

**PART- I**

**CURRICULUM OF DIPLOMA PROGRAMME ON**  
**CIVIL ENGINEERING, MECHANICAL ENGINEERING, AUTOMOBILE**  
**ENGINEERING, ELECTRONICS & ELECTRICAL ENGINEERING,**  
**ELETRONICS & COMMUNICATION ENGINEERING, COMPUTER**  
**SCIENCE & ENGINEERING, COMPUTER ENGINEERING &**  
**INFORMATION TECHNOLOGY,**

**IN**

**MULTI POINT ENTRY & CREDIT SYSTEM**

**For the State of Nagaland**



*Path Finder for Excellence in Technical Education*

**National Institute of Technical Teachers' Training &  
Research**

Block – FC, Sector – III, Salt Lake City, Kolkata – 700 106

<http://www.nittrkol.ac.in>

*January 2016*

Sample path for Civil Engineering, Mechanical Engineering, Automobile Engineering, Electronics and Electrical Engineering, Electronics and Communication Engineering, Computer Science and Engineering, Computer Engineering and Information Technology

TERM - I

Sl. No	Code	Course	Study Scheme			Evaluation Scheme							Total Marks	Credit	
			Pre-requisite	Contact Hours / Week			Theory			Practical					
				L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment			
								Class Test	Assignment	Attendance		Sessional			Viva-voce
1	G101	Communication Skill-I		2	0	2	75	10	10	5	-	25	-	125	3
2	G103	Mathematics-I		4	1	0	75	10	10	5	-	-	-	100	5
3	G106	Physics – I		3	0	2	75	10	10	5	25	25	-	150	4
4	G108	Chemistry – I		3	0	2	75	10	10	5	25	25	-	150	4
5	G201	Engineering Drawing – I		1	0	4	50	-	-	-	-	50	-	100	3
6	G203	Workshop Practice - I		0	0	4	-	-	-	-	50	50	-	100	3
7	*G205A / G205B	Introduction to Information Technology /Computer Programming		2	0	4	50	0	0	0	25	25	-	100	4
<b>TOTAL</b>				15	1	18	400	40	40	20	125	200	-	825	26

\*G205A is for CSE, IT, and CPE

TERM - II

Sl. No	Code	Course	Study Scheme				Evaluation Scheme							Total Marks	Credit	
			Pre-requisite	Contact Hours / Week			Theory			Practical						
				L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment				
								Class Test	Assignment	Attendance		Sessional	Viva-voce			
1	G102	Communication Skill-II	G101	2	0	2	75	10	10	5	-	25	-	125	3	
2	G104	Mathematics-II	G103	3	1	0	75	10	10	5	-	-	-	100	4	
3	G107	Physics – II	G106	3	0	2	75	10	10	5	25	25	-	150	4	
4	G109	Chemistry – II	G108	3	0	2	75	10	10	5	25	25	-	150	4	
5	G202	Engineering Drawing – I I	G201	1	0	4	50	-	-	-	-	50	-	100	3	
6	G204	Workshop Practice – II	G203	0	0	4	-	-	-	-	50	50	-	100	3	
7	G206A	Engineering Mechanics	G106 & G107	3	0	0	75	10	10	5	0	-	-	100	3	
	*G206B	C-Programming	G205B	2	0	2	50	0	0	0	25	25	-	100	3	
8	G301	Development of Life Skill-I		1	0	2	-	-	-	-	-	25	25	50	2	
9		Professional Practices – I#		0	0	2	-	-	-	-	-	50	-	50	1	
<b>TOTAL</b>					16/15	1	20/20	425/400	50	50	25/20	100/125	275	25	1025	30

\*For CSE, IT and CPE

#Applied Technology course

<b>Name of the course : COMMUNICATION SKILL -I</b>	
<b>Course code: G101</b>	<b>Semester : First</b>
<b>Teaching Scheme</b>	<b>Maximum Marks : 125</b>
	<b>PA and End Examination Scheme</b>
Theory : 2 hrs/week	Class test: 10
Tutorial: 0 hrs/week	Assignment / Quiz etc.: 10 Marks Attendance : 5 Marks Sessional : 25 marks
Practical : 2 hrs/week	End Semester Theory : 75 Marks
Credit : 3	Practical End Exam: 0 Marks

### **RATIONALE:**

English is not our mother tongue, nor do most of us live in an atmosphere of English. In schools you read English as a *subject* and the main reason behind your reading, for many of you, was simply to pass the examinations.

Now, in the job-oriented education, learners need to learn English not as a subject but as a *service language*- serving as a vehicle for his/her educational as well as professional needs. These are needs for communication. They need to write reports, read instructions and manuals for setting up a machine perfectly and speak to clients for more orders.

So this subject will help to develop reading skills, listening skills, speaking skills and writing skills while using appropriate grammar in reading, writing and speaking. It will enable the learner to use them more confidently in their communicative activities. Learners will be able to read by themselves text and reference books, articles, different government orders, various letters, non-text materials like charts, diagrams, brochures, technical reports and other writings which not only claim Factual comprehension but demand higher levels of comprehension involving inference and evaluation etc. It will enable learners to listen, understand and respond appropriately.

### **DETAILED COURSE CONTENT**

#### **THEORY:**

<b>UNIT TOPIC / SUB-TOPIC</b>	<b>Lecture Hrs.</b>	<b>Marks</b>
<b>1.0 COMMUNICATION</b>	<b>3</b>	<b>8</b>
1.1 Communication and Communications		
1.2 Features of Communication		
1.3 Essential Components of Communication		
1.4 Barriers of Communication		
1.5 Types of Communication		
1.6 Essential Elements of Effective Communication		
<b>2.0 READING AND REMEDIAL GRAMMAR USAGE</b>	<b>4</b>	<b>10</b>
2.1 Developing Reading Skills		
2.2 Skimming – Scanning – Reading for information structure		
2.3 Remedial Grammar		
• Time and Tense – Transformation of Sentences		
• Relative Clauses		

- Language Function: Reporting, Suggesting,
- Agreeing, Defining, Purpose, Instruction,
- Prohibition

<b>3.0</b>	<b>PREPARATION FOR WRITING</b>	<b>3</b>	<b>7</b>
	3.1 Understanding the writing assignment: topic, purpose, reader, scope and constraints		
	3.2 Analyzing the content		
	3.3 Determining the scope of topic		
	3.4 Audience analysis for entry behavior		
	3.5 Collecting information for the assignment		
<b>4.0</b>	<b>WRITING PARAGRAPHS</b>	<b>5</b>	<b>13</b>
	4.1 Identifying Paragraphs		
	4.2 Essentials of effective coherent paragraphs		
	4.3 Use of appropriate linkers in paragraphs		
	4.4 Developing notes into a paragraph		
	4.5 Identifying and Writing Topic Sentences and Supporting Sentences		
	4.6 Recognising different types of paragraph organisation		
	4.7 Use of appropriate tenses, voices and linkers in paragraphs		
	4.8 Writing different types of paragraphs		
	• Process description		
	• Comparison and contrast		
	• Cause and Effect		
	• Problem Solution		
<b>5.0</b>	<b>COMPREHENSION OF TECHNICAL TEXTS MANUALS, INSTRUCTIONS ETC.</b>	<b>3</b>	<b>8</b>
	5.1 Recognising important information in written texts		
	5.2 Note – taking with the use of abbreviations, charts, diagrams and Symbols		
	5.3 Interpreting with visuals and illustrating with visuals like tables, charts and graphs		
<b>6.0</b>	<b>LISTENING</b>	<b>3</b>	<b>7</b>
	6.1 Importance of Active Listening		
	6.2 Functions of Active Listening		
	6.3 Techniques for ensuring Active Listening		
<b>7.0</b>	<b>PUBLIC SPEAKING</b>	<b>4</b>	<b>10</b>
	7.1 Planning for the speech		
	7.2 Designing the speech		
	7.3 Deliver the speech		
	7.4 Evaluate the speech		
<b>8.0</b>	<b>PRESENTATION</b>	<b>5</b>	<b>12</b>
	8.1 Rationale of Presentation		
	8.2 Types of Presentation		
	8.3 Planning of Presentation		
	8.4 Guidelines for use of visual aids		
	8.5 Practice of Presentation on relevant topics		

**SUGGESTED LEARNING RESOURCES: Reference Books:**

1. English for Specific Purposes: A learning – Centred approach
2. Hutchinson, Tom and Waters, A Ian, CUP 1987
3. The Second Language Curriculum : Ed. Robert Keith Johnson, CUP 1989
4. Designing Tasks for the Communicative Classroom : David Nunan, CUP 1989
5. Writing English Language Tests : J. B. Heaton Longman Group, U K Limited 1988
6. Writing Matters : Kristine Brown & Susan Hood, CUP 1989
7. In at the deep end : Vicki & Hollett, OUP 1989
8. Teaching the Spoken Language: G. Brown and G. Yule CUP 1983
9. ENGLISH SKILLS for Technical Students – TEACHERS' HANDBOOK / West Bengal State Council of Technical Education in collaboration with THE BRITISH COUNCIL / Orient Longman.

## COMMUNICATION SKILL -II

L            T            P  
2            0            2

Curri. Ref. No.: G102

**Total Contact hrs.:**

Lecture: 30

Tutorial: 0

Practical: 30

**Pre-requisite: G101**

**Credit :4**

**Total marks: 125**

**Theory:**

End Term Exam.:75

P.A: 25

**Practical :**

P.A: 25

### RATIONALE

This subject will help to identify essentials of business correspondence. It will enable the learner to use them more confidently in their communicative activities. Learners will be able to write letters asking for application forms, fill in the application forms. They will be able to prepare a resume or a CV, write letters of application in response to advertisements, learn how to write technical reports, memos and they will be able to prepare themselves for job interview and group discussion.

### DETAIL COURSE CONTENT

#### THEORY:

UNIT TOPIC / SUB-TOPIC		Lecture Hrs.	Marks
<b>1.0</b>	<b>ESSENTIALS OF BUSINESS CORRESPONDENCE</b>	<b>2</b>	<b>5</b>
	1.1 Introduction		
	1.2 Simplicity		
	1.3 Clarity		
	1.4 Brevity		
	1.5 Courteous		
	1.6 Persuasive		
	1.7 Sincerity		
	1.8 Tactful approach		
<b>2.0</b>	<b>BUSINESS LETTERS</b>	<b>4</b>	<b>10</b>
	2.1 Introduction		
	2.2 Different types of Business Letters		
	• Letters of Enquiry		
	• Letters of Placing Orders		
	• Letters of Complaints		

- Letters in response Letters of Enquiry, Placing Orders and Complaints
- Letters in response to Tender Notices

(samples of effective letters referred to above are to be shown to students)

<b>3.0</b>	<b>JOB APPLICATION LETTERS</b>	<b>3</b>	<b>8</b>
	3.1 Introduction		
	3.2 Job Application Letters in response to advertisements		
	3.3 Self-application letters for Jobs		
	3.4 Covering Letters		
<b>4.0</b>	<b>MEETING – AGENDA AND MINUTES</b>	<b>2</b>	<b>5</b>
	4.1 Introduction		
	4.2 Technique		
	4.3 Key Language		
<b>5.0</b>	<b>MEMOS</b>	<b>3</b>	<b>7</b>
	5.1 Introduction		
	5.2 Essential features		
	5.3 Format and Body		
<b>6.0</b>	<b>E-MAILS</b>	<b>3</b>	<b>7</b>
	6.1 Introduction		
	6.2 Method		
	6.3 Use of attachments		
	6.4 Netiquettes related to e-mails		
	(Differences between Memos, Business Letters and E-mails to be explained to students)		
<b>7.0</b>	<b>TECHNICAL REPORT WRITING</b>	<b>5</b>	<b>13</b>
	7.1 Introduction		
	7.2 Techniques of writing a report		
	7.3 Structure of technical reports		
	7.4 Language of technical reports		
	7.5 Types of Reports		
	<ul style="list-style-type: none"> <li>• Accident Reports (related to industry)</li> <li>• Laboratory Experiment Reports</li> <li>• Workshop Reports</li> <li>• Report of a Job done requiring technical expertise</li> <li>• Investigative Report</li> </ul>		
<b>8.0</b>	<b>JOB INTERVIEWS</b>	<b>4</b>	<b>10</b>
	8.1 Importance		
	8.2 Prepare for an interview		

- to them
- 8.3 Anticipating possible questions and framing appropriate answers
  - 8.4 Responding politely and appropriately
  - 8.5 Non-verbal communication – body language, postures, gestures, facial expressions, use of space, modulation, pitch, intonation etc.

**9.0 GROUP DISCUSSIONS** **4** **10**

- 9.1 Importance and rationale
- 9.2 Required non-verbal behavior
- 9.3 Appropriate use of language in group interaction
  - Entry / Taking the lead
  - Asking for opinion / Creating turns for others to speak
  - Expressing opinion (agreeing)
  - Expressing opinion (disagreeing)
  - Making suggestions
  - Politely interrupting
  - Stopping or blocking interruptions

(Note: Chapters 8 and 9 are to be dealt in the practical classes)

**SUGGESTED LEARNING RESOURCES:**

**REFERENCES BOOKS:**

1. English for Specific Purposes : A learning – Centred approach  
— Hutchinson, Tom and Waters, A lan, CUP 1987
2. The Second Language Curriculum  
— Ed. Robert Keith Johnson, CUP 1989
3. Designing Tasks for the Communicative Classroom  
— David Nunan, CUP 1989
4. Writing English Language Tests  
— J. B. Heaton Longman Group, U K Limited 1988
5. Testing for Language Teachers  
— Arthur Hughes, CUP 1989
6. Writing Matters  
-- Kristine Brown & Susan Hood, CUP 1989
7. Communicate 2  
— Keith Morrow and Keith Johnson, CUP 1980
8. In at the deep end  
— Vicki & Hollett, OUP 1989
9. Teaching the Spoken Language,  
— G. Brown and G. Yule CUP 1983
10. Teaching Reading Skills in a Foreign Language  
— Christine Nuttall, Heinemann 1982



11. Communication in English for Technical Students  
— Orient Longman 1984
  
12. Teachers' Manual (for Communication in English for Technical Students,  
Orient Longman 1984)  
— Curriculum Development Centre  
Technical Teachers' Training Institute  
( Eastern Region ) 1985.

## **PRACTICALS (under G101 and G102):**

### **Suggested activities:**

- Students may be encouraged to look up books and websites to get an idea about frequently asked questions and finding out appropriate answers to these questions
- Mock group discussions are to be conducted for students in the presence of teachers and industry experts and these discussions are to be evaluated by peers, teachers and experts
- Organising and participating in Mock interviews by peers, teachers and also experts from the industry
- Students are to be given an exposure to sample Job Interviews and Group Discussions from videos, CDs, DVDs, websites etc.

## MATHEMATICS-I

L            T            P  
4            1            0

Curri. Ref. No.: G103

**Total Contact hrs.:**

**Total marks: 100**

**Theory:**

Lecture:60

End Term Exam.:75

Tutorial:15

P.A.:25

Practical: 0

**Credit : 5**

**RATIONALEE:** - Mathematics is an important tool to solve wide variety of engineering problems. Most of the technological processes in industry are described effectively by using mathematical framework. Mathematics has played an important role in the development of mechanical, civil, aeronautical and chemical engineering through its contribution to mechanics of rigid bodies, hydrodynamics, aero-dynamics and heat transfer etc. It has become of great interest to electrical engineers through its application to information theory, design of digital computer etc.

**AIM:-**Through this syllabus we aim to give students a strong foundation in Algebra, Trigonometry, Mensuration and Co-ordinate Geometry which are applicable in all branches of engineering.

UNI T	TOPIC/SUB-TOPIC	Contact Hrs	Marks
1.0	<p><b>ALGEBRA</b></p> <p><b>1.1 Laws of Indices and Surds.</b>                      (i) Fundamental Laws of Indices or Exponents.                      (ii) Definition of Surd and its applications.</p> <p><b>1.2 Logarithms.</b>                      (i) Definition of Logarithm with any finite base.                      (ii) Laws of logarithm.                      (iii) Common Logarithm and natural logarithm with Applications.                      (iv) Assignments and problems.</p> <p><b>1.3 Partial fractions with problems.</b>                      (i) Concept of general quadratic equation and its solution.                      (ii) Concept of imaginary numbers.                      (iii) Definition of partial fraction and polynomial function.                      (iv) Concept of proper and improper fractions.                      (v) To resolve proper fractions into partial fractions.                      (vi) To resolve improper fractions into partial fractions.</p>	1  3  3	1  2  3

(vii)Problems and assignments.		
<b>1.4 Determinants.</b>	3	2
(i) Concept of determinant or order 2 and 3, Minors and Co-factors and Evaluation of a determinant using Laplace Expansion.		
(ii) Properties of determinant.		
(iii) Problems and assignments.		
<b>1.5 Solution of a system of Linear Algebraic Equations by Cramer's Rule for 2 and 3 unknowns with R.H.S non-zero.</b>	3	2
<b>1.6 Matrices.</b>	6	5
(i)Definition of a rectangular and square matrix.		
(ii)Algebra of matrices such as addition, subtraction and Multiplication of a matrix by a scalar.		
(iii)Transpose of a matrix.		
(iv)Minor and co-factor of an element of determinant of a square matrix.		
(v)Adjoint of a square matrix and inverse of a square matrix.		
(vi)Solution of simultaneous linear equation containing 2 and 3 unknowns by matrix inversion method.		
<b>1.7 Exponential Theorems and Logarithmic Series with problems.</b>	2	2
<b>1.8 Binomial Theorem.</b>	4	3
(i)Definition of factorial notation.		
(ii) Definition of permutations and combinations with their formulae and their relations.		
(iii)Binomial Theorem for positive integral index.		
(iv)General term of a Binomial Theorem.	25	21
(v)Binomial Theorem for fractional and negative index.		
(vi)Use of Binomial Theorem to find approximate value.		

UNIT	TOPIC/SUB-TOPIC	Contact Hrs	Marks
2.0	<b>TRIGONOMETRY</b>		
	<b>2.1 Circular Functions.</b>	2	2
	(i) Definition of degree and radian measure and their relation.		
	(ii) Values of circular functions of $\frac{\pi}{4}, -\frac{\pi}{4}, \frac{\pi}{6}, \frac{\pi}{3}$ and $\frac{3\pi}{4}$		
	(iii) Fundamental identities in relation to sine, cosine, tangent, cotangent, secant and cosecant of an angle.		
	<b>2.2 Addition and Subtraction Formulae with problems and multiple and submultiples of an angle.</b>	3	3
	<b>2.3 Trigonometric Identities.</b>	3	3
	<b>2.4 Solution of Equations.</b>	2	2
	<b>2.5 Inverse theorems of circular Functions and principal values with problems.</b>	4	3
	<b>2.6 Properties of Triangles with problems.</b>	4	3
3.0	<b>2.7 Problems on applications of Trigonometry.</b>	3	3
	<b>TWO-DIMENSIONAL CO-ORDINATE GEOMETRY</b>		
	<b>3.1 Two dimensional Co-ordinate System</b>	3	3
	(i) Cartesian Co-ordinate of a point.		
	(ii) Distance between two points.		
	(ii) Co-ordinate of a point which divides the line joining two given points in a given ratio (internally and externally).		
	(iv) Centroid of a triangle having given three vertices.		
	(v) Area of a triangle having given the co-ordinates of three vertices.		
	(vi) Definition of polar Co-ordinates of a point.		
	(vii) Conversion of Polar Co-ordinates to Cartesian Co-ordinates and their applications.		
(IX) Problems.			

UNIT	TOPIC/SUB-TOPIC	Contact Hrs	Marks
4.0	<b>3.2 Straight Line.</b> (i) Gradient (or Slope) of a straight line. (ii) Equation of a straight line. (iii) Different form of a straight line. (iv) Perpendicular distance of a point from a straight line. (v) Angle between two intersecting straight lines. (vi) Condition of perpendicularity and parallelism. (vii) Bisectors of two straight lines. (viii) Problems.	3	3
	<b>3.3 Circle</b> (i) Introduction (ii) Standard form of the equation of a Circle. (iii) General equation of a Circle. (iv) Intercept made by circle on co-ordinate axes. (v) Equation of a circle passing through the points of intersection of two circles. (vi) Equation of a circle passing through the points of intersection of a circle and a straight line. (vii) Condition of tangency to a circle from an external point. (viii) Common chord and common tangent to circles. (ix) Equation of the tangent to a circle at a point on it and the length of the tangent drawn from an external point to a circle. (x) Problems.	4	3
	<b>VECTORS.</b> (i) Definition of a vector and definition of position vector. (ii) Algebra of vectors (addition, subtraction and scalar multiplication of a vector). (iii) Dot product of two vectors with properties and problems.	4	3
	(iv) Applications of vectors. (work done and moment of a force about a point and a line.	4	3

## **SUGGESTED LEARNING RESOURCES:**

### **Reference Books.**

- (1) Mathematics for polytechnic by S.P.Deshpande  
(Publisher:-Vidyarthi Griha, Pune)
- (2) Trigonometry by S.L.Loney (Publisher:-S.Chand Publications).
- (3) Higher Algebra by H.S.Hall &S.R.Knight.  
(Publisher:-Metric edition, Book Palace. New Delhi)
- (4) College Algebra by Fec.G.Valles.  
(Publisher:-Charotar Publications).
- (5) Matrices by Ayres.(Publisher:-Schuam series; McGraw hill).
- (6) Higher Engineering Mathematics.  
(Publisher:-Khanna publications, New Delhi).
- (7) Engineering Mathematics.(Publisher:-Prentice Hall of India).
- (8)Diploma Engineering Mathematics (Volume-I and Volume-II) by B.K.Paul.
- (9)College Algebra by A.R.Mazumdar and P.L.Ganguly.
- (10)Plane Trigonometry by Dr. J.Medhi and Dr.A.D.Misra.
- (11)Applied Mathematics-I by Anita Sachdeva.
- (12)Elementary Co-ordinate Geometry and Solid figures. By B.Das.
- (13)Engineering Mathematics by H.K.Dass
- (14)Engineering Mathematics (Volume-I and Volume-II) by Vishwanath.
- (15)Engineering Mathematics. Part-I by Shanti Narayan.

## MATHEMATICS-II

L            T            P  
3            1            0

Curri. Ref. No.: G104

**Total Contact hrs.:**

Lecture:45

Tutorial:15

Practical: 0

Pre-requisite: G103

**Credit: 4**

**RATIONALE**

**Total marks: 100**

**Theory:**

End Term Exam.:75

P.A.:25

The purpose of teaching Engineering Mathematics-II to diploma students is to enable them to understand advance uses of mathematics and solving engineering problems. Continuity and sequence is necessary for logical Development of subject. The topic includes Coordinate Geometry, Differential Calculus, Integral Calculus and Vector Algebra. This course will be helpful for the learners those who like to go for higher studies.

### DETAILED COURSE CONTENTS

#### THEORY :

UNIT	TOPIC / SUB-TOPIC	Lecture Hrs.	Marks
1.0	CO-ORDINATE GEOMETRY	10L+3T	16
1.1	Co-ordinate Systems:		
1.2	Cartesian & Polar Coordinates		
1.3	Distance between two points.		
1.4	Division of line segment.		
1.5	Area of a triangle.		
1.6	Locus of a point		
1.7	Standard forms of the equations of a straight line:		
1.8	Intersection of straight lines		
1.9	Angle between them		
1.10	Bisector of the angle between them.		
1.11	Change of axes		
1.12	Transformation of coordinates when origin is shifted and when axes are rotated.		
1.13	Pair of Straight lines: $x^2 + 2hxy + by^2 = 0$		
1.14	Geometric figures		
	• Circle		
	• Parabola		



- Ellipse
  - Hyperbola
- 1.15 Definition & Properties of Geometric figures
- 1.16 Standard Equations of Geometric figures

**2.0 DIFFERENTIAL CALCULUS 12L+5T 21**

- 2.1 Functions
- Independent & Dependent Variables.
  - Types of functions
- 2.2 Limits:
- Concept of limits.
  - Evaluation of limits.
- 2.3 Differentiation by 1<sup>st</sup> Principle:
- Differentiation of Sum, Product and Quotient of functions
  - Differentiation of a function of a function
  - Differentiation of Trigonometric, Inverse Trigonometric & Hyperbolic functions
  - Logarithmic differentiation.
  - Differentiation of Parametric functions.
- 2.4 Partial Differentiation:
- Partial Differentiation
  - Successive Differentiation
  - Higher order derivatives - up to nth order
  - Linear differential Equation.
- 2.5 Application of differentiation:
- Differential coefficient.
  - Application of coefficient.
  - Equation for Tangent, Normal  $\delta$  , Sub-tangent & Subnormal  $\delta$

**3.0 INTEGRAL CALCULUS 13L+5T 23**

- 3.1 Indefinite Integration:
- Definition
- 3.2 Methods of Integration:
- Integration by Substitution.
  - Integration by parts
  - Integration by partial fractions.
  - Reduction formulae for integration of  $\sin^n x \cdot \cos^n x$
- 3.3 Definite Integrals:
- Definite integral as limit of a sum.
  - Fundamental properties
  - Definition of gamma function.
  - Evaluation of gamma function.

- 3.4 Application of Integration:
- Area of a plane curve.
  - Length of plane curves.
  - Work done.
  - Volume
  - Mean & RMS values.
  - Centre of gravity
  - Simpson's One- Third Rule

- 3.5 Evaluation of Multiple Integrals:
- Evaluation of double integrals.
  - Evaluation of triple integrals.
  - Use of constant limits.

#### **4.0 VECTOR ALGEBRA**

**10L+2**

**15**

- 4.1 Vector and Scalar quantities.
- 4.2 Type of vectors, geometric representation of vector,
- 4.3 Addition and subtraction of vectors, unit vectors  $i, j$  and  $k$ ,
- 4.4 Magnitude and direction of vectors,
- 4.5 Product of a vector by a scalar, product of two vectors (scalar & vector)
- 4.6 Applications of vectors to engineering problems

#### **SUGGESTED LEARNING RESOURCES:**

Text Books:

1. Differential Calculus By B.C. Das & B.N. Mukherjee
2. Integral Calculus By B.C. Das & B.N. Mukherjee
3. Elementary Co-ordinate Geometry and Solid figures By B. Das

Reference Books:

1. Engineering Mathematics Part II By Shanti Narayan
2. Engineering Mathematics Vol I & II By Vishwanath
3. Polytechnic Mathematics Vol.II By Dutta & Bera

## PHYSICS - I

L        T        P  
2        0        2

Curri. Ref. No.: G105

**Total Contact hrs.:**

Theory: 30

Tutorial :0

Practical: 30

**Credit: 4**

**Total marks: 150**

**Theory:**

End Term Exam: 75

P.A.: 25

**Practical:**

End Term Exam: 25

P.A : 25

### RATIONALE:

Physics form a foundation for all technician courses. The study of engineering concepts of physics will help the students in understanding engineering subjects where the emphasis will be on the application of these concepts. A good foundation in physics will also help students for self-development in future, to cope up with the continuous flow of new innovation and discoveries in technology. The topics in Applied Physics for the foundation course were identified on the following basis:

- The attainment level of students in Physics at entry level to polytechnics.
- Reference to engineering subjects.
- Continuity of sequence necessary for logical development of the subject

### DETAILED COURSE CONTENTS

#### THEORY :

UNIT TOPIC / SUB-TOPIC	Lecture Hrs.	Marks
1.0 UNITS, DIMENSION AND MEASUREMENTS	2	5
1.1 <b>Units, Dimension</b>		
• Concept of unit of physical parameters		
• Fundamental and derived units		
• SI system of units of different physical parameters		
• Dimension with examples of different physical parameters.		
1.2 <b>Measurements</b>		
• Measuring devices e.g., slide callipers, screw gauge, spherometer with concept of vernier constant, least count and zero error.		
• Physical Balance		

2.0	<b>MECHANICS</b>	4	9
2.1	<b>Motion along a straight line and Force</b>		
	<ul style="list-style-type: none"> <li>• Concept of scalar and vector quantities</li> <li>• Speed, velocity and linear acceleration</li> <li>• Equations of motion with constant acceleration (derivation not required)</li> <li>• Equations of motion of falling body under gravity</li> <li>• Simple problems on linear motion</li> <li>• Newton's laws of motion, Action and reaction, tension</li> <li>• Force, inertia, momentum, impulse and impulsive force with practical examples</li> <li>• Conservation of linear momentum.</li> </ul>		
3.0	<b>GRAVITATION</b>	3	6
	<ul style="list-style-type: none"> <li>• Newton's laws of gravitation</li> <li>• Newton's gravitational constant G and its SI unit</li> <li>• Acceleration due to gravity (g) and its relation with "G".</li> <li>• Variation of g with altitude and latitude (deduction not required)</li> <li>• Difference between mass and weight</li> <li>• Simple problems</li> </ul>		
4.0	<b>WORK, POWER AND ENERGY</b>	3	6
	<ul style="list-style-type: none"> <li>• Work, power and energy with their units and mathematical expressions</li> <li>• Relation between Horse power and Watt</li> <li>• Different forms of mechanical energy : PE, KE and their expressions</li> <li>• Conservation of energy and transformation of energy with examples</li> <li>• Simple problems</li> </ul>		
5.0	<b>PROPERTIES OF MATTER</b>	6	13
5.1	<b>Properties of solid</b>		
	<ul style="list-style-type: none"> <li>• Plasticity and elasticity in solids</li> <li>• Deformation of bodies by the action of external forces change in size and change in shape</li> <li>• Unit of stress – tensile stress, compressive stress and Shear stress with examples</li> <li>• Unit of strain – tensile strain., volumetric strain and shear strain &amp; Hooke's law</li> </ul>		

- Modulus of elasticity – Young’s modulus, Bulk modulus and Modulus of rigidity, Poisson’s ratio and their units [Definition & basic concepts only, no deduction]
- Stress – Strain curve

## 5.2 Properties of Fluid

- Thrust and pressure
- Law of fluid pressure, Pascal’s law and working principles of hydraulic press
- Archimedes Principle and its applications
- Specific gravity and relative density
- Hydrometers and their uses
- Properties of gas : Toricelli’s Expt. & Simple Barometer
- Simple problems

## 6.0 HEAT

9

19

### 6.1 Heat and temperature (Review)

- Heat and temperature
- Fixed points and different scales of temperature - Fahrenheit, Celsius and Kelvin and their relationships
- Simple problems

### 6.2 Measurement of heat

- Quantity of heat, units of heat: Joule and Calorie
- Specific heat of solid, heat capacity, water equivalent
- Principle of calorimeter, Measurement of specific heat
- Change of state : Latent heat, evaporation & boiling, effect of pressure
- Boyle’s law and Charles law, Universal gas law and universal gas constant.
- Idea of two specific heat capacities of gas:  $C_p$  and  $C_v$  and their relationships (deduction not required)

### 6.3 Thermal expansion & Transmission of heat

- Expansion of solid – linear, superficial and cubical co-efficient of expansion & their units
- Interrelationship between different co-efficient of expansion with examples
- Different methods of transmission of heat : conduction, convection and radiation
- Co-efficient of thermal expansion & its unit
- Good conductors and bad conductors of heat
- Simple problems

**7.1 Simple Harmonic Motion**

- Simple harmonic motion and its characteristics
- Time period, frequency & amplitude of vibration
- Mathematical expression of SHM
- Examples of SHM: Simple Pendulum
- Idea on Longitudinal & Transverse wave
- Simple problems

**7.2 Production and propagation of Sound**

- Natural vibration, forced vibration with examples
- Resonance of sound with examples
- Principle of resonance to find out velocity of sound in air.
- Velocity of sound, Newton's formula and Laplace correction (Idea only, no deduction)

**7.3 Reflection of sound**

- Echo, reverberation
- Simple problems

**7.4 Musical sound, noise**

- Characteristics of musical sound and noise with examples
- Factors affecting sound

(Note: 10 L Hrs. can be used for assessment and evaluation of students on each module.)

**PRACTICAL:****Suggested list of experiments:**

1. To measure the volume of a wooden block by using Vernier callipers.
2. To measure the surface area of a metal washer by Vernier inside callipers
3. To measure the depth of a hole by Depth Gauge (Vernier callipers)
4. To measure the cross-section of a wire by Screw Gauge.
5. To determine the thickness of a glass plate by Spherometer.
6. To adjust a common balance and to determine the specific gravity of a liquid by specific gravity bottle.
7. To establish the relation between pressure and volume of a fixed mass of gas at a constant temperature using Boyle's apparatus.
8. To determine the acceleration due to gravity (g) of a place by simple pendulum.
9. To measure the velocity of sound in air by air resonance column method.

## **SUGGESTED LEARNING RESOURCES:**

### **REFERENCE BOOK:**

1. Principle of Physics – Subrahmanyam & Brizal
2. Intermediate Physics – S.C.Roy Chaudhury & D.B.Sinha
3. Fundamentals Of Physics – David Halliday, Robert Resnick & Jeal Walka
4. University Physics – Francis W. Sears, Mark W. Zemans Key & Hugh D. Young
5. University Physics – Hugh D. Young & Roger H. Freedman
6. A text book of Physics (Part I) – C. R. Dasgupta
7. Elements of Higher Secondary Physics (Part I) - D. Dutta, B. Pal & B. Chaudhuri
8. Physics (Volume I) - Ajoy Chakraborty
9. Applied Physics (Vol. 1) - Saxena H.C. & Singh Prabhakar
10. Physics for 10+2 students (Part I) - Das, S.K, Sisodia M.L, Neher P.K., Kachhawa C.M.

## PHYSICS – II

L        T        P  
3        0        2

Curri. Ref. No.: G106

**Total Contact hrs.:**

Lecture: 45

Tutorial: 0

Practical: 30

**Prerequisite: G105**

**Credit: 4**

**Total Marks: 150**

**Theory:**

End Term Exam:75

P.A.: 25

**Practical:**

End Term Exam: 25

PA : 25

### RATIONALE:

Physics form a foundation for all technician courses. The study of engineering concepts of physics will help the students in understanding engineering subjects where the emphasis will be on the application of these concepts. A good foundation in physics will also help students for self-development in future, to cope up with the continuous flow of new innovation and discoveries in technology. The topics in Applied Physics for the foundation course were identified on the following basis:

- To develop fundamentals knowledge and skills related to Light, Magnetism, Electricity, Modern Physics and their appropriate applications in engineering.
- Reference to engineering subjects
- Continuity of sequence necessary for logical development of the subjects.

### DETAIL COURSE CONTENT

#### THEORY :

UNIT TOPIC / SUB-TOPIC	Lecture Hrs.	Marks
<b>1.0 LIGHT</b>	8	17
<b>1.1 Reflection of light</b>		
<b>1.1.1 Reflection of light on plane surface (Review) :</b>		
• Laws of reflection		
• Image formation for reflection in a plane mirror.		
• Geometrical method of locating image.		
<b>1.1.2 Reflection of light on spherical surface :</b>		
• Different types of spherical mirror		
• Radius of curvature and focus of a spherical mirror.		



- Reflection by a spherical mirror: real and virtual images, magnification
- Geometrical method of determination of image position, size and nature of the images formed
- Relation between focal length and radius of curvature of the spherical mirror,
- Relation between object distance, image distance and focal length (no deduction).
- Uses of different types of mirrors.

## 1.2 Refraction of light:

### 1.2.1 Refraction of light through plane surface (Review)

- Laws of refraction
- Refractive index in terms of velocity of light in different media
- Total internal reflection and critical angle, concept of fibre optics & its various practical applications
- Dispersion of light through a prism.

### 1.2.2 Optical Lens :

- Different types of lenses
- Position and nature of images formed by convex and concave lenses ,
- Image formation formula (no deduction)
- Power of a lens
- Electromagnetic spectrum : Infrared, Ultra violet & visible light
- Simple problems

## 2.0 MAGNETISM

4

9

### 2.1 Magnetic properties (Review)

- Natural and artificial magnets
- Properties of magnets
- Types of magnets – bar, horse-shoe, needle
- Preparation of temporary and permanent magnets
- Induced magnetism

2.2	<b>Magnetic measurement:</b>		
	<ul style="list-style-type: none"> <li>• Uniform and non-uniform field</li> <li>• Magnetic moment</li> <li>• Inverse square law</li> <li>• Magnetic lines of force</li> <li>• Elements of Earth magnetism : dip, declination and horizontal component</li> </ul>		
<b>3.0</b>	<b>ELECTROSTATICS</b>	<b>3</b>	<b>6</b>
3.1	<b>Electrostatics Basic:</b>		
	<ul style="list-style-type: none"> <li>• Basic concept of Electric charge</li> <li>• Its production and nature – electrification by rubbing : Kinds of electrification</li> <li>• Electrostatic induction and conduction</li> <li>• Conductors and non-conductors</li> <li>• Surface density of charge, The lightning conductor</li> <li>• Coulomb’s law between electric charges</li> <li>• Field intensity and electric potential</li> <li>• Electric permittivity</li> <li>• Lines of force in electrostatic field</li> </ul>		
<b>4.0</b>	<b>CURRENT ELECTRICITY</b>	<b>13</b>	<b>28</b>
4.1	<b>Electric current:</b>		
	<ul style="list-style-type: none"> <li>• Cell: Primary &amp; Secondary</li> <li>• Flow of charge – electric current and its unit</li> <li>• Electric motive force (EMF)</li> <li>• Ohm’s law</li> <li>• Resistance and its unit, specific resistance</li> <li>• Resistance in series and parallel</li> <li>• Factors affecting resistanc</li> <li>• Wheatstone bridge circuit</li> <li>• Relation for balanced Wheatstone bridge (No deduction)</li> <li>• Meter bridge, P.O. Box</li> <li>• Simple problems</li> </ul>		
4.2	<b>Heating Effects of Current:</b>		
	<ul style="list-style-type: none"> <li>• Joule’s law</li> <li>• Electrical work, energy and power with units</li> <li>• Simple problems.</li> </ul>		

- 4.3            **Magnetic Effect of Electric Current:**
- Magnetic effect of electric current, Bio-Savart law
  - Fleming’s left hand rule
  - Application of Magnetic effect of electric current – Galvanometer (concept only)
  - Electromagnetic Induction: Faraday’s law, Fleming right hand rule , Basic concept of A.C. generator.

## 5.0 MODERN PHYSICS

7

15

### 5.1            **Photo-electric effect:**

- Photo-electron, Work function, photo electric effect
- Photo cell
- Einstein photo electric equation
- Stopping potential, Threshold Frequency
- Principle of solar photo-voltaic cell and its uses.

### 5.2            **Semiconductor:**

- Energy band in solids (Idea)
- Distinction between conductor, insulators & semi-conductors in terms of energy band diagram,
- Intrinsic and extrinsic (P-type; N-type) semiconductor,
- P – N junction diode, depletion region, potential barrier.
- Forward and reverse biasing; Forward and reverse bias characteristic curve.
- Application of P – N junction diode

(Note: 10 L Hrs. can be used for assessment and evaluation of students on each module.)

## **PRACTICAL:**

### **Suggested list of experiments:**

1. To determine refractive index of the material of glass slab by pin method.
2. To determine the focal length of a concave mirror by  $u, v$  method
3. To determine the focal length of the convex lens by  $u, v$  method
4. To plot magnetic lines of force of a bar magnet with North Pole pointing north and to locate the neutral points & measure the magnetic length
5. To plot magnetic lines of force of a bar magnet with South Pole pointing north and to locate the neutral points & measure the magnetic length.
6. To verify Ohm's law by ammeter and Voltmeter method with —
  - (a) Series connection of resistances;
  - (b) Parallel connection of resistances.
7. To measure the unknown resistance / resistivity of the material of a wire by meter Bridge
8. To measure the unknown resistance of the material of a wire by P. O. box.

### **SUGGESTED LEARNING RESOURCES:**

#### Reference Books:

1. Principle of Physics – Subrahmanyan & Brizal
2. Intermediate Physics – S.C.Roy Chaudhury & D.B.Sinha
3. Fundamentals of Physics – David Halliday, Robert Resnick & Jeal Walka
4. University Physics – Francis W. Sears, Mark W. Zemans Key & Hugh D. Young
5. University Physics – Hugh D. Young & Roger H. Freedman
6. A text book of Physics (Part II) – C. R. Dasgupta
7. Elements of Higher Secondary Physics (Part II) - D. Dutta, B. Pal & B. Chaudhuri
8. Physics (Volume II) - Ajoy Chakraborty
9. Applied Physics (Vol. II) - Saxena H.C. & Singh Prabhakar
10. Physics for 10+2 students (Part II) - Das, S.K, Sisodia M.L, Neher P.K., Kachhawa C.M.

## CHEMISTRY - I

L	T	P
3	0	2

Curri. Ref. No.: 107

**Total Contact hrs.:**

Theory: 45

Tutorial : 0

Practical: 30

**Credit: 4**

**Total marks: 150**

**Theory:**

End Term Exam: 75

P.A.: 25

**Practical:**

End Term Exam: 25

P.A : 25

### RATIONALE:

Chemistry is an important subject in technician education, because of the fact that fundamental knowledge and skills in respect of chemical characteristics of matters related to solid, liquid and gas are essential elements on which various aspects of application in technology depend upon.

Chemistry-I will enable the students to develop fundamental knowledge and skills related to chemical properties of matters in general, such as solid liquid and gas, and their appropriate applications in engineering disciplines which include general chemistry, chemistry of water Electro-chemistry, physical chemistry, organic chemistry and refractories.

### DETAIL COURSE CONTENT

#### THEORY:

UNIT TOPIC / SUB-TOPIC	Lecture Hrs.	Marks
<b>1.0 GENERAL CHEMISTRY</b>	<b>12</b>	<b>20</b>
1.1 Concept of symbol, valence, formula, atomic mass, molecular mass, Elementary idea of atomic structure (Review). Chemical Bonding: Covalent Bond, Ionic Bond, Hydrogen Bond and Metallic Bond Assignment and Class test Fundamental of electrons, protons, modern periodic laws, periodic tables, definition of orbitals, shells, sub-shells, electronic configuration (for atomic no. 1-30)		
1.2 <b>Solution</b>		
1.2.1 Classify and explain solution according to concentration		
1.2.2 Distinguish among suspension, colloids and true solution.		
1.2.2 Define and explain solubility, effect of temperature on solubility		

1.2.3 Mention practical applications of colloids in different situations

1.2.4.1 Colloidal impurities in drinking and sewage water.

1.2.4.2 Finely divided colloidal particles in air causes Air-Pollution.

Assignment and Class test

### 1.3 Acid, Base and Salt

1.3.1 Define and classify acid, base and salt (Review)

1.3.2 Define and explain normal solution, molar solution, titration and indicator, normality, molarity, molality

1.3.3 Define pH of a solution and pH Scale

1.3.4 Calculate pH from  $H^+$  ion concentration

1.3.5 Mention application of pH in industry such as

1.3.5.1 pH of a boiler feed water

1.3.5.2 Role of pH in sewage treatment

1.3.5.3 pH in Sugar, Paper industry

1.3.5.4 Buffer Solution, types and application.

Assignment and Class test

## 2.0 CHEMISTRY OF WATER

10

17

2.1 State the different types of impurities present in natural water and name impurities under each of them types.

2.2 Explain how natural water gets contaminated with the impurities.

2.3 Explain the action of soap on water

2.4 Define and explain soft and hard water with illustrations

2.5 Classify and explain hardness of water with illustration

2.6 State different ways of expressing concentration of impurities in water including hardness.

2.7 Name the bad effects caused by natural water when used in domestic as well as industrial purpose.

2.8 State and Explain the remedial measures of the following bad effects of natural water in boiler.

- Scales and sludges
- Caustic Embrittlement
- Priming and foaming
- Corrosion

- 2.9 Define boiler feed water
- 2.10 Describe with help of diagram of the following water treatment Process.
- 2.10.1 Lime soda process
- 2.10.2 Permutit or Zeolite process
- 2.11 Describe with the help of block diagram, the treatments done on a sample of raw water to produce drinking water and boiler feed water.  
Solve problems on a) bad effects on natural water b) water treatment process.

Assignment and Class test

<b>3.0</b>	<b>PHYSICAL CHEMISTRY</b>	<b>7</b>	<b>12</b>
3.1	Catalyst, types, characteristics and application of Catalyst in Industries		
3.2	Radioactivity-Introduction, Characteristics of alphas, beta and gamma rays, half-life period, artificial fission, atomic fusion, application in different fields.		
<b>4.0</b>	<b>ORGANIC CHEMISTRY</b>	<b>10</b>	<b>16</b>
4.1	Organic chemistry and its scope in various industries.		
4.2	Tetravalency of Carbon atom		
4.3	Functional groups		
4.4	Distinguish between organic and inorganic compounds.		
4.5	Nomenclature of simple organic compounds-alkane, alkene, alkyne, alcohol, aldehyde, ketone, ether, carboxylic acid.(general formula)		
4.6	Preparation method of Methane, ethane Ethene and ethylene		
4.7	Benzene and its preparation and discuss its derivatives.		
<b>5.0</b>	<b>Refractories</b>	<b>6</b>	<b>10</b>
5.1	Define refractories		
5.2	Classification		
5.3	Properties		
5.3.1	Refractoriness,		
5.3.2	Strength		
5.3.3	Thermal expansion,		
5.3.4	Porosity		
5.4	Portland Cement		
5.4.1	Composition		
5.4.2	Properties		
5.4.3	Types.		

## **PRACTICAL:**

### **Suggested list of experiments:**

- To titrate using standard acid solution to know the strength of a base using indicator or vice-versa.
- To determine alkalinity of a water sample by titration method.
- To observe action of soap on hard water (only demonstration).
- To determine the total hardness of water sample by complex metric method using EDTA
- To determine the pH of different sample by using pH meter.
- To detect qualitatively the presence of Arsenic/Iron in drinking water by using Arsenic/Iron Kit

### **SUGGESTED LEARNING RESOURCES:**

#### Text Books:

1. Modern Intermediate Chemistry Part I and Part II By R.N. Nanda, A.K. Das , Y.R Sharma
2. Engineering Chemistry by Jain & Jain
3. A Text Book of Polytechnic Chemistry by J.P. Mehta & Jain and Jain
4. Industrial Chemistry by B.K. Sarma

#### Reference Books:

Intermediate Chemistry by R.K. Samal.



## CHEMISTRY - II

L        T        P  
3        0        2

Curri. Ref. No.: G108

**Total Contact hrs.:**

Theory: 45

Practical: 30

**Prerequisite: G107**

**Credit: 4**

**Total marks: 150**

**Theory:**

End Term Exam: 75

P.A.: 25

**Practical:**

End Term Exam: 25

P.A : 25

### RATIONALE:

Chemistry is an important subject in technician education, because of the fact that fundamental knowledge and skills in respect of chemical characteristics of matters related to solid, liquid and gas are essential elements on which various aspects of application in technology depend upon.

Chemistry-II will enable the students to develop fundamental knowledge and skills related to chemical properties of matters in general, such as solid liquid and gas, and their appropriate applications in technical disciplines which include electro-chemistry, fuel, lubricants, corrosion, protective coatings, plastic and polymer, metallurgy and alloys.

### DETAIL COURSE CONTENT

#### THEORY:

UNIT	TOPIC / SUB-TOPIC	Lecture Hrs.	Marks
<b>1.0</b>	<b>ELECTROCHEMISTRY</b>	<b>8</b>	<b>13</b>
1.1	Define conductor, insulator, semi-conductor, electrolyte and non-electrolyte with examples.		
1.2	State postulates of Arrheniou's and electrolytic theory of dissociation		
1.3	Demonstrate the phenomenon of electrolysis.		
1.4	State and explain Faraday's 1 <sup>st</sup> and 2 <sup>nd</sup> laws of electrolysis		
1.5	Define and explain conductance, specific conductance, molar conductance, electrochemical cell		
	Solve problems on electrolysis		
	Solve problems, Assignment and Class test.		

## 2.0 FUEL & COMBUSTION

- 2.1 Explain importance of fuels in industries.
- 2.2 Define 'fuel' and 'combustion of fuel' with examples.
- 2.3 State the classification of fuels into two different ways, namely
  - 2.3.1 Classification based upon occurrence with examples.
  - 2.3.2 Classification based upon state of aggregation with examples.
- 2.4 Define calorific value and mention its units.
- 2.5 Distinguish between gross (or higher) and net (or lower) calorific value.
- 2.6 State the relative merits and demerits of solid, liquid and gaseous fuel
- 2.7 State the availability of different fuels in India.
- 2.8 Define coal.
- 2.9 State and explain origin of coal.
- 2.10 Classify coal by rank.
- 2.11 Define pulverized coal
- 2.12 State the advantage and disadvantage of pulverized coal.
- 2.13 Explain proximate and ultimate analysis of coal.
- 2.14 Define 'Petroleum' or 'Crude oil'
- 2.15 Describe the fractional distillation of crude petroleum
- 2.16 Name the main products obtained from crude petroleum and mention their respective boiling ranges and uses.
- 2.17 State and explain important properties of liquid fuels namely, viscosity, flash and fire point, smoke point, aniline point, knocking, octane number, cetane number, anti-knocking properties.
- 2.18 State composition, preparation and industrial application of coal gas, water gas, producer gas, LPG, natural gas and gobar gas.

Solve problems, Assignments and class tests

<b>3.0</b>	<b>LUBRICANTS</b>	<b>3</b>	<b>5</b>
	3.1 Define 'lubricant' and 'lubrication'.		
	3.2 Mention the major functions of a lubricant.		
	3.3 Different types of lubricants with examples		
	3.4 Applications.		
	Solve problems, Assignments and class tests		
<b>4.0</b>	<b>CORROSION</b>	<b>4</b>	<b>7</b>
	4.1 Define corrosion.		
	4.2 Describe the causes of corrosion.		
	4.3 State the different types of corrosion of metal.		
	4.4 Explain chemical corrosion of metals and mention the names of the corrosion products.		
	4.5 Explain rusting of iron		
	4.6 Name the various methods of corrosion control.		
	Solve problems, Assignments and class tests		
<b>5.0</b>	<b>PROTECTIVE COATING</b>	<b>4</b>	<b>7</b>
	5.1 State the necessity of protective coating.		
	5.2 State the main types of protective coatings.		
	5.3 Recall the different kinds of organic and inorganic (or metallic) protective coating.		
	5.4 Explain the term " Paint ”		
	5.5 State the functions of component-drying oil, pigment, driers and thinners with examples.		
	5.6 Varnish, types and application.		
	Solve problems, Assignments and class tests		

## **6.0 POLYMER AND PLASTICS**

**6**

**10**

- 6.1 Define polymer.
- 6.2 The types of polymerization.
- 6.3 Classify polymers
- 6.4 Properties of thermoplastics and thermosetting polymers.
- 6.5 Define plastics
- 6.6 Name important plastic materials with their properties and uses (in tabular form).  
Namely : Polythene, Polypropylene, polystyrene, PVC, Nylon, Terelene, Neoprene, Bakelite, Urea-formaldehyde and PET.
- 6.7 Mention examples of plastics used in different situations:
  - i) Electrical insulation
  - ii) Lubrication
  - iii) Ropes and beams
  - iv) Optical lens
  - v) Adhesives
  - vi) Pipes and housing
  - vii) Fibre glass
  - viii) Carrybag

Solve problems, Assignments and class tests

## **8.0 METALLURGY AND ALLOYS**

**8**

**13**

- 8.1 Types of metals & properties
- 8.2 General Metallurgical process
- 8.3 Metallurgy of iron by blast furnace (principle only)
- 8.4 Classification of Steel based on its carbon content and its application
- 8.5 Properties of cast iron, wrought iron and steel
- 8.6 Effects of adding alloying elements on the properties of steel
- 8.7 Definition of alloy and purpose of alloying
- 8.8 Method of preparation of alloy ( brief outline only)
- 8.9 Composition, properties and engineering uses of following alloys : Duralumin, Magnalium, Brass, Bronze, Monel metal, Babbitts metal, Gun metal and Alnico.

Solve problems, Assignments and class tests

## **PRACTICAL:**

### **Suggested list of experiments:**

1. To determine calorific value of solid fuel using Bomb Colorimeter.
2. To find the proximate analysis (% moisture, %Ash, % volatile matter) of a given sample of coal
3. To determine the viscosity of petroleum oil by using Red-wood Viscometer
4. To determine smoke point of petroleum(Kerosene) products by using Smoke meter
5. To determine flash point of petroleum products (Petrol)by using Pensky-Martain instrument
6. To determine the aniline point of petroleum products by using Aniline point Instrument
7. To determine the conductivity & TDS of water by Conductivity meter.

### **SUGGESTED LEARNING RESOURCES:**

#### Text Books:

1. Modern Intermediate Chemistry Part I and Part II
2. By R.N. Nanda, A.K. Das , Y.R Sharma
3. Engineering Chemistry by Jain & Jain
4. A Text Book of Polytechnic Chemistry by J.P. Mehta & Jain and Jain
5. Industrial Chemistry by B.K. Sarma

#### Reference Books

1. Intermediate Chemistry by R.K. Samal

### **Suggested List of Equipment :**

1. Pensky- Martain instrument
2. Red-wood Viscometer
3. Smoke meter
4. Bomb Calorimeter
5. Conductivity-TDS meter
6. Aniline point meter
7. Muffle Furnace
8. Hot air oven
9. Electronics balance
10. Different sieve trays
11. Glassware, Porcelain ware, and reagent

## HARD CORE COURSES

## ENGINEERING DRAWING – I

L	T	P
1	0	3

Curri. Ref. No. G201

**Total Contact hrs.:**

**Total marks: 100**

**Theory :**

Theory: 15

End Term Exam : 50

Tutorial :0

**Practical:**

Practical : 45

P.A.: 50

**Credit: 3**

### RATIONALE

Engineering Drawing is the precise means of communicating the ideas of the engineer, designer, and architect to the workmen who will produce/build the desired object. It is necessary that all diploma engineers have command over making and reading of engineering drawing and have thorough understanding of geometric principles on which engineering drawing is based.

### DETAILED COURSE CONTENTS:

#### THEORY/PRACTICAL:

UNIT	TOPIC/SUB-TOPIC	Hrs.	Total hrs.	Marks
1.0	INTRODUCTION TO DRAWING	1+3	4	3
	1.1 Use of different drawing instruments			
	1.2 Conventions of Lines			
	1.3 Principle of dimensioning system			
	1.4 Types and construction of scales – Plain and Diagonal scale			
2.0	<b>CURVES AND TANGENTIAL</b>	2+6	8	7
	2.1 Construction of Ellipse by: Arc and Circle method, Concentric Circle method, Rectangle/ Oblong method			
	2.2 Construction of Parabola by: Directrix focus method, Rectangle method			
	2.3 Draw Hyperbola by: Transverse axis and focus method, Passing through a given point			
	2.4 Draw involutes of: A polygon, A circle			
3.0	<b>PROJECTION OF POINTS AND LINES</b>	2+6	8	7
	3.1 Projection of Points in different planes			
	3.2 Projection of lines in different plane			
	3.3 Lines inclined to one and two reference plane(s)			
4.0	<b>PROJECTION OF PLANES</b>	3+9	12	10
	4.1 Projection of planes of following shapes: Circular, Rectangular, Pentagonal, Hexagonal			
	4.2 Projections for above planes for inclined to one plane			

5.0	<b>PROJECTION OF SOLIDS</b>	3+9	12	10
	5.1 Projection of following solids, inclined to one reference plane: Prism, Cube, Pyramid, Cylinder			
	5.2 Projection of above solids when section resting on base and ground			
6.0	<b>INTRODUCTION TO COMPUTER AIDED DRAFTING (CAD)</b>	4+9	13	11
	6.1 Introduction, unit system, coordinate system, layout of sheets, draw commands, edit commands, display commands with simple examples			
7.0	<b>FORMATIVE EVALUATION</b>		3	2
<b>TOTAL: 15+42</b>			60	

## SUGGESTED LEARNING RESOURCES

### Reference Books and Standards:

S. No.	Title	Author	Publisher
1.	SP 46: Engineering Drawing Practice for School & Colleges		Bureau of Indian Standard
2.	Elementary Engineering Drawing	N.D. Bhatt	[Charotar Publisher, Anand]
3.	Engineering Drawing	Shah / Rana	Pearson
5.	Engineering Drawing	Agarwal & Agarwal	TMH
	Engineering Drawing	Gujral and Shende	Khanna Pub. N.Delhi
6.	Engineering Drawing	R.B. Gupta	Satya Prakashan, Delhi
7.	Engineering Drawing: With an Introduction to CAD	D. Jolhe	TMH
8.	Computer Aided Drawing	Annaih & Patil	Newage International
9.	Engineering Graphics with Auto CAD 2013	Bethune James D	PHI Learning
10.	Auto CAD in Easy steps	Whelan	Wiley Eastern
11.	Auto CAD 2010 in simple steps	Kogent	Wiley Eastern



## ENGINEERING DRAWING – II

L	T	P
1	0	3

Curri. Ref. No. : G202

**Total Contact hrs.:**

**Total marks: 100**

**Theory :**

Theory: 15

End Term Exam : 50

Tutorial :0

**Practical:**

Practical: 45

P.A.: 50

**Prerequisite: G201**

**Credit: 3**

### RATIONALE

Engineering Drawing is the precise means of communicating the ideas of the engineer, designer, architect to the workmen who will produce/build the desired object. It is necessary that all diploma engineers have command over making and reading of engineering drawing and have thorough understanding of geometric principles of orthographic projection upon which engineering drawing is based.

### DETAIL COURSE CONTENT

#### THEORY/PRACTICAL:

UNIT	TOPIC/SUB-TOPIC	Hrs.	Total hrs.	Marks
1.0	<b>ORTHOGRAPHIC PROJECTIONS</b>	2+6	8	7
	1.1 Introduction			
	1.2 First angle and Third angle projections			
	1.3 Conversion of simple pictorial view to orthographic view			
	1.4 Draw plan side view and top view in third angle			
2.0	<b>SECTIONAL VIEWS</b>	2+6	8	7
	2.1 Conversion of given pictorial view to sectional view			
	2.2 Draw sectional view at given sections for both X and Y-axis			
3.0	<b>DEVELOPMENT OF SURFACES</b>	3+6	9	7
	3.1 Development of surfaces for the following: Cube, Cylinder, Prism, Cone and frustum cone			
4.0	<b>ISOMETRIC PROJECTIONS</b>	3+6	9	7
	4.1 Isometric Scales			
	4.2 Isometric views of simple objects			
	4.3 Isometric views for slots and cuts in the objects			
5.0	<b>STANDARD CONVENTIONS AND SYMBOLS</b>	1+3	4	3
	5.1 Conventions as per IS Codes			
	5.2 Symbols as per Codes			
	5.3 The above conventions and symbols are for Civil, Mechanical and Electrical Engineering			

6.0	APPLICATION OF CAD (COMPUTER AIDED DRAFTING)	4+15	19	16
6.1	Arc & curve			
6.2	Sectional view of simple objects			
6.3	Isometric projections of simple objects			
6.4	Practicing examples on simple building plans and machine elements			
7.0	FORMATIVE EVALUATION		3	3
<b>TOTAL:</b> 15+42			60	

## SUGGESTED LEARNING RESOURCES

### Reference Books and Standards:

S. No.	Title	Author	Publisher
1.	SP 46: Engineering Drawing Practice for School & Colleges		Bureau of Indian Standard
2.	Elementary Engineering Drawing	N.D. Bhatt	[Charotar Publisher, Anand]
3.	Engineering Drawing	Shah / Rana	Pearson
5.	Engineering Drawing	Agarwal & Agarwal	TMH
	Engineering Drawing	Gujral and Shende	Khanna Pub. N.Delhi
6.	Engineering Drawing	R.B. Gupta	Satya Prakashan, Delhi
7.	Engineering Drawing: With an Introduction to CAD	D. Jolhe	TMH
8.	Computer Aided Drawing	Annaih & Patil	Newage International
9.	Engineering Graphics with Auto CAD 2013	Bethune James D	PHI Learning
10.	Auto CAD in Easy steps	Whelan	Wiley Eastern
11.	Auto CAD 2010 in simple steps	Kogent	Wiley Eastern

## WORKSHOP PRACTICE – I

L        T        P  
1        0        3

Curri. Ref. No. G 203

**Total Contact hrs.:**

**Total marks: 100**

**Practical:**

Theory: 15

End Term Exam: 50

Tutorial : 0

P.A.: 50

Practical : 45

**Credit: 3**

### RATIONALE

Workshop practice equips students with basic knowledge of the principles of manufacturing, economic aspects and application of the various equipment, processes and measurement techniques used in Engineering Workshops. In addition to this safety aspects and safe working procedures specially those related to operating machinery and handling equipments will be taught.

### DETAIL COURSE CONTENT

#### THEORY:

<b>UNIT TOPIC / SUB-TOPIC</b>	<b>Lecture Hrs</b>	<b>Mark</b>
<b>1.0 WOOD WORKING SHOP</b>	<b>2</b>	<b>7</b>
1.1 Introduction to the trade		
1.2 Types of wood and its characteristics		
1.3 Defects in timber and its identification		
1.4 Wood working hand tools		
1.5 Wood working machine tools		
1.6 Wood working processes		
1.7 Joints and joinery processes		
1.8 Varnishing and painting		
1.9 Safety precautions		
<b>1.0 FABRICATION SHOP (WELDING)</b>	<b>2</b>	<b>7</b>
2.1 Introduction to metal joining		
2.2 Electric arc welding		
2.3 Gas welding		
2.4 Equipment and consumables used in welding		
2.5 Types of welding joints		
2.6 Welding defects		
2.7 Safety precautions in welding		
<b>3.0 FITTING SHOP</b>	<b>2</b>	<b>6</b>
3.1 Introduction to the equipments and tools of fitting shop		
3.2 Types of files and filling processes		
3.3 Drill bits and drilling process		
3.4 Safety precautions to be observed in fitting shop.		

<b>4.0 SHEET METAL SHOP</b>	<b>2</b>	<b>7</b>
4.1 Sheet metal hand tools and machines		
4.2 Types of sheets		
4.3 Operations in sheet metal shop: shearing bending, folding,		
4.4 Rolling, swaging, grooving, etc		
4.5 Sheet metal joints: temporary and permanent		
4.6 Soldering: process, equipment, consumables		
4.7 Brazing: process, equipment, consumables		
<b>5.0 MEASUREMENT &amp; INSPECTION</b>	<b>3</b>	<b>9</b>
5.1 Measurement and its types		
5.2 Instruments used for linear measurement		
5.3 Instruments used for angular measurement		
5.4 Instruments used for measuring weight and mass		
5.5 Instruments used for measuring current, voltage, power and insulation.		
<b>6.0 ERECTION OF MACHINES</b>	<b>2</b>	<b>7</b>
6.1 Levelling and alignment		
6.2 Assembly of machine		
6.3 Laying of cables		
6.4 Wiring of cables to interface		
6.5 Demonstration of erection of machine		
<b>7.0 PIPE FITTING</b>	<b>2</b>	<b>7</b>
7.1 Types of pipe and its application		
7.2 Pipe fitting tools		
7.3 Pipe bending		
7.4 Pipe fitting operations		
7.5 Pipe joints		
<b>SUGGESTED LIST OF EXPERIMENTS/ DEMONSTRATIONS</b>		<b>45</b>

1. Making a lap joint with help of wood working hand tools.
2. Making a Mortise and tennon joint as per drawing.
3. Making a Dovetail joint as per given drawing.
4. Varnishing of finished given job as per instructions
5. Cutting of metal workpiece using oxy acetylene gas welding
6. Preparation of butt joint using arc welding on 4mm M.S. plate
7. Preparation of Tee joint on M.S. sheet by arc welding
8. Carryout the following on given Mild Steel job:
  - (a) Prepare and check surface flatness
  - (b) Prepare and check surface perpendicularity.
  - (c) Drill three holes of different diameter as per instructions.
9. One job on fitting joints containing different operation such as hacksaw cutting, filing, slotting and fitting.
10. Soldering of IC on PCB
11. Preparation of sheet metal square box of size 12' and depth 4"
12. Preparation of temporary joint using screw
13. Compare various methods of length and diameter measurement.
14. Measure current and voltage (A.C. and D.C.)

## **SUGGESTED LEARNING RESOURCES:**

### Reference Books:

1. S.K. Hajra Choudhury *Workshop Technology Vol 1 &2* Media Promoters of Publishers
2. Workshop manual : P.Kannaiah & K.L.Narayana, SCITECH – Publication.
3. Khanna, O.P. *Workshop Technology* Dhanpat Rai & Sons Publications
4. Chapman *Workshop Technology Parts 1 & 2* 4th Edition, Viva Books P. Ltd., New Delhi
5. Kenyon Pitman *Basic Fabrication & Welding* Pitman Pub. Ltd.
5. P.N.Rao *Manufacturing Technology* Tata Macgraw Hill

## WORKSHOP PRACTICE – II

L        T        P  
1        0        3

Curri. Ref. No. G204

**Total Contact hrs.:**

**Total marks: 100**

**Practical:**

Theory: 15

End Term Exam: 50

Tutorial : 0

P.A.: 50

Practical : 45

**Prerequisite: G203**

**Credit: 3**

### RATIONALE

Diploma holders are responsible for supervising production processes to achieve production targets and for optimal utilization of resources. For this purpose, knowledge about various machining processes, modern machining methods, processing of plastic, tools, jigs and fixtures and processing of plastics is required to be imparted. Hence the subject of workshop technology.

### DETAIL COURSE CONTENT

#### **THEORY:**

<b>UNIT TOPIC / SUB-TOPIC</b>	<b>Lecture Hrs.</b>	<b>Marks</b>
<b>1. CUTTING TOOLS AND CUTTING MATERIALS</b>	<b>2</b>	<b>7</b>
1.1. Cutting Tools - Various types of single point cutting tools and their uses, Single point cutting tool geometry, tool signature and its effect, Heat produced during cutting and its effect, Cutting speed, feed and depth of cut and their effect		
1.2 Cutting Tool Materials - Properties of cutting tool material, Study of various cutting tool materials viz. High-speed steel, tungsten carbide, cobalt steel cemented carbides, stellite, ceramics and diamond.		
<b>2. LATHE</b>	<b>3</b>	<b>9</b>
2.1 Principle of turning		
2.2 Description and function of various parts of a lathe		
2.3 Classification and specification of various types of lathe		
2.4 Drives and transmission		
2.5 Work holding devices		
2.6 Lathe tools: Parameters/Nomenclature and applications		
2.7 Lathe operations :- Plain and step turning, facing, parting off, taper turning, eccentric turning, drilling, reaming, boring, threading and knurling, form turning, spinning.		

2.8	Cutting parameters – Speed, feed and depth of cut for various materials and for various operations, machining time.		
2.9	Speed ratio, preferred numbers of speed selection.		
2.10	Lathe accessories:- Centers, dogs, different types of chucks, collets, face plate, angle plate, mandrel, steady rest, follower rest, taper turning attachment, tool post grinder, milling attachment, Quick change device for tools.		
2.11	Brief description of capstan and turret lathe, comparison of capstan/Turret lathe, work holding and tool guiding devices in capstan and turret lathe.		
<b>3. DRILLING</b>		<b>2</b>	<b>7</b>
3.1	Principle of drilling.		
3.2	Classification of drilling machines and their description.		
3.3	Various operation performed on drilling machine – drilling, spot facing, reaming, boring, counter boring, counter sinking, hole milling, tapping.		
3.4	Speeds and feeds during drilling, impact of these parameters on drilling, machining time.		
3.5	Types of drills and their features, nomenclature of a drill		
3.6	Drill holding devices.		
3.7	Types of reamers.		
<b>4. BORING</b>		<b>2</b>	<b>6</b>
4.1	Principle of boring		
4.2	Classification of boring machines and their brief description.		
4.3	Specification of boring machines.		
4.4	Boring tools, boring bars and boring heads.		
4.5	Description of jig boring machine.		
<b>5. SHAPING, PLANING AND SLOTTING</b>		<b>2</b>	<b>7</b>
5.1	Working principle of shaper, planer and slotter.		
5.2	Type of shapers		
5.3	Type of planers		
5.4	Quick return mechanism applied to shaper, slotter and planer machine.		
5.5	Work holding devices used on shaper, planer and slotter.		
5.6	Types of tools used and their geometry.		
5.7	Specification of shaper, planer and slotting machine.		
5.8	Speeds and feeds in above processes.		
<b>6. BROACHING</b>		<b>1</b>	<b>3</b>
6.1	Introduction		
6.2	Types of broaching machines – Single ram and duplex ram horizontal type, vertical type pull up, pull down, push down.		
6.3	Elements of broach tool, broach tooth details – nomenclature, types, and tool material.		

<b>7. JIGS AND FIXTURES</b>	<b>2</b>	<b>7</b>
7.1 Importance and use of jigs and fixture		
7.2 Principle of location		
7.3 Locating devices		
7.4 Clamping devices		
7.5 Types of Jigs – Drilling jigs, bushes, template jigs, plate jig, channel jig, leaf jig.		
7.6 Fixture for milling, turning, welding, grinding		
7.7 Advantages of jigs and fixtures		
<b>8. CUTTING FLUIDS AND LUBRICANTS</b>	<b>1</b>	<b>4</b>
8.1 Function of cutting fluid		
8.2 Types of cutting fluids		
8.3 Difference between cutting fluid and lubricant		
8.4 Selection of cutting fluids for different materials and operations		
8.5 Common methods of lubrication of machine tools.		

**PRACTICAL** **45**

**Suggested list of exercises / Job :**

**Turning Shop**

- Job 1. Grinding of single point turning tool.
- Job 2. Exercise of simple turning and step turning.
- Job 3. A composite job involving, turning, taper turning, external thread cutting and knurling.

**Advanced Fitting Shop**

- Job 1. Exercise on drilling, reaming, counter boring, counter sinking and tapping
- Job 2. Dove tail fitting in mild steel
- Job 3. Radius fitting in mild steel
- Job 4. Pipe threading with die

**Machine Shop**

- Job 1. Prepare a V-Block up to  $\pm 0.5$  mm accuracy on shaper machine
- Job 2. Exercise on key way cutting and spline cutting on shaper machine.

**SUGGESTED LEARNING RESOURCES:**

**Reference Books :**

1. B.S. Raghuwanshi *Workshop Technology* Dhanpat Rai and Sons; Delhi
2. Workshop manual : P.Kannaiah & K.L.Narayana, SCITECH – Publication
3. M. Adithan and A.B. Gupta *Manufacturing Technology* New Age International



- (P) Ltd, Delhi.
4. SK Choudhry and Hajra **Elements of Workshop Technology** Asia Publishing House
  5. PC Sharma *A Text Book of Production Engineering* S Chand and Company Ltd. Delhi

## ENGINEERING MECHANICS

L        T        P  
3        0        0

Curri. Ref. No. G205

**Total Contact hrs.:**

**Total marks: 100**

**Theory:**

Theory: 45

End Term Exam: 75

Tutorial : 0

P.A.: 25

Practical: 0

**Credit: 3**

**Rationale:** Engineering Mechanics in Diploma Programme is intended to expose the students to the Principles of Mechanics including Static, Kinematics and Dynamics. The knowledge of this subject will be use full in higher level of courses like Strength of Material, Theory of structure, Theory of Machines and Machine design etc.

The selected topics aimed to develop in the students the ability to analyze system of forces and motion met within the field of Engineering.

### DETAIL COURSE CONTENT

#### THEORY :

UNIT TOPIC / SUB-TOPIC	Lecture Hrs.	Marks
<b>1.0 INTRODUCTION</b>	<b>3</b>	<b>5</b>
1.1 Definition of Statics, Mechanics, Kinetics, Kinematics, Dynamics		
1.2 Units of Measurement		
1.3 Units Conversion		
1.4 Scalar and vector quantity		
<b>2.0 CO IPOSITION &amp; RESOLUTION OF FORCES</b>	<b>11</b>	<b>18</b>
2.1 Definition of force		
2.2 Measurement and effect of force		
2.3 Composition of forces		
2.4 Methods of finding resultant of forces – Analytical and Graphical methods		
2.5 Classification for forces		
2.6 Law of Parallelogram of forces, Concepts & equilibrium of forces in two dimension, Free body concept and diagram, Lami's theorem, equation of equilibrium		
<b>3.0 CENTRE OF GRAVITY AND CENTROID &amp; MOMENT OF INERTIA</b>	<b>8</b>	<b>13</b>
3.1 Difference between Centre of Gravity (C.G) and Centroid		
3.2 Methods of finding-out C.G. of simple geometrical plane figures		

3.3	C.G. of standard solids: rod, rectangular prism, circular disk, circular cylinder, hollow cylinder, circular cone, solid sphere, hollow sphere and composite solid.		
3.4	Centroid of standard shapes: rectangle, parallelogram, triangle, circle, quarter circle, semi circle, sector of a circle and composite area		
3.5	Standard Sections: I-Section, C-Section, H-Section, T- Section, L-Section		
3.6	Theorem of moment		
3.7	Simple numerical problems on determination of C.G. & Centroid		
3.8	Concept of moment of inertia and second moment of area		
3.9	Radius of gyration		
3.10	Theorem of perpendicular axis and parallel axis (without derivation)		
3.11	Second moment of area of common geometrical sections :Rectangle, Triangle, Circle (without derivation); Second moment of area for L,T and I section		
<b>4.0</b>	<b>FRICITION AND ITS APPLICATIONS</b>	<b>4</b>	<b>7</b>
4.1	Definition and Concept of Friction		
4.2	Law of Friction, Co-efficient of friction, angle of friction, angle of repose		
4.3	Types of friction		
4.4	Screw Jacks – Friction, Relation between effort & load		
4.5	Simple numerical problems		
<b>5.0</b>	<b>MOTION AND ITS APPLICATIONS</b>	<b>3</b>	<b>5</b>
5.1	Definitions of speed, velocity, acceleration, uniform and variable Acceleration		
5.2	Newton’s law of Motion – Applications		
5.3	Angular displacement, Angular Velocity, Angular Acceleration, Relative Velocity		
5.4	Simple Engineering Problems		
<b>6.0</b>	<b>MOTION OF PROJECTILE</b>	<b>3</b>	<b>5</b>
6.1	Definition of Trajectory		
6.2	Velocity of Projection, Angle of Projection		
6.3	Time of flight and range		
6.4	Derivation of the equation of motion of a Projectile and its application		
<b>7.0</b>	<b>CURVILINEAR MOTION AND CENTRIPETAL FORCE</b>	<b>5</b>	<b>8</b>
7.1	Definition of Centripetal and Centrifugal forces		
7.2	Importance of Super-elevation Expression		
7.3	Simple Engineering Problem.		
<b>8.0</b>	<b>WORK, POWER AND ENERGY</b>	<b>5</b>	<b>9</b>
8.1	Definition of work & its unit		
8.2	Definition of Power		

- 8.3 Definition of Kinetic and Potential Energy
- 8.4 Work done in rotation
- 8.5 Force displacement diagram
- 8.6 Work done in machines used for lifting
- 8.7 Power of Engines & Pumps
- 8.8 Fly Wheels – Changes in speed and in Kinetic Energy
- 8.9 Simple Engineering Problems on work, Power and Energy.

## 9.0 SIMPLE MACHINES

3 5

- 9.1 Definition of effort, Mechanical Advantage (MA)  
Velocity Ratio (V.R) efficiency of machine, Law of Machines
- 9.2 Screw Jack, Wheel & Axle, Rope & Pulley
- 9.3 Simple Calculations **SUGGESTED**

### LEARNING RESOURCES: Reference Books :

1. R. K. Bansal *A Text Book Engineering Mechanics* Laxmi Publications
2. R. S. Khurmi *A Text book of Engineering Mechanics* S.Chand & Co Ltd.
3. S. Ramamurtham *Engineering Mechanics & Strength of Materials* Dhanpat Rai Publishing Co(P) Ltd.
4. Basudeb Bhattacharyya *Engineering Mechanics* Oxford University Press
5. Ali Hassan and R. A. Khan *Fundamentals of Engineering Mechanics* Acme Learning Pvt. Ltd.
6. J. L. Meriam and L. G. Kraige *Engineering Mechanics* Dynamics, John Wiley and Sons (Asia) Pvt. Ltd., Singapore, 2002.
7. I. H. Shames *Engineering Mechanics* Prentice-Hall of India Pvt. Ltd. New Delhi, 1995

## INTRODUCTION TO COMPUTER PROGRAMMING

L        T        P  
2        1        2

Curri. Ref. No.: G206A

**Total Contact hrs :**

**Total marks: 100**

**Theory:**

Theory: 30

End Term Exam: 50

Tutorial: 15

P.A.: 0

Practical: 30

**Practical:**

**Credit : 4**

End Term Exam: 25

PA : 25

### RATIONALE

This course is an introduction to the C-programming language. The student will be introduced to Flowcharts, Algorithm and Pseudo-code. They will also have knowledge of different types of programming language. The student will get acquainted with fundamentals of C Language like the character set, operators and expressions used and the control structure. They will learn to write programs containing the following C language features: simple data type, looping, branching, one-dimensional arrays and user-defined functions. The use of structured programming techniques, program readability, program documentation and testing will be emphasized.

### DETAIL COURSE CONTENT

#### THEORY:

UNIT	TOPIC/SUB-TOPIC	Lecture Hrs.	Marks
<b>1.0</b>	<b>INTRODUCTORY CONCEPTS</b>	6	10
	1.1 Introduction to Computers		
	1.2 Programming techniques		
	1.3 Flowcharts		
	1.4 Algorithm		
	1.5 Pseudo codes		
	1.6 Types of Programming Languages – Machine Level Language, Assembly Level Language, High Level Language, 4Gen. Language		
	1.7 Introduction to assembler, compilers, case tools		
	1.8 Introduction to C		
<b>2.0</b>	<b>C FUNDAMENTALS</b>	2	4
	2.1 The 'C' Character Set		
	2.2 Identifiers and Keywords		
	2.3 Data Types		
	2.4 Constants		
	2.6 Variables and Arrays		
	2.7 Declarations		
	2.8 Expressions		
	2.9 Statements		
	2.10 Symbolic Constants		

<b>3.0</b>	<b>OPERATORS AND EXPRESSIONS</b>	<b>2</b>	<b>3</b>
3.1	Arithmetic Operators		
3.2	Unary operators		
3.3	Relational and Logical Operators		
3.4	Assignment Operators		
3.5	The Conditional Operator		
3.6	Library Functions		
<b>4.0</b>	<b>DATA INPUT AND OUTPUT</b>	<b>2</b>	<b>3</b>
4.1	Preliminaries		
4.2	Single Character Input- The getchar Function		
4.3	Single Character Output-The putchar Function		
4.4	Entering Input data – The scanf function		
4.5	Writing Output Data – The printf function		
4.6	gets and puts Function		
<b>5.0</b>	<b>PREPARING AND RUNNING A COMPLETE C PROGRAM</b>	<b>2</b>	<b>3</b>
5.1	Planning a C Program		
5.2	Writing a C Program		
5.3	Entering the Program into the Computer		
5.4	Compiling and Executing the Program		
5.5	Error Diagnostics		
5.6	Debugging Techniques		
<b>6.0</b>	<b>CONTROL STATEMENTS</b>	<b>5</b>	<b>8</b>
6.1	Preliminaries		
6.2	Branching: The if-else statement		
6.3	Looping: while, do-while & for statements		
6.4	Nested Control Structures		
6.5	The switch statement		
6.6	The break statement		
6.7	The continue statement		
6.8	The Comma operator		
6.9	The goto statement		
<b>7.0</b>	<b>ARRAYS</b>	<b>6</b>	<b>10</b>
7.1	Defining an Array		
7.2	Processing and Array		
7.3	Passing Arrays to Functions		
7.4	Multidimensional Arrays		
7.5	Arrays and Strings		
<b>8.0</b>	<b>USER DEFINED FUNCTIONS</b>	<b>5</b>	<b>9</b>
8.1	Concepts of a User Defined Function		
8.2	Declaration of Function		
8.3	Function Prototypes/ signatures		
8.4	Function calling		
8.5	Passing Arguments to a Function		
8.6	Recursive functions		

## **PRACTICAL:**

### **Suggested demonstrations / tasks:**

#### **1.0 Introduction**

- 1.1 C language and its compilers
- 1.2 Keywords, expressions, constant
- 1.3 Primitive data types in C
- 1.4 Header files and library functions
- 1.5 Types of Variable
- 1.6 Pre-processor directive and Macro

#### **2.0 Using Program Control**

- 2.1 Conditional Statements
- 2.2 Iterative Statement
- 2.3 Unconditional jump and its restrictive usage
- 2.4 Importance of initialisation

#### **3.0 Working with Array**

- 3.1 Overview of array
- 3.2 One dimensional array
- 3.3 Multidimensional array
- 3.4 String representation
- 3.5 String manipulation

#### **4.0 Creating User defined Function**

- 4.1 Writing functions in C language
- 4.2 Function definition and function declaration
- 4.3 Writing void function
- 4.4 Writing parameter passing and global declaration
- 4.5 Scope of variables in function
- 4.6 Recursion: Binary search, quick sort

## **SUGGESTED LEARNING RESOURCES**

### Reference Books :

1. Programming in ANSI C – by E. Balagurusamy, TMH
2. C Programming Language, the (ANSI C version) – by Kernighan & Ritchie, PHI
3. Let Us C – by Yashwant Kanitkar, BPB
4. Programming in C – Schaum Series

## **LIST OF EQUIPMENT**

Hardware : Stand alone PC  
(for detail, please refer Annex –

I) Software : C Compiler

## INTRODUCTION TO INFORMATION TECHNOLOGY

L        T        P  
2        1        2

Curri. Ref. No. G206B

**Total Contact hrs.:**

Theory: 30

Tutorial: 15

Practical: 30

**Credit: 4**

**Total marks: 100**

**Theory:**

End Term Exam: 50

**Practical:**

End Term Exam: 25

P.A : 25

### RATIONALE

Information Technology is an in-avoidable part now-a-days. The discipline of Engineering is also being highly influenced by the recent development in the field of IT. This course emphasizes of the various components of Information Technology. The course deals with Hardware, Software and Communication technologies in brief that are the foundation of IT. It therefore becomes important for the students to understand the concept and develop necessary skills in different aspects of information technology.

### DETAIL COURSE CONTENT

#### THEORY:

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UNIT	TOPIC/SUB-TOPIC.	Lecture Hrs.	Marks
1.0	Introduction to IT - its components computer, communication & management	03	5
2.0	Introduction to Number System, Bits, Bytes, Word, Logical Gates, Truth Table, ASCII, BCD, Floating point and Fixed Point number representation.	06	10
3.0	Introductory ideas about the components of computer - Hardware - Central Processing Unit, Input Unit, Output Unit, Memory Unit, Auxiliary Unit, Peripherals - Monitor, Keyboard, Mouse, Printer, Hard disk, CD / DVD, USB storage devices, Micro SD Cards, etc. Software and firmware building blocks of a computer, its function and its use. Role of operating system.	08	13
4.0	Classification of software - System Software, Application Software Translator - Compiler, Interpreter, Preprocessor Operating System - Single User, Multiple User	06	10



	Windows XP/Vista / 7 / 8 - Definition of Windows, Windows element, Concept of Graphical user Interface, Concept of Icon, Working with File Management, Concept of GUI based software; concept of client & server, concept of www, Internet services, use of standard browsers, basics of HTML and searching.		
5.0	Computer communication interface, introductory concepts of networking, Transmission media – Wired and Wireless, use of Modem Concept of LAN, WAN, Internet, Intranet, Email.	07	12

**PRACTICAL:**

**Suggested demonstration / tasks :**

1.	Introduction to MS Office	01
	Basic features of Ms Office, Overview of Different Office Tools	
2.	Introduction to MS Word	08
	Creating and Editing document, Formatting Documents, Working with Tables, Spell checking, Mail Merging, Importing Graphics into word Document	
3.	Introduction to MS Excel	09
	Creating a New Work Book, Entering Labels, Values and Formulas, Formatting the layout, Working with Functions, Creating the Chart from data, Writing macros	
4.	Introduction to Power Point	07
	Creating a Presentation, Adding/Editing Text, Working with objects, Formatting the Presentation, Placing the chart in slide, Slide Show and Printing	
5.	Internet Browsing and Emailing	05
	Internet surfing and browsing, searching content from the Internet using search engines, Email – account opening, composition of e-mails, searching mails, forward and reply of mails	

## Introduction to C–Programming

*L*      *T*      *P*  
2      0      4

**Curri. Ref. No.:** CSE206

**Total Contact hrs : 105**

**Total marks: 200**

Theory: 100

*Theory: 45*

*End Term Exam: 75*

*Tutorial: 15*

*L.A.: 25*

*Practical: 60*

Practical: 100

**Credit : 6**

*End Term Exam: 50*

*L.A : 50*

### Theory

Total Periods: 45

Periods: 3 P/W

UNIT	TOPIC/SUB-TOPIC	TOTAL HRS.	Marks
1.	<b>Introductory Concept</b>	2	4
	1.1 Introduction to Computers		
	1.2 Computer Characteristics		
	1.3 Modes of Operation		
	1.4 Types of Programming Languages		
	1.5 Introduction to C		
2.	<b>C Fundamentals</b>	3	5
	2.1 The 'C' Character Set		
	2.2 Identifiers and Keywords		
	2.3 Data Types		
	2.4 Constants		
	2.6 Variables and Arrays		
	2.7 Declarations		
	2.8 Expressions		
	2.9 Statements		
	2.10 Symbolic Constants		
3.	<b>Operators and Expressions</b>	2	4
	3.1 Arithmetic Operators		
	3.2 Unary operators		
	3.3 Relational and Logical Operators		
	3.4 Assignment Operators		
	3.5 The Conditional Operator		
	3.6 Library Functions		
4.	<b>Data Input and Output</b>	3	5
	4.1 Preliminaries		
	4.2 Single Character Input- The getchar Function		
	4.3 Single Character Output-The putchar Function		
	4.4 Entering Input data – The scanf function		
	4.5 Writing Output Data – The printf function		
	4.6 gets and puts Function		

5.	<b>Preparing and running a complete C Program</b>	3	5
	5.1 Planning a C Program		
	5.2 Writing a C Program		
	5.3 Entering the Program into the Computer		
	5.4 Compiling and Executing the Program		
	5.5 Error Diagnostics		
	5.6 Debugging Techniques		
6.	<b>Control Statements</b>	5	8
	6.1 Preliminaries		
	6.2 Branching: The if-else statement		
	6.3 Looping: while, do-while & for statements		
	6.4 Nested Control Structures		
	6.5 The switch statement		
	6.6 The break statement		
	6.7 The continue statement		
	6.8 The Comma operator		
	6.9 The goto statement		
7.	<b>Functions</b>	5	8
	7.1 Concepts of a Function		
	7.2 Accessing a Function		
	7.3 Function Prototypes		
	7.4 Passing Arguments to a Function		
	7.5 Recursion		
8.	<b>Program Structures</b>	5	8
	8.1 Storage Classes		
	8.2 Automatic Variables		
	8.3 External (Global) Variables		
	8.4 Static Variables		
9.	<b>Arrays</b>	4	7
	9.1 Defining an Array		
	9.2 Processing and Array		
	9.3 Passing Arrays to Functions		
	9.4 Multidimensional Arrays		
	9.5 Arrays and Strings		
10.	<b>Pointers</b>	6	10
	10.1 Concepts of pointers & its role in C programming		
	10.2 Pointer Declarations		
	10.3 Passing Pointers to Functions		
	10.4 Pointers and one-dimensional Arrays		
	10.5 Dynamic Memory Allocation		
	10.6 Operations on Pointers		
	10.7 Pointers and Multidimensional Arrays		
	10.8 Arrays of Pointers		
	10.9 Passing Functions to Other Functions		
11.	<b>Structures and unions</b>	4	6
	11.1 Defining a structure		
	11.2 Processing a Structure		
	11.3 Unions		

12.	<b>Data files</b>	3	5
12.1	Opening and closing a Data File		
12.2	Creating a Data File		

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45

## **Practical**

Total Periods: 60

Periods: 4 P/W

1. **Introduction**
  - 1.1 C language and its compilers
  - 1.2 Keywords, expressions, constant
  - 1.3 Primitive data types in C
  - 1.4 Header files and library functions
  - 1.5 Types of Variable
  - 1.6 Pre-processor directive and Macro
  
2. **Using Program Control**
  - 2.1 Conditional Statements
  - 2.2 Iterative Statement
  - 2.3 Unconditional jump and its restrictive usage
  - 2.4 Importance of initialisation
  
3. **Working with Array**
  - 3.1 Overview of array
  - 3.2 One dimensional array
  - 3.3 Multidimensional array
  - 3.4 String representation
  - 3.5 String manipulation
  
4. **Creating User defined Function**
  - 4.1 Writing functions in C language
  - 4.2 Function definition and function declaration
  - 4.3 Writing void function
  - 4.4 Writing parameter passing and global declaration
  - 4.5 Scope of variables in function
  - 4.6 Recursion: Binary search, quick sort
  
5. **Using Pointers**
  - 5.1 Overview of pointer
  - 5.2 Pointer and array
  - 5.3 Dynamic allocation using pointers
  - 5.4 Pointer to pointer
  - 5.5 Parameter passing using pointer
  - 5.6 Using command line argument

6.     **Application of Structure and Union**
  - 6.1    Over of structure
  - 6.2    Array of structure
  - 6.3    Pointer to structure
  - 6.4    User defined data type
  - 6.5    Representation linked list: Stacks Queries
  - 6.6    Representation of binary tree
  - 6.7    Representation of generalized tree
  - 6.8    Union
  
7.     **Low Level Programming in C**
  - 7.1    Bitwise operation
  - 7.2    Register handling
  - 7.3    Enumerated data type
  
8.     **File Handling in C**
  - 8.1    Modes of file handling
  - 8.2    Linking file pointer

**REFERENCE BOOKS :**

1.     Programming in ANSI C – by E. Balagurusamy, TMH
2.     C Programming Language, the (ANSI C version) – by Kernighan & Ritchie, PHI
3.     Let Us C – by Yashwant Kanitkar, BPB
4.     Programming in C – Schaum Series

**LIST OF EQUIPMENT**

Hardware :     Stand alone PC  
                  (for detail, please refer Annex – I)

Software :     C Compiler

## FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING

L 3	T 0	P 2	Curri. Ref. No. G207
<b>Total Contact hrs :</b> Theory: 45 Tutorial :0 Practical: 30 <b>Credit: 4</b>		<b>Total Marks: 150</b>	<b>Theory:</b> End Term Exam: 75 P. A: 25 <b>Practical:</b> End Term Exam: 25 P. A: 25

### RATIONALE

The application of Electrical and Electronic circuits is widespread in all sphere of Engineering. Even knowledge of this subject is essential in Mechanical or Civil Engineering related disciplines. This subject covers the basic electrical principles both in d.c. and a.c. circuits, fundamental principles of Magnetic circuits, basic knowledge of semiconductor physics, working principles of diode, transistors, field effect transistors, feedback amplifiers.

### DETAIL COURSE CONTENT

#### THEORY:

UNIT	TOPIC/SUB-TOPIC	Lecture Hrs.	Marks
<b>1.0</b>	<b>D. C. CIRCUITS</b> 1.1 Define e.m.f. and p.d., electric current, resistance, resistivity and conductivity. 1.2 State Ohm's Law and calculate resistance. 1.3 Define electrical power and energy, 1.4 Explain heating effect of electric current, relation between electrical, mechanical and heat units. 1.5 Describe effect of temperature on resistance and resistivity. 1.6 Explain series parallel combination of resistances and division of current through them. 1.7 State and explain Kirchoff's laws (KCL & KVL) and its application to series, parallel & combination circuits.	<b>4</b>	<b>7</b>
<b>2.0</b>	<b>A.C. CIRCUITS</b> 2.1 Define cycle, time period, frequency, amplitude of A. C. Signal (voltage). 2.2 Explain generation of A.C. signal (voltage). 2.3 Define phase, phase difference, R.M.S, average value, form factor and ripple factor with mathematical equation. 2.4 Explain vector representation of A. C. Signal (voltage) 2.5 Explain A. C. circuits with pure resistance, pure inductance, pure capacitance, voltage-current relationship and phasor diagram. 2.6 Explain simple series and parallel RL, RC, RLC circuits and solutions using analytical method. 2.7 Explain series and parallel resonating RLC circuits. 2.8 Define active power, reactive power, apparent power and power factor using power triangle.	<b>8</b>	<b>13</b>

**3.0 ELECTRO-MAGNETISM & MAGNETIC CIRCUITS 10 17**

- 3.1 Describe Magnetic field in a current carrying conductor.
- 3.2 State Fleming's left hand rule.
- 3.3 Describe Force on a current carrying conductor in a magnetic field.
- 3.4 Derive Force between two current carrying conductors.
- 3.5 State BIOT SAVART'S Law.
- 3.6 Define Electromagnetic induction.
- 3.7 State Lenz's Law and Flemings Right hand Rule.
- 3.8 Define Self inductance, Mutual inductance & Co-efficient of coupling.
- 3.9 State Dot Convention in Mutual inductance
- 3.10 Derive Energy store in inductor.
- 3.11 Define Magnetomotive force, Magnetic field intensity, Reluctance, Permeance, Permeability,
- 3.12 State B-H Characteristics of Magnetic materials.
- 3.13 Describe Magnetic circuit and its comparisons with Electric circuit.
- 3.14 Describe Series and parallel Magnetic circuit

**4.0 SEMICONDUCTOR 5 8**

- 4.1 Explain structure of solid.
- 4.2 Classify solids.
- 4.3 Explain energy band theory of solids.
- 4.4 Explain energy level diagram of conductors, semiconductor and insulators.
- 4.5 Define drift velocity, current density, conductivity, mobility and energy gap.
- 4.6 Define intrinsic and extrinsic semiconductor.
- 4.7 Define acceptor and donor type impurities.
- 4.8 Explain conduction in intrinsic and extrinsic semiconductor.
- 4.9 Explain properties of semiconductor materials.

**5.0 DIODE AND CIRCUITS. 5 8**

- 5.1 Discuss construction and working principle of p-n junction diode.
- 5.2 Biasing of p-n junction diode.
- 5.3 Define depletion layer, barrier voltage, reverse saturation current, junction capacitance of p-n junction diode.
- 5.4 Effect of voltage on depletion capacitance and diffusion capacitance.
- 5.5 Explain the current voltage characteristic of p-n junction diode.
- 5.6 Effect of temperature on I-V characteristic of p-n junction diode.
- 5.7 Define and classify the rectifiers and explain working of different types of rectifiers.
- 5.8 Derive efficiency of half-wave rectifier and full-wave rectifiers.
- 5.9 Define ripple factor.
- 5.10 Derive expression for ripple factor for half-wave & full-wave rectifier.
- 5.11 Describe construction, working and I-V characteristics of Zener diode.

<b>6.0</b>	<b>TRANSISTOR AND CIRCUITS</b>	<b>4</b>	<b>7</b>
6.1	Discuss construction and working principle of p-n-p and n-p-n transistor.		
6.2	Explain different types of transistor configurations (CB, CE and CC).		
6.3	Explain input & output characteristics of transistors in different configurations.		
6.4	Define $\alpha$ and $\beta$ and derive relation between $\alpha$ and $\beta$ of transistors.		
6.5	Explain Transistor as a switch.		
6.6	Explain Transistor as an amplifier.		
6.7	Explain the different transistor biasing circuits.		
6.8	Draw the load line and determine the Q- point.		
<b>7.0</b>	<b>FIELD EFFECT TRANSISTOR</b>	<b>4</b>	<b>7</b>
7.1	State concept of FET.		
7.2	Differentiate between JFET & BJT.		
7.3	Classify FET.		
7.4	Explain construction, working principle & characteristics of JFET.		
7.5	Explain JFET as an amplifier.		
7.6	Define parameters of JFET.		
7.7	Establish relation among JFET parameters.		
7.8	Explain JFET biasing method and connection.		
7.9	Explain construction & working principle of MOSFET.		
<b>8.0</b>	<b>FEED BACK AMPLIFIER &amp; OSCILLATOR.</b>	<b>3</b>	<b>5</b>
8.1	Define feedback amplifier.		
8.2	Explain principle of negative feed back with the help of block diagram.		
8.3	Define gain of an amplifier with feedback.		
8.4	Explain principle of working, characteristics & use of emitter follower.		
8.5	State and explain fundamental principle of working of oscillators.		
8.6	Explain Barkhausen criteria.		
8.7	Differentiate between amplifier and oscillators.		
8.8	Explain construction, working principle of Hartley and Collpits oscillators.		
<b>Class Test</b>		<b>2</b>	<b>3</b>



## **PRACTICAL:**

### **Suggested list of experiments:**

1. Verify Ohm's Law in DC Circuit.
2. Verify Kirchhoff's voltage and current law in a D.C. circuit.
3. Verify equivalent resistance in a series / parallel D.C. circuit
4. Determine resonant frequency & Q-factor in a series and parallel RLC circuit.
5. Determine mutual inductance in a coupled circuit.
6. Determine self inductance and power factor of choke coil.
7. Develop the charging and discharging curve of voltage across the capacitor connected in series with a resistance.
8. Study Diode Characteristics.
9. Study Transistor Characteristics.
10. Construct half wave, full wave bridge rectifier circuits and study the output waveforms and the input and output voltage levels (peak and RMS).
11. Study Zener diode characteristics
12. Construct single stage transistor amplifier and measure  $Z_{in}$ ,  $Z_{out}$  and gain. Plot its frequency response curve and find its band with.
13. Construct emitter follower and plot its frequency response curve and find its bandwidth.
14. Study of FET.
15. Study of oscillators.

## **SUGGESTED LEARNING RESOURCES**

### **Reference Books:**

1. Electrical Technology by B.L. Thareja and A.K. Thareja
2. Electrical Technology by J.B. Gupta.
3. Basic Electrical Engineering by A. Chakrabarti.
4. Principle of Electronics by V.K.Meheta.
5. Electronics Fundamentals and Applications by D. Chottopadhyay and Rakshit.
6. Electronics Devices by G.K.Mithal.
7. Electronics Devices & Circuit theory by Robert Boyelstad.
8. Basic Electronics by S. K. Mandal.

## ENGINEERING ECONOMICS AND ACCOUNTANCY

L      T      P  
3      0      0

Curri. Ref. No.: G303

**Total Contact hrs.:**

**Total marks: 100**

**Theory:**

Theory: 45

End Term Exam: 75

Tutorial: 0

P.A.: 25

Practical: 0

**Credit: 3**

### RATIONALE

The knowledge of Engineering Economics and Accountancy is needed by personnel dealing with the cost of products of any kind related to quality and standards of production including its financial control. Engineers / Technicians, in general, need to know the cost of the final products for marketing purposes. The knowledge of Economics as well as Accountancy is required by all people dealing in any business or enterprise.

This particular subjects deals in basic concepts of economics, production of commodities, different types of industries, market forms, objective of economic planning, concept of value of money, causes of unemployment, industrial policy, business transaction and accountancy, maintenance of cash and balances, receipt and expenditures and final accounts.

### DETAIL COURSE CONTENT

#### THEORY:

UNIT TOPIC / SUB-TOPIC		Lecture Hrs. Marks	
<b>1.0</b>	<b>INTRODUCTION</b>	<b>1</b>	<b>2</b>
	1.1 Introduction to Economics and its Utility of study		
	1.2 Importance of the study of Economics		
<b>2.0</b>	<b>BASIC CONCEPTS OF ECONOMICS</b>	<b>3</b>	<b>5</b>
	2.1 Definition of Utility, Consumption, Want, Value, Price, Goods, National Income.		
	2.2 Classification of goods, characteristics and classification of wealth.		
	2.3 Basic Laws of demand and supply.		
	2.4 Concept and Measurement of Elasticity of demand		
<b>3.0</b>	<b>PRODUCTION</b>	<b>3</b>	<b>5</b>
	3.1 Meaning and factors of production.		
	3.2 Land, Labour, Capital and Organisation		
	3.3 Formation of Capital, Break even chart-its uses.		

<b>4.0</b>	<b>SCALE OF INDUSTRIES</b>	<b>2</b>	<b>3</b>
4.1	Definition, advantages and disadvantages of small, medium and large scale production		
4.2	Internal and External Economies		
<b>5.0</b>	<b>MARKET FORMS</b>	<b>3</b>	<b>5</b>
5.1	Definition and types of Markets in respect of present trends.		
5.2	Features of Perfect, Imperfect and monopoly markets.		
5.3	Price determination under perfect competition and monopoly		
<b>6.0</b>	<b>ECONOMIC PLANNING</b>	<b>3</b>	<b>5</b>
6.1	Features of Under-developed and Developing Countries.		
6.2	Meaning, objectives and needs of planning.		
6.3	Introduction to industrial development in India during the five year plans.		
<b>7.0</b>	<b>MONEY</b>	<b>3</b>	<b>5</b>
7.1	Meaning and functions of Money		
7.2	Introduction to the concept of the value of money		
7.3	Meaning of Inflation, Deflation, Stagnation.		
<b>8.0</b>	<b>UNEMPLOYMENT</b>	<b>2</b>	<b>3</b>
8.1	Meaning, types and causes of Unemployment		
8.2	Unemployment problems in India		
<b>9.0</b>	<b>INDUSTRIAL POLICY</b>	<b>3</b>	<b>5</b>
9.1	Current Industrial Policy		
9.2	Industrial licensing Policy, De-licensing		
9.3	Monopolistic and Restricted Trade practices (MRTP) Foreign Exchange Regulation Act (FERA).		
<b>10.0</b>	<b>BUSINESS TRANSACTIONS AND ACCOUNTANCY</b>	<b>5</b>	<b>9</b>
10.1	Transactions and classifications, need and objectives of proper records including double entry system.		
10.2	Classification of Accounts and its description (in respect of real accounts, personal accounts and nominal accounts)		
10.3	Debit and credit concept; golden rules of debit and credit.		
10.4	Objectives and principles of double entry book-keeping.		
<b>11.0</b>	<b>BOOKS OF ACCOUNTS</b>	<b>2</b>	<b>3</b>
11.1	Journal and Ledger, their sub-divisions; posting from journals to ledger.		
11.2	Balancing of Accounts		
<b>12.0</b>	<b>CASH BOOK</b>	<b>2</b>	<b>4</b>
12.1	Objective of Cash Book (in respect of all kinds of Cash transactions)		
12.2	Single column, double column and triple column cash book		
12.3	Imprest system of Petty Cash Book.		

<b>13.0</b>	<b>TRIAL BALANCE</b>	<b>2</b>	<b>3</b>
13.1	Objective, Preparation, errors and rectification (in respect of balance of accounts for the total period).		
<b>14.0</b>	<b>FINAL ACCOUNTS</b>	<b>5</b>	<b>8</b>
14.1	Steps of preparing accounts; Trading Account; Profit and Loss Account		
14.2	Revenue and Depreciation adjustment		
14.2	Introduction to balance sheet		
<b>15.0</b>	<b>CAPITAL AND REVENUE EXPENDITURE DISTRIBUTION</b>	<b>3</b>	<b>5</b>
15.1	Receipts and payments		
15.2	Income and Expenditure differences		
<b>16.0</b>	<b>MEANING AND PURPOSE OF COSTING</b>	<b>2</b>	<b>3</b>
16.1	Elements of Cost-Analysis and classification of expenditure for cost accounts.		
16.2	Cost Control – Prime cost, Overhead cost, and Indirect materials and tools.		
<b>17.0</b>	<b>ELECTRONICS COMMERCE – MEANING – SCOPE</b>	<b>1</b>	<b>2</b>
17.1	Accounting Software – Tally latest version		

**SUGGESTED LEARNING RESOURCES:**

**Reference Books :**

1. Agrawal, A.N., Indian Economy, New Delhi ; wish Prahashan, 2005
2. Wali, B.M., and A.B. Kalkundrikar – Managerial Economics, New Delhi : **R.Chand and Co., 1983**

## ENTREPRENEURSHIP DEVELOPMENT

L        T        P  
3        0        0

Curri. Ref. No.: G304

**Total Contact hrs.:**

**Total marks: 100**

**Theory:**

Theory: 45

End Term Exam: 75

Tutorial :0

P.A.: 25

Practical: 0

Credit: 3

### RATIONALE

The course intends to provide the fundamental aspects of entrepreneurship as a means for self employment and culminating in economic development of the country. It deals with basic issues like entrepreneurial characteristics and quality, governmental policy support and overall scenario along with opportunities and the facilities available for entrepreneurship development.

### DETAIL COURSE CONTENT

#### THEORY:

UNIT TOPIC / SUB-TOPIC	Lecture Hrs.	Marks
<b>1.0 INTRODUCTION</b>	<b>10</b>	<b>16</b>
1.1 Definition and functions of Entrepreneur, entrepreneurship quality, entrepreneurial spirit, need for entrepreneurship.		
1.2 Individual and social aspects of business – achievement motivation theory		
1.3 Social responsibilities of Entrepreneurs		
<b>2.0 FORMS OF BUSINESS ORGANISATION</b>	<b>4</b>	<b>7</b>
2.1 Types of company		
2.2 Merits and demerits of different types		
2.2 Registration of small scale industries		
2.4 Conglomeration.		
<b>3.0 SMALL SCALE AND ANCILLARY INDUSTRIES</b>	<b>8</b>	<b>13</b>
3.1 Definition – scope with special reference to self employment.		
3.2 Procedure to start small scale and Ancillary industries		
3.3 Pattern on which the Scheme/Project may be prepared		
3.4 Sources of finance - Bank, govt., and other financial institutions.		
3.5 Selection of site for factory		
3.6 Factors of selection		
3.7 N.O.C. from different authorities, e.g., Pollution Control Board, Factories Directorate etc.		
3.8 Trade License.		

<b>4.0</b>	<b>SYSTEM OF DISTRIBUTION</b>	<b>1</b>	<b>2</b>
4.1	Wholesale Trade		
4.2	Retail trade		
<b>5.0</b>	<b>SALES ORGANISATION</b>	<b>3</b>	<b>5</b>
5.1	Market survey, marketing trends, knowledge of competitors, product selection & its basis .		
5.2	Sales promotion		
5.3	Advertisement		
5.4	Public relations and selling skills		
<b>6.0</b>	<b>PRICING THE PRODUCT</b>	<b>1</b>	<b>2</b>
6.1	Basic guidelines		
<b>7.0</b>	<b>INTRODUCTION TO IMPORT AND EXPORT</b>	<b>6</b>	<b>10</b>
7.1	Procedures for export		
7.2	Procedures for import		
7.3	Technical collaboration – international trade		
7.4	Business insurance		
7.5	Rail and road transport		
7.6	Forwarding formalities, FOR, FOB, CIF, etc.		
<b>8.0</b>	<b>BUSINESS ENQUIRIES</b>	<b>4</b>	<b>7</b>
8.1	Enquiries: From SISI, DIC, SFC Dept. of Industrial Development Banks.		
8.2	Offers and Quotations		
8.3	Orders		
<b>9.0</b>	<b>PROJECT REPORT</b>	<b>6</b>	<b>10</b>
9.1	Project Report on feasibility studies for small scale industries, proposal for finances from bank and other financial institutions for establishing new industries and its extension, obtaining License enlistment as suppliers, different vetting organizations for Techno Economic feasibility report. Breakeven analysis, Breakeven point.		
<b>10.0</b>	<b>ENVIRONMENT LEGISLATION</b>	<b>2</b>	<b>3</b>
10.1	Air Pollution Act		
10.2	Water Pollution Act		
10.3	Smoke Nuisance Control Act		
10.4	ISO: 14000, OSHA		

## **SUGGESTED LEARNING RESOURCES:**

### **Reference Books:**

1. Entrepreneurship Development  
Prepared by CTSC Manila Publishers by Tata Mc Graw Hill Publishing Co. Ltd.
2. Small Enterprise Management Published by ISTE, Mysore
3. Motivation Published by ISTE, Mysore
4. S.S.M. in Environmental Engineering Published by ISTE, Mysore
5. Entrepreneurship New Venture Creations, Holt, Prentice Hall, India.
6. Essence of TQM by John Bank
7. Rathore, B.S. and J.S. Saini(ed), A Handbook of Entrepreneurship – Panchkula :  
Aapga, 1997
8. Jose Pauletal, Entrepreneurship Development, Mumbai : Himalaya Publishing  
House, 1996
9. Khanka, S.S., Entrepreneurship Development, New Delhi : S. Chand and Co.,  
2001
10. Nagarazan, R.S. and A.A. Arivalagar, TQM New Delhi : New Age International  
Publishers, 2005
11. Bhatia, R.C., Marketing Communication and Advertising, New Delhi : Galgotia  
Publishing Co., 2003
12. Sinha, J.C., and V.N. Mugali : A Textbook of Commerce, New Delhi : R. Chand  
and Co., 1994

## PRINCIPLES OF MANAGEMENT

L        T        P  
3        0        0

Curri. Ref. No. G305

**Total Contact hrs.:**

**Total marks: 100**

**Theory:**

Theory: 45

End Term Exam: 75

Tutorial :0

P.A.: 25

Practical : 0

**Credit: 3**

### RATIONALE

Management is the integrated component of all areas of technological courses as recognized across the world. Technicians or supervisors coming out of the system hence need to study the basics components of the management relevant to them. Principals of management will enable them to apply basic knowledge of management in their field of work. Keeping with this in mind necessary content details of the course on Principles of Management has been developed. With the assumption that, it will develop some management foundation to the diploma students.

### DETAIL COURSE CONTENT

#### THEORY:

UNIT TOPIC / SUB-TOPIC	Lecture Hrs.	Marks
<b>1.0 FRAMEWORK OF MANAGEMENT</b>	<b>8</b>	<b>13</b>
1.1 Nature of management		
1.2 Development of management thoughts		
1.3 Management and process skills		
<b>2.0 PLANNING</b>	<b>9</b>	<b>15</b>
2.1 Fundamentals of planning		
2.2 Planning premises and forecasting		
2.3 Decision making		
2.4 Mission and objective		
<b>3.0 ORGANIZING</b>	<b>10</b>	<b>17</b>
3.1 Fundamentals of organizing		
3.2 Design of organization structure		
3.3 Forms of organization structure		
3.4 Power and authority		
3.5 Authority relationship		
<b>4.0 STAFFING</b>	<b>8</b>	<b>13</b>
4.1 Fundamentals of staffing		
4.2 HR planning		
4.3 Recruitment and selection		
4.4 Training and development		
4.5 Performance appraisal		



<b>5.0 DIRECTING</b>	<b>6</b>	<b>10</b>
5.1 Fundamentals of directing		
5.2 Operational control techniques		
5.3 Overall control technique		
<b>6.0 TOTAL QUALITY MANAGEMENT</b>	<b>4</b>	<b>7</b>
6.1 Concepts and definitions		
6.2 Sages of quality gurus and their contributions		
6.3 Basic tools of TQM		

### **SUGGESTED LEARNING RESOURCES:**

Reference books:

1. Principles of management, by: T.Ramasamy (Himalya publishing house)
2. Management by: S. P. Robins
3. Management principles by: Anil Bhat and Arya Kumar
4. Principles and practice of management by LM Prasad
5. Principles of management by LM Prasad
6. Essentials of Management / Joseph L. Massie / Prentice-Hall of India

## ORGANIZATIONAL BEHAVIOUR

L        T        P  
3        0        0

Curri. Ref. No.:G306

**Total Contact hrs.:**

**Total marks: 100**

**Theory:**

Theory: 45

End Term Exam: 75

Tutorial :0

P.A.: 25

Practical: 0

**Credit: 3**

### RATIONALE

Knowledge in behavioural principles in an organization is an important requirement because concepts such as work motivation, behavioural patterns of individuals as also those of group of individuals etc are intimately related to it. Organizational Behavioural principles, its scopes, applicability etc. are therefore important to know by the students irrespective of the branch of specialization. Based of the above facts following content details of the subject on Organizational Behaviour has been suggested.

### DETAIL COURSE CONTENT

#### THEORY:

UNIT TOPIC / SUB-TOPIC	Lecture Hrs.	Marks
<b>1.0 ORGANIZATION:</b>	<b>8</b>	<b>13</b>
Concept and Definition Structures (line, staff, functional divisional, matrix)		
<b>2.0 MOTIVATION :</b>	<b>10</b>	<b>17</b>
Principles of Motivation Aspects of Motivation Job motivation Theories of motivation (Maslow, Herzberg, Theory of X&Y of Mc. Gregar)		
<b>3.0 DEVELOPING GOOD WORK HABITS:</b>	<b>10</b>	<b>17</b>
Principles of habit formation Attitude and values Personality- - Concepts - Theories - Personality and Behaviour		

<b>4.0 ORGANIZATIONAL CULTURE:</b>	<b>8</b>	<b>13</b>
Concepts and its importance Determinants of organizational culture Rules & regulations		
<b>5.0 TEAM BUILDING:</b>	<b>9</b>	<b>15</b>
Concepts		
Team and Group		
Formation of Team building		

**SUGGESTED LEARNING RESOURCES:**

**Reference Books:**

1. Organisational Behaviour — An introductory Text – Huezyski A. & Bucheman C. (Prentice Hall of India)
2. Image of Organisation — Morgan G. (Sage)
3. Understanding Management — Linstoand S. (Sage)
4. Organizational Behaviour — Robbins (Prentice Hall of India)
5. Understanding and Managing – Organizational Behavior — George & Jones
6. Organisational Behaviour, L.M. PRASAD, New Delhi, Sultan Chand & Sons
7. Essentials of Management — Koontz (Tata McGraw Hill)

## ENVIRONMENTAL EDUCATION

L            T            P  
3            0            0

Curri. Ref. No. G307

**Total Contact hrs.:**

**Total marks: 100**

**Theory:**

Theory: 45

End Term Exam: 75

Tutorial : 0

P.A.: 25

Practical : 0

**Credit: 3**

### RATIONALE

Management of Environmental Degradation as also its control using innovative technologies is of prime importance in the times we are living in. Since the days of the famed Rio Summit (1992) awareness about degradation of environment we live in an its management through participation of one and all has literally blossomed into a full fledged movement of universal importance. Technically qualified people, such as the Diploma Engineers, should not only be aware about new technologies to combat environmental degradation at their disposal but also various aspects of environment, ecology, bio-diversity, management, and legislation so that they can perform their jobs with a wider perspective and informed citizens. This course can be taken by all diploma students irrespective of their specializations.

### DETAILED COURSE CONTENT

#### THEORY:

UNIT TOPIC / SUB-TOPIC	Lecture Hrs.	Marks
<b>1.0 INTRODUCTION</b>	<b>2</b>	<b>4</b>
1.1 Introduction		
1.2 Environment and its components		
1.3 Environment in India		
1.4 Public Awareness		
<b>2.0 ECOLOGICAL ASPECTS OF ENVIRONMENT</b>	<b>8</b>	<b>13</b>
2.1 Ecology		
• Eco-system		
• Factors affecting Eco-system		
2.2 Bio-geochemical cycles		
• Hydrological cycle		
• Carbon cycle		
• Oxygen cycle		
• Nitrogen cycle		
• Phosphorous cycle		
• Sulphur cycle		
2.3 Bio-diversity		
2.4 Bio-diversity Index		

<b>3.0 NATURAL RESOURCES</b>	<b>5</b>	<b>8</b>
3.1 Definition of Natural Resources		
3.2 Types of Natural Resources		
3.3 Quality of life		
3.4 Population & Environment		
3.5 Water Resources		
• Sources of Water		
3.6 Water Demand		
3.7 Forest as Natural Resource		
• Forest and Environment		
• Deforestation		
• Afforestation		
• Forest Conservation, its methods		
3.8 Land		
• Uses and abuses of waste and wet land		
<b>4.0 GLOBAL ENVIRONMENTAL ISSUES</b>	<b>9</b>	<b>15</b>
4.1 Introduction		
4.2 Major Global Environmental Problems		
4.3 Acid Rain		
• Effects of Acid Rain		
4.4 Depletion of Ozone Layer		
• Effects of Ozone Layer Depletion		
4.5 Measures against Global Warming		
4.6 Green House Effect		
<b>5.0 ENVIRONMENTAL POLLUTION</b>	<b>9</b>	<b>15</b>
5.1 Introduction		
5.2 Water Pollution		
• Characteristics of domestic waste water		
• Principles of water treatment		
• Water treatment plant (for few industries only- unit operations & unit processes - names only)		
5.3 Air Pollution		
• Types of air pollutants		
• Sources of Air Pollution		
• Effects of Air Pollutants		
5.4 Noise Pollution		
• Places of noise pollution		
• Effect of noise pollution		
<b>6.0 CLEAN TECHNOLOGY</b>	<b>6</b>	<b>10</b>
6.1 Introduction to Clean Technologies		
6.2 Types of Energy Sources		
• Conventional Energy sources		
• Non-conventional sources of Energy		
6.3 Types of Pesticides		
6.4 Integrated Pest Management		

7.1 Introduction to Environmental Legislation

7.2 Introduction to Environmental Laws

**8.0 ENVIRONMENTAL IMPACT ASSESSMENT**

3

5

8.1 Introduction to Environmental Impact Assessment

8.2 Environmental Management (elements of ISO 14001)

8.3 Environmental ethics

**SUGGESTED IMPLEMENTATION STRATEGIES:**

The teachers are expected to teach the students as per the prescribed subject content. This subject does not have any practical but will have only demonstration and field visit as stated. The students will have to prepare report of the site visit.

**SUGGESTED LEARNING RESOURCES:**

(a) Reference Books:

S. No.	Title	Author, Publisher, Edition & Year
1.	Environmental Engineering	Pandya & Carny, Tata McGraw Hill, New Delhi
2.	Introduction to Environmental Engineering and Science	Gilbert M. Masters Tata McGraw Hill, New Delhi
3.	Waste Water Engineering – Treatment, Disposal & Reuse	Metcalf & Eddy Tata McGraw Hill, New Delhi
4.	Environmental Engineering	Peavy, TMH International New York
5.	Study / training materials, references, reports etc. developed by Central Pollution Control Board, New Delhi as also State Pollution Control Boards	Central Pollution Control Board Postal Address: Parivesh Bhawan, CBD-cum-Office Complex East Arjun Nagar, DELHI - 110 032, INDIA Tel.: 91-11-22307233 Fax: 91-11-22304948 e-mail: <a href="mailto:ccb.cpcb@nic.in">ccb.cpcb@nic.in</a>
6.	Environmental Science	Aluwalia & Malhotra, Ane Books Pvt. Ltd, New Delhi
7.	Text Book of Environment & Ecology	Sing, Sing & Malaviya, Acme Learning, New Delhi
8.	Environmental Science & Ethics	Sing, Malaviya & Sing, Acme Learning, New Delhi
9.	Environmental Chemistry	Samir K. Banerji, Prentice Hall of India, New Delhi

(b) Others:

1. Text book mentioned in the references
2. Lab Manuals
3. OHP Transparencies
4. Video film on Environment

**SUGGESTED LIST OF DEMONSTRATIONS/FIELD VISIT**

- pH value of water sample.
- Hardness of water
- Calcium hardness
- Total Hardness
- Residual Chlorine to a given sample of water

- Turbidity
- B.O.D.
- C.O.D.

**Visits: Following visits shall be arranged by the teachers during the semester:**

- Water Treatment Plant
- Sewage Treatment Plant
- Maintenance work of water supply mains and sewage system