# FINAL DRAFT

# Sample path for 1st year Diploma Curriculum for Meghalaya

**(On Civil Engg. ,Mechanical Engg, Automobile Engg. Electrical Engg. , Electronics and Communication Engg., Computer Science and Engineering, Computer Application, Food Processing and preservation and Medical Electronics)**

**Sample path for Civil Engg. ,Mechanical Engg, Automobile Engg. Electrical Engg. ,Electronics and Communication Engg., Food Processing and Preservation and Medical Electronics.**

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 | 70 | 15 | 10 | 5 | 0 | 25 | 0 | 125 | 3 |
| 2 | G103 | Mathematics-I | | 4 | 1 | 0 | 70 | 15 | 10 | 5 | 0 | 0 | 0 | 100 | 5 |
| 3 | G106 | Physics - I | | 2 | 0 | 2 | 70 | 15 | 10 | 5 | 25 | 25 | 0 | 150 | 3 |
| 4 | G108 | Chemistry - I | | 2 | 0 | 2 | 70 | 15 | 10 | 5 | 25 | 25 | 0 | 150 | 3 |
| 5 | G201 | Engineering Drawing – I | | 1 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 50 | 0 | 50 | 3 |
| 6 | G203 | Workshop Practice - I | | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 25 | 25 | 50 | 2 |
| 7 | G205A | Introduction to Information Technology | | 2 | 0 | 3 | 50 | 0 | 0 | 0 | 25 | 50 | 0 | 125 | 4 |
| **TOTAL** | | | | 13 | 1 | 17 | 330 | 60 | 40 | 20 | 75 | 200 | 25 | 750 | 23 |

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 | 70 | 15 | 10 | 5 | 0 | 25 | 0 | 125 | 3 |
| 2 | G104 | Mathematics-II | G103 | 4 | 1 | 0 | 70 | 15 | 10 | 5 | 0 | 0 | 0 | 100 | 5 |
| 3 | G107 | Physics - II | G106 | 2 | 0 | 2 | 70 | 15 | 10 | 5 | 25 | 25 | 0 | 150 | 3 |
| 4 | G109 | Chemistry - II | G108 | 2 | 0 | 2 | 70 | 15 | 10 | 5 | 25 | 25 | 0 | 150 | 3 |
| 5 | G202 | Engineering Drawing – I I | G201 | 1 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 50 | 0 | 50 | 3 |
| 6 | G204 | Workshop Practice - II | G203 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 25 | 25 | 50 | 2 |
| 7 | G206A | Engineering Mechanics | G106 & G107 | 3 | 0 | 2 | 70 | 15 | 10 | 5 | 0 | 50 | 0 | 150 | 4 |
| 8 | G301 | Development of Life Skill-I | | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 25 | 25 | 50 | 2 |
| 9 | | Professional Practices - I | | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 50 | 0 | 50 | 1 |
| **TOTAL** | | | | 15 | 1 | 20 | 350 | 75 | 50 | 25 | 50 | 275 | 50 | 875 | 26 |

**Sample path for Computer Science and Engg. and Computer Application**

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 | 70 | 15 | 10 | 5 | 0 | 25 | 0 | 125 | 3 |
| 2 | G103 | Mathematics-I | | 4 | 1 | 0 | 70 | 15 | 10 | 5 | 0 | 0 | 0 | 100 | 5 |
| 3 | G106 | Physics - I | | 2 | 0 | 2 | 70 | 15 | 10 | 5 | 25 | 25 | 0 | 150 | 3 |
| 4 | G108 | Chemistry - I | | 2 | 0 | 2 | 70 | 15 | 10 | 5 | 25 | 25 | 0 | 150 | 3 |
| 5 | G201 | Engineering Drawing – I | | 1 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 50 | 0 | 50 | 3 |
| 6 | G203 | Workshop Practice - I | | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 25 | 25 | 50 | 2 |
| 7 | G205B | Introduction to Computer Programming | | 2 | 0 | 3 | 50 | 0 | 0 | 0 | 25 | 50 | 0 | 125 | 4 |
| **TOTAL** | | | | 13 | 1 | 17 | 330 | 60 | 40 | 20 | 75 | 200 | 25 | 750 | 23 |

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 | 70 | 15 | 10 | 5 | 0 | 25 | 0 | 125 | 3 |
| 2 | G104 | Mathematics-II | G103 | 4 | 1 | 0 | 70 | 15 | 10 | 5 | 0 | 0 | 0 | 100 | 5 |
| 3 | G107 | Physics - II | G106 | 2 | 0 | 2 | 70 | 15 | 10 | 5 | 25 | 25 | 0 | 150 | 3 |
| 4 | G109 | Chemistry - II | G108 | 2 | 0 | 2 | 70 | 15 | 10 | 5 | 25 | 25 | 0 | 150 | 3 |
| 5 | G202 | Engineering Drawing – I I | G201 | 1 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 50 | 0 | 50 | 3 |
| 6 | G204 | Workshop Practice - II | G203 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 25 | 25 | 50 | 2 |
| 7 | G206B | C-Programming | G205B | 2 | 1 | 2 | 70 | 15 | 10 | 5 | 25 | 25 | 0 | 150 | 4 |
| 8 | G301 | Development of Life Skill-I | | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 25 | 25 | 50 | 2 |
| 9 | | Professional Practices - I | | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 50 | 0 | 50 | 1 |
| **TOTAL** | | | | 14 | 2 | 20 | 350 | 75 | 50 | 25 | 75 | 250 | 50 | 875 | 26 |

**Detailed Contents of 1st year (Term - I and Term - II) Diploma Curriculum**

**(For Civil Engg. , Mechanical Engg, Automobile Engg. , Electrical Engg. ,Electronics and Communication Engg., Computer Science and Engg., Computer Application, Food Processing and Preservation and Medical Electronics)**

## COMMUNICATION SKILL -I

| L | T | P | Curri. Ref. No.: G101 |
|---|---|---|---|
| 2 | 0 | 2 | |

| **Total Contact hrs.:** | **Total marks: 125** | **Theory:** |
|---|---|---|
| Lecture: 30 | | End Term Exam.:70 |
| Tutorial: 0 | | P.A: 30 |
| Practical: 30 | | **Practical:** |
| **Credit :3** | | P.A. 25 |

### 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. Learner s 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 :

| UNIT TOPIC / SUB-TOPIC | Lecture Hrs. |
|---|---|
| **1.0 COMMUNICATION** | **3** |
| 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

**2.0 READING AND REMEDIAL GRAMMAR USAGE 4**

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

**3.0 PREPARATION FOR WRITING 3**

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

**4.0 WRITING PARAGRAPHS 5**

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 paraqgraphs

4.8 Writing different types of paragraphs

- Process description
- Comprison and contrast
- Cause and Effect
- Problem Solution

**5.0 COMPREHENSION OF TECHNICAL TEXTS _ MANUALS , INSTRUCTIONS ETC. 3**

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

**6.0 LISTENING 3**

6.1 Importance of Active Listening

6.2 Functions of Active Listening

6.3 Techniques for ensuring Active Listening

**7.0 PUBLIC SPEAKING 4**

7.1 Planning for the speech

7.2 Designing the speech

7.3 Deliver the speech

7.4 Evaluate the speech

**8.0 Presentation 5**

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 lan, 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 | Curri. Ref. No.: G102 |
|---|---|---|---|
| 2 | 0 | 2 | |

**Total Contact hrs.:**
Lecture: 30
Tutorial: 0
Practical: 30
**Pre-requisite: G101**
**Credit :4**

**Total marks: 125**

**Theory:**
End Term Exam.:70
P.A: 30
**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. Learner s 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.

### DETAILED COURSE CONTENT

### THEORY:

| UNIT | TOPIC / SUB-TOPIC | Lecture Hrs. |
|---|---|---|
| **1.0** | **ESSENTIALS OF BUSINESS CORRESPONDENCE** | **2** |
| 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 | |
| **2.0** | **BUSINESS LETTERS** | **4** |
| 2.1 | Introduction | |
| 2.2 | Different types of Business Letters<br>• Letters of Enquiry<br>• 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)

**3.0 JOB APPLICATION LETTERS** **3**

3.1 Introduction
3.2 Job Application Letters in response to advertisements
3.3 Self-application letters for Jobs
3.4 Covering Letters

**4.0 MEETING – AGENDA AND MINUTES** **2**

4.1 Introduction
4.2 Technique
4.3 Key Language

**5.0 MEMOS** **3**

5.1 Introduction
5.2 Essential features
5.3 Format and Body

**6.0 E-MAILS** **3**

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)

**7.0 TECHNICAL REPORT WRITING** **5**

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

- Accident Reports (related to industry)
- Laboratory Experiment Reports
- Workshop Reports
- Report of a Job done requiring technical expertise
- Investigative Report

**8.0 JOB INTERVIEWS** **4**

8.1 Importance

8.2 Prepare for an interview

8.3 Anticipating possible questions and framing appropriate answers to them

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**

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 | Curri. Ref. No.: G103 |
|---|---|---|---|
| 4 | 1 | 0 | |

**Total Contact hrs.:**
Lecture:60
Tutorial:15
Practical: 0
**Credit : 5**

**Total marks: 100**

**Theory:**
End Term Exam.:70
P.A:30

**RATIONALE:**

Mathematics is the backbone of all areas of technology and hence, technicians and engineers need study of relevant theories and principles of mathematics to enable them to understand and grasp the concept of advance courses of the curriculum. With the above view in mind, the necessary content details for the course of Mathematics-I are derived. It is presumed that this course content will provide a satisfactory foundation for technical applications, which technicians/ engineers supposed to come across in the field of studies.

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

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

| UNIT | TOPIC/SUB-TOPIC | Contact Hrs | Total Hrs |
|---|---|---|---|
| **2.0** | **TRIGONOMETRY**<br>**2.1 Circular Functions**.<br>(i) Definition of degree and radian measure and their relation.<br>(ii) Values of circular functions of $\frac{\pi}{4}, -\frac{\pi}{4}, \frac{\pi}{6}, \frac{\pi}{3}$ and $\frac{3\pi}{4}$<br>(iii)Fundamental identities in relation to sine, cosine, tangent, cotangent, secant and cosecant of an angle.<br>2.2 Addition and Subtraction Formulae with problems and multiple and submultiples of an angle.<br>2.3 Trigonometric Identities.<br>2.4 Solution of Equations.<br>2.5 Inverse theorems of circular Functions and principal values with problems.<br>2.6 Properties of Triangles with problems.<br>2.7 Problems on applications of Trigonometry. | 2<br><br><br><br><br><br>3<br>3<br>2<br>4<br><br>4<br>3 | 21 |
| **3.0** | **TWO-DIMENSIONAL CO-ORDINATE GEOMETRY**<br>**3.1** Two dimensional Co-ordinate System<br>(i) Cartesian Co-ordinate of a point.<br>(ii) Distance between two points.<br>(ii )Co-ordinate of a point which divides the line joining two given points in a given ratio(internally and externally).<br>(iv) Centroid of a triangle having given three vertices.<br>(v)Area of a triangle having given the co-ordinates of three vertices.<br>(vi)Definition of polar Co-ordinates of a point.<br>(vii)Conversion of Polar Co-ordinates to Cartesian Co-ordinates and their applications.<br>(IX) Problems. | 3 | |

| UNIT | TOPIC/SUB-TOPIC | Contact Hrs | Total Hrs |
|---|---|---|---|
| | **3.2 Straight Line.**<br>(i) Gradient (or Slope) of a straight line.<br>(ii) Equation of a straight line.<br>(iii)Different form of a straight line.<br>(jv)Perpendicular distance of a point from a straight line.<br>(v)Angle between two intersecting straight lines.<br>(vi)Condition of perpendicularity and parallelism.<br>(viii)Bisectors of two straight lines.<br>(ix)Problems. | 3 | |
| | **3.3 Circle**<br>(i) Introduction<br>(ii) Standard form of the equation of a Circle.<br>(iii)General equation of a Circle.<br>(iv)Intercept made by circle on co-ordinate axes.<br>(v)Equation of a circle passing through the points of intersection of two circles.<br>(v)Equation of a circle passing through the points of intersection of a circle and a straight line.<br>(vi)Condition of tangency to a circle from an external point.<br>(vii)Common chord and common tangent to circles.<br>(viii)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.<br>(ix)Problems. | 4 | 10 |
| **4.0** | **VECTORS.**<br>(i)Definition of a vector and definition of position vector.<br>(ii) Algebra of vectors (addition, subtraction and scalar multiplication of a vector).<br>(iii)Dot product of two vectors with properties and problems.<br>(iv)Applications of vectors.(work done and moment of a force about a point and a line. | 4 | 4 |

**SUGGESTED LEARNING RESOURCES:**

**Reference Books.**


(1) Mathematics for polytechnic by S.P.Deshpande, Vidyarthi Griha, Pune
(2) Trigonometry by S.L.Loney, S.Chand Publications
(3) Higher Algebra by H.S.Hall &S.R.Knight, Metric edition, Book Palace. New Delhi
(4) College Algebra by Fec.G.Valles, Charotar Publications
(5) Matrices by Ayres, Schuam series; McGraw hill
(6) Higher Engineering Mathematics, Khanna publications, New Delhi
(7) Engineering Mathematics, 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 | Curri. Ref. No.: G104 |
|---|---|---|---|
| 4 | 1 | 0 | |

**Total marks: 100**

**Theory:**
End Term Exam.:70
P.A:30

**Total Contact hrs.:**
Lecture:60
Tutorial:15
Practical: 0
Pre-requisite: G103
**Credit : 5**

**RATIONALE:**

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 Statistics and Probability, Differential Calculus, and Integral Calculus. This course will be helpful for the learners those who like to go for higher studies.

**DETAILED COURSE CONTENT**

**THEORY:**

| UNIT TOPIC / SUB-TOPIC | Lecture Hrs. |
|---|---|

## 1.0 DIFFERENTIAL CALCULUS

### 1.1 Functions 7

**(i)** Definition of functions or mappings
**(ii)** Real functions, value of a function, domain and range of a function.
**(iii)** Concept of intervals on the set of all real numbers.
**(iv)** Types of functions and some important functions.
**(v)** Even functions, odd functions and periodic functions.
**(vi)** Problems on range and domain of a given function.

### 1.2 Limit 5

(i) Definition of limits**.**

(ii) Concept of right-hand limit and left-hand limit.
(ii) Fundamental Theorems on limits or Algebra of limits.
(iv) Proof of some important formulae of limits.
(v) Problems on limits.

**1.3 Continuity and Differentiability. 10**

(i) Continuity of a function at a point.
(ii) Geometrical meaning of continuity.
(iii) Continuity on an interval.
(iv) Discontinuity and types of discontinuities.
(v) Definition of differential coefficient or derivative.
(vi) Differentiability of a function at a point.
(vii)Relation between continuity and differentiability.
(viii)Derivative at a point.
(ix)Derivative of a function.
(x) Geometrical meaning of derivative.
(xi)Left-hand derivative and Right-hand derivative.
(xii) Derivative of some important functions.
(xiii) Derivative of the algebraic sum of two or more functions.
(xiv)Product and Quotient rule of differentiation.
(xv)Derivative of a function of a function (Chain Rule).
(xvi) Differentiation of implicit function.
(Xvii) Differentiation of parametric function.
(xviii) Logarithmic differentiation.
(xix)Differentiation of inverse trigonometric functions.
(xx) Successive differentiation up to $3^{rd}$ order.
(xxi)Problems on the above topics.

**2.0 Applications of Derivatives. 7**

(i) Derivative as a rate of change of quantities.
(ii) Equations of tangent and normal with the help of derivatives.
(iii) Increasing functions and decreasing functions
(iv) Maxima and minima of a function
(v) Problems on the above topics

**3.0 Statistics and Probability**

**3.1 Statistics. 4**

(i) Measures of Central tendency (mean, mediam, and mode) for ungrouped and ungrouped frequency distribution.
(ii)Measures of Dispersions such as range, mean deviation, Standard Deviation, Variance and coefficient of variation, Comparison of two sets of observations.

(iii) Problems on the above topics.

## 3.2 Probability. 4

(i) Definition of random experiment, sample space, event, occurrence of event and types of events (impossible .mutually exclusive, exhaustive, equally likely).
(ii) Definition of Probability, addition and multiplication theorems of Probability.
(iii)Problems on the above topics.

## 4.0 Complex Numbers. 7

(i)Definition of Complex numbers.
(ii)Cartesian, Polar, Exponential forms of Complex numbers.
(iii)Algebra of complex number (Equality, Addition, Subtraction, Multiplication and Division).
(iv)De-Moivre's theorems.
(v)Euler's form of Circular functions.
(vi)Hyperbolic functions
(viii)Problems on the above topi

## 5.0 Integral Calculus 2

5.1 Indefinite Integration:

- Definition

5.2 Methods of Integration: 3

- Integration by Substitution.
- Integration by parts
- Integration by partial fractions.
- Reduction formulae for integration of $\sin^n x.\cos^n x$

5.3 Definite Integrals: 3

- Definite integral as limit of a sum.
- Fundamental properties
- Definition of gamma function.
- Evaluation of gamma function.

5.4 Application of Integration: 4

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

5.5 Evaluation of Multiple Integrals: 4

- Evaluation of double integrals.
- Evaluation of triple integrals.
- Use of constant limits.

**SUGGESTED LEARNING RESOURCES**

## Reference Books.

**Reference Books.**

(1) Mathematics for polytechnic by S.P.Deshpande, Vidyarthi Griha, Pune

(2) Calculus: Single Variable by Robert T.Smith, Tata McGraw Hill
(3) Advanced Engineering Mathematics by H.K.Dass, S.Chanda Publication, New Delhi
(4) Fundamentals of Mathematical Statistics by S.C.Gupta and Kapoor, S.Chanda Publication, New Delhi
(5) Higher Engineering Mathematics by B.S.Grewal, Khanna Publication, New Delhi
(6)Applied Mathematics by P.N.Wartikar, Vidyarthi Griha Prakashan, Pune
(7) Diploma Engineering Mathematics (Volume-I and Volume-II) by B.K.Paul,
(8)College Algebra by A.R.Mazumdar and P.L.Ganguly.
(9)Differential Calculus by B.C.Das & B.N.Mukherjee.
(10)Differential Calculus by B.C.Das & B.N.Mukherjee.
(11)Engineering Mathematics (Volume-I & Volume-II) By G.S.Sharma & I.J.S.Sarna.
(12) Polytechnic Mathematics Vol.II By Dutta & Bera

## PHYSICS - I

| L | T | P | | |
|---|---|---|---|---|
| 2 | 0 | 2 | | Curri. Ref. No.: G106 |

**Total Contact hrs.:**
Theory: 30
Tutorial :0
Practical: 30
**Credit: 3**

**Total marks: 150**

**Theory:**
End Term Exam: 70
P.A.: 30
**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. |
|---|---|---|
| 1.0 | **UNITS, DIMENSION AND MEASUREMENTS** | **2** |

1.1 **Units, Dimension**

- 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 **Measurements**

- Measuring devices e.g., slide callipers, screw gauge, spherometer with concept of vernier constant, least count and zero error.
- Physical Balance

## 2.0 MECHANICS 4

### 2.1 Motion along a straight line and Force

- Concept of scalar and vector quantities
- Speed, velocity and linear acceleration
- Equations of motion with constant acceleration (derivation not required)
- Equations of motion of falling body under gravity
- Simple problems on linear motion
- Newton's laws of motion, Action and reaction, tension
- Force, inertia, momentum, impulse and impulsive force with practical examples
- Conservation of linear momentum.

## 3.0 GRAVITATION 3

- Newton's laws of gravitation
- Newton's gravitational constant G and its SI unit
- Acceleration due to gravity (g) and its relation with "G".
- Variation of g with altitude and latitude (deduction not required)
- Difference between mass and weight
- Simple problems

## 4.0 WORK, POWER AND ENERGY 3

- Work, power and energy with their units and mathematical expressions
- Relation between Horse power and Watt
- Different forms of mechanical energy : PE, KE and their expressions
- Conservation of energy and transformation of energy with examples
- Simple problems

## 5.0 PROPERTIES OF MATTER 6

### 5.1 Properties of solid

- Plasticity and elasticity in solids
- Deformation of bodies by the action of external forces change in size and change in shape
- Unit of stress – tensile stress, compressive stress and Shear stress with examples
- Unit of strain – tensile strain., volumemetric strain and shear strain & Hooke's law

- Modulus of elasticity – Young's modulus, Bulk modulus and Modulus of rigidity, Poison'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** 6

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

**7.0 SOUND** **6**

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 – 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 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 | Curri. Ref. No.: G107 |
|---|---|---|---|
| 2 | 0 | 2 | |

**Total Contact hrs.:**
Lecture: 30
Tutorial: 0
Practical: 30
**Prerequisite: G105**
**Credit: 3**

**Total Marks: 150**

**Theory:**
End Term Exam:70
P.A.: 30
**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.

**DETAILED COURSE CONTENT**

**THEORY :**

| UNIT | TOPIC / SUB-TOPIC | Lecture Hrs. |
|---|---|---|
| **1.0** | **LIGHT** | 8 |
| | 1.1 **Reflection of light** | |
| | 1.1.1 **Reflection of light on plane surface (Review) :**<br>• Laws of reflection<br>• Image formation for reflection in a plane mirror.<br>• Geometrical method of locating image. | |
| | 1.1.2 **Reflection of light on spherical surface :**<br>• 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 3**

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 **Magnetic measurement**:

- Uniform and non-uniform field
- Magnetic moment
- Inverse square law
- Magnetic lines of force
- Elements of Earth magnetism : dip, declination and horizontal component

**3.0 ELECTROSTATICS 3**

**3.1 Electrostatics Basic:**

- Basic concept of Electric charge
- Its production and nature – electrification by rubbing : Kinds of electrification
- Electrostatic induction and conduction
- Conductors and non-conductors
- Surface density of charge, The lightening conductor
- Coulomb's law between electric charges
- Field intensity and electric potential
- Electric permittivity
- Lines of force in electrostatic field

**4.0 CURRENT ELECTRICITY 10**

4.1 **Electric current:**

- Cell: Primary & Secondary
- Flow of charge – electric current and its unit
- Electric motive force (EMF)
- Ohm's law
- Resistance and its unit, specific resistance

- Resistance in series and parallel
- Factors affecting resistance
- Wheatstone bridge circuit
- Relation for balanced Wheatstone bridge (No deduction)
- Meter bridge, P.O. Box
- Simple problems

4.2 **Heating Effects of Current:**

- Joule's law
- Electrical work, energy and power with units
- Simple problems.

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 6**

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 | Curri. Ref. No.: 108 |
|---|---|---|---|
| 2 | 0 | 2 | |

**Total Contact hrs.:**
Theory: 30
Tutorial : 0
Practical: 30
**Credit: 3**

**Total marks: 150**

**Theory:**
End Term Exam: 70
P.A.: 30
**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.

**DETAILED COURSE CONTENT**

**THEORY:**

| UNIT | TOPIC / SUB-TOPIC | Lecture Hrs. |
|---|---|---|
| **1.0** | **GENERAL CHEMISTRY** | **10** |
| 1.1 | Concept of symbol, valency, formula, atomic mass, molecular mass, elementary idea of atomic structure (Review). | |
| 1.2 | **Solution**<br>1.2.1 Classify and explain solution according to concentration<br>1.2.2 Distinguish among suspension, colloids and true solution.<br>1.2.2 Define and explain solubility, effect of temperature on solubility<br>1.2.3 Mention practical applications of colloids in different situations<br>1.2.4.1 Colloidal impurities in drinking and sewage water.<br>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

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

### 1.4 Chemical Bonding

1.4.1 Covalent Bond, Ionic Bond, Hydrogen Bond and Metallic Bond

Assignment and Class test

## 2.0 CHEMISTRY OF WATER 7

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 Permuit or Zeoilite 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

**3.0 PHYSICAL CHEMISTRY 3**

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.

**4.0 ORGANIC CHEMISTRY 6**

4.1 Organic chemistry and its scope in various industries.

4.2 Tetravelancy of Carbon atom

4.3 Functional groups

4.4 Distinguish between organic and inorganic compounds.

4.5 Homologous series-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.

**5.0 Refractories 4**

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 complexometric 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 | Curri. Ref. No.: G109 |
|---|---|---|---|
| 2 | 0 | 2 | |

**Total Contact hrs.:** Theory: 30, Practical: 30
**Prerequisite: G107**
**Credit: 3**

**Total marks: 150**

**Theory:**
End Term Exam:70
P.A.: 30
**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.

**DETAILED COURSE CONTENT**

**THEORY**:

| UNIT | TOPIC / SUB-TOPIC | Lecture Hrs. |
|---|---|---|
| **1.0** | **ELECTROCHEMISTRY** | **4** |
| 1.1 | Define conductor, insulator, semi-conductor, electrolyte and non-electrolyte with examples. | |
| 1.2 | State postulates of Arrhenuou's and electrolytic theory of dissociation | |
| 1.3 | Demonstrate the phenomenon of electrolysis. | |
| 1.4 | State and explain Faraday's 1st and 2nd laws of electrolysis | |
| 1.5 | Define and explain conductance, specific conductance, molar conductance, electrochemical cell | |
| | Solve problems on electrolysis<br>Solve problems, Assignment and Class test. | |

**2.0 FUEL** **10**

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

**3.0 LUBRICANTS** 2

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

**4.0 CORROSION** **2**

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

**5.0 PROTECTIVE COATING** **2**

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 4

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 6

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, Babbits 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-Martein instrument
   1. 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- Martein 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, Porcelin ware, and reagent

## ENGINEERING DRAWING – I

| L | T | P | Curri. Ref. No. G201 |
|---|---|---|---|
| 1 | 0 | 4 | |

**Total Contact hrs.:** Theory: 15, Tutorial :0, Practical : 60
**Credit: 3**

**Total marks: 50**

**Practical:** P.A.: 50

### 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 | Total hrs. |
|---|---|---|
| **1.0** | **INTRODUCTION TO DRAWING** | 4 |
| | 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** | **CURVES AND TANGENTIAL** | 8 |
| | 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** | **PROJECTION OF POINTS AND LINES** | 8 |
| | 3.1 Projection of Points in different planes | |
| | 3.2 Projection of lines in different plane | |
| | 3.3 Lines inclined to one reference plane | |
| **4.0** | **PROJECTION OF PLANES** | 12 |
| | 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 PROJECTION OF SOLIDS** 12

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 INTRODUCTION TO COMPUTER AIDED DRAFTING (CAD)** 13

6.1 Introduction, unit system, coordinate system, layout of sheets, draw commands, edit commands, display commands with simple examples

**7.0 FORMATIVE EVALUATION** 3

**TOTAL:** 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 | Wlley Eastern |

## ENGINEERING DRAWING – II

| L | T | P | Curri. Ref. No. : G202 |
|---|---|---|---|
| 1 | 0 | 4 | |

**Total Contact hrs.:** **Total marks: 50** **Practical:**
Theory: 15 P.A.: 50
Tutorial :0
Practical: 60
**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.

### DETAILED COURSE CONTENT

### THEORY/PRACTICAL:

| UNIT | TOPIC/SUB-TOPIC | Total hrs. |
|---|---|---|
| 1.0 | ORTHOGRAPHIC PROJECTIONS | 8 |
| | 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 | **SECTIONAL VIEWS** | 8 |
| | 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 | **DEVELOPMENT OF SURFACES** | 9 |
| | 3.1 Development of surfaces for the following: Cube, Cylinder, Prism, Cone and frustum cone | |
| 4.0 | **ISOMETRIC PROJECTIONS** | 9 |
| | 4.1 Isometric Scales | |
| | 4.2 Isometric views of simple objects | |
| | 4.3 Isometric views for slots and cuts in the objects | |
| 5.0 | **STANDARD CONVENTIONS AND SYMBOLS** | 4 |
| | 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)** 19

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

**TOTAL:** 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 | Wlley Eastern |

# WORKSHOP PRACTICE – I

| L | T | P | | Curri. Ref. No. G 203 |
|---|---|---|---|---|
| 0 | 0 | 4 | | |
| **Total Contact hrs.:** | | **Total marks: 50** | **Practical:** | |
| Practical : 60 | | | P.A.: 50 | |
| **Credit: 2** | | | | |

**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.

**DETAILED COURSE CONTENT**

**THEORY**:

| UNIT TOPIC / SUB-TOPIC | Lecture Hrs |
|---|---|
| **1.0 WOOD WORKING SHOP** | **2** |
| 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 | |
| **1.0 FABRICATION SHOP (WELDING)** | **2** |
| 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 | |
| **3.0 FITTING SHOP** | **2** |
| 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.

**4.0 SHEET METAL SHOP** **2**

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

**5.0 MEASUREMENT & INSPECTION** **3**

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.

**6.0 ERECTION OF MACHINES** **2**

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

**7.0 PIPE FITTING** **2**

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

**SUGGESTED LIST OF EXPERIMENTS/ DEMONSTRATIONS** **45**

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 the area of irregular figure with the help of plannimeter.
15. Measure current and voltage (A.C. and D.C.)
16. Investigation of some errors in electrical measurements.

**SUGGESTED LEARNING RESOURCES:**

Reference Books:


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

# WORKSHOP PRACTICE – II

| L | T | P | Curri. Ref. No. G204 |
|---|---|---|---|
| 0 | 0 | 4 | |

**Total Contact hrs.:** Practical : 60
**Total marks: 50**
**Practical:** P.A.: 50
**Prerequisite: G203**
**Credit: 2**

**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.

**DETAILED COURSE CONTENT**

**THEORY:**

| UNIT TOPIC / SUB-TOPIC | Lecture Hrs. |
|---|---|

1. **CUTTING TOOLS AND CUTTING MATERIALS** — **2**

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.

2. **LATHE** — **3**

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.

3. **DRILLING** **2**

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.

4. **BORING** **2**

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.

5. **SHAPING, PLANING AND SLOTTING** **2**

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.

6. **BROACHING** **1**

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.

7. **JIGS AND FIXTURES** **2**

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

8. **CUTTING FLUIDS AND LUBRICANTS** **1**

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 taping
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 ± 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. M. Adithan and A.B. Gupta ***Manufacturing Technology*** New Age International (P) Ltd, Delhi.
3. SK Choudhry and Hajra **Elements of Workshop Technology** Asia Publishing House
4. PC Sharma ***A Text Book of Production Engineering*** S Chand and Company Ltd. Delhi

## INTRODUCTION TO INFORMATION TECHNOLOGY

| L | T | P | Curri. Ref. No. G205A |
|---|---|---|---|
| 2 | 0 | 3 | |

**Total Contact hrs.:**
Theory: 30
Tutorial: 0
Practical: 45
**Credit: 4**

**Total marks: 125**

**Theory:**
End Term Exam: 50

**Practical:**
End Term Exam: 25
P.A : 50

### RATIONALE

Information Technology is an in-evitable 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.

### DETAILED COURSE CONTENT

### THEORY:

| UNIT | TOPIC/SUB-TOPIC | Lecture Hrs. |
|---|---|---|
| 1.0 | Introduction to IT - its components computer, communication & management | 03 |
| 2.0 | Introduction to Number System, Bits, Bytes, Word, Logical Gates, Truth Table, ASCII, BCD, Floating point and Fixed Point number represeantation. | 06 |
| 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 |
| 4.0 | Classification of software - System Software, Application Software Translator - Compiler, Interpreter, Preprocessor Operating System - Single User, Multiple User Windows XP/Vista / 7 / 8 - Definition of Windows, Windows | 06 |

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,<br>Transmission media – Wired and Wireless, use of Modem<br>Concept of LAN, WAN, Internet, Intranet, Email. | 07 |

**PRACTICAL:**

**Suggested demonstration / tasks :**

| | | |
|---|---|---|
| 1. | Introduction to MS Office<br><br>Basic features of Ms Office, Overview of Different Office Tools | 01 |
| 2. | Introduction to MS Word<br><br>Creating and Editing document, Formatting Documents, Working with Tables, Spell checking, Mail Merging, Importing Graphics into word Document | 08 |
| 3. | Introduction to MS Excel<br><br>Creating a New Work Book, Entering Labels, Values and Formulas, Formatting the layout, Working with Functions, Creating the Chart from data, Writing macros | 09 |
| 4. | Introduction to Power Point<br><br>Creating a Presentation, Adding/Editing Text, Working with objects, Formatting the Presentation, Placing the chart in slide, Slide Show and Printing | 07 |
| 5. | Internet Browsing and Emailing<br>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 | 05 |

## INTRODUCTION TO COMPUTER PROGRAMMING

| L | T | P | | |
|---|---|---|---|---|
| 2 | 0 | 3 | | **Curri. Ref. No.: G205B** |

| **Total Contact hrs :** | **Total marks: 125** | **Theory:** |
|---|---|---|
| Theory: 30 | | End Term Exam: 50 |
| Tutorial: 0 | | P.A.: 0 |
| Practical: 45 | | **Practical:** |
| **Credit : 4** | | End Term Exam: 25 |
| | | PA : 50 |

**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.

**DETAILED COURSE CONTENT**

**THEORY:**

| UNIT | TOPIC/SUB-TOPIC | Lecture Hrs. |
|---|---|---|
| **1.0** | **INTRODUCTORY CONCEPTS** | 6 |
| 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 | |
| **2.0** | **C FUNDAMENTALS** | 2 |
| 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

**3.0 OPERATORS AND EXPRESSIONS** 2

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

**4.0 DATA INPUT AND OUTPUT** **2**

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

**5.0 PREPARING AND RUNNING A COMPLETE C PROGRAM** **2**

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

**6.0 CONTROL STATEMENTS** **5**

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

**7.0 ARRAYS** **6**

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

**8.0 USER DEFINED FUNCTIONS** **5**

8.1 Concepts of a User Defined Function
8.2 Declaration of Function
83 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

Software : C Compiler

## ENGINEERING MECHANICS

| L | T | P | **Curri. Ref. No. G206A** |
|---|---|---|---|
| 3 | 0 | 2 | |

**Total Contact hrs.:** Theory: 45, Tutorial : 0, Practical: 30
Prerequisite : G106 & G107
**Credit: 4**

**Total marks: 150**

**Theory:** End Term Exam: 70, P.A.: 30
**Practical:** P.A.: 50

**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.

**DETAILED COURSE CONTENT**

**THEORY :**

| UNIT TOPIC / SUB-TOPIC | Lecture Hrs. |
|---|---|
| 1.0 **INTRODUCTION** | **3** |
| 1.1 Definition of Statics, Mechanics, Kinetics, Kinematics, Dynamics | |
| 1.2 Units of Measurement | |
| 1.3 Units Conversion | |
| 1.4 Scalar and vector quantity | |
| **2.0 COMPOSITION & RESOLUTION OF FORCES** | **11** |
| 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 | |

**3.0 CENTRE OF GRAVITY AND CENTROID & MOMENT OF INERTIA 8**

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

4.0 **FRICTION AND ITS APPLICATIONS 4**

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

**5.0 MOTION AND ITS APPLICATIONS 3**

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

**6.0 MOTION OF PROJECTILE 3**

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

**7.0 CURVILINEAR MOTION AND CENTRIPETAL FORCE 5**

7.1 Definition of Centripetal and Centrifugal forces
7.2 Importance of Super-elevation Expression
7.3 Simple Engineering Problem.

**8.0 WORK, POWER AND ENERGY** ***5***

8.1 Definition of work & its unit
8.2 Definition of Kinetic and Potential Energy
8.3 Work done in rotation
8.4 Force displacement diagram
8.5 Work done in machines used for lifting
8.6 Definition of Power
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**

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

# C–Programming

| *L* | *T* | *P* | **Curri. Ref. No.: CSE206B** |
|---|---|---|---|
| *2* | *1* | *2* | |

**Total Contact hrs :** **Total marks: 200**

*Theory: 30*
*Tutorial: 15*
*Practical: 30*
***Credit : 4***

Theory:
*End Term Exam: 70*
*P.A.: 30*
Practical:
*End Term Exam: 25*
*P.A : 25*

**DETAILED COURSE CONTENT**

**THEORY:**

| UNIT | TOPIC/SUB-TOPIC | TOTAL HRS. |
|---|---|---|
| 1. | **Review of C Fundamentals** | 2 |
| | 1.1 Introduction to C<br>1.2 The 'C' Character Set<br>1.3 Identifiers and Keywords<br>1.4 Data Types<br>1.5 Constants<br>1.6 Variables and Arrays<br>1.7 Declarations<br>1.8 Expressions<br>1.9 Statements<br>1.10 Symbolic Constants | |
| 2. | **Operators and Expressions** | 2 |
| | 2.1 Arithmetic Operators<br>2.2 Unary operators<br>2.3 Relational and Logical Operators<br>2.4 Assignment Operators<br>2.5 The Conditional Operator<br>2.6 Library Functions | |
| 3. | **Data Input and Output** | 2 |
| | 3.1 Preliminaries<br>3.2 Single Character Input- The getchar Function | |

3.3 Single Character Output-The putchar Function
3.4 Entering Input data – The scanf function
3.5 Writing Output Data – The printf function
3.6 gets and puts Function

4. **Preparing and running a complete C Program** 3

4.1 Planning a C Program
4.2 Writing a C Program
4.3 Entering the Program into the Computer
4.4 Compiling and Executing the Program
4.5 Error Diagnostics
4.6 Debugging Techniques

5. **Control Statements** 3

5.1 Preliminaries
5.2 Branching: The if-else statement
5.3 Looping: while, do-while & for statements
5.4 Nested Control Structures
5.5 The switch statement
5.6 The break statement
5.7 The continue statement
5.8 The Comma operator
5.9 The goto statement

6. **Functions** 3

6.1 Concepts of a Function
6.2 Accessing a Function
6.3 Function Prototypes
6.4 Passing Arguments to a Function
6.5 Recursion

7. **Program Structures** 3

7.1 Storage Classes
7.2 Automatic Variables
7.3 External (Global) Variables
7.4 Static Variables

8. **Arrays** 3

8.1 Defining an Array
8.2 Processing and Array
8.3 Passing Arrays to Functions
8.4 Multidimensional Arrays
8.5 Arrays and Strings

| | | |
|---|---|---|
| 9. | **Pointers** | 4 |
| | 9.1 Concepts of pointers & its role in C programming | |
| | 9.2 Pointer Declarations | |
| | 9.3 Passing Pointers to Functions | |
| | 9.4 Pointers and one-dimensional Arrays | |
| | 9.5 Dynamic Memory Allocation | |
| | 9.6 Operations on Pointers | |
| | 9.7 Pointers and Multidimensional Arrays | |
| | 9.8 Arrays of Pointers | |
| | 9.9 Passing Functions to Other Functions | |
| 10. | **Structures and unions** | 2 |
| | 10.1 Defining a structure | |
| | 10.2 Processing a Structure | |
| | 10.3 Unions | |
| 11. | **Data files** | **3** |
| | 11.1 Opening and closing a Data File | |
| | 11.2 Creating a Data File | |
| | 11.3 Processing a Data File | |
| | 11.4 Unformatted Data Files | |
| | | --- |
| | | 30 |

**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
8.3 Working with binary file
8.4 Building own header file
8.5 Linking multiple source files

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

Software : C Compiler

## Development of Life Skill -I

| *L* | *T* | *P* | | **Curri. Ref. No.: G301** |
|---|---|---|---|---|
| *1* | *0* | *2* | | |
| **Total Contact hrs :** | | **Total marks: 50** | Practical: | |
| *Theory: 15* | | | *End Term Exam: 25* | |
| *Tutorial: 0* | | | *P.A : 25* | |
| *Practical: 30* | | | | |
| ***Credit : 2*** | | | | |

**Aim :-This subject is kept to**

- Conduct different session to improve students memory Power
- Conduct different session to improve time management skills
- Motivate student to face realistic problem with confidence and positive approach

**Objective: - This course will enable the students to:**

- Develop reading skills
- Use techniques of acquisition of information from various sources
- Draw the notes from the text for better learning.
- Apply the techniques of enhancing the memory power.
- Develop assertive skills.
- Prepare report on industrial visit.
- Apply techniques of effective time management.
- Set the goal for personal development.
- Enhance creativity skills.
- Develop good habits to overcome stress.
- Face problems with confidence

**DETAILED COURSE CONTENT**

**THEORY:**

| UNIT | TOPIC/SUB-TOPIC | TOTAL HRS. |
|---|---|---|
| Unit -1 | **Importance of DLS**<br>Introduction to subject, importance in present context ,application | **01** |
| Unit -2 | **Information Search** | |

Information source –Primary, secondary, tertiary Print and non – print, documentary, Electronic Information center, Library, exhibition, Government Departments. Internet Information search – Process of searching, collection of data –questionnaire, taking Interview, observation method. **02**

Unit – 3 **Written communication**
Method of note taking
Report writing –Concept, types and format. **01**

Unit – 4 **Self Analysis**
Understanding self—
Attitude, aptitude, assertiveness, self esteem,
Confidence buildings. Concept of motivation. **02**

Unit – 5 **Self Development**
Stress Management –Concept, causes, effects and remedies to Avoid / minimize stress.
Health Management – Importance, dietary guidelines and exercises.
Time management- Importance, Process of time planning, Urgent Vs importance, Factors leading to time loss and ways to handle it, Tips for effective time management.

Emotion-concept, Types, Controlling, Emotional intelligence,
Creativity-concept, Factors enhancing creativity
Goal setting-concept, Setting smart goal **06**

Unit – 6 **Study habits**
Ways to enhance memory and concentration.
Developing reading skill.
Organisation of knowledge,
Model and methods of learning. **03**

**SUGGESTED LEARNING RESOURCES**

Reference Books:

1. Personality Development & Soft Skills - B. K. Mitra, Oxford University Press
2. Basic Managerial Skills for All - E.H. Mc Grath , S.J., Prentice Hall of India Pvt Ltd
3. Body Language - Allen Pease, Sudha Publications Pvt. Ltd.
4. Creativity and problem solving - Lowe and Phil, Kogan Page (I) P Ltd
5. Decision making & Problem Solving - Adair, J, Orient Longman
6. Develop Your Assertiveness - Bishop , Sue, Kogan Page India
7. Time management - Chakravarty, Ajanta, Rupa and Company
8. Life Skills Activities for Secondary Students with Special Needs - Darlene Mannix, Kindle Edition

**Internet Assistance:**
1) http://www.mindtools.com
2) http://www.stress.org
3) http://www.ethics.com
4) http://www.coopcomm.org/workbook.htm
5) http://www.mapfornonprofits.org/
6) http://www.learningmeditition.com http://bbc.co.uk/learning/courses/
7) http://eqi.org/
8) http://www.abacon.com/commstudies/interpersonal/indisclosure.html
9) http://www.mapnp.org/library/ethics/ethxgde.htm
10)http://www.mapnp.org/library/grp_cnfl/grp_cnfl.htm
11)http://members.aol.com/nonverbal2/diction1.htm
12)http://www.thomasarmstron.com/multiple_intelligences.htm
13)http://snow.utoronto.ca/Learn2/modules.html
14)http://www.quickmba.com/strategy/swot/

**Practical :**
**Suggested List of activities:**

- 1 Conduct Guest Lectures.
- Conduct Industrial visits.
- Conduct Seminar/Group Discussions.

**Suggested List of Assignments/Tutorial :**

**The Term Work Will Consist Of Following Assignments.**

1 Library search:-
Visit your Institute's Library and enlist the books available on the topic given by your teacher. Prepare a bibliography consisting name of the author, title of the book, publication and place of publication.

2 Enlist the magazines, periodicals and journals being available in your library. Select any one of them and write down its content. **Choose a topic for presentation.**

3 Attend a seminar or a guest lecture, listen it carefully and note down the important points and prepare a report of the same.

4 Visit to any one place like historical/office/farms/development sites etc. and gather information through observation, print resources and interviewing the people.

5 Prepare your individual time table for a week –
(a) List down your daily activities.
(b) Decide priorities to be given according to the urgency and importance

of the activities.
(c) Find out your time wasters and mention the corrective measures.

6 Keep a diary for your individual indicating- planning of time, daily transactions, collection of good thoughts, important data, etc

7 Find out the causes of your stress that leads tension or frustration .Provide the ways to Avoid them or to reduce them.

8 Undergo the demonstration on yoga and meditation and practice it. Write your own iews, feeling and experiences on it.

**NOTE: -** THESE ARE THE **SUGGESTED ASSIGNMENT** FOR GUIDE LINES TO THE SUBJECT TEACHER. HOWEVER THE SUBJECT TEACHERS CAN SELECT, DESIGN ANY ASSIGNMENT RELEVANT TO THE TOPIC, KEEPING IN MIND THE OBJECTIVES OF THIS SUBJECT.

## Professional practices -I

| *L* | *T* | *P* | | **Curri. Ref. No.:** |
|---|---|---|---|---|
| *0* | *0* | *2* | | |
| **Total Contact hrs :** | | **Total marks: 50** | Practical: | |
| *Theory: 15* | | | *End Term Exam: 25* | |
| *Tutorial: 0* | | | *P.A : 25* | |
| *Practical: 30* | | | | |
| ***Credit : 2*** | | | | |

**Aim :-This subject is kept to**

Deliver knowledge education beyond the baccalaureate degree for the practice

**Objective: -** On completion of this course, the Student will be able to:

- Search information from different sources for preparing notes on given topic.
- Present given topic in a seminar. Interact with peers to share thoughts.
- Prepare a report on industrial visit, expert lecture.

**Suggested List of activities to be done:**

**1. Industrial Visits: 10**

Structured industrial visits ( two nos.) be arranged and report of the same should be submitted by the individual student, to form part of the term work.

2. Lectures by Professional / Industrial Expert / Student Seminars based on information search to be organized Three nos. ) **06**

**3. Group Discussion: 06**

The students should discuss in a group of six to eight students and write a brief report on the same as a part of term work. Two topics for group discussions may be selected by the faculty members. Some of the suggested topics are -

i) Sports
ii) Current news items
iii) Discipline and House Keeping
iv) Current topics related to own engineering field.

**4. Student Activities: 08**

The students in a group of 3 to 4 will perform **one** activity (Faculty members of the concerned discipline may provide a list of activities)