Sound Waves

Topic No.4: Acoustics of buildings-reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time

Topic No.5: Ultrasonic's-Methods of production (magnetostriction oscillator only) and their engineering applications to cold welding, drilling, cleaning and SONAR

### Unit No.3 Principles of Optics

Topic No.6: Lenses, reflection & refraction of light, refractive index, lens formula (no derivation), real and virtual. image, magnification

Topic No.7: Power of lens, microscope, telescope (definition only)

Topic No.8: Total internal reflection, critical angle and conditions for total internal reflection.

### Unit No.4 Electrostatics

Topic No.9: Coulomb's law, unit charge Gauss's Law

Topic No.10: Electric field intensity and electric potential (definition and units only)

Topic No.11: Application of Gauss's Law to straight charged conductor, plane charged sheet  
Capacitance, capacitance of parallel plate capacitor, series and parallel combination of capacitors

Topic No.12: Dielectric and its effect on capacitors, dielectric constant and dielectric breakdown

### Unit No.5 Current Electricity

Topic No.13: Definition of electric current, resistance, potential & their units.

Topic No.14: Ohm's law

Topic No 15: Specific resistance, series and parallel combination of resistances, effect of temperature on resistance.

Topic no.16: Kirchoff's laws, Wheatstone bridge

Topic No. 17: Heating effect of current and concept of electric power

### Unit No.6 Semi Conductor Physics

Topic No.18: Types of materials (insulator, semi-conductor, conductor), intrinsic and extrinsic semi conductor, p-n Junction diode and its characteristics

Topic No19: Diode as rectifier-half wave and full wave rectifier, semi conductor transistor pnp and npn (Introduction only)

### Unit No.7 Modern Physics

Topic no. 20: Lasers: concept of energy levels, ionizations and excitation potentials; spontaneous and stimulated Emission; population inversion, Laser, types of lasers, ruby laser and applications of laser

Topic no. 21: Fiber optics: Introduction and applications

Topic no. 22: Super conductivity: Phenomenon of super conductivity, Type I and Type II Super conductor and its Applications

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment		External Assessment (Examination)				
Hrs/week	Theory	Practical	Written Paper		Practical				
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
4		-	25	-	100	3	-	-	125





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## REFERENCE BOOKS:

1. Concept of Physics by H.C. Verma, Part-1, Bharti Bhawan, New Delhi
2. Concept of Physics by H.C. Verma, Part-2, Bharti Bhawan, New Delhi
3. A Text Book of Applied Physics by RA Banwat and SD Dogra, Eagle Parkashan, Jalandhar
4. Applied Physics by BL Arora, King India Publications, New Delhi

## INSTRUCTIONAL STRATEGY

Teacher may use various instructional media like models, charts and graphs while imparting instructions. The field application should be made clear before teaching the basics of waves, sound, light, electrostatics, semiconductor and modern physics etc to develop proper understanding of the physical phenomenon. Use of demonstration will make the subject interesting and develop scientific temper in the students.

## SUGGESTED DISTRIBUTION OF MARS

Sr. No	Topic	Time Allotted (Hrs.)	Marks Allotted (%)
1	Waves and Vibrations	10	14
2	Applications of Sound Waves	10	14
3	Principles of Optics	10	14
4	Electrostatics	12	20
5	Current Electricity	10	16
6	Semi Conductor Physics	06	12
7	Modern Physics	06	10
<b>Total</b>		<b>64</b>	<b>100</b>



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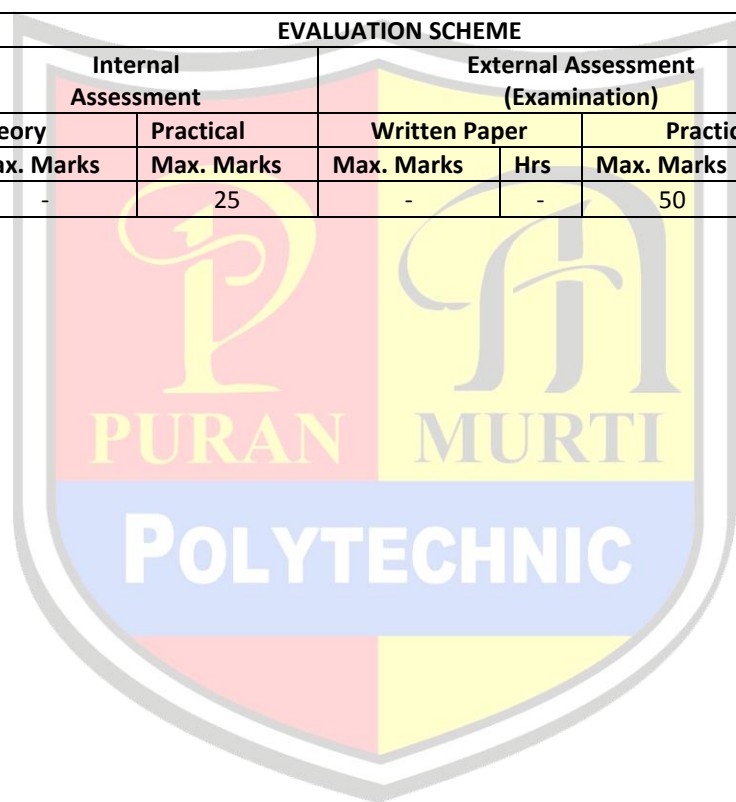
**Subject: Applied Physics-II (Practical)**

**Subject Code: 120023(P)**

## LIST OF PRACTICALS

1. To determine and verify the time period of cantilever.
2. To determine time period of Simple Pendulum.
3. To verify ohm's law.
4. To verify law of resistance in series.
5. To verify law of resistances in parallel.
6. To find resistance of galvanometer by half deflection method.
7. To convert a galvanometer into an ammeter of given range.
8. To convert a galvanometer into a voltmeter of given range.
9. To study and verify laws of reflection using mirrors.

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment		External Assessment (Examination)				
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
-		2	-	25	-	-	50	3	75





## Detailed Contents

### **Unit No.1 Metallurgy**

Topic No.1: A brief introduction of the terms: Metallurgy (types), mineral, ore, gangue or matrix, flux, slag, concentration (methods of concentrating the ores), ore, roasting, calcinations, smelting and refining of metal.

Topic No.2: Metallurgy of (i) Aluminium (ii) Iron

Topic No.3: Definition of an alloy, purposes of alloying, composition, properties and uses of alloys, monel metal, magnalium, duralumin, alnico, stainless steel and invar.

### **Unit No.2 Fuels**

Topic No.4: Definition of a 'Fuel', characteristics of a good fuel and classification of fuels with suitable examples

Topic No.5: Definition of Calorific value of a fuel and determination of calorific value of a solid fuel with the help of Bomb calorimeter. Simple numerical problems based upon Bomb-calorimeter method of finding the Calorific values

Topic No.6: Brief description of 'Proximate' and 'Ultimate' analysis of a coal. Importance of conducting the proximate and ultimate analysis of a fuel

Topic No.7: Merits of gaseous fuels over those of other varieties of fuels

Topic No.8: Manufacture, composition, properties and uses of (i) Water gas (ii) Oil gas (iii) Biogas

Topic No.9: Composition, calorific values and applications of (i) LPG (ii) CNG (iii) Power alcohol

Topic No.10: Fuel rating; Octane number for petrol, Cetane number for diesel

### **Unit No.3 Corrosion**

Topic No.11: Definition of corrosion

Topic No.12: Theories of corrosion i.e. (i) direct chemical action theory and (ii) electro chemical theory

Topic No.13: Passivity

Topic No.14: Prevention of corrosion by; Alloying, Providing metallic coatings, Cathodic protections : (a) Sacrificial (b) Impressed voltage method

Topic No. 15: Heat treatment (quenching, annealing, tempering & normalizing)

### **Unit No.4 Lubricants**

Topic No.16: Definition of (i) lubricant (ii) lubrication

Topic No.17: Classification of lubricants

Topic No.18: Principles of lubrication; fluid film lubrication, boundary lubrication, extreme pressure lubrication

Topic No.19: Properties of lubricants; Physical properties: viscosity, viscosity index, flash-point, fire-point, cloud-point, pour point, oiliness, volatility, emulsification. Chemical properties: Total acidity number (TAN), saponification and iodine value, coke number and aniline point.

Topic No.20: Criterion for selection of a good lubricant

### **Unit No.5 Glass**

Topic No.21: Glass: Chemical composition, types of glasses and their applications

Topic No.22: Manufacture of ordinary glass and lead glass

### **Unit No.6 Classification and Nomenclature of Organic Compounds**

Topic No.23: Classification of Organic Compounds, functional group, Homologous Series, IUPAC-Nomenclature of various homologous series i.e. alcohols, aldehydes, ketones, carboxylic acids, and phenols. (First six members of each series only)

### **Unit No.7 Polymers & Plastics**

Topic No.24: Definition of polymer, monomer & degree of polymerization

Topic No.25: Brief introduction of addition & condensation polymers with suitable examples (PVC, Polyester, Teflon, Nylon 66, Bakelite)

Topic No.26: Definition of plastic & type of plastics (thermo & thermo setting plastics) with suitable examples.





STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment		External Assessment (Examination)				
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
3	-	-	25	-	100	3	-	-	

#### TEXT BOOKS:

1. Chemistry in Engineering by J.C. Kuriacose and J. Rajaram; Tata McGraw-Hill Publishing Company Limited, New Delhi
2. Engineering Chemistry by Dr. S. Rabindra and Prof. B.K. Mishra ; Kumar and Kumar Publishers (P) Ltd. Bangalore-40
3. A Text Book of Applied Chemistry-I by SS Kumar; Tata McGraw Hill, Delhi

#### RECOMMENDED BOOKS

1. Progressive Applied Chemistry –I and II by Dr. G.H. Hugar; Eagle Prakashan, Jalandhar
2. Engineering Chemistry by Jain PC and Jain M, Dhanpat Rai Publishers, Delhi
3. Chemistry of Engineering by Aggarwal CV
4. Chemistry for Environmental Engineers by Swayer and McCarty, McGraw Hill, Delhi
5. A Text Book of Applied Chemistry-I by Sharma and Others; Technical Bureau of India, Jalandhar
6. A Text Book of Applied Chemistry-II by Dr. J K Sharma (Hindi version), Abhishek Publications, Sec. 17-C, Chandigarh

#### INSTRUCTIONAL STRATEGY

Teacher may take help of various models and charts while imparting instructions to make the concepts clear. More emphasis may be laid on discussing and explaining practical applications of various chemical processes and reactions. In addition, students should be encouraged/motivated to study those processes in more details, which may find practical applications in their future professional life.

#### SUGGESTED DISTRIBUTION OF MARKS

Sr. No	Topic	Time Allotted (Hrs)	Marks Allocation (%)
1	Metallurgy	08	16
2	Fuels	10	20
3	Corrosion	06	14
4	Lubricants	06	14
5	Glass	04	08
6	Classification of organic compounds and their nomenclature	06	12
7	Polymers and plastics	08	16
	<b>total</b>	<b>48</b>	<b>100</b>



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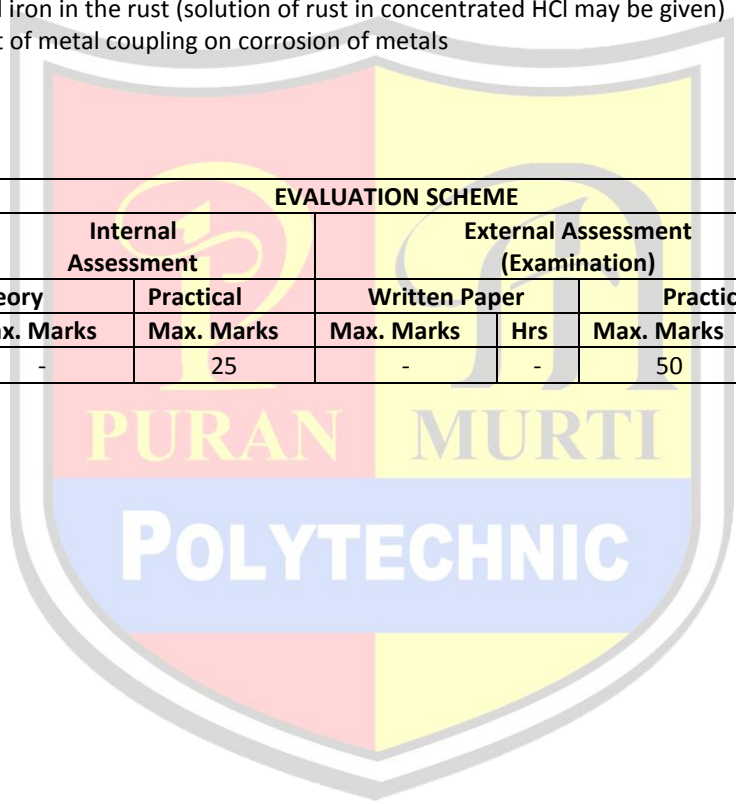
**Subject: Applied Chemistry-II (Practical)**

**Subject Code: 120024(P)**

## LIST OF PRACTICALS

1. Gravimetric analysis and study of apparatus used
2. To determine the percentage composition of a mixture consisting of a volatile and a non-volatile Substances
3. Determine the viscosity of given oil with the help of "Redwood viscometer"
4. Determine the flash point of the given oil with the help of Abel's Flash Point Apparatus
5. Estimate the amount of moisture in the given sample of coal
6. Estimate the amount of ash in the given sample of coal
7. Electroplate the given strip of Cu with Ni
8. Confirmation test of alcohol, aldehydes, carboxylic acid
9. To determination the total acidity number of a lubricant
10. Detection of metal iron in the rust (solution of rust in concentrated HCl may be given)
11. To study the effect of metal coupling on corrosion of metals

STUDY SCHEME		EVALUATION SCHEME								Total Marks
		Internal Assessment			External Assessment (Examination)					
Hrs/week			Theory	Practical	Written Paper		Practical		Total Marks	
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs		
-		2	-	25	-	-	50	3	75	





## Detailed Contents

### **Unit No.1: Introduction**

Topic No.1: Concept of engineering mechanics definition of mechanics, statics, dynamics, application of engineering mechanics in practical fields. Definition of Applied Mechanics.

Topic No.2: Definition, basic quantities and derived quantities of basic units and derived units

Topic No.3: Different systems of units (FPS, CGS, MKS and SI) and their conversion from one to another for density, force, pressure, work, power, velocity, acceleration

Topic No.4: Concept of rigid body, scalar and vector quantities.

### **Unit No.2: Laws of forces**

Topic No.5: Definition of force, measurement of force in SI units, its representation, types of force: Point Force/concentrated force & Uniformly distributed force, effects of force, characteristics of a force

Topic No.6: Different force systems (coplanar and non-coplanar), principle of transmissibility of forces, law of super-Position

Topic No.7: Composition and resolution of coplanar concurrent forces, resultant force, method of composition of Forces, laws of forces, triangle law of forces, polygon law of forces - graphically, analytically, resolution of forces, resolving a force into two rectangular components.

Topic No.8: Free body diagram

Topic No.9: Equilibrant force and its determination

Topic No.10: Lami's theorem (concept only) [Simple problems on above topics]

### **Unit No. 3: Moment**

Topic No.11: Concept of moment

Topic No.12: Moment of a force and units of moment.

Topic No.13: Varignon's theorem (definition only)

Topic No.14: Principle of moment and its applications

Topic No.15: Parallel force (like & unlike parallel force) calculate their resultant

Topic No.16: Concept of couple, its properties and effects

Topic No.17: General conditions of equilibrium of bodies under coplanar forces

Topic No.18: Position of resultant force by moment

### **Unit No. 4: Friction**

Topic No.19: Definition and concept of friction, types of friction, force of friction

Topic No.20: Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction

Topic No.21: Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane.

### **Unit No. 5: Centre of Gravity**

Topic No.22: Concept, definition of centroid of plain figures and centre of gravity of symmetrical solid bodies.

Topic No.23: Determination of centroid of plain and composite lamina using moment method only.

Topic No.24: Determination of center of gravity of solid bodies - cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed

### **Unit No. 6: Simple Machines**

Topic No.25: Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their Relationship, law of machines.

Topic No.26: Simple and compound machine, Definition of ideal machine, reversible and self locking machine

Topic No.27: Effort lost in friction, Load lost in friction, determination of maximum M.A. and efficiency.

Topic No.28: System of pulleys determination of velocity ratio, mechanical advantage and efficiency.

Topic No.29: Working principle and application of wheel and axle, Weston's Differential Pulley Block, simple screw jack, worm and worm wheel, single and double winch crab.

### **Unit No.7: Torsion**

Topic No.30: Torsion in shafts/bars, Modulus of rigidity.

Topic No.31: Torsional Equation (simple numerical problems)

Topic No.21: Power Transmission in shafts (simple numerical problems)



STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment		External Assessment (Examination)				
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
3	-	-	25	-	100	3	-	3	125

## RECOMMENDED BOOKS

1. A Text Book of Applied Mechanics by S Ramamurtham, Dhanpat Rai Publishing Co.Ltd.
2. Applied Mechanics By, Col. Harbhajan Singh, TL Singha and Parmod Kumar Singla, Published By Abhishek Publication, 57-59, Sector-17, Chandigarh
3. A Text Book of Engineering Mechanics (Applied Mechanics) by RK Khurmi; S Chand and Co. Ltd., New Delhi.
4. A Text Book of Applied Mechanics by RK Rajput; Laxmi Publications, New Delhi..
5. Text Book of Applied Mechanics by Birinder Singh, Kaption Publishing House, New Delhi.

## INSTRUCTIONAL STRATEGY

Applied Mechanics, being a fundamental subject, the teachers are expected to emphasize on the Applications of applied mechanics in various subjects so that students are able to appreciate the Importance of the subject

## SUGGESTED DISTRIBUTION OF MARS

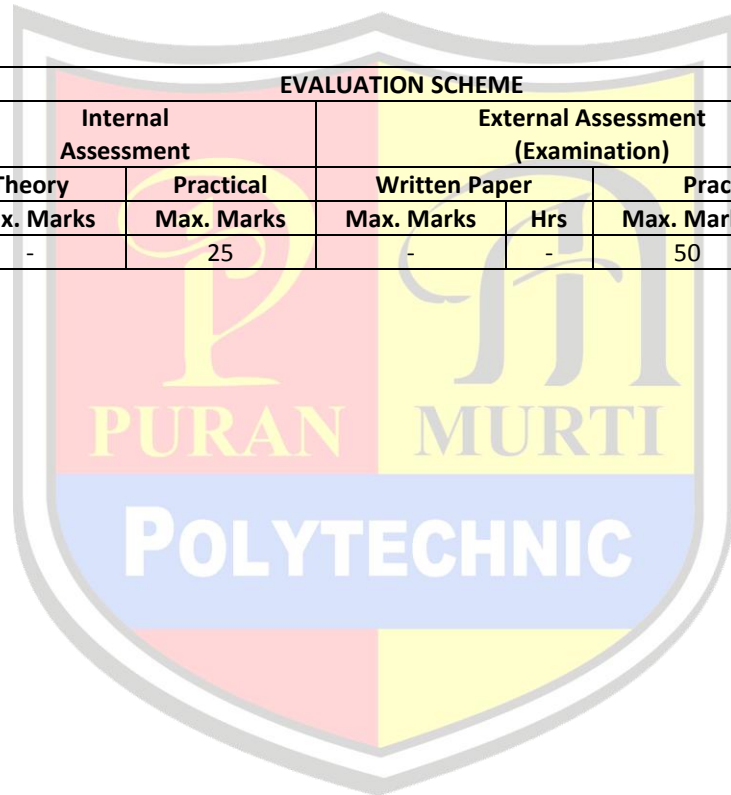
Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	04	08
2	09	20
3	09	20
4	06	12
5	08	16
6	06	12
7	06	12
<b>Total</b>	<b>48</b>	<b>100</b>



**List of Practicals**

1. Verification of the polygon law of forces using greaves and apparatus.
2. To verify the forces in different members of jib crane.
3. To verify the reaction at the supports of a simply supported beam.
4. To find the mechanical advantage, velocity ratio and efficiency in case of an inclined plane.
5. To find the mechanical advantage, velocity ratio and efficiency of a screw jack.
6. To find the mechanical advantage, velocity ratio and efficiency of worm and worm wheel.
7. To find mechanical advantage, velocity ratio and efficiency of single purchase crab.
8. To find out center of gravity of regular lamina.
9. To find out center of gravity of irregular lamina.
10. To determine coefficient of friction between three pairs of given surface.

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment		External Assessment (Examination)				
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
-	-	2	-	25	-	-	50	3	75







## Detailed Contents

### **Unit No.1: Detail and Assembly Drawing (2 sheets)**

Topic No.1: Principle and utility of detail and assembly drawings

Topic No.2: Wooden joints i.e. corner mortise and tenon joint, Tee halving joint, Mitre faced corner joint, Tee bridge joint, Crossed wooden joint, Cogged joint, Dovetail joint, Through Mortise and Tenon joint, furniture drawing - freehand and with the help of drawing instruments.

### **Unit No.2: Screw threads and threaded fasteners (8 sheets)**

Topic No.3: Thread Terms and Nomenclature

3.1 Types of threads-External and Internal threads, Right and Left hand threads (Actual and Conventional representation), single and multiple start threads.

3.2 Different Forms of screw threads-V threads (B.S.W threads, B.A thread, American National and Metric thread), Square threads (square, Acme, Buttress and Knuckle thread)

Topic No.4: Nuts and Bolts

4.1 Different views of hexagonal and square nuts and hexagonal headed bolt

4.2 Assembly of Hexagonal headed bolt and Hexagonal nut with washer.

4.3 Assembly of square headed bolt with hexagonal and with washer.

Topic No.5: Locking Devices

5.1 Different types of locking devices-Lock nut, castle nut, split pin nut, locking plate, slotted nut and spring washer.

5.2 Foundations bolts-Rag bolt, Lewis bolt, curved bolt and eye bolt.

Topic No.6: Drawing of various types of machine screw, set screw, studs and washers

### **Unit No. 3: Keys and Cotter (3 sheets)**

Topic No.7: Various types of keys and cotters and their practical application and preparation of drawing of various keys and cotters showing keys and cotters in position.

Topic No.8: Various types of joints

Spigot and socket joint

Gib and cotter joint

Knuckle joint

### **Unit No. 4: Rivets and Riveted Joints (4 sheets)**

Topic No.9: Types of general purpose-rivets heads Caulking and fullering of riveted joints

Topic No.10: Types of riveted joints

(i) Lap joint-Single riveted, double riveted (chain and zig-zag type)

(ii) Single riveted, Single cover plate butt joint (chain type)

Topic No.11: (i) Single riveted, double cover plate butt joint (chain type)

(ii) Double riveted, double cover plate butt joint(chain and zig-zag type)

### **Unit No. 5: Couplings (2 sheets)**

Topic No.12: Flange coupling (Protected and non-protected)

Topic No.13: muff coupling and half-lap muff coupling

### **Unit No. 6: Symbols and Conventions (2 sheets)**

Topic No.14: Civil engineering sanitary fitting symbols

Topic No.15: Electrical fitting symbols for domestic interior installations

### **Unit No.7: AUTO CAD (for practical and viva-voce only)**

Topic No.16: Concept of AutoCAD, Tool bars in AutoCAD, coordinate system, snap, grid, and ortho mode

Topic No.17: Drawing commands – point, line, arc, circle, ellipse

Topic No.18: Editing commands – scale, erase, copy, stretch, lengthen and explode



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STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment		External Assessment (Examination)				
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
-	-	6	25	25	100	3	25	3	175

#### RECOMMENDED BOOKS

1. Engineering Drawing by KK Dhiman, Ishan Publications, Ambala, Haryana
2. Elementary Engineering Drawing (in first angle projection) by ND Bhatt, Charotar Publishing House, Anand Gujarat
3. A Text Book of Engineering Drawing by Surjit Singh published by Dhanpat Rai and Co., Delhi
4. Engineering Drawing by PS Gill published by SK Kataria and Sons, Delhi
5. Engineering Drawing by RB Gupta published by Satya Prakashan, New Delhi
6. Engineering Drawing by NS Kumar published by King India Publication, New Delhi

#### INSTRUCTIONAL STRATEGY

Teacher should show model or realia of the component/part whose drawing is to be made. Emphasis should be given on cleanliness, dimensioning and layout of sheet. Focus should be on Proper selection of drawing instrument and its proper use.





## Detailed Contents

### **Unit No.1 Carpentry Shop-II**

- Topic No.1: Introduction to joints, their relative advantages and uses.  
Job I Preparation of dovetail joint and glued joint.  
Job II Preparation of mitre joint  
Job III Preparation of a lengthening Joint  
Job IV Preparation of at least one utility job with and without lamination.
- Topic No.2: Demonstration of job showing use of rip saw, bow saw and tenon saw, method of sharpening various saws.
- Topic No.3: Demonstration of job on band saw and circular saw, chain and chisel, universal wood working machine, Saw re-sharpening machine, saw brazing unit.
- Topic No.4: Importance and need of polishing wooden items. Introduction to polishing materials.  
Job V Polishing on wooden items.

### **Unit No.2 Plumbing Shop**

- Topic No.5: Introduction to various types of threads (internal and external)-single start, multi-start, left hand and right hand threads.
- Topic No.6: Description and demonstration of various types of drills, taps and dies Selection of dies for threading, selection of drills, taps and reamers for tapping operations.  
Job I Making internal and external threads on a job by tapping and dieing operations (manually)
- Topic No.7: Precautions while drilling soft metals, e.g. copper, brass, aluminium etc.  
Job II Drilling practice on soft metals such as aluminum, brass and copper  
Job III Preparation of a job by filing on non-ferrous metal up to an accuracy of 0.2mm  
Job IV Preparation of job involving thread on GI pipe/ PVC pipe and fixing of different types of elbow, tee, union, socket, stopcock, taps etc

### **Unit No.3 Welding Shop – II**

- Topic No.8: Introduction to gas welding, spot welding and seam welding and welding techniques. Adjustments of different types of flames in gas welding, demonstration and precautions about handling welding equipment.  
Job I Practice in handling gas welding equipment (Low pressure and High pressure) and welding and tacking practice on simple jobs.
- Topic No.9: Common welding joints generally made by gas welding.  
Job II Preparation of butt joint by gas welding.  
Job III Preparation of small cot frame from conduit pipe by gas welding.  
Job IV Preparation of square pyramid from MS rods by welding (type of welding to be decided by students themselves).  
Job V Exercise of preparing a job on spot/seam welding machine.
- Topic No.13: Demonstration and use of TIG and MIG welding equipment

### **Unit No.4 Electric Shop – II**

- Topic No.10: Importance of three-phase wiring and its effectiveness. Demonstration of three-phase wiring with the help of a demonstrating panel.  
Job I Laying out 3-phase wiring for an electric motor or any other 3-phase machine.  
Job II Connecting single-phase energy meter and testing it. Reading and working out the power consumption and the cost of energy.  
Job III Checking continuity of connection (with tester and series lamp) location of faults with a multimeter and their rectification in simple machines and/or other electric circuits fitted with earthing.  
Job IV Finding fault in simple electric machine and its rectification
- Topic No.11: Demonstration of dismantling, servicing and reassembling a table fan/ceiling fan/air cooler/mixer/electric iron, electric heater, geyser, electric oven, air conditioner etc.  
Job V Testing single phase/three phase electrical motor by using voltmeters, ammeter, clip-on meter,



tachometer etc.

Job VI Reversing the direction of rotation of a motor.

### Unit No. 5 Electronic Shop- II

Topic No.12: Identification, demonstration and uses of the items mentioned below:

- Various types of single, multi-cored insulated screened wire and cables -power, audio, video, co-axial, general purpose wires/cables
- Various types of plugs, sockets, connectors suitable for general purpose audio and video use, 2 and 3 pin mains plugs and sockets, RF plugs and sockets. Banana-plugs, and sockets, BNG, RCA, DIN UHF, ear phone speaker connector, telephone jacks and similar male and female connectors and terminal strips.
- Various types of switches such as normal/miniature toggle, slide, push button, piano key, rotary, micro switches, SPST, SPDT, DPST, DPDT, band selector, multi way master mains switch.
- Various types of protective devices such as : wire fuse, cartridge fuse, slow acting/fast acting fuse, HRC fuse, thermal fuse, single/multiple circuit breakers, over and under current relays.
- Materials: conducting, insulating and magnetic materials.
- Single beam simple CRO, signal generator and function-generator
- Regulated power supply-fixed and variable voltage, single output as well as dual output.

Topic No.13: Identification and familiarization with active and passive components; types and colour code of resistor, capacitors and potentiometers (including VDR, LDR, and thermistor). Identification of components including diode, LED, transistor, LCD, UJT, FET, coils, relays, read relays, transformers, linear and digital ICs, thyristors.

Topic No.14: Demonstration of the following:

- Making perfect solder joints and soldering on PCBs
- Removing components/wires by unsoldering.
- Assembling components on boards, chassis, tape strips.
- Laying of cables by various methods
- Modern soldering and de-soldering processes
- Working of active and passive components
- Testing of active and passive components by the use of multimeter

Note: For the above field visits to relevant place may be arranged.

Job I Cut, bend, tin components, leads, inserts and solder components (capacitor, diodes, transistor, IFT, ICs etc) on a PCB.

Job II Soldering practice

Job III Temperature controlled soldering station

Job IV De-soldering pump

Job V De-soldering strip/wik

Job VI De-solder, remove and clean all the components, wires from a given equipment, a PCB or a tag strip.

Job VII Wiring of a small circuit on a PCB/tag strip involving lacking, sleeving and use of identifier tags

### Unit No.6 Painting Shop

Topic No.15: Introduction to painting shop and its necessity. Different types of paints. Introduction of powder coating plant and spray painting with their uses.

Job I Preparation of surface before painting such as cleaning, sanding, applying putty, filling procedure and application of primer coat and painting steel item.

Job II Painting practice by brush on MS sheet

Job III Practice of dip painting

Job IV Practice of lettering: name plates / sign board

Job V Polishing and painting on wooden and metallic surfaces

Job VI Practical demonstration of powder coating



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L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
-	-	6	-	50	-	-	100	3	150

#### RECOMMENDED BOOKS

1. Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Choudhary; Media Promoters and Publishers Pvt. Ltd., Bombay
2. Workshop Technology by Manchanda Vol. I,II,III; India Publishing House, Jalandhar.
3. Manual on Workshop Practice by K Venkata Reddy; MacMillan India Ltd. New Delhi
4. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
5. Workshop Technoogy by B.S. Raghuwanshi; Dhanpat Rai and Co., New Delhi
6. Workshop Technology by HS Bawa; Tata McGraw Hill Publishers, New Delhi.

