




**MAHARAJA AGRASEN
HIMALAYAN GARHWAL UNIVERSITY
UTTARAKHAND**

**POLYTECHNIC
(DIPLOMA IN AUTOMOBILE ENGINEERING)**

REVISED SYLLABUS PREPARED BY


1. DR. SHAILESH KUMAR SINGH 

2. DR. ALOK BHARDWAJ 

3. ER. ABHISHEK GOYAL 

Registrar
Maharaja Agrasen Himalayan Garhwal University 

**RECOMMENDED BY BOARD OF STUDIES DEPARTMENT OF
ENGINEERING AND TECHNOLOGY**

S.N.	NAME	DESIGNATION
1.	DR. ALOK BHARDWAJ	HEAD 
2.	MR. ANOOP SINGH	ASSOCIATE PROFESSOR
3.	MR. UMESH CHANDRA	ASSISTANT PROFESSOR
4.	DR. SADANAND SINGH	EXTERNAL EXPERT*
5.	DR. NARESH KUMAR TRIVEDI	EXTERNAL EXPERT*

(*NOMINATED BY VICE CHANCELLOR)


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**APPROVED BY
ACADEMIC COUNCIL, MAHARAJA AGRASEN HIMALAYAN GARHWAL
UNIVERSITY**

W.E.F. - ACADEMIC SESSION 2022-23

Diploma 1st Sem.

Subject Code	Subject	L	T	P	T O	EVALUATION SCHEME						Total Marks	Credit Point
						Internal		External					
		Period/Weeks				Theory	Practical	Theory		Practical			
		Max Marks	Max Marks	Max Marks	Hrs. : Min	Max Marks	Hrs. : Min						
DA101	English & Communication Skills -1st	3	0	2	5	20	30	50	2:15	50	3:00	150	4
DA102	Applied Mathematics 1st	3	0	0	3	50	0	100	2:15	0	0	150	3
DA103	Applied Physics 1st	3	0	2	5	20	30	50	2:15	50	3:00	150	4
DA104	Applied Chemistry 1st	3	0	2	5	20	30	50	2:15	50	3:00	150	4
DA105	Basics of Information Technology	3	0	2	5	10	10	50	2:15	30	3:00	100	4
DA106	Engineering Drawing-1st	0	0	6	6	0	50	100	0:00	0	9:00	150	3
DAP107	General Workshop Practice 1st	0	0	6	6	0	50	0	0	50	9:00	100	3
Disc/Game/Sca/Ncc/NSS		0	0	4	4	0	0	0	0	25	6:00	25	2
Industrial Exposure(Assestment at Inst. Level)		0	0	0	0	0	0	0	0	25	0	25	0
Total		15		24	39	120	200	400	11:15	280	36:00:00	1000	27

General Proficiency will comprise of various co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, NCC, NSS, cultural activities and discipline etc.

+ Industrial visit compulsory at minimum 2 industry or department

Note: 1- Each period will be 45 minutes. 2- Each session will be of 16weeks. 3- Effective teaching will be at least 15 week + Industrial Visit

Theory 1 Credit = 10 Hrs

Practical 1 Credit = 10 Hrs


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Diploma 2nd Sem.

Subject Code	Subject	L	T	P	T O T	EVALUATION SCHEME						Total Marks	Credit Point
						Internal		External					
						Theory	Practical	Theory		Practical			
						Max Marks	Max Marks	Max Marks	Hrs. : Min	Max Marks	Hrs. : Min		
DA201	English & Communication Skills - 2nd	3	0	2	5	20	30	50	2:15	50	3:00	150	4
DA202	Applied Mathematics 2nd	3	0	0	3	50	0	100	2:15	0	0:00	150	3
DA203	Applied Physics 2nd	3	0	2	5	20	30	50	2:15	50	3:00	150	4
DA204	Applied Chemistry 2nd	3	0	2	5	20	30	50	2:15	50	3:00	150	4
DA205	Environmental Science	3	0	0	3	30	0	70	2:15	0	0:00	100	3
DA206	Engineering Drawing-2nd	0	0	6	6	0	50	100	0:00	0	9:00	150	3
DAP207	General Workshop Practice 2nd	0	0	6	6	0	50	0	0	50	9:00	100	3
	Disc/Game/Sca/Ncc/NSS	0	0	6	6	0	0	0	0	25	9:00	25	3
	Industrial Exposure(Assestment at Inst. Level)	0	0	0	0	0	0	0	0	25	0	25	0
	Total	15	0	24	39	140	190	420	11:15	250	36:00:00	1000	27

General Proficiency will comprise of various co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, NCC, NSS, cultural activities and discipline etc.

+ Industrial visit compulsory at minimum 2 industry or department

Note: 1- Each period will be 45 minutes. 2- Each session will be of 16weeks. 3- Effective teaching will be at least 15 week + Industrial Visit

Theory 1 Credit = 10 Hrs

Practical 1 Credit = 10 Hrs

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STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN AUTOMOBILE ENGINEERING THIRD SEMESTER

Subject Code	Subject	L	T	P	TOT	EVALUATION SCHEME						Total Marks	Credit		
						Internal Assessment		External Assessment (Examination)							
						Periods/Week		Theory	Practical	Theory				Practical	
						Max. Marks	Max. Marks	Max. Marks	Hrs: Min	Max. Marks	Hrs: Min				
AE 301	Applied Mechanics	3		2	5	20	30	80	2.15	30	3	160	4		
AE 302	Engineering Materials	3		2	5	20	30	80	2.15	30	3	160	4		
AE 303	Basics of Auto Engines	3		2	5	20	30	80	2.15	30	3	160	4		
AE 304	Chassis, body & Transmission	3		2	5	20	30	80	2.15	30	3	160	4		
AE 305	Measurement, Instrumentation & Control	3		2	5	20	30	80	2.15	30	3	160	4		
AE 306	Auto Engineering Drawing	-		8	8	-	50	100	-	-	12	150	4		
	General Proficiency#	-		4	4	-	25	-	-	-	6	25	2		
	Industrial exposure (Assessment at Institute Level)	-		-	-	-	25	-	-	-	-	25			
Total		15		22	37	100	250	500	11:15	150	33	1000	26		

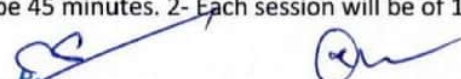
General Proficiency will comprise of various co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, NCC, NSS, cultural activities and discipline etc.

+ Industrial visit compulsory at minimum 2 industry or department

Note: 1- Each period will be 45 minutes. 2- Each session will be of 16weeks. 3- Effective teaching will be at least 15 week + Industrial Visit

Theory 1 Credit = 10 Hrs

Practical 1 Credit = 20 Hrs


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 Pantnagar, Garhwal University

FOURTH SEMESTER (AUTOMOBILE ENGINEERING)

Subject Code	Subject	L	T	P	T	EVALUATION SCHEME						Total Marks	Credit		
						Internal Assessment		External Assessment (Examination)							
						Theory		Practical		Theory				Practical	
						Max. Marks	Max. Marks	Max. Marks	Hrs:Min	Max. Marks	Hrs: min				
AE 401	Mechanics of Materials	3		2	5	20	30	80	2.15	30	3	160	4		
AE 402	Principle of Thermal Engineering	3		2	5	20	30	80	2.15	30	3	160	4		
AE 403	Auto Engines	3		2	5	20	30	80	2.15	20	3	150	4		
AE 404	Suspension, Steering & Braking	3		2	5	20	30	80	2.15	30	3	160	4		
AE 405	Auto Electrical & Electronics Equipment	3		2	5	20	30	80	2.15	30	3	160	4		
AE 406	Manufacturing Technology	3		6	9	20	30	80	2.15	30	9	160	6		
	General Proficiency #	-		4	4	-	25	-	-	-	6	25	2		
	Industrial exposure (Assessment at Institute Level)	-		-	-	-	25	-	-	-	-	25			
	Industrial Training	Industrial Training of 30 days done after 4 th Semester would be evaluated in 5 th semester through Report and Viva-voce.													
		18		21	38	120	230	480	13:30	170	30:00	1000	28		


General Proficiency will comprise of various co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, NCC, NSS, cultural activities and discipline etc.

+ Industrial visit compulsory at minimum 2 industry or department

Note: 1- Each period will be 45 minutes. 2- Each session will be of 16weeks. 3- Effective teaching will be at least 15 week + Industrial Visit

Theory 1 Credit = 10 Hrs

Practical 1 Credit = 20 Hrs


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STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAME IN AUTOMOBILE ENGINEERING

FIFTH SEMESTER

Subject Code	Subject	L	T	P	T	EVALUATION SCHEME						Total Marks	Credit
						Internal Assessment		External Assessment (Examination)					
						Theory	Practical	Theory		Practical			
						Max. Marks	Max. Marks	Max. Marks	Hrs:Min	Max. Marks	Hrs:min		
	Industrial training	4 Weeks				-	25	-	-	75	-	100	
AE 501	Auto design	4	-	-	4	50	-	100	3:00	-	-	150	4
AE 502	Garage equipment	4	-	-	4	50	-	100	3:00	-	-	150	4
AE 503	Earth Moving Equipment	4	-	-	4	50	-	100	3:00	-	-	150	4
AE 504	Production Planning and Costing	4	-	-	4	50	-	100	3:00	-	-	150	4
AE 505	Fault Diagnosis and Driving Practice	-	-	10	10	-	50	-	-	75	15	125	5
AE 506	CAD in Automobile Engineering	-	-	10	10	-	50	-	-	75	15	125	5
	General Proficiency #	-	-	4	4	-	25	-	-	-	6	25	2
AE 507	Industrial exposure (Assessment at Institute level) +	-	-	-	-	-	25	-	-	-	-	25	
Total		16	-	24	40	200	175	400	12:00	225	36:00	1000	28

General Proficiency will comprise of various co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, NCC, NSS, cultural activities and discipline etc.

+ Industrial visit compulsory at minimum 2 industry or department

Note: 1- Each period will be 45 minutes. 2- Each session will be of 16 weeks. 3- Effective teaching will be at least 15 week + Industrial Visit

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Garhwal University

STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAME IN AUTOMOBILE ENGINEERING

SIXTH SEMESTER

Subject Code.	Subject	L	T	P	T	EVALUATION SCHEME						Total Marks	Credit
						Internal Assessment		External Assessment (Examination)					
						Theory	Practical	Theory		Practical			
								Max. Marks	Max. Marks	Max. Marks	Hrs:min		
AE 601	Entrepreneurship Development and Management	4	-	-	4	25	-	75	3:00	-	-	100	4
AE 602	Motor Vehicle Act and Transport Management	4	-	-	4	25	-	100	3:00	-	-	125	4
AE 603	Machining Processes	3	-	4	7	25	50	100	2.15	75	6	250	5
AE 604	Mechanics of Vehicle	4	-	-	4	25	-	100	3:00	-	-	125	4
AE 605	Overhauling Practice lab.	-	-	6	6	-	50	-	-	75	9	125	3
AE 606	Employable Skills	-	-	4	4	-	25	-	-	-	6	25	2
AEPR 607	Project Work	-	-	8	8	-	75	-	-	125	12	200	4
	General Proficiency #	-	-	4	4	-	25	-	-	-	6	25	2
	Industrial exposure (Assessment at Institute level) +	-	-	-	-	-	25	-	-	-	-	25	
Total		15	-	26	41	100	250	375	11:15	275	39:00	1000	28

General Proficiency will comprise of various co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, NCC, NSS, cultural activities and discipline etc.

+ Industrial visit compulsory at minimum 2 industry or department

Note: 1- Each period will be 45 minutes. 2- Each session will be of 16 weeks. 3- Effective teaching will be at least 15 week + Industrial Visit

Theory 1 Credit = 10 Hrs

Practical 1 Credit = 20 Hrs

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FIRST SEMESTER

DA101 ENGLISH AND COMMUNICATION SKILLS – I

Periods/Week L T P
 3 - 2

RATIONALE

Interpersonal communication is a natural and necessary part of organizational life. Yet, communicating effectively can be challenging because of our inherent nature to assume, overreact to and misperceive what actually is happening. Poor communication or lack of communication is often cited as the cause of conflict and poor teamwork. In today's team-oriented workplace, managing communication and developing strategies for creating shared meaning are crucial to achieve results and create successful organizations. The goal of the Communicating Skills course is to produce civic-minded, competent communicators. To that end, students must demonstrate oral as well as written communication proficiency. These include organizational and interpersonal communication, public address and performance. The objectives of this subject are understanding how communication works, gaining active listening and responding skills, understanding the importance of body language, acquiring different strategies of reading texts and increasing confidence by providing opportunities for oral and written expressions

DETAILED CONTENTS

1. **COMMUNICATION SKILLS** (12 Periods)
 - 1.1 Introduction and Process of Communication
 - 1.2 Objectives of Communication
 - 1.3 Verbal and Non-verbal Communication
 - 1.4 Process of Communication
 - 1.5 Barriers to Communication; Overcoming Strategies
 - 1.6 Listening and Speaking Skills and Sub-Skills
(All topics should be in detail)

2. **GRAMMAR AND USAGE** (08 Periods)
 - 2.1 Syntax (Parts of speech)

3. **WRITING SKILLS** (10 Periods)
 - 3.1 Writing Paragraphs
 - 3.2 Picture Composition
 - 3.3 Developing writing skills based on some audio-visual stimulus

    
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4. READING COMPREHENSION SKILLS (10 Periods)
Unseen comprehension passages (at least 3 passages of literary, scientific, data interpretation).
5. FACETS OF LITERATURE (24 Periods)
- 5.1 Fiction
- 5.1.1 Homecoming – R.N. Tagore
5.1.2 The Selfish Giant - Oscar Wilde
5.1.3 The Missing Mail – R K Laxman
- 5.2 Prose
- 5.2.1 Of Studies – Francis Bacon
5.2.2 Art of Conversation – Richard Steel
5.2.3 Democracy – Dr. Radhakrishnan
- 5.3 Poems
- 5.3.1 Ozymandias – P.B. Shelley
5.3.2 Daffodils – William Wordsworth
5.3.3 Stopping by Woods on a Snowy Evening – Robert Frost

LIST OF PRACTICALS

(Note: The following contents are only for practice. They should not be included in the final theory examination)

DEVELOPING ORAL COMMUNICATION SKILLS

- Greeting, Starting a Conversation
- Introducing Oneself
- Introducing Others
- Leave Taking
- Thanking, Wishing Well
- Talking about Oneself
- Talking about Likes and Dislikes
- Mock Interview

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LIST OF REFERENCE BOOKS

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


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DA102 APPLIED MATHEMATICS - I

	L	T	P
Periods/Week	3	-	-

RATIONALE

Applied Mathematics forms the backbone of engineering students. The curriculum of mathematics has undergone changes from time to time in accordance with growth of subject. Diploma in Engineering is a launching stage where the students learn the basics of engineering. The revised syllabus has been designed keeping in view the emerging needs of all categories of students. Great emphasis has been laid on application of various contents like algebra, complex numbers, trigonometry and coordinate geometry. This course will develop analytical abilities to make exact calculations and provide continuing educational base to the students.

Note: - Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles.

DETAILED CONTENTS

1. Algebra (30 Periods)

- 1.1 Series: A.P. and G.P., n th term of AP and GP, sum to n th term, Value of ${}^n P_r$ and ${}^n C_r$.
- 1.2 Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof)
- 1.3 Partial fractions (linear factors, repeated linear factors, non-reducible quadratic factors only)
- 1.4 Determinants and Matrices – expansion of determinants (up to third order), properties of determinants, solution of equations (up to 3 unknowns) by Cramer's rule. Definition of matrix, addition, subtraction, multiplication of matrices (up to third order), minors and co-factors, inverse of a matrix by adjoint method (up to second order)
- 1.5 Scalar and vector product of two /three vectors

2. Trigonometry (20 Periods)

Review of ratios of some standard angles (0,30,45,60,90 degrees), T-Ratios of Allied angles (without proof), Sum, difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa). T-Ratios of multiple angles, sub-multiple angles (2A, 3A, A/2).

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3. Complex numbers (10 Periods)

Definition of complex numbers, real and imaginary parts of a complex number, polar and Cartesian form and their inter-conversion, conjugate of a complex number, modulus and argument of a complex number, addition, subtraction, multiplication and division of a complex number. De-Moiver's Theorem (simple problems)

4. Co-ordinate Geometry (20 Periods)

4.1 Equation of straight line in various standard forms (without proof), inter section of two straight lines, angle between two lines, perpendicular distance formula (without proof)

4.2 General equation of a circle and its characteristics. To find the equation of a circle, given:

- * Centre and radius
- * Three points lying on it
- * Coordinates of end points of a diameter

4.3 Equations of conics (ellipse, parabola and hyperbola), simple problems related to engineering (standards forms only)

RECOMMENDED BOOKS

1. Applied Mathematics by Dr. RD Sharma, Dhan pat Rai Publications, Delhi
2. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
3. Applied Mathematics-I (Hindi) by Dr. Kailash Sinha, Nav Bharat Publication, Meerut.
4. Engineering Mathematics by Vol. I & II by S Kohli, IPH, Jalandhar
5. Applied Mathematics, Vol. I & II by SS Sabharwal and Sunita Jain, Eagle Parkashan, Jalandhar


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DA103 APPLIED PHYSICS – I

	L	T	P
Periods/Week	3	-	2

RATIONALE

Applied physics includes the study of a large number of diverse topics all related to things that go on in the world around us. It aims to give an understanding of this world both by observation and by prediction of the way in which objects will behave. Concrete use of physical principles and analysis in various fields of engineering and technology are given prominence in the course content.

Note: - Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles.

DETAILED CONTENTS

1. Units and Dimensions (8 Periods)




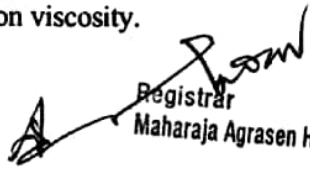
- 1.1 Physical quantities
- 1.2 Units - fundamental and derived units, systems of units (FPS, CGS, MKS and SI units)
- 1.3 Dimensions and dimensional formulae of physical quantities
- 1.4 Dimensional equations and principle of homogeneity, applications to conversion from one system of units to another, checking the correctness of physical relations and derivation of simple physical relations, limitations of dimensional analysis
- 1.5 Error in measurement, random and systematic errors, types of errors, propagation of errors, significant figures

2. Force and Motion (12 Periods)

- 2.1 Concept of Scalar and Vector quantities – examples, types of vectors.
- 2.2 Resolution and Composition of vectors, Vector multiplication (scalar product and vector product of vectors), addition of vectors (Parallelogram law)
- 2.3 Force: Newton's laws of motion, linear momentum and conservation of linear momentum, impulse and its application, simple numerical problem in brake system of vehicles and trains etc.
- 2.4 Friction: Types of friction and its application.

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- 2.5 Circular motion: Angular displacement, angular velocity and angular acceleration
- 2.6 Relation between linear and angular variables (velocity and acceleration)
- 2.7 Centripetal force (derivation) and centrifugal force with application such as banking of roads and bending of cyclists
- 2.8 Application of various forces in lifts
- 3 Rotational Motion (6 Periods)
- 3.1 Concept of translatory and rotating motion with examples
- 3.2 Definitions of torque, angular momentum and their relationship
- 3.3 Conservation of angular momentum (qualitative) and its examples
- 3.4 Moment of inertia and its physical significance, radius of gyration, Theorems of parallel and perpendicular axes (statements), Moment of inertia of rod, disc, ring and sphere (Formulae only).
- 3.5 Application of rotational motions in transport vehicles, trains and aero plane turbine/engine.
- 4 Work, Power and Energy (8 Periods)
- 4.1 Work: definition and its SI units
- 4.2 Work done in moving an object on horizontal and inclined plane (incorporating frictional forces) with its application
- 4.3 Power: definition and its SI units, calculation of power with numerical problems
- 4.4 Energy: Definition and its SI units: Kinetic energy and Potential energy with examples and their derivation
- 4.5 Principle of conservation of mechanical energy (for freely falling bodies), transformation of energy from one form to another with its application
- 5 Properties of Matter (10 Periods)
- 5.1 Elasticity: definition of stress and strain, different types of modulus of elasticity, stress – strain diagram, Hooke's law with its applications
- 5.2 Pressure: definition, its units, atmospheric pressure, gauge pressure, absolute pressure, Fortin's Barometer and its applications
- 5.3 Surface tension: concept, its units, angle of contact, measurement of surface tension by capillary tube method, applications of surface tension, effect of temperature and impurity on surface tension
- 5.4 Viscosity and coefficient of viscosity: Stoke's Law and derivation of terminal velocity, effect of temperature on viscosity.

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- 6 Thermometry (10 Periods)
- 6.1 Difference between heat and temperature
 - 6.2 Principles of measurement of temperature and different scales of temperature and their relationship
 - 6.3 Types of thermometers (Concept only)
 - 6.4 Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them
 - 6.5 Modes of transfer of heat (Conduction, convection and radiation with examples)
 - 6.6 Co-efficient of thermal conductivity
 - 6.7 Engineering Application of conduction, convection and radiations
7. Waves and Vibrations (10 Periods)
- 7.1 Simple Harmonic Motion(SHM): definition, expression for displacement, velocity, acceleration, time period, frequency in S.H.M. Equation of simple harmonic progressive wave
 - 7.2 Wave motion: transverse and longitudinal wave motion with examples, sound and light waves, velocity, frequency and wave length of a wave (relationship $v = n\lambda$) and their applications
 - 7.3 Free, forced and resonant vibrations with examples
 - 7.4 Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time and their applications
 - 7.5 Ultrasonics – production (magnetostriction and piezoelectric methods) and their engineering and medical applications

LIST OF PRACTICALS (to perform minimum ten experiments)

1. To find the diameter of wire using a screw gauge
2. To find volume of solid cylinder and hollow cylinder using a vernier calipers
3. To determine the thickness of glass strip and radius of curvature using a spherometer
4. To verify parallelogram law of forces
5. To find the time period of a simple pendulum and determine the length of second's pendulum.
6. To find the velocity of sound by using resonance apparatus at room temperature.
7. To determine the viscosity of glycerin by Stoke's method
8. To determine the coefficient of friction on horizontal plane.

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9. To determine the Young's Modulus by Searles apparatus
10. To determine force Constant of spring using Hooke's Law

INSTRUCTIONAL STATREGY

Teacher may use various teaching aids like models, charts, graphs and experimental kits etc. for imparting effective instructions in the subject. The teacher should explain about field applications before teaching the basics of mechanics, work power and energy, rotational motion, properties of matter etc. to develop proper understanding of the physical phenomenon. Use of demonstration can make the subject interesting and develop scientific temper in the students.

RECOMMENDED BOOKS

1. Text Book of Physics for Class XI (Part-I, Part-II) N.C.E.R.T
2. Text Book of Physics for Class XII (Part-I, Part-II) N.C.E.R.T
3. Applied Physics Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, New Delhi
4. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
5. Berkeley Physics Course, Vol. I, II & III, Tata McGraw Hill, Delhi
6. Comprehensive Practical Physics, Vol. I & II, JN Jaiswal, Laxmi Publishers
7. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
8. Applied Physics I & II by RA Banwait & R Dogra, Eagle Parkashan, Jalandhar
9. Applied Physics by Jasmer Kaur and Bhupinder Singh, Lords Publications, Jalandhar
10. Engineering Physics by Vanchna Singh and Sheetal Kumar, Cengage Learning India Pvt. Ltd. Patparganj, Delhi




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DA104 APPLIED CHEMISTRY - I

	L	T	P
Periods/Week	3	-	2

RATIONALE

The role of Chemistry and chemical products in every branch of engineering is expanding greatly. Now a days various products of chemical industries are playing important role in the field of engineering with increasing number of such products each successive year. The strength of materials, the chemical composition of substances, their behavior when subjected to different treatment and environment, and the laws of heat and dynamic energy have entered in almost every activity of modern life. Chemistry is considered as one of the core subjects for diploma students in engineering and technology for developing in them scientific temper and appreciation of chemical properties of materials, which they have to handle in their professional career. Effort should be made to teach this subject through demonstration and with the active involvement of students.

DETAILED CONTENTS

1. Basics Concepts (08 Periods)
 - 1.1 Definition of chemistry and its importance
 - 1.2 Definition of matter, element, compound and mixtures, atom, molecule, ion, symbol, formula, valency and chemical equation.
 - 1.3 Writing of the chemical formula of a simple chemical compound. Calculation of percentage composition of a chemical compound and form the empirical and molecular formula of the compound
 - 1.4 Essentials of a chemical equation, balancing of a chemical equation by hit and trial method

2. Atomic Structure and Chemical Bonding (08 Periods)
 - 2.1 Fundamental particles i.e. electron, proton and neutron, their characteristics (discovery is not included)
 - 2.2 Electronic concept of valency
 - 2.3 Elementary account of electrovalent, covalent and coordinate bond formation on the basis of the electronic concept of valency giving suitable examples to each
 - 2.4 Hydrogen bonding and its effect on physical properties of the compounds
 - 2.5 Electronic configuration of elements (up to $Z = 30$) with special reference to Aufbau principle

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3. Water (16 Periods)
- 3.1 Hard and soft water, types of hardness and its causes, disadvantages of hardness of water (i) in industrial use (ii) in boilers for steam generation with special reference to sludge and scale formation; foaming and priming in boilers
- 3.2 Methods to remove hardness of water (i) Clark's Process (ii) Permutit Process (iii) Soda Lime process (iv) Ion-Exchange resin process. Simple numerical problems related to soda lime process.
- 3.3 Definition of degree of hardness of water and the systems to express the degree of hardness of water. Simple numerical problems related to finding the degree of hardness on different scales. Estimation of hardness of water sample by O'Hehner's Method and E.D.T.A. Method
- 3.4 Qualities of water used for drinking purposes, treatment of river water to make it fit for town supply
- 3.5 Disinfection of water by chlorination process
4. Solutions (12 Periods)
- 4.1 Concept of homogenous solution, brief introduction of the terms (i) Ionization (ii) Acidity (iii) Basicity (iv) equivalent weight and gram equivalent weight with suitable examples
- 4.2 Strength of a solution (i) Normality (ii) Molarity (iii) Molality as applied in relation to a solution with simple numerical problems related to these terms
- 4.3 Definition of pH, and different industrial applications of pH, determination of pH of a solution with the help of pH meter including simple numerical problems.
- 5 Electrolysis (12 Periods)
- 5.1 Definition of the terms: Electrolytes, Non-electrolytes conductors and non-conductors with suitable examples
- 5.2 Faraday's Laws of Electrolysis with simple numerical problems
- 5.3 Different industrial applications of 'Electrolysis' with special reference to electroplating and electrorefining of metals
- 5.4 Basic concept of Buffer solutions, indicators and solubility product.

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6 Environmental Chemistry

(08 Periods)

- 6.1 General concept of pollution and pollutants
- 6.2 Types and control of pollution like air, water, noise and soil pollution
- 6.3 General idea of ozone depletion, global warming

LIST OF PRACTICALS

1. Volumetric analysis and study of apparatus used therein. Simple problems on volumetric analysis equation
2. Preparation of standard solution of oxalic acid or potassium dichromate
3. To analyse the inorganic mixture for two acidic and two basic radicals from the following radicals
 - a) Acidic Radicals CO_3^{2-} , SO_4^{2-} , NO_3^- , CH_3COO^- , Cl^- , Br^- , I^-
 - b) Basic Radicals NH_4^+ , Pb^+ , Cu^{2+} , Cd^{2+} , As^{3+} , Sb^{3+} , Sn^{2+} , Al^{3+} , Fe^{3+} , Cr^{3+} , Mn^{2+} , Ni^{2+} , Co^{2+} , Zn^{2+} , Ba^{2+} , Sn^{2+} , Ca^{2+} and Mg^{2+} ,
4. Determine the degree of temporary hardness of water by O'Heher's method
5. Estimation of total alkalinity of water volumetrically
6. Determine pH of a given sample by using pH meter
7. Determination of solubility of a solid at room temperature
8. Demonstration – Application of FeCl_3 in etching process for designing circuits on PCB (Printed Circuit Board)

RECOMMENDED 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
4. A Text Book of Applied Chemistry-I by Sharma and Others; Technical Bureau of India, Jalandhar
5. Engineering Chemistry by Jain PC and Jain M,
6. Chemistry of Engineering by Aggarwal CV,
7. Chemistry for Environmental Engineers by Swayer and McCarty, McGraw Hill, Delhi
8. Progressive Applied Chemistry –I and II by Dr. G.H. Hugar; Eagle Prakashan, Jalandhar

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DA105 BASICS OF INFORMATION TECHNOLOGY

Periods/Weeks L T P
3 - 2

RATIONALE

Information technology has great influence on all aspects of life. Almost all work places and living environment are being computerized. In order to prepare diploma holders to work in these environments, it is essential that they are exposed to various aspects of information technology such as understanding the concept of information technology and its scope; operating a computer; use of various tools of MS office; using internet etc. form the broad competency profile of diploma holders. This exposure will enable the students to enter their professions with confidence, live in a harmonious way and contribute to the productivity.

DETAILED CONTENTS

1. Information Technology – its concept and scope (2 Periods)
2. Elements of a computer system, its usefulness and applications, block diagram of a computer, CPU, memory, data – numeric data, alpha numeric data; contents of a program, processing of data (4 Periods)
3. Computer organization, computer hardware and software; primary and secondary memory: RAM, ROM, PROM etc. (4 Periods)
4. Input devices; keyboard, scanner, mouse etc.; output devices; VDU and Printer, Plotter (4 Periods)
5. Primary and Secondary Storage (Auxiliary Storage), Secondary storage; magnetic disks – tracks and sectors, optical disk (CD, CD-RW and DVD Memory) (4 Periods)
6. Introduction to Operating Systems such as MS-DOS and Windows (4 Periods)
7. Introduction to internet, browsing using search engine (like google etc.) (5 Periods)
8. Basics of Networking – LAN, WAN, Topologies (5 Periods)

LIST OF PRACTICALS

1. Given a PC, name its various components and list their functions
2. Identification of various parts of a computer and peripherals
3. Practice in installing a computer system by giving connection

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4. DOS Commands (internal / external) e.g. TYPE, REN, DEL, CD, MD, COPY, TREE, BACKUP
5. Exercises on entering text and data (Typing Practice using any tutor)
6. Features of Windows as an operating system
 - Start
 - Shutdown and restore
 - Creating and operating on the icons
 - Opening closing and sizing the windows
 - Using elementary job commands like – creating, saving, modifying, renaming, finding and deleting a file
 - Creating and operating on a folder
 - Changing setting like, date, time color (back ground and fore ground)
 - Using short cuts
 - Using on line help
7. MS-Word
 - File Management:
Opening, creating and saving a document, locating files, copying contents in some different file(s), protecting files, Giving password protection for a file
 - Page Set up:
Setting margins, tab setting, ruler, indenting
 - Editing a document:
Entering text, Cut, copy, paste using tool- bars
 - Formatting a document:
Using different fonts, changing font size and colour, changing the appearance through bold/ italic/ underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods
 - Aligning of text in a document, justification of document, Inserting bullets and numbering
 - Formatting paragraph, inserting page breaks and column breaks, line spacing
 - Use of headers, footers: Inserting footnote, end note, use of comments
 - Inserting date, time, special symbols, importing graphic images, drawing tools
 - Tables and Borders:
Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting a row in a table
 - Print preview, zoom, page set up, printing options
 - Using Find, Replace options
 - Using Tools like:
Spell checker, help, use of macros, mail merge, thesaurus word content and

- statistics, printing envelopes and labels
- Using shapes and drawing toolbar,
- Working with more than one window in MS Word,
- How to change the version of the document from one window OS to another
- Conversion between different text editors, software and MS word

8. MS-Excel

- Starting excel, open worksheet, enter, edit, data, formulae to calculate values, format data, create chart, printing chart, save worksheet, switching between different spread sheets
- Menu commands:
Create, format charts, organize, manage data, solving problem by analyzing data, exchange with other applications. Programming with MS-Excel, getting information while working
- Work books:
Managing workbooks (create, open, close, save), working in work books, selecting the cells, choosing commands, data entry techniques, formula creation and links, controlling calculations, working with arrays
- Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet
- Creating a chart:
Working with chart types, changing data in chart, formatting a chart, use chart to analyze data
- Using a list to organize data, sorting and filtering data in list

9. MS PowerPoint

- a) Introduction to PowerPoint
 - How to start PowerPoint
 - Working environment: concept of toolbars, slide layout, templates etc.
 - Opening a new/existing presentation
 - Different views for viewing slides in a presentation: normal, slide sorter etc.
- b) Addition, deletion and saving of slides
- c) How to view the slide show?
 - Viewing the presentation using slide navigator
 - Slide transition
 - Animation effects etc.

10. Internet and its Applications

- a) Log-in to internet
- b) Navigation for information seeking on internet
- c) Browsing and down loading of information from internet

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d) Sending and receiving e-mail

- Creating a message
- Creating an address book
- Attaching a file with e-mail message
- Receiving a message
- Deleting a message

INSTRUCTIONAL STRATEGY

Since this is an introductory computer related subject, the teacher should demonstrate and explain computer and its peripherals in the laboratory. The theory may be dovetailed with practical exercises for better understanding. The students may be encouraged to work independently on computer to gain confidence.

RECOMMENDED BOOKS

1. Fundamentals of Computer by V. Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
2. Computers Today by SK Basandara, Galgotia Publication Pvt Ltd. Darya Ganj, New Delhi.
3. MS-Office 2000 for Everyone by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., New Delhi
4. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
5. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
6. Mastering Windows 95, BPB Publication, New Delhi
7. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
8. Fundamentals of Information Technology by Leon and Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
9. On Your Marks - Net...Set...Go... Surviving in an e-world by Anushka Wirasinha, Prentice Hall of India Pvt. Ltd., New Delhi
10. Learning MS Office XP by Ramesh Bangia, Khanna Book Publishing Co. (P) Ltd., New Delhi.
11. Fundamentals of Information Technology by Vipin Arora, Eagle Parkashan, Jalandhar

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DA106 ENGINEERING DRAWING – I

L T P

Periods/Weeks - - 6

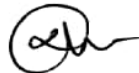
RATIONALE

Drawing is said to be the language of engineers and technicians. Reading and interpreting engineering drawing is their day-to-day responsibility. The course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation. The emphasis while imparting instructions should be to develop conceptual skills in the students.

- Note:
1. First angle projection is to be followed
 2. Instruction relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the students
 3. S.P. 46.1988 should be followed
 4. Minimum of 15 sheets to be prepared by each student

DETAILED CONTENTS

1. Drawing Office Practice, Lines & Lettering (2 Sheets)
 - 1.1 Drawing instruments
 - 1.2 Sizes and layout of standard drawing sheets and drawing boards
 - 1.3 Different types of lines in engineering drawing as per BIS specifications
 - 1.4 Free hand lettering (alphabet and numerals) lower case and upper case, single stroke vertical and inclined at 75 degree in different standard series of 2.5, 3, 5, 7, 10, and 15 mm heights in the ratio of 7:4
2. Dimensioning (2 Sheets)
 - 2.1 Necessity of dimensioning, Types of dimensioning (chain, parallel and progressive dimensioning, size and location dimensioning)
Methods of placing dimensioning (Aligned and unidirectional system), use of leader lines. General principles of dimensioning.
 - 2.2 Dimensioning of overall sizes, circles, thread holes, chamfered surfaces, angles, tapered surface holes equally spaced on PCD, counter sunk hole counter bored holes, cylindrical parts, narrow space and gaps, radii, curves and arches.
3. Simple Geometrical Constructions used in Engineering Practice (2 Sheets)
 - 3.1 Construction of regular polygons (triangle, square, pentagon, hexagon) and circles
 - 3.2 Ellipses (concentric circle method and Intersecting Arcs method)
 - 3.3 Parabola (rectangle and tangent method), cycloid




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4. Scale (2 sheets)
 - 4.1 Scale – their need and importance, Definition of representative fraction (R.F), find RF of given scale
 - 4.2 Construction of plain and diagonal scales
5. Principle of Projections (7 sheets)
 - 5.1 Principle of orthographic projection and introduction to first angle projection and third angle projection
 - 5.2 Projection of points situated in different quadrants (1 Sheet)
 - 5.3 Projection of lines, Lines inclined to one plane and parallel to the other and vice versa (1st & 3rd quadrants); Line inclined to both reference planes (HP and VP) (1 Sheet)
 - 5.4 Projection of Planes: Planes perpendicular and parallel to either of the planes; planes perpendicular to one plane and inclined to the other or vice versa (1st & 3rd quadrants) (1 Sheet)
 - 5.5 Projection of solids, such as Prism, Cube, Cylinder and Cones with axis perpendicular to horizontal plane or parallel to horizontal plane/vertical plane or both
 - 5.6 Drawing 3 orthographic views of given objects (3 sheets, at least one sheet in 3rd Angle Projection)
 - 5.7 Identification of surfaces on drawn orthographic views from isometric object drawn (1 Sheet)
6. Sectional Views (1 sheet)
 - 6.1 Need for sectional views –Drawing of different conventions for materials in sections, conventional breaks for shafts, pipes, rectangular, square, angle, channel and rolled sections
7. Isometric Views (2 sheets)
 - 7.1 Fundamentals of isometric projections (theoretical instructions) and isometric scales
 - 7.2 Isometric views of combination of regular solids like cylinder, cone, cube, prism and pyramid
8. Symbols and Conventions (2 sheets)
 - 8.1 Civil engineering sanitary fitting symbols
 - 8.2 Electrical fitting symbols for domestic interior installations and electronics symbols
 - 8.3 Building plan drawing with electrical and civil engineering symbols

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RECOMMENDED BOOKS

1. Engineering Drawing by C M Verma, Takniki Parkashak, Roorkee.
2. Elementary Engineering Drawing (in First Angle Projection) by ND Bhatt, Charotar Publishing House
3. A Text Book of Engineering Drawing by Surjit Singh ; Dhanpat Rai and Co., Delhi
4. Engineering Drawing by PS Gill ; SK Kataria and sons, Delhi
5. Engineering Drawing by RB Gupta ; Satya Prakashan, New Delhi



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DAP107 GENERAL WORKSHOP PRACTICE – I

L T P
Periods/Week - - 6

RATIONALE

In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practice. General workshop practices are included in the curriculum in order to provide hand on experience about use of different tools and basic manufacturing practices. This course aims at developing general manual and machining skills in the students. Besides above, the development of dignity of labour, precision, safety at work place, team working and development of right attitude are the other objectives.

DETAILED CONTENTS (PRACTICALS)

Note: The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.

The following shops are included in the syllabus:

1. Carpentry and Painting Shop-1
2. Fitting Shop
3. Welding Shop-I
4. Electric Shop -I
5. Smithy Shop or Electronic Shop-I
6. Sheet Metal Shop

Note:

1. The branches e.g. Civil Engineering, Electrical Engineering and Automobile Engineering, will do **Smithy Shop** instead of Electronic Shop- I
2. The branches e.g. Electronics and Communication Engineering, Computer Engineering and Information Technology will do **Electronic Shop-I** instead of Smithy Shop.


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1. Carpentry and Painting Shop -I

- 1.1 Introduction to various types of wood such as Deodar, Kail, Partal, Teak, Mango, Sheesham, etc. (Demonstration and their identification).
- 1.2 Demonstration, function and use of commonly used hand tools. Care, maintenance of tools and safety measures to be observed.
Job I Marking, sawing, planning and chiseling & their practice (size should be mentioned)
- 1.3 Introduction to various types of wooden joints, their relative advantages and uses.
Job II Preparation of half lap joint
Job III Preparation of Mortise and Tenon Joint
- 1.4 Demonstration of various methods of painting wooden items.
Job IV Preparation of wooden surface before painting including primer coating
Job V Painting Practice by brush/spray
Job VI Preparation of surface, before Painting such as cleaning, sanding, putty. Procedure and application of primer code and painting steel items.
- 1.5 Safety precautions in carpentry shop

2. Fitting Shop

- 2.1 Introduction to fitting shop tools, common materials used in fitting shop, Identification of materials. Such as Steel, Brass, Copper, Aluminum etc. Identification of various sections of steel such as Flat, Angle, Tee, Channel, Bar Girder, Square, Z-Section, etc.
- 2.2 Description and demonstration of various types of work benches, holding devices and files. Precautions while filing.
- 2.3 Description and demonstration of simple operation of hack-sawing, demonstration and description of various types of blades and their specifications, uses and method of fitting the blade.

Job I Marking of job, use of marking tools and measuring instruments.
Job II Filing a dimensioned rectangular or square piece of an accuracy of $\pm 0.5\text{mm}$
Job III Filing practice (production of flat surfaces). Checking by straight edge.

Job IV Making a cutout from a square piece of MS Flat using hand hacksaw.
- 2.4 Care and maintenance of measuring tools like calipers, steel rule, try square, vernier calipers, micrometer, height gauge, combination set. Handling of measuring instruments, checking of zero error, finding of least count (all gauges including dial gauge).

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3. Welding Shop – I

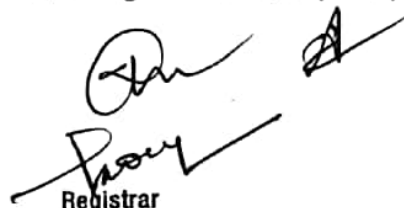
- 3.1 (a) Introduction to welding and its importance in engineering practice; types of welding; common materials that can be welded, introduction to welding equipment e.g. a.c. welding set, d.c. rectifier, electrode holder, electrodes and their specifications, welding screens and other welding related equipment, accessories and gloves.
- (b) Safety precautions during welding
- (c) Hazards of welding and its remedies
- 3.2 Electric arc welding, (a.c. and d.c.) precautions while using electric arc welding, Practice in setting current and voltage for striking proper arc. Earthing of welding machine.
- Job I Practice of striking arc bending and tacking while using electric arc welding set.
- Job II Welding practice on electric arc welding for making uniform and straight weld beads
- 3.3 Various types of joints and end preparation.
- Job III Preparation of butt joint by electric arc welding.
- Job IV Preparation of lap joint by electric arc welding.
- Job V Preparation of corner joint by using electric arc welding.
- Job VI Preparation of Tee joint by electric arc welding.

4. Electric Shop – I

- 4.1 Study, demonstration and identification of common electrical materials such as wires, cables, switches, fuses, ceiling roses, PVC Conduits, PVC Channels and allied items, tools along with electrical instruments such as voltmeter, ammeter and multimeter.
- 4.2 Study of electrical safety measures and demonstration about use of protective devices such as fuses, MCBs, ELCBs and relays including earthing.
- Job I Identification of phase, neutral and earth of domestic appliances and their connection to two pin/three pin plugs.
- Job II Preparation of a house wiring circuit on wooden board using fuse, switches, socket, holder, ceiling rose etc. in PVC conduit and PVC casing and capping wiring system.
- 4.3 Study of common electrical appliances such as electric iron, electric kettle, ceiling fan, table fan, electric mixer, electric Geyser, gas geyser, desert cooler, refrigerator, water purifier
- 4.4 Introduction to lead-acid battery, identification of parts and its working.
- Job III Installation of inverter with battery and to connect two or more batteries in series and in parallel (knowledge of a.c. and d.c.)
- Job IV Charging of a battery and testing it with the help of hydrometer and cell tester

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5. Smithy Shop

- 5.1 Demonstration and detailed explanation of tools and equipment used. Forging operations in smithy shop. Safety measures to be observed in the smithy shop.
- 5.2 Demonstration and description of bending operation, upsetting operation, description and specification of anvils, swage blocks, hammers etc.
- 5.3 Demonstration and description of tongs, fullers, swages etc.
 - Job I To forge a L-hook.
 - Job II To prepare a job involving upsetting process
 - Job III To forge a chisel
 - Job IV To prepare a cube from a M.S. round by forging method.

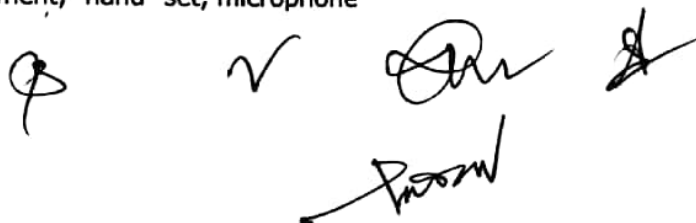
OR

5. Electronic Shop – I

- 5.1 Identification and familiarization with the following tools used in electronic shop: Such as Tweezers, Screw drivers (different sizes), Insulated Pliers, Cutter, Sniper, Philips Screw Driver (Star Screw Driver), L- Keys, Soldering Iron, soldering wire, flux. Their demonstration and uses.
- 5.2 Identification and familiarization with Multimeter (analog and digital)
 - Job I Practice in the use of above mentioned tools and instruments. For this a small experimental set up may be done
- 5.3 Various types of protective devices such as : wire fuse, cartridge fuse etc. ,
- 5.4 Identification and familiarization with ear phone speaker connector, telephone jacks and similar male and female connectors (audio, video)
- 5.5 Safety precautions to be observed in the electronic shop
- 5.6 Identification and familiarization with soldering and desoldering practice
- 5.7 Introduction to thimbles and crimping tools

NOTE: Demonstration boards for the electronics components such as resistor, capacitor, diodes, transistors, FETs, IFT Coils, ICs should be made.

- Job II Cut, strip, join an insulated wire with the help of soldering iron (repeat with different types of wires)
- Job III Cut, strip, connect/solder/crimp different kinds of wires/ cables (including co-axial and shielded cable) to different types of power/general purpose/audio video/telephone plugs, sockets, jacks, terminals, binding posts, terminal strips, connectors. The tasks should include making complete recording/playback/ antenna/ speaker leads for common electronic products such as Radio, TV, CD players, VCD/DVD players, cassette recorder and players, Hi-Fi equipment, hand- set, microphone

The image shows several handwritten signatures and initials in black ink. There are four distinct signatures at the top, and a larger, more stylized signature below them that appears to be 'Prasanna'.

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6. Sheet Metal Shop

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

- 6.1 Introduction and demonstration of hand tools used in sheet metal shop.
- 6.2 Introduction and demonstration of various machines and equipment used in sheet metal shop e.g. shearing machine, bar folder, burring machine, power press, sheet bending machine.
- 6.3 Introduction and demonstration of various raw materials used in sheet metal shop e.g., M.S. sheet, galvanized-iron plain sheet, galvanized corrugated sheet, aluminum sheets etc.
- 6.4 Study of various types of rivets, steel screw etc.

Job I Shearing practice on a sheet using hand shears.

- a) Practice on making single riveted lap joint/double riveted lap Joint.
- b) Practice on making single cover plate chain type, seam joint and riveted butt joint

RECOMMENDED BOOKS

1. Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Chaoudhary. 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, KL Narayana et al; MacMillan India Ltd. New Delhi
4. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
5. Workshop Technology by B.S. Raghuwanshi, Dhanpat Rai and Co., New Delhi
6. Workshop Technology by HS Bawa, Tata McGraw Hill Publishers, New Delhi.

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**SECOND
SEMESTER**

DA201: ENGLISH AND COMMUNICATION SKILLS – II

Periods/Week L T P
 3 - 2

RATIONALE

Interpersonal communication is a natural and necessary part of organizational life. Yet, communicating effectively can be challenging because of our inherent nature to assume, overreact to and misperceive what actually is happening. Poor communication or lack of communication is often cited as the cause of conflict and poor teamwork. In today's team-oriented workplace, managing communication and developing strategies for creating shared meaning are crucial to achieve results and create successful organizations. The goal of the Communicating Skills course is to produce civic-minded, competent communicators. To that end, students must demonstrate oral as well as written communication proficiency. These include organizational and interpersonal communication, public address and performance. The objectives of this subject are understanding how communication works, gaining active listening and responding skills, understanding the importance of body language, acquiring different strategies of reading texts and increasing confidence by providing opportunities for oral and written expressions

DETAILED CONTENTS

Section A

1. FACETS OF LITERATURE

(22 Periods)

- 1.1 Fiction
 - 1.1.1 The Portrait of a Lady - Khushwant Singh
 - 1.1.2 The Doll's House – Katherine Mansfield
 - 1.1.3 The Refugees – Pearl S. Buck
- 1.2 Prose
 - 1.2.1 Of Truth – Francis Bacon
 - 1.2.2 Praises of Solitude – Samuel Johnson
 - 1.2.3 A Gentleman – John Henry Newman
- 1.3 Poems
 - 1.3.1 All The World's A Stage – W. Shakespeare
 - 1.3.2 A Solitary Reaper – William Wordsworth

2. READING SKILLS

Unseen comprehension passages (at least 3 passages).

(08 Periods)

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Section B

3. WRITING SKILLS (16 Periods)

Writing Notice Page 31 of 21

- Writing Circular
- Writing a Memo
- Agenda for a Meeting
- Minutes of the Meeting
- Press release
- Telephonic Messages
- Paragraph writing:
Simple and Current Topics should be covered.

4. Correspondence (06 Periods)

- Business Letters
- Personal Letters

5. Communication (12 Periods)

- Media and Modes of Communication
- Channels of Communication
- Barriers to Communication
- Listening Skills
- Body language
- Humour in Communication

LIST OF PRACTICALS

(Note: The following contents are only for practice. They should not be included in the final theory examination)

1. LISTENING COMPREHENSION
 - a. Locating Main Ideas in a Listening Excerpt, Note-taking
2. DEVELOPING ORAL COMMUNICATION SKILLS
 - a. Offering-Responding to Offers, Requesting-Responding to Requests, Congratulating, Expressing Sympathy and Condolences, Expressing Disappointments, Asking Questions-Polite Responses, Apologizing, Forgiving

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Complaining, Persuading, Warning, asking for and Giving Information, Giving Instructions, Getting and Giving Permission, asking for and Giving Opinions, Group Discussion

TEXTBOOK:

1. Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi

LIST OF REFERENCE 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.

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DA202: APPLIED MATHEMATICS - II

L T P
Periods/Week 3 - -

RATIONALE

Applied Mathematics forms the backbone of engineering students. The curriculum of mathematics has undergone changes from time to time in accordance with growth of subject. Diploma in Engineering is a launching stage where the students learn the basics of engineering. The revised syllabus has been designed keeping in view the emerging needs of all categories of students. Great emphasis has been laid on application of various contents like differential calculus, integral calculus, differential equations and statistics. This course will develop analytical abilities to make exact calculations and provide continuing educational base to the students.

Note: Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles.

DETAILED CONTENTS

1. Differential Calculus

(30 Periods)

Definition of function; Concept of limits.

Four standard limits $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a}$

$\lim_{x \rightarrow 0} \frac{\sin x}{x}$, $\lim_{x \rightarrow 0} \frac{a^x - 1}{x}$, $\lim_{x \rightarrow 0} (1+x)^{1/x}$

Differentiation by definition of x^n , $\sin x$, $\cos x$, $\tan x$, e^x , $\log_a x$ only

Differentiation of sum, product and quotient of functions. Differentiation of function of a function.

Differentiation of inverse trigonometrical functions, Logarithmic differentiation, Exponential differentiation, Successive differentiation (up to third order only).

Applications:

(a) Maxima and minima

(b) Equation of tangent and normal to a curve (for explicit functions only) – Simple problems only

2. Integral Calculus

(25 Periods)

Integration as inverse operation of differentiation

Simple standard integrals and related problems

Simple integration by substitution, by parts and by partial fractions (for

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linear factors only)

Properties of definite integrals

Evaluation of definite integrals (simple problems)-

$$\text{Evaluation of } \int_0^{\pi/2} \sin^n x \, dx, \quad \int_0^{\pi/2} \cos^n x \, dx, \quad \int_0^{\pi/2} \sin^m x \cos^n x \, dx$$

using formulae without proof (m and n being positive integers only)

Numerical integration by Simpson's Rule and Trapezoidal Rule (simple problems only)

3 Ordinary Differential Equations (10 Periods)

- 3.1 Definition, order, degree, linear and non-linear differential equations
- 3.2 Formation of differential equations (up to second order)
- 3.3. Solution of first order differential equations (a) Variable Separable (b) Homogeneous (c) Linear and (d) Exact.

4. Statistics (15Periods)

Measures of Central Tendency: Mean, Median, Mode
Measures of Dispersion: Mean deviation, Standard deviation
Co-efficient of rank correlation

TEXTBOOK:

- 1. Applied Mathematics by Dr. RD Sharma, Dhanpat Rai Publications, Delhi

RECOMMENDED BOOKS

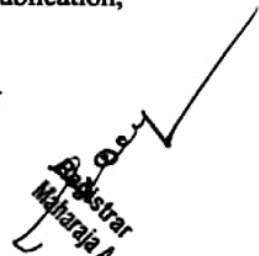
- 1. Applied Mathematics by Dr. RD Sharma, Dhanpat Rai Publications, Delhi
- 2. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
- 3. Applied Mathematics-I (Hindi) by Dr. Kailash Sinha, Nav Bharat Publication, Meerut.
- 4. Engineering Mathematics by Vol. I & II by S Kohli, IPH, Jalandhar
- 5. Applied Mathematics, Vol. I & II by SS Sabharwal & Sunita Jain, Eagle Parkashan, Jalandhar










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DA203: APPLIED PHYSICS – II

	L	T	P
Periods/Week	3	-	2

RATIONALE

Applied physics includes the study of a large number of diverse topics related to things that go in the world around us. It aims to give an understanding of this world both by observation and prediction of the way in which objects behave. Concrete use of physical principles and analysis in various fields of engineering and technology

DETAILED CONTENTS

- Optics** (10 Periods)
Review of basic optics laws: reflection and refraction

Refraction and refractive index, image formation in lenses, image magnification, lens formulae (thin lens only), power of lens, total internal reflection and their applications

Simple and compound microscope, astronomical telescope, magnifying power and its calculation (in each case), Terrestrial and Galileo's telescope (Concept only) and their applications
- Electrostatics** (12 Periods)
Coulombs law, unit of charge, electric potential and electric potential difference

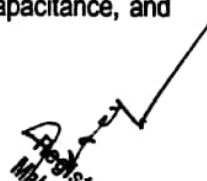
Electric field, electric field intensity, electric lines of force, electric flux Gauss's Law

Applications of Gauss law in finding electric field of point charge, straight charged conductor, plane charged sheet and between two plane parallel charged sheets

Capacitance, types of capacitors, capacitance of parallel plate capacitor, series and parallel combination of capacitors, Dielectric and its effect on capacitance, and dielectric break down

Application of electrostatics in electrostatic precipitator




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3. DC Circuits

(12 Periods)

Concept of electricity, current and its units, direct and alternating current, voltage, resistance and resistivity, potential difference and e.m.f., Concept and applications of potentiometer.

Ohm's law and its applications, concept of resistance, conductance, specific resistance, effect of temperature on resistance, co-efficient of resistance, series and parallel combination of resistors, introduction to super conductivity.

Kirchhoff's laws, Wheatstone bridge principle and its applications (Slide Wire Bridge)

Heating effect of current and concept of electric power, energy and their units, related numerical problems

Application of electricity in various equipment, advantages of electrical energy over other forms of energy

4. Electromagnetism

(13 Periods)

Magnetic field and its units, magnetic intensity, magnetic lines of force, magnetic flux and their units, Right hand thumb rule, magnetic lines of force due to straight conductor, circular coil and solenoid

Force on a charge, moving in a uniform magnetic field (Lorentz force). Force on a current carrying straight conductor. Torque on a current carrying rectangular coil.

Moving coil galvanometer conductor, its principle, construction and working, conversion of a galvanometer into ammeter and voltmeter.

Electromagnetic induction, Faradays Laws, Lenz's Law.

Applications of Electromagnetism

5. Semiconductor physics

(07 Periods)

Energy bands, intrinsic and extrinsic semiconductors, p-n junction diode and its characteristics

Diode as rectifier – half wave and full wave rectifier, semiconductor transistor pnp and npn (concept only)



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6. Modern Physics

(10 Periods)

Electromagnetic spectrum, photo electric effect and work function, X rays -properties, production and their applications in medicine and industries.

Lasers: concept of energy levels, ionizations and excitation potentials; spontaneous and stimulated emission; lasers and its characteristics, population inversion, types of lasers, Helium- Neon and ruby lasers, their engineering and medical applications

Fiber optics: introduction to optical fiber materials, types, light propagation and applications in communication.

LIST OF PRACTICALS (To perform minimum eight experiments)

1. Conversion of Galvanometer into an Ammeter of given range.
2. Conversion of Galvanometer into Voltmeter of given range.
3. To verify ohm's laws by drawing a graph between voltage and current.
4. To verify laws of resistances in series and in parallel connection.
5. To draw characteristics of a pn junction diode and determine knee and break down voltages
6. Verification of Kirchhoff's Laws
7. Determination of resistivity by Wheatstone bridge
8. To determine the resistance of electronic components by multimeter
9. Determination of internal resistance of primary cell by using ammeter and voltmeter
10. To determine emf of primary cell using potentiometer and standard voltage source.

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, dc circuits, electromagnetism, and semiconductor physics etc to develop proper understanding of the physical phenomenon. Use of demonstration can make the subject interesting and develop scientific temper in the students.

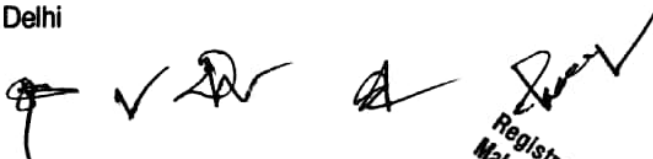

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TEXTBOOK:

1. Applied Physics Vol II by Jasmer Kaur and Bhupinder Singh, Lords Publications, Jalandhar

RECOMMENDED BOOKS

1. Text Book of Physics for Class XI (Part-I, Part-II) N.C.E.R.T
2. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi
3. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
4. Fundamentals of Physics by Resnick, Halliday and Walker, Asian Book Pvt. Ltd., New Delhi
5. Fundamentals of Optics by Francis A. Jenkins & Harvey E White, McGraw Hill International Editions, Physics Series
6. A Text Book of Optics, Subramanian and Brij Lal, S Chand & Co., New Delhi
7. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publishers
8. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
9. Applied Physics I & II by RA Banwait & R Dogra, Eagle Parkashan, Jalandhar
10. Applied Physics Vol II by Jasmer Kaur and Bhupinder Singh, Lords Publications, Jalandhar
11. Basic Electronics and Linear Circuits by NN Bhargava et al Tata Mc Graw Hill Publishers, New Delhi
12. Principles of Electronics by SK Sahdev, Dhanpat Rai and Co, New Delhi
13. Engineering Physics by Vanchna Singh and Sheetal Kumar, Cengage Learning India Pvt. Ltd. Patparganj, Delhi


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DA204: APPLIED CHEMISTRY-II

L T P
Periods/Week 3 - 2

RATIONALE

The role of Chemistry and chemical products in every branch of engineering is expanding greatly. Now a days various products of chemical industries are playing important role in the field of engineering with increasing number of such products each successive year. The strength of materials, the chemical composition of substances, their behavior when subjected to different treatment and environment, and the laws of heat and dynamic energy have entered in almost every activity of modern life. Chemistry is considered as one of the core subjects for diploma students in engineering and technology for developing in them scientific temper and appreciation of chemical properties of materials, which they have to handle in their professional career. Effort should be made to teach this subject through demonstration and with the active involvement of students.

DETAILED CONTENTS

1. Metallurgy (12 Periods)

A brief introduction of the terms: Metallurgy, mineral, ore, gangue or matrix, flux, slag, concentration (methods of concentrating the ores), roasting calcination and refining as applied in relation to various metallurgical operations

Metallurgy of (i) Aluminum (ii) Iron

Definition of an alloy, purposes of alloying, composition and uses of alloys like magnalium, duralumin, alnico, invar and stainless steel

2. Fuels (16 Periods)

Definition of a 'Fuel', characteristics of a good fuel and classification of fuels with suitable examples

Definition of Calorific value of a fuel and its determination for a solid fuel with the help of Bomb calorimeter with simple numerical problems.

Merits of gaseous fuels over those of other varieties of fuels

Manufacture, composition, properties and uses of (i) Water gas (ii) Oil gas (iii) Biogas (iv) Compressed Natural gas (CNG) Octane Number and Cetane

Number

3 Corrosion (08 Periods)

Meaning of the term 'corrosion' and its definition

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Theories of corrosion i.e. (i) direct chemical action theory and (ii) electro chemical theory

Prevention of corrosion by

- (a) Alloying
- (b) Providing metallic coatings
- (c). Sacrificial cathodic protections:

4 Lubricants (08 Periods)

Definition of (i) lubricant (ii) lubrication
Classification of lubricants
Principles of lubrication
(i) fluid film lubrication
(ii) boundary lubrication

Characteristics of a lubricant such as viscosity, viscosity index, volatility, oxidation, oiliness, acidity, emulsification, flash point, fire point and pour point.

Importance of additives in lubricants

Dewaxing and solvent refining of liquid lubricants

5 Cement and Glass (04 Periods)

General introduction to cement and glass

Manufacture of Cement

Manufacture of ordinary glass and lead glass

6. Classification and Nomenclature of Organic Compounds (16 Periods)

Classification of Organic Compounds, functional group, Homologous Series

Physical and Chemical properties, and industrial use of Organic Compound

IUPAC system of nomenclature of Carboxylic acid, Alcohols, Phenols, Aldehydes, Ketones and Amines (first six members of each series only).

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LIST OF PRACTICALS

1. Gravimetric analysis and study of apparatus used there in
2. To determine the percentage composition of a mixture consisting of a volatile and a non-volatile substance
3. Estimate the amount of moisture in the given sample of coal
4. Esterification and ceric ammonium tests of alcohol
5. Sodium carbonate and Ester test of carboxylic acids
6. To determine the amount of copper in the given sample of copper sulphate with the help of N/20 sodium thiosulphate solution.
7. Detection of metal iron in the rust (solution of rust in concentrated HCL may be given)
8. Demonstration to determine calorific value of a solid fuel with the help of Bomb Calorimeter

TEXTBOOK:

1. Applied Chemistry-II by Dr. J K Sharma, Abhishek Publications, Sector 17-C, Chandigarh

RECOMMENDED 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-II by SS Kumar; Tata McGraw Hill, Delhi
4. A Text Book of Applied Chemistry-II by Sharma and Others; Technical Bureau of India, Jalandhar
5. Engineering Chemistry by Jain PC and Jain M,
6. Chemistry of Engineering by Aggarwal CV,
7. Chemistry for Environmental Engineers by Swayer and McCarty, McGraw Hill, Delhi
8. Progressive Applied Chemistry –I and II by Dr. G.H. Hugar; Eagle Prakashan, Jalandhar
9. Applied Chemistry-II by Dr. J K Sharma, Abhishek Publications, Sector 17-C, Chandigarh.

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DA205: ENVIRONMENTAL SCIENCE

L T P
Periods/Week 3 - -

RATIONALE

A diploma holder must have knowledge of different types of pollution caused due to industries and constructional activities so that he may help in balancing the eco system and controlling pollution by pollution control measures. He should also be aware of environmental laws related to the control of pollution.

DETAILED CONTENTS

1. Basics of ecology, eco system and sustainable development (03 Periods)
2. Conservation of land reforms, preservation of species, prevention of advancement of deserts and lowering of water table (04 Periods)
3. Sources of pollution - natural and man-made, their effects on living and non-living organisms, Pollution of water - causes, effects of domestic wastes and industrial effluent on living and non-living organisms, Pollution of air-causes and effects of man, animal, vegetation and non-living organisms, Sources of noise pollution and its effects
4. Solid waste management; classification of refuse material, types, sources and properties of solid wastes, abatement methods (06 Periods)
5. Mining, blasting, deforestation and their effects (03 Periods)
6. Legislation to control environment (04 Periods)
7. Environmental Impact Assessment (EIA), Elements for preparing EIA statements (04 Periods)
8. Current issues in environmental pollution and its control, role of non-conventional sources of energy in environmental protection (06 Periods)

TEXTBOOK:

1. Environmental Science by Deswal and Deswal; Dhanpat Rai and Co. (P) Ltd. Delhi.

RECOMMENDED BOOKS

1. Environmental and Pollution Awareness by Sharma BR; Satya Prakashan, New Delhi.
2. Environmental Protection Law and Policy in India by Thakur Kailash; Deep and Deep Publications, New Delhi.
3. Environmental Engineering and Management by Suresh K Dhamija; SK Kataria and Sons, New Delhi.
4. Environmental Science by Deswal and Deswal; Dhanpat Rai and Co. (P) Ltd. Delhi.

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DA206: ENGINEERING DRAWING – II

Periods/Week L T P
 - - 6

RATIONALE

Drawing is said to be the language of engineers and technicians. Reading and interpreting engineering drawing is their day-to-day responsibility. The course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation

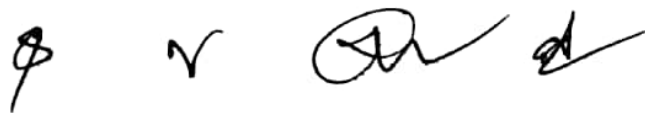
- Note:**
1. First angle projection is to be followed
 2. Minimum of 15 sheets to be prepared by each student
 3. SP 46 – 1988 should be followed
 4. Instructions relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the students

DETAILED CONTENTS

1. Section of Solids by Different Cutting Planes
2. Development of Surfaces (2 sheets)

Development of surfaces – cubes, prisms, (square, pentagonal and hexagonal), cylinders, pyramids (square, pentagonal, hexagonal) and cones
3. Detail and Assembly Drawing (2 sheets)
Principle and utility of detail and assembly drawings
Wooden joints i.e., corner mortice and tenon joint, Tee halving joint, Mitre faced corner joint, Tee bridle joint, crossed wooden joint, cogged joint, Dovetail joint, Through Mortise and Tenon joint
4. Threads (2 sheets)
Nomenclature of threads, types of threads (metric), single and multiple start threads
Forms of various external thread sections such as V, square and acme threads, BA, BSW and Knuckle, Metric, Seller Thread, Buttress Threads
Simplified conventions of left hand and right-hand threads, both external and internal threads
5. Locking Devices (1 sheet)

Lock nut, castle nut, split pin nut, sawn nut, slotted nut



6. Nuts and Bolts (3 sheets)
Different views of hexagonal and square nuts; Assembly of hexagonal headed, square headed, square headed with square neck, bolts with hexagonal and square nuts and washers. Foundations bolts – Rag bolt and Lewis's bolt
7. Screws, Studs and Washers (1 sheet)
Drawing various types of machine screws
Drawing various types of studs and set screws
8. Keys and Cotters (2 sheets)
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
Cotter joints (i) gib and cotter joint (ii) knuckle joint
9. Rivets and Riveted Joints (2 sheets)
Types of structural and general purposes rivet heads
Caulking and fullering of riveted joints
Types of riveted joints – lap, butt (single riveted, double riveted lap joint, single cover plate and double cover plate), chain and zig – zag riveting
10. Welded Joints (1 sheet)
Various conventions and symbols of welded joints (IS 696)
Practical applications of welded joints say joints on steel frames, windows, doors and furniture
11. Couplings (2 sheets)
Muff or Box coupling, half lap muff coupling
Flange coupling (Protected and non-protected)
Flexible coupling
12. AutoCAD (for practical and viva only)

Practice on drawing commands, editing commands
Practice on sectioning and hatching
Practice on preparing simple drawings

TEXTBOOK:

1. A Text Book of Engineering Drawing by Surjit Singh, Dhanpat Rai and Co. Delhi

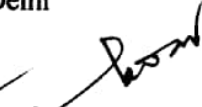
RECOMMENDED BOOKS

1. Engineering Drawing by C M Verma, Takniki Parkashak, Roorkee.
2. Elementary Engineering Drawing by ND Bhatt, Charotar Publishing House
3. A Text Book of Engineering Drawing by Surjit Singh, Dhanpat Rai and Co. Delhi
4. Engineering Drawing by PS Gill, SK Kataria and Sons, New Delhi
5. Machine Drawing by RB Gupta, Satya Prakashan, New Delhi.

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Note:

1. A minimum of 15 sheets should be prepared by each student
2. No table is suggested for distribution of marks, instead it is emphasized that the examination paper should contain exercises for evaluation of all necessary skills envisaged in the curriculum.
3. It is also suggested that a comprehensive viva of each student should be conducted by an external examiner during or just after the examinations to ascertain understanding of the subject e.g., reading and interpreting drawings and development of necessary skills etc.

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DAP207: GENERAL WORKSHOP PRACTICE - II

Periods/Weeks L T P
 - - 6

RATIONALE

Psychomotor skills are mastered through practice, an opportunity therefore, has been extended to students through this course to refine their skills in different trades. The basic skills developed during first semester will be refined during this course by doing higher order skills jobs. In addition to developing general manual and machining skills in the students, the objective of development of sense of dignity of labour, precision, safety at work places, team working and right attitude among the students will also be met.

DETAILED CONTENTS (PRACTICALS)

Note: The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.

The following shops are included in the syllabus.

1. Carpentry and Painting shop-II
2. Fitting and Plumbing Shop
3. Welding shop -II
4. Electric shop -II
5. Electronic shop-II or Machine Shop

Note:

1. The branches e.g., Civil Engineering, Mechanical Engineering, Mechanical (Automobile), Chemical Engineering, Chemical (R&P), Agriculture Engineering, Electrical Engineering and Automobile Engineering will do **Machine Shop** instead of electronic shop- II
2. The branches e.g., Electronics and Communication Engineering, Computer Engineering and Information Technology will do **electronic shop-II** instead of Machine shop.
- 3 The instructor is to first explain the introductory part given at the beginning under each shop followed by demonstration and practice by students.

1. Carpentry and Painting Shop-II

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.

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Demonstration of job showing use of rip saw, bow saw and tenon saw, method of sharpening various saws.

Demonstration of job on band saw and circular saw, chain and chisel, universal wood working machine, saw re-sharpening machine, saw brazing unit.

Importance and need of polishing wooden items. Introduction to polishing materials.

Job V Polishing on wooden items.

2. Fitting and Plumbing Shop

Introduction to various types of threads (internal and external)-single start, multi-start, left hand and right-hand threads.

Description and demonstration of various types of drills, taps and dies Selection of dies for threading, selection of drills, taps and reamers for tapping operations.

Job, I Making internal and external threads on a job by tapping and dyeing operations (manually)

Precautions while drilling soft metals, e.g., copper, brass, aluminum 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 $\pm 0.2\text{mm}$

Job IV Preparation of job involving thread on GI pipe/ PVC pipe and fixing of different types of elbows, tee, union, socket, stopcock, taps etc.

3. Welding Shop – II

3. 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 Highpressure) and welding and tacking practice on simple jobs.

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.

Demonstration and use of TIG and MIG welding equipment

4. Electric Shop = II

Importance and demonstration of three-phase wiring on three-phase panel 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.

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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
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 rotation of a motor.

5. Electronic Shop- II

Uses of the items mentioned below:

- a) Various types of single, multi-cored insulated screened wire and cables - power, audio video, co-axial, general purpose wires/cables
- b) Various types of plugs, sockets, connectors suitable for general purpose audio and video use, 2 and 3 pin mains plug 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.
- c) 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.
- d) 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.
- e) Materials: Conducting, insulating and magnetic materials.
- f) Demonstration and uses of single beam simple crop, signal generator and function-generator
- g) Regulated power supply-fixed and variable voltage, single output as well as dual output.

Identification and familiarization with active and passive components; types and color code of resistor, capacitors and potentiometers (including VDR, LDR, and thermistor). Identification of components including diode, LED, transistor, LCD, UJT, FET, coils, relays, reed relays, transformers, linear and digital ICs, thyristors.

Demonstrate the following:

- To make perfect solder joints and soldering on PCBs
- To remove components/wires by unsoldering
- To assemble components on boards, chassis, tape strips
- Various laying methods of cables
- Exposure to modern soldering and de-soldering processes








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- Field visits to relevant work-places
- Identification of active and passive components

Use of multimeter and testing of active and passive components.

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

Job II Soldering practices

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

OR

5 Machine Shop

Introduction to various machines used in machine shop

Job I: Exercise on simple turning

Job II: Exercise on taper turning

Job III: Marking a d drilling practice on mild steel piece

Job IV: Marking and drilling practice on aluminum piece

Job V. Demonstration of various functions of CNC Machine

TEXTBOOK:


1. Workshop Technology by B.S. Raghuvanshi, Dhan pat Rai and Co., New Delhi

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 Technology by B.S. Raghuvanshi, Dhan pat Rai and Co., New Delhi
6. Workshop Technology by HS Bawa, Tata McGraw Hill Publishers, New Delhi



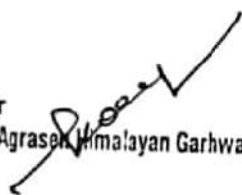





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THIRD SEMESTER

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AE301 APPLIED MECHANICS

Periods/week L T P
 3 - 2

RATIONALE

The subject Applied Mechanics deals with basic concepts of mechanics like laws of forces, moments, friction, centre of gravity, laws of motion and simple machines which are required by the students for further understanding of other allied subjects. The subject enhances the analytical ability of the students.

DETAILED CONTENTS


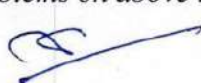
1. Introduction (08 period)

Concept of engineering mechanics definition of mechanics, statics, dynamics, application of engineering mechanics in practical fields. Definition of Applied Mechanics.
Definition, basic quantities and derived quantities of basic units and derived units
Different systems of units (FPS, CGS, MKS and SI) and their conversion from one to another density, force, pressure, work, power, velocity, acceleration
Concept of rigid body, scalar and vector quantities

2. Laws of forces (12 period)

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
Different force systems (coplanar and non-coplanar), principle of transmissibility of forces, law of super-position
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
Free body diagram
Equilibrant force and its determination
Lami's theorem (concept only)

[Simple problems on above topics]



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3. Moment (10 period)

Concept of moment

Moment of a force and units of moment

Varignon's theorem (definition only)

Principle of moment and its applications (Levers – simple and compound, steelyard, safety valve, reaction at support)

Parallel forces (like and unlike parallel force), calculating their resultant

Concept of couple, its properties and effects

General conditions of equilibrium of bodies under coplanar forces and beams, fixed support, roller, support, over hanging, Uniformly distributed load, point load, varying load

Position of resultant force by moment

[Simple problems on the above topics]

4. Friction (10 period)

Definition and concept of friction, types of friction, force of friction

Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction

Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane, friction in simple screw jack

Calculation of least force required to maintain equilibrium of a body on a rough inclined plane subjected to a force:

a) Acting along the inclined plane Horizontally

b) At some angle with the inclined plane

[Simple problems on the above topics]

5. Centre of Gravity (08 period)

Concept, definition of centroid of plain figures and centre of gravity of symmetrical solid bodies

Determination of centroid of plain and composite lamina using moment method only, centroid of bodies with removed portion

Determination of center of gravity of solid bodies - cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed

[Simple problems on the above topics]

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6. Moment of Inertia (06 period)

Concept of moment of inertia and second moment of area and radius of gyration, theorems of parallel and perpendicular axis, second moment of area of common geometrical sections: rectangle, triangle, circle (*without derivations*). Second moment of area for L, T and I sections, section modulus.

7. Simple Machines (10 period)

Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machines

Simple and compound machine (Examples)

Definition of ideal machine, reversible and self locking machine

Effort lost in friction, Load lost in friction, determination of maximum mechanical advantage and maximum efficiency

System of pulleys (first, second, third system of pulleys), determination of velocity ratio, mechanical advantage and efficiency

Working principle and application of wheel and axle, different pulley blocks, simple screw jack, worm and worm wheel, single and double winch crab.

Expression for their velocity ratio and field of their application

[Simple problems on the above topics]

LIST OF PRACTICALS

1. Verification of the following laws:
 - a) Parallelogram law of forces
 - b) Triangle law of forces
 - c) Polygon law of forces
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.

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RECOMMENDED BOOKS

1. A Text Book of Applied Mechanics by S Ramamurtham, Dhanpat Rai Publishing Co. Ltd.
2. A Text Book of Engineering Mechanics (Applied Mechanics) by RK Khurmi; S Chand and Co. Ltd., New Delhi.
3. A Text Book of Applied Mechanics by RK Rajput; Laxmi Publications, New Delhi.
4. Text Book of Applied Mechanics by Birinder Singh, Kaption Publishing House, New Delhi.

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AE302 ENGINEERING MATERIALS

L T P

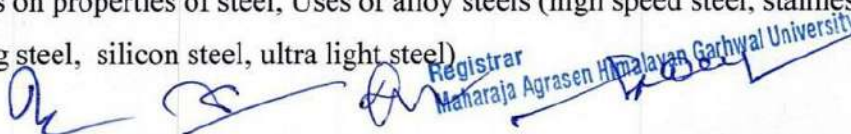
Periods/week 3 - 2

RATIONALE

Lot of developments have taken place in the field of materials. New materials are being developed and it has become possible to change the properties of materials to suit the requirements. Diploma holders in this course are required to make use of different materials for various applications. For this purpose, it is necessary to teach them basics of metal structure, properties, usage and testing of various ferrous and non ferrous materials and various heat treatment processes. This subject aims at developing knowledge about the characteristics, testing and usage of various types of materials used in industries.

DETAILED CONTENTS

1. Introduction (12 period)
Material, History of material origin, Scope of Material Science, Overview of different engineering materials and application, Classification of materials, Thermal, chemical, electrical, mechanical properties of various materials, present and future needs of materials Usage –Economical, Environmental and Social
2. Crystallography (12 period)
 - Fundamentals - Crystal, Unit Cell, Space, Arrangement of atoms in Simple Cubic Crystal, BCC, FCC and HCP Crystals, Number of atoms per unit Cell, Atomic packing Factor
 - Deformation - Overview of deformation and its mechanisms, behavior of materials under load and stress – strain
 - Failure Mechanism - Overview of failure modes, fracture, fatigue and creep
3. Metal and Alloys (20 period)
 - Introduction - History and development of iron and steel, Different iron ores, Raw Materials in Production of Iron and Steel, Basic Process of Iron making and steel making, Classification of iron and steel
 - Cast Iron - Different types of Cast Iron, manufacture, properties and their usage
 - Steels - Steels and alloy steel, Classification of plain carbon steels, availability, Properties and usage of different types of Plain Carbon Steels, effect of various alloys on properties of steel, Uses of alloy steels (high speed steel, stainless steel, spring steel, silicon steel, ultra light steel)

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- Non Ferrous Materials - Properties and uses of Light Metals and their properties, properties and uses of White Metals and their alloys, Aluminum , Magnesium, Titanium & Copper-Properties and their use in automobile industry

4. Theory of Heat Treatment (14 period)

Purpose of heat treatment, Solid solution and its types, Iron Carbon diagram, Formation and decomposition of Austenite, Martensite Transformation – Simplified Transformation Cooling Curves various heat treatment processes – hardening, tempering, annealing, normalizing, Case hardening and surface hardening. Types of heat treatment furnaces required for above operations (only basic idea)

5. Engineering Plastics (08 period)

Important sources of plastics, Classification – Thermoplastic and Thermo Set and their uses, various trade names of engineering plastics, Plastic Coatings

6. Other Important Materials (14 period)

- Composites - Classification, properties, application
- Ceramics and Silicon - Classification, properties, application
- Heat Insulating Materials
- Bio Materials
- SMART materials

LIST OF PRACTICALS

1. Classification of about 25 specimen of materials/parts into
 - Metals and Non Metals
 - Metals and Alloys
 - Ferrous and non ferrous metals
 - Ferrous and non ferrous alloys
2. Given a set of specimen of metals and alloys (copper, brass, aluminum, cast iron, HSS, Gun metal), identify and indicate the various properties possessed by them
3. Study of heat treatment furnace
4. Study of metallurgical microscope and a specimen polishing machine.
5. To prepare specification of following materials for microscopic examination and to examine the micro structure of specimens of following materials
 - (i) Brass
 - (ii) Copper
 - (iii) Grey CI
 - (iv) Malleable CI
 - (v) Low carbon Steel
 - (vi) High carbon steel
 - (vii) HSS

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6. To anneal a given specimen and find out difference in hardness as a result of annealing
7. To normalize a given specimen and to find out the difference in hardness as a result of normalizing
8. To temper a given specimen to find out the difference in hardness as a result of tempering

INSTRUCTIONAL STRATEGY

While imparting instruction, teacher should show various types of engineering materials to the students. Students should be asked to collect samples of various materials available in the market. Visits to industry should be planned to demonstrate use of various types of materials or Heat Treatment Processes in the industry.

RECOMMENDED BOOKS

1. Text book of Material Science by RK Rajput; SK Kataria and Sons Pubs, Ludhiana
2. Text book of Material Science Material Science by Varinder Kumar, Eagle Publisher, Jalandhar
3. Text book of Material Science by V. K. Manchanda, India Publishing House, Jalandhar
4. Engineering Metallurgy by R. A. Higgins, Standard Publishers, New Delhi
5. Introduction to Materials Science by A.R. Gupta, Satya Prakashan, New Delhi


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4. Cooling System (12 period)

Necessity of cooling system. Air cooling, Water cooling system. Components of water cooling system- Radiators, thermostat, water pump, fan, pressure cap, water jackets, antifreeze solution. Trouble shooting

5. Lubrication System (12 period)

Necessity of lubrication, types of lubricants, lubricant rating, oil additives, effect of engine conditions on consumption of lubricant oil, crank case ventilation, pressure lubrication system, splash lubrication. Components of lubrication system-oil pump, oil lines, oil filters, oil coolers, classification and service ratings of lubricating oil, additives for lubricants.

6. Fuels (12 period)

Desirable properties of engine fuels, types of auto engine fuels. Properties of conventional fuels (petrol, diesel), properties of alternative fuels (Alcohols, LNG, CNG, LPG, Bio-Diesel, Hydrogen)

LIST OF PRACTICALS

1. Servicing of lubricating system
2. Servicing of fuel systems in petrol engines
3. Servicing of fuel injector
4. Servicing of F.I.P (Fuel Injection Pump)
5. Engine tune up
6. Study of turbocharger
7. Servicing of cooling system
8. Study of engine block
9. Servicing of fuel system in diesel engine
10. Study of M.P.F.I engine

INSTRUCTIONAL STRATEGY

The teacher should lay emphasis on making the students conversant with the principles and practices related to various types of engines. Audio visual aids should be used to show engine features and working. Demonstrations should be made in automobile shop to explain various engine components.

RECOMMENDED BOOKS

1. Automobile Engineering – Vol. II by Dr. Kirpal Singh; Standard Publishers Distributors, 12th edition

2. Automobile Engineering by R.B. Gupta; Satya Prakashan, New Delhi



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AE303 BASICS OF AUTO ENGINE

L T P
Periods/week 3 - 2

RATIONALE

Engine forms the heart of an automobile. This subject deals with engine terminology, basic concept of 2 stroke and 4 stroke engine, classification of engines, constructional details of engine, cooling system and lubrication system.

DETAILED CONTENTS

1. Introduction (16 period)

Layout and working of internal combustion engine

- Engine terms - Bore, stroke, dead centres, compression ratio, swept volume, clearance volume, capacity, torque, power at the crank shaft
- Classification and brief description of engines as per stroke, cycle, fuel, ignition, cooling, number and arrangement of cylinders, valve arrangement
- Rotary engine
- HCCI engine
- Atkinson cycle engine, Miller cycle engine
- Alternate Fuel Engine
 - LPG/CNG vehicles
 - Electric vehicles
 - Hybrid vehicles
 - Plug in hybrid vehicles
 - Wheel motor vehicles
 - Fuel cell vehicles

2. Constructional Details (16 period)

- Constructional details of cylinder block, cylinder head, cylinder liner, piston, piston coatings, piston rings, gudgeon pin, connecting rod, crankshaft, camshaft, valve timing, variable valve timing and lift, valve mechanisms, camless engines, flywheel and damper

3. Performance of Engine (12 period)

Performance curves, Effect on engine performance due to atmospheric temperature, pressure, compression ratio, engine speed, working conditions, dirt, desert, hills, injection timing/spark timing. Air fuel ratio, RAC/SAE/DIN engine ratings

  
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3. Automotive Engines by Srinivasan, TMH, Delhi
4. Automobile Engineering by Chikara, Dhanpat Rai and Sons, New Delhi
5. Automobile Engineering by KM Gupta, Umesh Publishers, Delhi
6. Auto Engine -I by G.S. Aulakh, Eagle Prakashan, Jalandhar



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AE304 CHASSIS, BODY AND TRANSMISSION

L T P
Periods/week 3 - 2

RATIONALE

Chassis, body and transmission forms the core of automobile engineering. The subject focuses at imparting knowledge and skills regarding chassis and body and transmission system.

DETAILED CONTENTS

1. Chassis (12 period)
Classification of vehicles, types of chassis, layout of conventional type of chassis, function and arrangement of major assemblies. Alternating arrangement used such as engine position, drive types, their merits and demerits
2. Body (26 period)
Classification of automobiles on different basis. Car body types, Chassis construction, types of commercial vehicles, Commercial vehicle body details. Selection of paint and painting process, body trim items, Chassis construction types- frame and unitary, body components and their constructional details. Ergonomics in design of seat, controls and displays, gear lever, steering wheel and foot control.
3. Clutch (14 period)
Necessity, function and requirements of clutch, types of clutch - single plate clutch, multiplate clutch, hydraulic power assisted and wet and dry plate clutch, clutch plate and lining material, construction and working of centrifugal, semi centrifugal, diaphragm clutch and fluid coupling
4. Transmission (14 period)
Necessity, function and types of transmission- Sliding, constant mesh and synchromesh. Over drive, over running clutch, description and operation of transfer gear box. Common faults and remedies, types of automatic transmission, working of epicyclic gear box, torque converter
5. Final Drive (14 period)
Propeller shaft – function, construction details. Universal joints - functions and types. Types of final drive – hotchkiss drive, torque tube drive. Differential – principle, functions and it's working. Rear axles – semi floating, three quarter floating, fully floating. Common faults and remedies



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LIST OF PRACTICALS

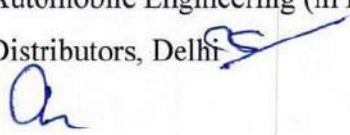
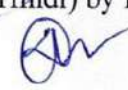
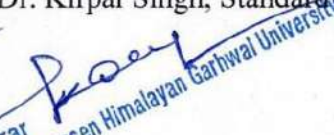
1. Study and sketches of Heavy and Light vehicle chassis.
2. Study and sketches of Motor cycle and scooter chassis
3. Study and sketches of single plate clutch(coil pressure spring and diaphragm type)
4. Study and sketches of multiple clutch
5. Study and sketches of sliding mesh gear box
6. Study and sketches of constant mesh gear box
7. Study and sketches of synchromesh gear box
8. Study and sketches of universal joints, slip joint and propeller shaft
9. Study and sketches of different floating axles
10. Study and sketches of differential

INSTRUCTIONAL STRATEGY

Teacher should make use of audio visual aids to show features of chassis, body and transmission. Demonstration should be made in the automobile shop to explain various aspects of chassis, body and transmission.

RECOMMENDED BOOKS

1. Automobile Engineering, Vol. I by Dr. Kirpal Singh, Standard Publishers
2. Automobile Engineering by GBS Narang, Khanna Publishers, Delhi
3. Automobile Engineering (in Hindi) by Dr. Kirpal Singh, Standard Publishers
Distributors, Delhi




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AE305 MEASUREMENT, INSTRUMENTATION AND CONTROL

L T P

Periods/week 3 - 2

RATIONALE

A diploma holder should have knowledge of measurement systems, various sensors, transducers and devices for measuring various parameters. Hence this subject.

DETAILED CONTENTS

1. Measurements and Measurement Systems (06 period)
Definition, significance of measurement, generalized measurement systems, definitions and concept of accuracy, precision, calibration, threshold, sensitivity, hysteresis, repeatability, linearity, loading effect, sources of errors in measurement, classification of errors
2. Sensors, Transducers and Strain Gauges (12 period)
Introduction, classification, primary sensing elements, photo sensors, hall effect sensors, transducer conditioning, transducer selection and specification, resistance transducers, variable inductance type transducers, capacitive transducers, piezoelectric transducers, introduction to strain gauges, gauge materials,
3. Measurement of Force, Torque, Shaft Power, Speed and Acceleration (10 period)
Introduction, force and weight measurement systems, measurement of torque, shaft power, speed and velocity, acceleration, pressure measurements
4. Temperature and Strain Measurement (10 period)
Resistance thermometers, thermocouple, law of thermocouple, materials used for construction, pyrometer, optical pyrometer, strain measurements, strain gauge, preparation and mounting of strain gauges, gauge factor
5. Comparators and Angular Measurement (12 period)
Introduction to comparators, characteristics, classification of comparators, mechanical comparator, electric and electronic comparators- principles. LVDT, pneumatic comparators, angular measurements, bevel protractor
6. Determination of Count and Measurement of Time, Time Interval and Frequency (10 period)
Introduction, counters, time and frequency standards, clock and watches, frequency interval and frequency


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7. Signal Transmission and Processing (10 period)
Introduction, interfacing circuits, amplifiers, modulation and demodulation, filters, transmission of signal and data, devices and systems, signal display & recording devices
8. Measurement of Process Variables -Pressure, Temperature, Flow and Level (04 period)
Introduction, pressure, temperature, flow rate, level measurement, thermometers, bimetallic thermocouples, thermistors and pyrometers.
9. Automation and Control (06 period)
Definition, types, need of automation, advantages and disadvantages of automation, introduction of control system terminology introduction to numerical control, basic concepts of NC, CNC and DNC. PLC and its applications in automotive industry

INSTRUCTIONAL STRATEGY

1. Use computer based learning aids for teaching learning
2. Demonstrations should be made to explain the concepts

RECOMMENDED BOOKS

1. Mechanical Measurements by Beckwith Marangoni and Lienhard; Pearson Education, 6th Ed., 2006
2. Engineering Metrology by R.K. Jain; Khanna Publishers, 1994
3. Industrial Instrumentation by Alstuko and Jerry. D. Faulk; Thompson Asia Pvt. Ltd.2002
4. Mechanical Measurements by Beckwith Thomas G; Narosa Publishing House, N. Delhi
6. Measurement Systems, Application Design by Doeblein E.O; McGraw Hill, 1990
6. Mechanical Measurements and Control by Kumar D.S ; Metropolitan, N. Delhi
7. Mechanical Measurement by Sirohi; New Age Publishers
8. Instrumentation and Control by D. Patranabis; ISBN No. 81-88114-30-8, Umesh Publications

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AE306 AUTO ENGINEERING DRAWING

L T P
Periods/week - - 8

RATIONALE

An Automobile Engineering diploma holder, irrespective of his field of operation in an industry or transport undertaking, is expected to possess a thorough understanding of engineering drawing, which includes clear spatial visualization of the subject and the proficiency in reading and interpreting a wide variety of drawings. Besides this, he is also expected to have a certain degree of drafting skills depending upon his job functions to perform his day-to-day activities e.g. communicating and discussing the ideas with his superiors and passing on instructions to his subordinates in an unambiguous way. The teachers are recommended to lay emphasis on showing automobile components to students..

DETAILED CONTENTS

Assembly Drawings of the following automotive components:

1. Joints and Bearings (30 period)
 - Cotter Joint
 - Knuckle Joint
 - Universal joint
 - Bush bearing
 - Plummer block or pedestal bearing
 - Ball bearing
 - Roller bearing- Straight and Needle type
2. Engine Components (30 period)
 - Four Stroke Petrol Engine Piston
 - Diesel Engine Piston
 - Connecting rod
 - Crank shaft – 4 cylinder Engine
 - Spark Plug
3. Gears (24 period)
 - Nomenclature of gears
 - Profile of spur gear by ‘Approximate method’
 - Profile of spur gear by ‘Unwin’s Method’
4. Cam Profile (26 period)
 - Different types of cams and followers
 - Drawing of cam profile for following motion of follower
 - a. Uniform velocity motion
 - b. Simple harmonic motion (SHM)
 - c. Uniformly accelerated and retarded motion

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5. Coupling

(18 period)

Flange coupling – Protected, unprotected and flexible, muff coupling, Oldham coupling

INSTRUCTIONAL STRATEGY

Teacher should make use of models while explaining the details of drawing of various automobile parts and components. Emphasis should be laid on cleanliness and quality of drawings.

RECOMMENDED BOOKS

1. Auto Engineering Drawing by RB Gupta; Satya Parkashan, New Delhi
2. Automobile Engineering Drawing by Raj Kumar, North Publication, Jalandhar
3. Machine Drawing by PS Gill; BD Kataria and Sons, Ludhiana
4. Machine Drawing by Lakshminarayan; Jain Brothers, New Delhi
5. Automobile Engineering- Vol. I and II by Dr. Kirpal Singh, Standard Publishers Distributors, Delhi




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FOURTH SEMESTER

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AE401 MECHANICS OF MATERIALS

L T P
Periods/week 3 - 2

RATIONALE

Diploma holders in this course are required to analyze reasons for failure of different components and select the material for different applications. For this purpose, it is essential to teach them concepts, principles, applications and practices covering stress, strain, bending moment, shearing force, shafts and springs. Hence this subject has been introduced.

DETAILED CONTENTS

1. Introduction to Material Properties (4 Periods)

Mechanical properties of materials such as elasticity, plasticity, ductility, brittleness, toughness, hardness, tenacity, fatigue, malleability, stiffness. Elastic bodies, plastic bodies and rigid bodies, deformation, stress concentration factor

2. Stresses and Strains (12 Periods)

Force, its definition and types, units, different types of loads.

Definition of stress and strain, axial loading, different types of stresses and strains, tensile and compressive stress and strain, elastic limit, Hooke's law, stress-strain curve for ductile and brittle material, salient features of stress- strain curve. Young's modulus of elasticity

Factor of safety, safe stresses, ultimate stress

Stress and strain in straight, stepped bars and taper bar of circular cross section, determination of stress and elongation of a bolt in a bolted joint when subjected to direct external load only

Temperature stresses for single section

Stress and strain on composite section under axial loading, stress and strain due to temperature variations in homogeneous and composite bars and metallic tyres

Shear load, shear stress and strain, modulus of rigidity, lateral strain, Poisson's ratio

Volumetric strain, bulk modulus. relation between modulus of elasticity, modulus of rigidity and bulk modulus

3. Shear Force and Bending Moment (12 Periods)

Types of beams and types of supports and loads

Concept of shear force and bending moment, sign convention

Shear force and bending moment diagram for cantilever and simply supported beams subjected to point load and uniformly distributed loads only. Maximum bending moment and point of contra flexure, simple numerical problems


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4. Theory of Simple Bending (10 Periods)

Concept of pure bending, neutral axis, moment of resistance, section modulus, assumptions of simple bending and limitations, bending equation, bending of simple and flitched beams, beams of uniform strength, section modulus, flexural rigidity
Application of flexural formula for solid rectangular and circular section, Channel section, hollow rectangular and circular section
Simple numerical problems

5. Torsion (10 Periods)

Pure torsion, torsion equation (relation between twisting moment, shear stress and angle of twist), polar modulus of section
Assumptions in theory of pure torsion
Strength of circular solid shaft and hollow shaft in pure torsion
Power transmitted by shaft
Torsion in helical springs
Simple numerical problems

6. Strain Energy (04 Periods)

Concept of strain energy, proof resilience and modulus of resilience
Stresses developed due to gradual, sudden and impact load
Strain energy stored due to gradual, sudden and impact load
Strain energy due to bending and torsion
Simple numerical problems

7. Springs (08 Periods)

Types of springs and their uses
Laminated spring (semi-elliptical and quarter-elliptical type), determination of number of plates, maximum deflection under axial load
Helical Springs closed coiled and open coiled helical springs subjected to axial load
Angle of twist, strain energy, shear stress and maximum deflection under axial load
Effect of falling load helical spring
Simple numerical problems

8. Column and Strut (04 Periods)

Definition of column and strut, classification
Buckling, slenderness ratio, buckling factor
Euler's formula and Rankine formula
Eccentric loading, stress diagram
8.5 Simple numerical problems

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LIST OF PRACTICALS

1. Tensile test on bars of mild steel and aluminum.
2. Shear test on specimen of two different metals.
3. Bending test on a steel bar or wooden beam.
4. Perform following impact test:
 - (a) Izod impact test
 - (b) Charpy test
5. Torsion test on specimen of different metals for determination of angle of twist for a given torque.
6. Determine the stiffness of a helical spring and plot a graph between load and extension.
7. Hardness test on metal and find Brinell hardness, Rockwell hardness and Vicker's hardness.

INSTRUCTIONAL STRATEGY

1. Use computer based learning aids for effective teaching-learning
2. Expose the students to real life problems
3. Plan assignments so as to promote problem solving abilities and develop continued learning skills

RECOMMENDED BOOKS

1. Mechanics of Materials by Kirpal Singh; Standard Publishers, New Delhi
2. Strength of Materials by R.S. Khurmi; S. Chand and Company, Delhi
3. Strength of Materials by S. Ramamurtham; Dhanpat Rai Publishing Co.(P) Limited, Delhi
4. Strength of Materials by SS Rattan, TMH, Delhi
5. Elements of Strength of Materials by D.R. Malhotra and H.C, Gupta; Satya Parkashan, New Delhi
6. Mechanics of Solids by VS Prasad; Galgotia Publications, New Delhi
7. Strength of Materials Dr. B.C Puniya & S.Rama Murthi; Laxmi Publication, New Delhi
8. Mechanics of Solids by J.K.Kapoor; Bharat Bharati Prakashan, Meerut

 
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AE402 PRINCIPLES OF THERMAL ENGINEERING

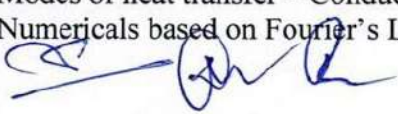
L T P
Periods/week 3 - 2

RATIONALE

A diploma holder in Automobile Engineering is supposed to look after the I.C engines, air compressors and air conditioning of automobiles. Therefore, it is essential to teach concepts, principles, applications and practices covering laws of thermodynamics, basic air cycles, types of fuel used and their properties and components of air conditioners. Hence this subject has been included in this course.

DETAILED CONTENTS

1. Thermodynamic terminology (08 periods)
Concept of thermodynamics, heat, temperature, intensive and extensive properties, path, process, system, surroundings, enthalpy, internal energy and thermodynamic work
2. Gas Laws (08 periods)
Boyle's law, Charle's law, Joule's law, Characteristic gas equation, gas constant, universal gas constant. Simple numerical problems based on above laws.
3. Laws of Thermodynamics (10 periods)
Zeroth law of thermodynamics, Irreversible process, First law of thermodynamics, Second law of thermodynamics (concept only), Thermal efficiency, Heat pump, heat engine and heat sink, concept of entropy, Constant volume, constant pressure, isothermal, adiabatic, polytropic, throttling and free expansion processes. Numericals based on above processes
4. Air Cycles (10 periods)
Carnot cycle – concept only, Otto cycle, Diesel cycle, Dual combustion cycle, Numericals based on above cycles
5. Air Compressors (08 periods)
Reciprocating air compressor, Centrifugal compressor, Rotary air compressor - its types. Working of single stage and double stage compressor and applications, super charging
6. Heat Transfer (08 periods)
Modes of heat transfer – Conduction, convection, radiation, Fourier's Law, Numericals based on Fourier's Law


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7. Refrigeration and Air Conditioning

(12 periods)

- Concept of refrigeration, Unit of refrigeration, refrigerants, heat pump, coefficient of performance, rating of refrigeration machines
- Principles of air conditioning, Concept of human comfort, Air-conditioning system, components of air conditioning system and their function

LIST OF PRACTICALS


1. To find flash point and fire point of a given fuel.
2. Study and Sketch of four stroke and two stroke Engine
3. Identification of components in air-conditioning system
4. Study of components of a refrigerator
5. To study different air compressors
6. To study room air conditioning system

INSTRUCTIONAL STRATEGY

Teachers should provide simple exercises to students involving applications of various concepts and principles being covered in the subject. Problems on various topics should be prepared and students should be asked to solve them. In practical work, students should independently perform practicals.

RECOMMENDED BOOKS

1. Thermal Engineering by SK Kulshreshtha; Vikas Publishing House Pvt. Ltd., Delhi
2. Thermal Engineering by A.S. Sarao; Satya Prakashan, New Delhi
3. Engineering Thermodynamics by Valan A. Arasu, TMH, Delhi
4. Thermal Engineering by P.L. Ballaney; Khanna Publishers, Delhi
5. Thermal Engineering by R.K. Rajput; Laxmi Publications, New Delhi
6. Refrigeration and Air conditioning by G.S. Aulakh, Eagle Prakashan, Jalandhar
7. Thermodynamics –I by B.S. Ubhi, S.K. Kataria & Sons, Delhi
8. Hydraulics & Pneumatics by Birinder Singh, Kaption Publishing house, New Delhi
9. Hydraulic and Pneumatic control by Shammuga Sundram, S.Chand & Company Ltd., New Delhi
10. Pneumatic controls by Festo Didactic, Bangalore



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AE403AUTO ENGINES

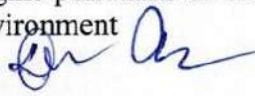
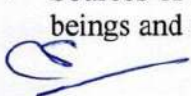
L T P
Periods/week 3 - 2

RATIONALE

A diploma holder in this field must have knowledge of combustion phenomenon, fuel system and ignition system in engine. In addition, knowledge about engine testing and engine pollutants is also necessary. Hence this subject.

DETAILED CONTENTS

1. Combustion (10 periods)
Phenomenon of combustion in C.I engines and S.I engines, phases of combustion and after burning. Methods producing turbulence. Various types of combustion chambers for petrol and diesel engines. Detonation, preignition and knocking, octane and cetane numbers, swirl and squish
2. Fuel System (20 periods)
 - Fuel System in Spark Ignition Engine: Fuel feed system, fuel pumps- their types , construction and working, fuel tank, fuel lines, fuel filters, concept of carburetion. Working and construction of a simple carburetor. Advantages of using fuel injection system in spark ignition engines. Concept of MPFI system, Constructional details of an MPFI system. Dry and wet air cleaners, Direct injection in petrol engines.
 - Fuel System in Diesel Engine: Fuel filters-primary and secondary, Fuel injection pumps- plunger and barrel type, distributor type; priming of fuel feed pumps, Fuel injectors and solid injection, Common rail direct Injection(CRDI). Layout and details of a CRDI fuel supply system. Type of nozzles, Governing and type of governors. Use of turbo charger and super charger in diesel engine
3. Ignition System in S.I. Engine (12 periods)
 - Concept of ignition system, battery ignition systems. Function and constructional details of ignition coil, condenser, contact breaker point, distributor, spark plugs. Ignition timing systems. Distribution less ignition system, Capacitor discharge system, Coil on plug system
4. Engine Testing (12 periods)
Classification of tests, fault finding test, routine test, measurement of IP, BP , mechanical efficiency, fuel consumption, thermal efficiency relative efficiency, air consumption, volumetric efficiency, lubricating oil consumption. Heat balance sheet
5. Engine Pollutants and its control (10 periods)
 - Sources of engine pollutants of S.I and C.I engine. Effect of pollutants on human beings and environment



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- Methods of Control – Crank case ventilation, fuel tank ventilation, carburetion and recirculation. Redesigning of various engine systems, V.V.T, Exhaust gas recirculation systems. Catalytic converters. Close loop feedback selective catalytic reaction, electronic integrated engine management system. Exhaust gas treatment for diesel engines. Emission Norms (Latest Bharat/ Euro norms)

LIST OF PRACTICALS

1. Dismantling, inspection and assembling of fuel injection pump.
2. Dismantling, inspection and assembling of fuel injector.
3. Phasing and calibration of fuel injection pump on calibration machine.
4. Gasoline engine Emission test using exhaust gas analyser.
5. Diesel engine Emission test using smokemeter.
6. Study of CRDT engine
7. Servicing of valves and valve-mechanism
8. To prepare heat balance sheet of an IC engine
9. To conduct Morse test an multi cylinder petrol engine

RECOMMENDED BOOKS

1. Automobile Engineering, Vol 2, by Dr. Kirpal Singh; Standard Publishers Distributors, 12th or later edition.
2. Automobile Engineering by R.B. Gupta; Satya Parkash, New Delhi
3. I.C. Engines by M.L. Mathur and Sharma; Dhanpat Rai and Sons, Delhi
4. Auto Engines by Halderman and Mitchell; Pearson Publications


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AE404 SUSPENSION, STEERING & BRAKING

L T P
Periods/week 3 - 2

RATIONALE

Suspension, steering and braking forms the important components of automobile engineering. The subject aims at imparting knowledge and skills regarding suspension, steering and braking system of vehicles.

DETAILED CONTENTS

1. Suspension System (12 periods)

Function, types- independent, rigid axle. Springs – functions, construction materials and types (coil spring, leaf spring and torsion bar) sprung and unsprung weight, characteristics of springs, spring eye, bushes, variable rate spring, helper leaves, leaf sections, camber grading and nippling spring seats, rubber pads, pressure blocks, spring cover, interleaf inserters. Function and construction of hydraulic dampers (shock absorbers). Pneumatic suspension system – lay out and working. Function and Construction of hydraulic damper (shock absorber). Diagnosis of common faults and their rectifications

2. Front Axle (03 periods)

Types – Stub double drop, fully dropped, load distribution, effect of braking on axle shape, steering head, Elliot and reverse Elliot, steering knuckle

3. Steering (14 periods)

- Power steering - necessity, types, Construction features and working of hydraulic and electronic power steering system, Four wheel steering, Common steering system troubles and remedies
- Steering mechanism, function, Davis and Ackerman's Principle of steering. Working and constructional details of steering gear, steering linkages, sector arm, center arm, drag link and tie rod steering stops. Front wheel geometry-caster, camber, steering axis inclination, toe in and toe out. Cornering force, cornering power and self-righting torque. Over steering and under steering. Common steering troubles and remedies

4. Wheel and Tyres (09 periods)

Wheels – types, hub attachment, wheel specification, Tyres - classification and types. Construction of pneumatic tyres, composition of covers, tread breaker, bead and casing, comparison of cross-ply and radial-ply tyres. Causes of excessive tyre wear. Tyre care and maintenance. Static and dynamic balance. Tubeless tyres, Run flat tyres, retreading of tyres


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5. Braking System

(10 periods)

- Purpose of brakes, layout of braking system, components, Types of brakes- mechanical, hydraulic, power. Principle of hydraulic brakes, braking action, master cylinder, wheel cylinder, leading and trailing shoes, self adjusting brakes, self applying and self releasing action, anti-skid devices, pedal travel, brake enclosures, Drum brakes- Construction & Working, Disc. Brakes- Construction and Working. Common faults and their rectification.
- Power Brakes - Air, air-hydraulic, hydro-vac brakes-their construction components and working details. Brake fluid and its characteristics, brake liner, hand brake, Antilock brake systems. Brake test, common faults and their rectification.

LIST OF PRACTICALS

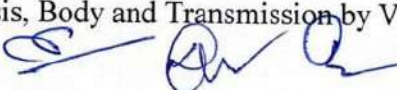
1. Study and sketch of suspension system - coil spring, leaf spring, torsion bar, shock absorber
2. Study and sketch of power brake system
3. Study and sketch of epicyclic gear box
4. Study and sketch of torque converter
5. Study and sketches of mechanical and hydraulic brake system and its parts

INSTRUCTIONAL STRATEGY

Teacher should make use of audio visual aids to show features of chassis, body and transmission. Demonstration should be made in the automobile shop to explain various aspects of chassis, body and transmission.

RECOMMENDED BOOKS

1. Automobile Engineering, Vol. I by Dr. Kirpal Singh, Standard Publishers, Delhi
2. Automobile Engineering by GBS Narang, Khanna Publishers, Delhi
3. Automobile Engineer (in Hindi) by Dr. Kirpal Singh, Standard Publisher, Delhi
4. Chassis, Body and Transmission by Vijay Singh & Raj Kumar, Ishan Publications, Jalandhar


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AE405 AUTO ELECTRICAL AND ELECTRONICS EQUIPMENT

L T P
Periods/week 3 - 2

RATIONALE

Diploma holders in Automobile Engineering have to deal with different types of batteries, their charging and testing, regulators, ignition system, lighting system and various other electrical accessories used in Automobile Engineering. Hence the subject of automotive electric equipment is very essential for these technicians.

DETAILED CONTENTS

1. Introduction (04 periods)
Various Electrical components/systems in Automobile. Their functions and demands, earth return system, types of earthing, 6V, 12V system
2. Batteries (16 periods)
Lead Acid Batteries - Construction, working, elements, types, materials used, electrolyte and its strength, effect of added plate area and temperature, rating, capacity, efficiency, temperature characteristics, terminal voltages, charging and discharging
Battery Testing: Electrolyte testing by hydrometer, voltage test, high discharge and cadmium test (voltage)
Battery Charging: Constant potential and constant current, initial charging, normal charging, trickle charging, intermittent charging, boost charging.
Battery Defects: Stipulation, plates decay, working, erosion, cracking, sedimentation, separator defects, short circuits, overcharging
Alkaline Batteries: Construction, working, merits and demerits of Ni-Fe, Ni-Cd, Ag-Zn cells
Lithium ion battery - Construction and working
3. Charging System (10 periods)
Circuits, function and various components, dynamo and alternator, types, construction, working, advantages and disadvantages of dynamo and alternators, drives, cut out relay
Regulation: Functions of various components of two unit, three unit and heavy duty Regulators, Regulator adjustments, Regulators for alternators
4. Starting System (14 periods)
Function of various components, torque terms, principle and constructional details of starter motor, switches, types, starter to engine drive and their types, Starter-alternators
5. Ignition System (10 periods)
Constructional details of coil, distribution, condenser, meaning of cam angle, ignition timing, ignition advancing mechanisms, centrifugal and vacuum type

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transistorized ignition system, construction and working details of magneto ignition system

Spark Plugs: Constructional details of spark plugs, classification as per reach, heat range, diameter, and effect of leaded fuels, care and maintenance of spark plug

6. Lighting System (08 periods)

Various lighting circuits, head lamp, type and constructional details, sealed beam, double filaments, asymmetric and dual units, vertical and side control of lamps, fog light, side light, brake light, instrument light, indicator lights, reversing light, lamp mounting

Wiring: HT and LT, their specifications, cable colour codes, wiring Harness, Cable connections, Wiring diagrams of cars and two wheeler, Fuses, faults and rectification

7. Electrical Accessories (07 periods)

Fuel gauges- bimetallic and balancing coil type, Air pressure gauges, temperature gauges, Ammeter, warning light, speedometer, wind screen wipers, horns, horn relay, electric fuel pump, Faults and rectification

8. Miscellaneous Electrical Equipment (03 periods)

Impulse Speedometer, tachometer, heaters, defrosters, Air conditioner, and Electric door locks, window actuation, Seat adjusters, Electric motors and Pumps – Definition, types and various application of single phase and three phase motors, type of pumps and their applications, direct online starter and star delta starter

9. Electronic Devices (02 periods)

Automobile electronic devices, Sensing units, Computer controlled sensors

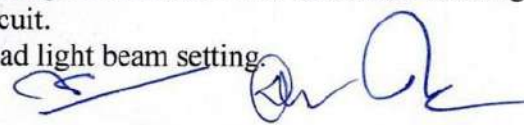
10. Electronics and Computer Applications in Automobiles (06 periods)

Introduction to circuit-symbols, Integrated circuits, Amplifiers, filters stepper and synchronous motors, Logic gates, Combinational and sequential logics, Flip flops, sensors. Analog and digital devices, converters, signal conditioners, communication chips, multiplexed wiring, working of ECU, microprocessor and its applications, concept of operation by wire

LIST OF PRACTICALS

1. Testing of Battery with hydrometer and high rate discharge tester, charging of Batteries.
2. Testing and measurement of ignition timing and dwell angle with timing light and cam angle tester.
3. Testing, cleaning and setting of spark plug on spark plug cleaning and testing machine
4. Testing of alternator rotor and stator winding for short circuit, ground and broken circuit.
5. Head light beam setting.

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6. Testing and setting of horn and relay.
7. Testing and fault tracing of field winding, armature and magnetic switch for short circuit, grounding of a starter.
8. Testing dipper switch, flasher unit and indicator circuits and fault tracing.
9. Testing and fault tracing of different components of transistorized ignition system.
10. Testing of magneto ignition circuit and Adjustment.
11. Identification of colour codes for continuity test in a wiring harness.
12. Study and sketching of complete wiring circuit of an Indian vehicle.
13. Dismantling, inspection and assembling of alternator.
14. Dismantling, inspection and assembling of starter motor.
15. Identify various electrical components on the mock up wiring board.
16. Removing and refitting head light assembly, head light beam setting.
17. Checking and setting of horn, relay, dipper switch, flasher unit and indicator circuits.

INSTRUCTIONAL STATREGY

Teachers should lay emphasis on concepts and principles while imparting instructions. As far possible, subject teaching should be supplemented by demonstrations in the laboratory. During practical work, individual students should be given opportunities to perform practicals independently.

RECOMMENDED BOOKS

1. Automobile Engineering by Kirpal Singh, Standard Publishers, Delhi
2. Automotive Electrical Equipment by P.L. Kohli, Tata McGraw Hill, Delhi
3. Automotive Electrical Equipment by William H. Crouse, Tata McGraw Hill, Delhi
4. Automobile Engineering by R.B. Gupta, Satya Prakashan, New Delhi

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AE406 MANUFACTURING TECHNOLOGY

L T P
Periods/week 3 - 6

RATIONALE

The knowledge of manufacturing techniques in the area of foundry, machine shop (fitting shop, lathe machines and shaping), inspection and gauging and in coating both on metallic and non-metallic is essential at the first stage for understanding technology. Hence this subject.

DETAILED CONTENTS

1. Fitting (15 periods)
Fits, limits and tolerances and their applications, unilateral and bilateral tolerances, gauges, gauge tolerances, use of micrometer, vernier, height gauges, dial comparator, straight edge, surface plate. Metal cutting, metal shear, metal sawing, metal bending processes
2. Metallic and Non-metallic Coatings (15 periods)
Necessity of metallic and non-metallic coatings, principles and processes of electroplating, galvanizing, metal spraying, painting and their applications, preparation of base materials. Uses of primers, paints and finish coatings, powder coating and its advantages
3. Foundry (15 periods)
Introduction, types of patterns, pattern materials, cores and core boxes, core materials, preservation and storage of patterns, Introduction to moulding, types of moulding, types of moulds, preparation of cores, defects in moulds and their remedies, casting defects and their remedies
4. Lathe (15 periods)
 - Introduction, types of lathes, specifications, description and functions of lathe parts, feed mechanism, drives and transmission, work holding devices, turning tools
 - Lathe operations – plain turning, facing, centring, parting off, undercutting, taper turning, eccentric turning, drilling, reaming, thread cutting and knurling. Speed, feed and depth of cut
 - Introduction to capstan and turret lathes, copying lathe and their attachments, difference between capstan and turret lathes and heads, tool holders and tool layout, tool geometry and use of throwaway tips, brazed tools and HSS tools


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5. Shaper (05 periods)

Operation and mechanism

6. Inspection Instruments and Gauges (15 periods)

Height gauge, depth gauge, bore gauge, slip gauge, sine bar, measurement of taper by use of slip gauges, interchangeability, Go and Not-Go gauges, screw thread micrometer, thread gauge, radius gauge, dial gauge, and gear tooth vernier, hardness checking instruments, coating thickness checking instruments, surface finish checking instruments. Quality Control, concept of control chart.

LIST OF PRACTICALS

1. Fitting shop

Bench work and fittings; simple male-female fitting (fitting of pulley, bearings, gears on shafts), scraping, pipe fittings with leak proof joints, checking alignment and centre distance

2. Pattern making and Foundry shop

- To prepare pattern of rectangular block, 'V' block, step pulley with core box, split pattern
- Preparation of open floor mould of solid pattern, cope drag mould using split pattern
- Visit to foundry to see castings of cast iron, steel, non-ferrous materials, hand moulding, machine moulding and melting furnaces. Induction heating and gas fired furnace

3. Lathe

- Introduction to turning machine and allied services like cutting tool grinding, general shop layout including maintenance, oils, tools and gauge stores.
- Different exercises in turning like plain turning, step-turning, facing, chamfering, knurling, parting off and thread cutting, use of compound slide and tailstock, tool grinding, selection of coolant and lubricants and speed and feeds. Use of safety Goggles

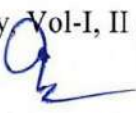
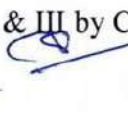
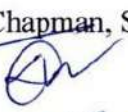
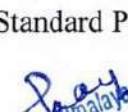
INSTRUCTIONAL STRATEGY

1. Teachers should lay emphasis on making the students conversant with concepts, principles, procedures and practices related to various manufacturing processes.
2. Focus should be laid in preparing jobs using various machines in the workshop.


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RECOMMENDED BOOKS

1. Workshop Technology by BS Raghuwanshi, Dhanpat Rai & Sons, Delhi
2. Elements of Workshop Technology by SK Choudhary & Hazara, Asia Publishing House
3. Principles of Foundry Technology by Jain, Tata McGrawHill, New Delhi
4. Workshop Technology Vol-I, II & III by Chapman, Standard Publishers Distributors, New Delhi





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INDUSTRIAL TRAINING

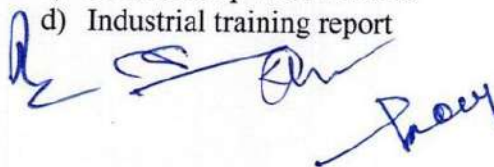
Industrial training provides an opportunity to students to experience the environment and culture of industrial production units and commercial activities undertaken in field organizations. It prepares student for their future role as diploma engineers in the world of work and enables them to integrate theory with practice.

For this purpose, students at the end of fourth semester need to be sent for industrial training for a minimum of 4 weeks duration to be organised during the semester break starting after IV Semester examinations. The concerned HODs along with other teachers will guide and help students in arranging appropriate training places relevant to their specific branch. It is suggested that a training schedule may be drawn for each student before starting of the training in consultation with the training providers. Students should also be briefed in advance about the organizational setup, product range, manufacturing process, important machines and materials used in the training organization.

Equally important with the guidance is supervision of students training in the industry/organization by the teachers. A teacher may guide a group of 4-5 students. A minimum of one visit by the teacher is recommended. Students should be encouraged to write daily report in their diary to enable them to write final report and its presentation later on.


Internal assessment and external assessment have been provided in the study and evaluation scheme of V Semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations. The formative and summative evaluation may comprise of weightage to performance in testing, general behaviour, quality of report and presentation during viva-voce examination. It is recommended that such evaluations may be carried out by a team comprising of concerned HOD, teachers and representative from industry, if any. The components of evaluation will include the following.

- | | |
|--------------------------------------|-----|
| a) Punctuality and regularity | 15% |
| b) Initiative in learning new things | 15% |
| c) Relationship with workers | 15% |
| d) Industrial training report | 55% |



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FIFTH SEMESTER


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AE501AUTO DESIGN

L T P
Periods/week 4 0 0

RATIONALE

Understanding of basic principles of components like cylinder liner, piston, crank shaft, connecting rod, simple mechanisms are essential for diploma holders in Automobile Engineering, hence this subject.

DETAILED CONTENTS

1. Introduction (12 period)
 - Design consideration and basics of design, design procedure
 - Classification of design and principles of good economic design
 - Standardization, interchange ability of automobile parts among industry and at global level
 - Limits, fits and tolerances
 - Material Properties: elasticity, plasticity, ductility, malleability, toughness, brittleness, hardness, strength, fatigue, creep
 - Materials selection and ergonomics
2. Design of (20 period)
 - Friction Clutch
 - Flywheel
 - Gears
 - Brakes
 - Coupling (flange coupling and its types)
3. Design of (12 period)
 - Design of shaft subjected to torsion only, determination of shaft diameter (hollow and solid shaft) on the basis of strength criteria, rigidity criterion
 - Types of keys, Functions of key, Failure of key, Design of key (determination of key dimensions)
4. Design of following Auto parts (20 period)
 - Piston
 - Cylinder
 - Connecting rod
 - Crankshaft
5. Design of Screw Jack (06 period)
6. Design of Knuckle and Cotter Joint (06 period)
7. Design of Flat belt and V-belt (04 period)

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INSTRUCTIONAL STRATEGY

Teacher should lay emphasis on conceptual understanding and design aspects of various parts/components. Various models should be demonstrated in the class to explain mechanism.

RECOMMENDED BOOKS

1. A Text Book of Machine Design by RS Khurmi & JK Gupta, Eurasia Publishing House, Pvt. Ltd., New Delhi
2. Introduction to Machine Design by VB Bhandari, TMH, Delhi
3. Theory of Machines by PL Ballaney, Khanna Publishers, New Delhi
4. Theory of Machines by DR Malhotra & HC Gupta, Satya Prakashan, Delhi




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AE502 GARAGE EQUIPMENT

L T P
Periods/week 4 0 0

RATIONALE

Management of garages forms an important function of automobile technicians. To perform such functions, knowledge of service station equipment, tuning equipment, engine repair tools, electrical repair equipment and reconditioning and fabrication of equipment is very essential. Hence the subject.

DETAILED CONTENTS

1. Hand Tools/Measuring Tools (13 period)
Classification and Use of
 - Screw drivers
 - Spanners and wrenches
 - Pliers
 - Hammers
 - Chisels
 - Files
 - Hacksaw
 - Tools for tubes flaring
 - Taps and dies
 - Reamers
 - Feeler gauge
 - Cylinder dial gauge

2. General Equipment (13 period)
Construction, working and application use of
 - Bench grinder
 - Air compressor
 - Hydraulic and electric hoists
 - High pressure washing equipment (Car washer)
 - Oil sprayers
 - Grease Guns-manual and bucket type, pneumatic
 - Tyre inflation gauge (Manual and Digital type automatic)
 - Fire extinguisher
 - Contents of First aid box

3. Turning and Testing Equipment (10 period)
Construction, working and application use of
 - Vacuum Gauge
 - Compression Gauge (Pressure Gauge)
 - Distributor Tester cam (dwell) angle tester, r.p.m. tester.
 - Spark plug cleaner and tester
 - Ignition timing light
 - Fuel injector tester
 - Fuel consumption tester

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4. Engine Repair Tools/Measuring and Testing Equipment (13 period)
- Construction and use of
- Torque wrench, pneumatic wrench
 - Piston ring compressor, expander
 - Valve lifter and valve spring tester
 - Piston ring files, groove cleaner
 - Scrappers
 - Piston ring remover
 - Smokemeter
5. Reconditioning/Testing Equipment for Chassis, Body (10 period)
- Construction, working and use of
- Brake Efficiency Tester (Chassis Dynamometer) or brake testing equipment
 - Jacks – mechanical, hydraulic, trolley type,
 - Creeper
 - Paint chamber
 - Paint Spray Gun
 - Paint Drying Equipment
 - Spring tester
6. Special Tools (10 period)
- Construction and use of
- Ridge cutter
 - Crank shaft cutter
 - Tools for tubes flaring
 - Soldering tool
 - Nipple forming tool
 - Decarbonising kit
7. Body Repair Tools Kit (11 period)
- Assorted hammers, asserted dollies, body spoons, sanders, pick tools, adjustable file, drip moulding pliers, assorted wrenches, assorted screw drivers, cold chisels, fender bleeding tool, sanders, power tools

INSTRUCTIONAL STRATEGY

Teacher should make use of audio visual aids to show features of chassis, body and transmission. Demonstration should be made in the automobile shop to explain various aspects of garage equipment.

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RECOMMENDED BOOKS

1. Automotive Mechanics by WH Crouse and Donald Anglin; Tata McGraw Hill Publishing Co. Ltd., Delhi
2. Auto Mechanics Fundamentals by MW Stockel, Goodheart Wilcox Publishers
3. Automobile Engineering Vol. I and II by Dr. Kirpal Singh; Standard Publishers, Delhi
4. Garage Equipment by G.S. Aulakh, Eagle Prakashan, Jalandhar
5. Garage Equipment by Raj Kumar, Ishan Publication, Jalandhar




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AE503 EARTH MOVING EQUIPMENT

L T P
Periods/week 4 0 0

RATIONALE



A diploma holder in Automobile Engineering has to deal with repair and maintenance of heavy earthmoving vehicles. The subject provides basic understanding of such special vehicles

DETAILED CONTENTS

1. Earth Moving Equipment (36 period)
Function, classification, constructional features and applications of the following earth moving machinery: Excavator, scrapper, ripper, dragline, grader, shovel, trailer, loader, dozer. Equipment used - drill, ripper, crusher, feeder, compressor, snow remover. Tractor types. Difference in each type of engine used, features of clutch, power transmission, track chains, sprockets, springs and blades.
Working principal and design considerations of different systems involved like power system, transmission system, final drive, lubrication system, electrical system, braking system, steering system and pneumatic and hydraulic control circuits of earth moving equipment
2. Hoisting Equipment (14 period)
Description of hoist winch, part lines, hoisting chains, slings, fork-lift truck, cranes (hand operated type electric overhead travelling type), Jacks (hydraulic, mechanical), bucket elevators. Factors affecting the selection of hoisting equipment
3. Rollers (10 period)
Types of rollers, type of engines used for rollers. Chassis, power transmission, steering, braking and other features
4. Pneumatic Equipment (12 period)
Function and salient features of pneumatic tools-rock drill, hammer, chipper. Air operated grease gun and spray gun
5. Calculation of hire charges for various types of earth moving equipment (08 period)

INSTRUCTIONAL STRATEGY

Visits to construction sites should be organized for better understanding of concepts and principles. It is important to make use of audio-visual aids/video films to support the instructional material

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RECOMMENDED BOOKS

1. Construction Equipment & its planning & applications by Mahesh Varma, Metropolitan Book Company, New Delhi
2. Hand Book of Earth Moving Machinery by Central Water and Power Commission
3. Construction Equipment Operation and Maintenance by Y Pokras and M Tushnyakov, Mir Publishers, Moscow
4. Heavy Construction Planning Equipment & Methods by Jagman Singh, Oxford & IBH Publishing Co., New Delhi
5. Construction Equipment Operation and Maintenance by Y Pokras and M Tushnyakov, Mir Publishers, Moscow


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AE504 PRODUCTION PLANNING AND COSTING

L T P
Periods/week 4 0 0

RATIONALE

A diploma holder in Automobile Engineering is supposed to look after the planning, scheduling and production control activities in the industry. He is also required to have knowledge about cost estimation of new and repaired components, material management, quality aspects and productivity. Therefore it is essential to teach above topics.

DETAILED CONTENTS

- I. Introduction to Production Planning and Control (06 period)
 - Necessity of planning and control
 - Functions of production, planning and control department Factors determining control procedure
 - 1.3. Advantages of Production Planning & Control
 - 1.4. Types of production.
2. Planning (10 period)
 - Forecasting
 - Material planning and allocation
 - Allocation for optimum utilization
 - Break even analysis
 - Procedure for process planning. Process planning sheet.
 - Calculation of man and machine hours
3. Production Control (10 period)
 - Objectives
 - Routing
 - Loading and scheduling
 - Dispatching
 - Follow up
4. Inspection and Quality Control (14 period)
 - Inspection - Need and Planning for Inspection
 - Types of Inspection
 - Role of Operator and Inspector in Inspection
 - Quality Control and Quality Assurance - Meaning and Need
 - Statistical Quality Control
 - Acceptance Sampling
 - Control Charts for variables and Attributes
 - QC tools
 - Introduction to 5S and Kaizan technique

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5. Standards and Codes (06 period)
- National and International Codes
Concept, elements, benefits and implementation of Quality Management System (ISO 9000) and environmental Management System (ISO 14000), Quality Circles

6. Introduction to Estimating and Costing (04 period)

Meaning and importance of estimating and costing
Difference between estimating and costing.
Importance of preparing realistic estimates.
Estimating procedures.

7. Elements of Cost and Estimation (22 period)

Terms used in costing
Direct materials - components
Direct costs e.g. labour, raw material, hired equipment, machines and equipment,
components indirect materials such as lubricants, cotton waste and indirect labour
Overhead expenses - rent of building, office expenses, depreciation and service charges
Profits – Concepts and requirements
Variable and fixed cost, production cost
Perception of job/work order
Different units of work (Bifurcation as per type, section)
Analysis of time – Handling time, preparation time, production cycle time, inspection
and dispatch time
Computation of charges
Operator charges, supervisory charges, storage charges, components charges, material
charges, consumable stores charges, Total charges. Estimation of service charges,
overhauling
Estimation for machining, casting, forging, welding and fabrication

8. Productivity (08 period)

Production, productivity,
Factors affecting productivity,
Measurement of productivity
Causes of decrease in productivity

INSTRUCTIONAL STRATEGY

Efforts should be made to relate process of teaching with direct experiences in the industry. Students should be taken to various industrial enterprises for better conceptualization of specific topics such as production planning, inspection and quality control. Simple problems on costing should be given to students for comprehension.


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AE602 MOTOR VEHICLE ACT AND TRANSPORT MANAGEMENT

L T P
Periods per week 4 - -

RATIONALE

A diploma holder in Automobile Engineering is supposed to have knowledge about significance of vehicle accident, accidental vehicle claim procedure from insurance company and about Motor Vehicle Act. Therefore, it is essential to teach Motor Vehicle Act features and appropriate practices covering Motor Vehicle Act. Further, knowledge of transport management systems and techniques would also be an asset to him.

DETAILED CONTENTS

1. Garage location, layout and types, and change work procedure and records (10 period)
 - Location of garage/selection of site of garage
 - Layout of garage
 - Types of garage
 - Inspection of faulty vehicle
 - Estimation of repair
 - Job control system
 - Work – order or job card
 - Testing and test reports
 - Costing and billing

2. Garage Store (10 period)
 - Definition
 - Purpose of store keeping
 - Function of store keeping
 - Location of store
 - Layout of store
 - Advantage of good store – keeping and recording
 - Procurement of store
 - Prevention of pilferage of store
 - Bin card
 - Store organisation

3. Insurance of Vehicle (10 period)
 - Meaning and necessity of vehicle insurance
 - Types of vehicle insurance
 - Duties of surveyor
 - Duties of driver in case of accident and injury to a person
 - Relation between surveyor and insurance cooperation
 - Procedure to get accidental claim and compensation

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RECOMMENDED BOOKS

1. Production Estimating and Costing by M. Adithan and B.S. Pabla, Konark Publishers, Delhi
2. Industrial Engineering and Management by T.R. Bānga, and S.C. Sharma, Khanna Publishers, Delhi




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AE505 FAULT DIAGNOSIS AND DRIVING PRACTICE

Periods/week L T P
 0 0 10

RATIONALE

Now, as the students have learnt about the engines, chassis, body, transmission, auto electrical and electronics systems and garage equipments, they should be able to test the various automotive parts and accessories as well as diagnosis the various problems relating to them. So emphasis is given to familiarize and practice about fault diagnosis and testing.

DETAILED CONTENTS

1. Basic electrical checks – Battery connections, electrical bulbs and units, circuit protection devices and wiring connections
2. Testing of battery – Specific gravity test, high rate discharge test, open circuit voltage test, charging of battery
3. Testing and setting of ignition timing, cam angle
4. Testing of field winding of alternator and armature of starter motor for open circuit, short circuit and earthing
5. Engine testing and finding out fuel consumption
6. Diagnosing battery ignition system
7. Diagnosing and rectifying high oil consumption
8. Diagnosing and rectifying high fuel consumption
9. Diagnosing and rectifying engine noises and knocks
10. Diagnosing and rectifying engine starting troubles
11. Diagnosing and rectifying engine running faults
12. Diagnosing and rectifying engine overhauling
13. Measuring of bore for wear, ovality and taperness
14. Inspection of crankshaft – bearing replacement and setting of journal bearings, crank pin bearings and crank shaft bearings, measuring bearing clearances by gauges
15. Demonstration of body repair techniques

RECOMMENDED BOOKS

1. Automobile Engineering by Dr. Kirpal Singh; Standard Publisher, Delhi
2. Automobile Engineering by Sh. R. B Gupta; Satya Prakashan, New Delhi
3. Maintenance and Repair of Motor Vehicle by H.O Geneva; Dialogue, R-686, New Rajinder Nagar, New Delhi
4. Automotive Mechanics by William H. Crouse, Tata McGraw Hill, Delhi
5. Auto Mechanics – Theory and Service by W.J Dekrygen, ET Hall

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AE506 CAD IN AUTOMOBILE ENGINEERING

Periods/week L T P
 0 0 10

RATIONALE

Competency in computer aided drafting is essential for diploma holders in Automobile Engineering. Hence this subject is required.

DETAILED CONTENTS

1. Introduction to AutoCAD

Introduction to AutoCAD. Setting the drawing environment: Limits, Grid, Snap, Axis, Units, Ortho, Co- Ordinates ON, OFF Units and Color

2D Drawing entities - Point - Line - Arc - circle, Ellipse, Polygon, and Trace. Object Selection using Object Snap (OSNAP)

Editing commands: Selection of entities by different methods - copy, Move, Scale, Rotate, Fillet, Chamfer, Mirror, Array-Polar, Rectangular. Measure, Divide, and Erase. Drawing Display Methods: Zoom, Pan, and View

Drawing Display Methods – Zoom, Pan, and View

Adding Texts and Dimensions: Text, Dimension-linear, continued, angular

Pedit commands. Working on multiple layers, Layer concepts in Auto CAD - Various options with layer command - Hatch command - Creating line types, library and user made library

Preparing the schematic drawing of a workshop building in one layer, the blocks of machines in another Layer and Electrical connection on another layer

2. Drawing of 2D views of following automotive components using AutoCAD (Any Six sheets)

- V – belt pulley
- Stepped cone pulley
- Ball bearing
- Sectional front view of screw jack
- Spur gear
- Poppet valve
- Wheel cylinder (sketch)
- Valve tappet
- Piston
- Semi-elliptic leaf spring
- Internal expanding shoes brake (sketch)

3. Introduction to 3D features of AutoCAD

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INSTRUCTIONAL STATREGY

1. Teachers should demonstrate use of AutoCAD, while teaching..
2. Emphasis should be given on dimensioning and layout of sheet.
3. Teacher should ensure use of IS Codes related to drawing.

RECOMMENDED BOOKS

1. AutoCAD by Shyam Tickoo, Dream Tech. Publication, Delhi
2. Computer Aided Drafting – Auto CAD; ISTE Nomogram, Delhi




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SIXTH SEMESTER

8-2

AE601 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

L T P
Periods per week 4 - -

RATIONALE

In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. This subject focuses on imparting the necessary competencies and skills of enterprise set up and its management.

DETAILED CONTENTS

SECTION – A **ENTREPRENEURSHIP**

1. Introduction (23 periods)
 - Concept /Meaning and its need
 - Qualities and functions of entrepreneur and barriers in entrepreneurship
 - Sole proprietorship and partnership forms of business organisations
 - Schemes of assistance by entrepreneurial support agencies at National, State, District level: NSIC, NRDC, DC:MSME, SIDBI, NABARD, Commercial Banks, SFC's TCO, KVIB, DIC, Technology Business Incubator (TBI) and Science and Technology Entrepreneur Parks (STEP)

2. Market Survey and Opportunity Identification (17 periods)
 - Scanning of business environment
 - Salient features of National and State industrial policies and resultant business opportunities
 - Types and conduct of market survey
 - Assessment of demand and supply in potential areas of growth
 - Identifying business opportunity
 - Considerations in product selection

3. Project report Preparation (14 periods)
 - Preliminary project report
 - Detailed project report including technical, economic and market feasibility
 - Common errors in project report preparations
 - Exercises on preparation of project report




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SECTION –B MANAGEMENT

4. Introduction to Management (06 periods)

- Definitions and importance of management
- Functions of management: Importance and Process of planning, organising, staffing, directing and controlling
- Principles of management (Henri Fayol, F.W. Taylor)
- Concept and structure of an organisation
- Types of industrial organisations
 - a) Line organisation
 - b) Line and staff organisation
 - c) Functional Organisation

5. Leadership and Motivation (05 periods)

- a) Leadership
 - Definition and Need
 - Qualities and functions of a leader
 - Manager Vs leader
 - Types of leadership
- b) Motivation
 - Definitions and characteristics
 - Factors affecting motivation
 - Theories of motivation (Maslow, Herzberg, McGregor)

6. Management Scope in Different Areas (10 periods)

- a) Human Resource Management
 - Introduction and objective
 - Introduction to Man power planning, recruitment and selection
 - Introduction to performance appraisal methods
- b) Material and Store Management
 - Introduction functions, and objectives
 - ABC Analysis and EOQ
- c) Marketing and sales
 - Introduction, importance, and its functions
 - Physical distribution
 - Introduction to promotion mix
 - Sales promotion
- d) Financial Management
 - Introductions, importance and its functions
 - Elementary knowledge of income tax, sales tax, excise duty, custom duty and VAT

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7. Miscellaneous Topics

(05 periods)

a) Customer Relation Management (CRM)

- Definition and need
- Types of CRM

b) Total Quality Management (TQM)

- Statistical process control
- Total employees Involvement
- Just in time (JIT)

c) Intellectual Property Right (IPR)

- Introductions, definition and its importance
- Infringement related to patents, copy right, trade mark

Note: In addition, different activities like conduct of entrepreneurship awareness camp extension lecturers by outside experts, interactions sessions with entrepreneurs and industrial visits may also be organised.

INSTRUCTIONAL STRATEGY

Some of the topics may be taught using question/answer, assignment or seminar method. The teacher will discuss stories and case studies with students, which in turn will develop appropriate managerial and entrepreneurial qualities in the students. In addition, expert lecturers may also be arranged from outside experts and students may be taken to nearby industrial organisations on visit. Approach extracted reading and handouts may be provided.

RECOMMENDED BOOKS

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development published by Tata McGraw Hill Publishing Company Ltd., New Delhi
3. Entrepreneurship Development in India by CB Gupta and P Srinivasan; Sultan Chand and Sons, New Delhi
4. Entrepreneurship Development - Small Business Enterprises by Poornima M Charantimath; Pearson Education, New Delhi
5. Entrepreneurship : New Venture Creation by David H Holt; Prentice Hall of India Pvt. Ltd., New Delhi
6. Handbook of Small Scale Industry by PM Bhandari
7. Principles and Practice of Management by L M Prasad; Sultan Chand & Sons, New Delhi.

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4. Driving and Highway code (16 period)

- Principle of driving
- Driving procedure
- Driving precautions
- Driving in abnormal conditions, like hilly area, night, fog, heavy traffic and rain
- Emergency Driving situations
- Driving License - purpose, importance and requirements
- Different types of driving license
- Procedure to get driving license
- Highway code – types with sketches with colour code

5. Transport Management (10 period)

- History of transport with special reference to road transport in India
- Modes of Road transport
- Organization- Service station and its functions, General layout of modern service station, Spare parts section and dealership service section, Accounts and books, Different types of cards and their use in maintaining service station records
- Structure of fleet organization
- State transport - optimum utilization of fleet
- Roadworthiness requirement
- Maintenance of logbook, History sheet, Causes, and prevention of Road Accident, Analysis of Accident, Economy of replacement

6. Motor Vehicle Act (8 period)

- Definitions
- Salient features of motor vehicle act
- Licensing of drivers and conductors of motor vehicles
- Registration of old and new vehicles
- Transfer of vehicle – local and state to state
- Traffic offences, penalties procedure
- Fitness of vehicle – meaning and purpose, provision in the act
- Vehicle permit – different types
- Imposition of penalties of violation of rules
- Different documents required for registration of vehicle, for driving license, and for transfer of vehicle

INSTRUCTIONAL STRATEGY

Teacher should lay emphasis on basic principles and practices covering Motor Vehicle Act and fleet management. Visits should be organized to service stations for understanding of topics.

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RECOMMENDED BOOKS

1. Automobile Engineering Vol. I by Dr. Kirpal Singh, Standard Publisher Distributors, Delhi.
2. Transport Management Vol. III & IV by Central Institute of Road Transport, Pune.
3. Motor Vehicle Act of India (with Latest Amendment).
4. Motor Vehicle Act with Rules by B.S. Kohli.
5. Motor Transportation: Principles and Practices by WJ Hudson and James; Ronald Press Company, New York.
6. Transport in Modern India by KP Bhatnagar, Satish Bahadur, DN Aggarwal and SC Gupta.
7. Central Motor Vehicle Rules.




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AE603 MACHINING PROCESSES

L T P
Periods per week 3 - 4

RATIONALE

Knowledge in various machining operations viz. drilling, boring, milling, planning and grinding processes, finishing operations, gear production, CNC machining, bending forming and welding processes is very essential for the diploma holders. Hence this subject.

DETAILED CONTENTS

1. Drilling and Boring (10 period)
Introduction, Types of drills, types of drilling machines i.e. portable, bench type, pillar and radial, drilling speeds and feeds, drill chucks and other accessories (jigs etc.) used in drilling machines, reaming, introduction to boring, types of boring machines – horizontal and vertical, specifications, boring bar and boring heads
2. Machining Processes (16 period)
 - Milling – Types of milling machines and their operations, speeds and feeds, indexing (simple and compound), types of milling cutters
 - Planning machines and their operation
 - Grinding – cylindrical, centreless and surface grinding machines, types of grinding wheels, specifications, grades and their selection, balancing of grinding wheels and their storage
3. Finishing Operations (06 period)
Lapping, honing, super finishing operations and their applications, types of abrasives used and their selection
4. Gear Production (04 period)
Gear cutting and gear shaving machines, gear cutters and coolants
5. CNC Machines (06 period)
Introduction to CNC control systems, advantages, productivity, accuracy and cost
6. Bending and Forming (06 period)
Description of press brakes, bending dies, forming machines



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7. Welding (14 period)
- Introduction, types of welding (gas welding, arc welding, resistance welding), butt welding, flash, projection, seam and spot welding. Selection of electrodes, filler metals, types of welding defects and their remedies, soldering and brazing – processes and applications
 - Special welding processes for stainless steel and aluminium
8. Types of Coolants and Lubricants for various machining processes (02 period)

LIST OF PRACTICALS

1. Introduction to drilling and boring machines, an exercise of simple drilling and boring operation, selection of speeds and feeds, use of jigs and fixtures and coolant.
2. Simple exercises on shaper
3. Practice on horizontal and vertical milling machines, work holding devices and types of milling cutters
4. Practice on cylindrical and centreless grinding machine, selection, dressing and storage of grinding machines. Use of lubricants
5. Practice on honing machines with selection of honing sticks, honing and finish pattern in the bore. Bore geometry measurement
6. Observe working of CNC machines including setting of cutting parameters and dimensions and loading of tools, repeatability of operation and adjustment for wear allowances
7. Visit to industry (sheet metal shops) to observe bending and forming operation and use of Dies
8. Use of appropriate coolant and lubricants for all machining operation in the workshop and during Industrial visits.

RECOMMENDED BOOKS

1. Workshop Technology by BS Raghuvanshi, Dhanpat Rai & Sons, Delhi.
2. Workshop Technology Vol. – I, II & III by Chapman, Standard Publishers Distributors, New Delhi.
3. Workshop Practice by RK Singhal, SK Kataria & Sons, New Delhi.
4. Production Technology by HMT, Tata McGraw Hill, New Delhi.
5. Elements of Workshop Technology by SK Chaudhary & Hazra, Asia Publishing House.

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AE604 MECHANICS OF VEHICLE

Periods per week L T P
4 - -

RATIONALE

Various types of motions, power transmission, forces acting on moving vehicle, vehicle braking, balancing and vibration in rotating body are some of the concepts which are essential for diploma holders in Automobile Engineering. Hence the subject is introduced in the syllabus.

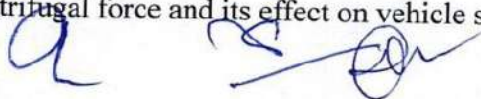
DETAILED CONTENTS

1. Simple Mechanism (10 period)
 - Definition of link, kinematic pair, kinematic chain, Mechanism, inversions and machines
 - Simple examples of mechanism with:-
 - Lower pairs, Four bar chain, Slider crank chain, Double slider crank chain, Higher pairs

2. Motion and Turning Moment (10 period)
 - Displacement, velocity and acceleration of piston
 - Angular velocity and angular acceleration of connecting rod
 - Calculations of piston effort and crank effort at different angles
 - Fly wheel - its types, weight and moment of inertia
 - Fluctuation of energy for fly wheel
 - Turning moment diagrams with reference to internal combustion engines.
 - Analysis of Hooke's Joint

3. Power Transmission (10 period)
 - Flat belt, V-belt and chain drives.
 - Ratio of tension of two sides of the belt with and without centrifugal tension.
 - Horse power transmitted and condition for maximum horse power transmitted.
 - Velocity ratios transmitted by
 - Belts
 - Simple, compound and epicyclic gear box

4. Vehicle in Motion (10 period)
 - Air, grade, and rolling resistances
 - Tractive effort, traction, Inertia load, Draw bar pull and power required to proper a vehicle
 - Calculations of acceleration and tractive effort required in case of front wheel drive, rear wheel drive and four wheel drive
 - Centrifugal force and its effect on vehicle stability on banked and unbanked road


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5. Vehicle Control

(08 period)

- Braking friction and limits of braking
- Retardation and Braking force, calculations in case of front wheel, rear wheel and all wheel braking
- Weight transfer during braking
- Stopping distance and stopping time
- Davis and Ackermann Steering Mechanism, Correct Steering angle

6. Balancing

(10 period)

- Concepts of static and dynamic balancing, working of static and dynamic machine
- Balancing of rotating masses-single rotating mass by a single mass rotating in the same plane and by two masses rotating in different planes, balancing of several masses rotating in the same plane. Balancing of several masses rotating in different planes

7. Vibration

(06 period)

- Introduction, Types of vibrating motion, Types of free vibrations, Natural Frequency of Free longitudinal Vibrations, Natural frequency of free, Transverse vibrations
- Causes of vibration in rotating bodies, damping of vibrations, Free damped vibrations (Vacuum Damping)

INSTRUCTIONAL STRATEGY

1. Models should be shown
2. Practical demonstrations should be organized

RECOMMENDED BOOKS

1. Theory of Machines by R.S. Khurmi
2. Automobile Engineering Vol-I, II, Dr. Kirpal Singh, Standard Publishers and Distributor, New Delhi
3. Theory of Machines by D.R. Malhotra; Satya Parkashan
4. Theory of Machines by PL Balaney; Khanna Publishers, Delhi
5. Mechanics of Vehicles by W. Steed; Kafe books Limited, London

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AE605 OVERHAULING PRACTICE LAB

L T P
Periods per week - - 6

RATIONALE

Automobile overhauling and troubleshooting forms the main job of a diploma holder in automobile engineering. The competencies in knowing the faults and reconditioning of various components and accessories of automobile will go a long way in instilling confidence for a diploma holder. The practice in above areas has thus been included in the curriculum.

DETAILED CONTENTS

1. Diagnosing the engine for overhauling
2. Removal of engine from vehicle
3. Dismantling of engine
4. Overhauling of petrol engine
5. Overhauling of diesel engine
6. Decarbonising of engine blocks, combustion chamber, piston crown and valve parts.
7. Surfacing of cylinder heads, cylinder blocks and manifolds on cylinder head refacing machine
8. Replacing of piston and piston rings – removal and refitting
9. Practice on cylinder boring machine
10. Practice in fitting cylinder liners- sleeving and desleeving
11. Testing and aligning of connecting rod
12. Overhauling of valves and valve mechanism
13. Overhauling of gear box
14. Overhauling of differential and propeller shaft
15. Overhauling of wheels and axles
16. Overhauling of brakes
17. Overhauling of clutch

RECOMMENDED BOOKS

1. Automobile Engineering by Dr. Kirpal Singh; Standard Publisher, Delhi.
2. Automobile Engineering by Sh. R.B. Gupta; Satya Prakashan, New Delhi.
3. Maintenance and Repair of Motor Vehicle by H.O. Geneva; Dialogue, R-686, New Rajinder Nagar, New Delhi.
4. Automotive Mechanics by William H. Crouse, Tata McGraw Hill, Delhi.
5. Auto Mechanics: Theory & Service by W.J.deKryger et al

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Dehra Dun

AE606 EMPLOYABLE SKILLS

Periods per week L T P
 - - 4

RATIONALE

Diploma holders are required to not only possess subject related knowledge but also soft skills to get good jobs and to rise steadily at their workplace. This subject is included to develop employability skills amongst the students.

DETAILED CONTENTS

1. Industrial Scenario Engineering Education and expectations of competences from an engineer by employer (04 period)
2. Personality types, characteristic and features for a successful engineer (04 period)
3. Professional Engineer desirable values and ethics and their development. Relation between engineering profession, society and environment (04 period)
4. Managing project (16 period)
 - Leadership
 - Motivation
 - Time management
 - Resource management
 - Computer Software
 - Interpersonal relationship
 - Engineer economics and fundamentals
5. Effective Communication (08 period)
 - Listening
 - Speaking
 - Writing
 - Presentation Technique/Seminar
 - Group discussion
6. Preparing for Employment (08 period)
 - Searching for job/job hunting
 - Resume Writing
 - Interview technique in personal interview telephonic interview, panel interview, group interview, video conference
7. Managing Self (06 period)
 - Managers body, mind, emotion and spirit
 - Stress Management
 - Conflict resolution
8. Continuing professional development (04 period)

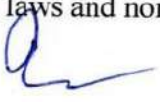
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- Organising learning and knowledge
- Use of computer for organising knowledge resource

9. Creativity, Innovation and Intellectual property right (06 period)

- Concept and need in present time for an engineer

10. Basic rules, laws and norms to be adhered by engineers during their working (04 period)



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AEPR607 PROJECT WORK

L T P
Periods per week - - 8

Project work aims at developing skills in the students whereby they apply the totality of knowledge and skills gained through the course in the solution of particular problem or undertaking a project. The students have various aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given for a group. The students should identify or given project assignment at least two to three months in advance. The project work identified in collaboration with industry may be preferred.

Each teacher is expected to guide the project work of 5-6 students.

- Projects related to repair and maintenance of automobiles
- Projects related to increasing productivity
- Projects related to quality assurance
- Projects related to estimation and economics of production
- Projects connected with repair and maintenance of plant and equipment
- Projects related to identification of raw material thereby reducing the wastage
- Any other related problems of interest of host industry

A suggestive criteria for assessing student performance by the external (personnel from industry) and internal (teacher) examiner is given in table below:

Sr. No.	Performance criteria	Max. marks	Rating Scale				
			Excellent	Very good	Good	Satis- factory	Poor
1.	Selection of project assignment	10	10	8	6	4	2
2.	Planning and execution of considerations	10	10	8	6	4	2
3.	Quality of performance	20	20	16	12	8	4
4.	Providing solution of the problems or production of final product	20	20	16	12	8	4
5.	Sense of responsibility	10	10	8	6	4	2
6.	Self expression/ communication skills	5	5	4	3	2	1
7.	Interpersonal skills/human relations	5	5	4	3	2	1
8.	Report writing skills	10	10	8	6	4	2
9.	Viva voce	10	10	8	6	4	2
Total marks		100	100	80	60	40	20

The overall grading of the practical training shall be made as per following table

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	Range of maximum marks	Overall grade
i)	More than 80	<i>Excellent</i>
ii)	65-80	Very good
iii)	50-64	Good
iv)	41-49	Fair
v)	Less than 40	Poor

In order to qualify for the diploma, students must get "Overall Good grade" failing which the students may be given one more chance of undergoing 8 -10 weeks of project oriented professional training in the same industry and re-evaluated before being disqualified and declared "not eligible to receive diploma ". It is also important to note that the students must get more than six "goods" or above "good" grade in different performance criteria items in order to get "Overall Good" grade.

Important Notes

1. This criteria must be followed by the internal and external examiner and they should see the daily, weekly and monthly reports while awarding marks as per the above criteria.
2. The criteria for evaluation of the students have been worked out for 100 maximum marks. The internal and external examiners will evaluate students separately and give marks as per the study and evaluation scheme of examination.
3. The external examiner, preferably, a person from industry/organization, who has been associated with the project-oriented professional training of the students, should evaluate the students performance as per the above criteria.
4. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific nearby industries are approached for instituting such awards.

The teachers are free to evolve another criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organizations in such an exhibition. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific industries are approached for instituting such awards.


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