

Syllabus, 2015

H.S. (Vocational)

XI-XII

Engineering & Technology



**The West Bengal State Council of Technical and
Vocational Education and Skill Development
Plot No. B/7, Action Area III, New Town, Rajarhat,
Kolkata - 700160**

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Nomenclature of different vocational groups under Engineering & Technology discipline

| SL No | Group Name | Gr. Code | Vocational subject combinations available in Class XII | Remarks |
|-------|-----------------------------------|----------|--|--|
| 1 | Building Construction Maintenance | ETBC | 1. Civil Construction & Maintenance Technology (CCMT) 2. Civil Estimation & Material Testing (CEMT) 3. Basic Field Surveying & Levelling (BFSL) | <i>Any paper of this combination can be chosen as VP1 or VP2 as per discretion of the Vocational Training Centre (VTC). For all students of a VTC choice of VP1 & VP2 must be same. Choice of 7th subject of all students for a VTC must be either VP3 or AE3.</i> |
| 2 | Automobile Technology | ETAT | 1. Motor Vehicle Mechanic-I (MVM1) 2. Motor Vehicle Mechanic-II (MVM2) 3. Fundamentals of Mechanical Technology (FDMT) | <i>Papers mentioned in Sl. No. 1 & Sl. No. 2 of this combination must be chosen as VP1, VP2. Choice of 7th subject of all students for a VTC must be either VP3 or AE3.</i> |
| 3. | Refrigeration & Air Conditioning | ETRA | 1. Principles of Refrigeration & Air conditioning (PRAC) 2. Applications of Refrigeration & Air Conditioning (ARAC) 3. Fundamentals of Mechanical Technology (FDMT) | <i>Paper mentioned Sl. No. 1 & Sl. No. 2 of this combination must be chosen as VP1, VP2. Choice of 7th subject of all students for a VTC must be either VP3 or AE3.</i> |
| 4 | Computer Maintenance & Networking | ETCM | 1. Basic Computer Maintenance and Networking (CMNT) 2. Web Page Development using HTML and ASP (WPDV) 3. Introduction to Visual Basic and its Application (VBIT) | <i>Papers mentioned in Sl. No 1 of this combination must be chosen as VP1. VP2 can be selected from Sl 2 & Sl. No. 3 of this combination as per discretion of the Vocational Training Centre (VTC). For all students of a VTC. choice of VP2 must be same. Choice of 7th subject of all students for a VTC must be either VP3 or AE3.</i> |
| 5 | IT Application | ETIA | 1. Introduction to Database Management System with SQL (DBMS) 2. Web Page Development using HTML and ASP (WPDV) 3. Introduction to Visual Basic and its Application (VBIT) | <i>Any paper of this combination can be chosen as VP1 or VP2 as per discretion of the Vocational Training Centre (VTC). For all students of a VTC. Choice of VP1 & VP2 must be same. Choice of 7th subject of all students for a VTC must be either VP3 or AE3.</i> |

| Sl. No | Group Name | Gr. Code | Vocational subject combinations available in Class XII | Remarks |
|--------|---------------------------------------|----------|--|--|
| 6. | Electrical Maintenance & Installation | ETEM | <ol style="list-style-type: none"> 1. Maintenance & Repair of Eletrical Domestic Appliances (MRED) 2. Eletrical Wiring & Installation of motors (EWIM). 3. Solar energy & Photovoltaic system and their applications (SPSA) 4. Rural Eletrification & Distribution of Power (REDP) | <i>Any Paper of this combination can be chosen as VP1 or VP2 as per discretion of the Vocational Training Centre (VTC). For all students of a VTC, choice of VP1 & VP2 must be same. Choice of 7th subject of all students for a VTC must be either VP3 or AE3.</i> |
| 7. | Consumer Electronics | ETCE | <ol style="list-style-type: none"> 1. Consumer and Industrial Electronics Appliances (CIEA) 2. Television and Cable TV Appliances (TCTA) 3. Computer Hardware and Network (CHNW) 4. Mobile and Smart phone Repairing (MSPR) | <i>Any paper of this combination can be chosen as VP1 or VP2 as per discretion of the Vocational Training Centre (VTC). For all students of a VTC, choice of VP1 & VP2 must be same. Choice of 7th subject of all students for a VTC must be either VP3 or AE3.</i> |

VP1 and VP2 are two compulsory papers, Optional paper may be VP3

For all students of a VTC, choice of VP1 and VP2 must be same. Choice of 7th subject of all students for a VTC must be either VP3 or AE3.

[VP = Vocational Paper, AE = Academic Elective]

CURRICULUM STRUCTURE FOR H.S. (VOCATIONAL) COURSES w.e.f. 2015-16 Session**Discipline : Engineering & Technology [ET]****I. Scheme of Studies**

| | | | | |
|--------------------------|-------------------|----------|---------------------------------|----|
| No. of periods per week* | Theory +Practical | 44/41/42 | No. of effective weeks per year | 40 |
| | | | No. of weeks for class | 36 |
| | | | No. of weeks for exam | 4 |
| Duration of period ** | Theory | 40 min | | |
| | Practical | 40 min | | |

* 8 periods per day (Monday to Friday) x 5 =40 periods + 4 periods in each Saturday.

** Effective class duration : Monday to Friday – 5 hours20min. per day, and Saturday - 2 hours 40 min.

II. Courses, Distribution of Marks and Classes**Class-XI**

| Group | Paper no. | Code | Subject | Theory | Distribution of Mark | | | Distribution of Classes/Week | | | | Total yearly classes |
|------------------------|-----------|---|--|--------|----------------------|---------|-------|------------------------------|-----------|-------------------|-------|----------------------|
| | | | | | Practical | Project | Total | Theory | Practical | Project/ Tutorial | Total | |
| Language | 1 | BEN1/ HIN1/ NEP1/ URD1 | First Language: Bengali /Hindi/Nepali/Urdu | 80 | | 20 | 100 | 2 | 1 | 3 | | 108 |
| | 2 | ENG1 | Second Language: English | 80 | | 20 | 100 | 2 | 1 | 3 | | 108 |
| Basic Vocational group | 3. | FMTD | Fundamentals of Mechanics & Technical Drawing a) Fundamentals of Mechanics b) Technical Drawing | 50 | | | 100 | | | | 8 | 288 |
| | | | | | | | | 3 | 1 | | | (144+ |
| | | | | | 50 | | | 1 | 3 | | | 144) |
| | 4 | Basic Vocational Subject & Workshop Practice Students will choose any one amongst (i) to (v) below (See Note 2 below) | | | | | | | | | | |
| | i) | FLWK | Foundation course on Electronics (a) Basic Electronics Theory (b) Workshop Practice [House Wiring/Fitting / Welding/Carpentry] [Any three from four] | 50 | | | 100 | 3 | | | 12 | 432 |
| | | | | | 50 | | | | 9 | | | (108+ |
| | | | | | | | | | | | | 324) |

| Group | Paper no. | Code | Subject | Theory | Distribution of Mark | | | Distribution of Classes/Week | | | | Total yearly classes |
|-------------------|-----------|------|---|-------------------|----------------------|---------|--------------------|------------------------------|-----------------|------------------|----------------|----------------------|
| | | | | | Practical | Project | Total | Theory | Practical | Project/Tutorial | Total | |
| | ii) | FEWK | Foundation course on Electrical (a)Basic Electrical Theory (b)Workshop Practice <i>[House Wiring/Fitting /Welding/Carpentry]</i> <i>[Any three from four]</i> | 50 | 50 | | 100 | 3 | 9 | | 12 | 432 (108+ 324) |
| | iii) | FMWK | Foundation course on Mechanical (a) Basic Mechanical Theory (b)Workshop Practice <i>[House Wiring/Fitting /Welding/Carpentry]</i> <i>[Any three from four]</i> | 50 | 50 | | 100 | 3 | 9 | | 12 | 432 108+ 324) |
| | iv) | FCWK | Foundation course on Civil (a)Basic Civil Theory (b)Workshop Practice <i>[House Wiring/Fitting / Welding/Carpentry]</i> <i>[Any three from four]</i> | 50 | 50 | | 100 | 3 | 9 | | 12 | 432 108+ 324) |
| | v) | FDWK | Foundation course on Computer (a)Fundamentals of Digital Logic Design (b)Workshop Practice <i>[House Wiring/Fitting / Welding/Carpentry]</i> <i>[Any three from four]</i> | 50 | 50 | | 100 | 3 | 9 | | 12 | 432 108+ 324) |
| Academic elective | 5 | MTH1 | Mathematics | 80 | | 20 | 100 | 3 | 1 | | 4 | 144 |
| | 6 | BSPC | Basic Science [Physics + Chemistry] | 70 [35+ 35] | 30 [15+ 15] | | 100 [50+ 50] | 4 [2+ 2] | 2@ [1+ 1] | | 6 (4+ 2) | 216 [144+ 72] |
| Common | 7 | EDCA | Entrepreneurship Development & Computer Application | 50 [25+ 25] | 25 | 25 | 100 [50+ 50] | 4 [2+ 2] | 4 [1+ 3] | | 8 (3+ 5) | 288 [108+ 180] |
| | | | | | | | | 22 | 22 | | 44 | |

Note 1 :

A Candidate shall have to appear all subjects in the Annual Examination of Class XI and have to pass at least 5 subjects to pass class XI as per below distribution:

- Both subjects of Language group (Paper1 & Paper2)
- Both Subjects of Vocational group (Paper3 & Paper4)
- Any one subject either from Academic Elective group or from Common group (i.e. any one paper from Paper5, Paper6 & Paper7). In case candidate pass in more than one subjects then subject with highest marks will be considered for calculation of Grade.

Note 2:

A candidate choosing a particular paper under Basic vocational subject 4 (i) to 4 (v) will have to choose VP1, VP2, and VP3 in class XII from options corresponding to the same group as per table under Sl No IV

@Physics and Chemistry practical may be taken in alternate week keeping continuous 2 periods for each lab.

\$Workshop Practice [House Wiring/Fitting /Welding/Carpentry][Any three from four]

CLASS-XII

| Group | Paper no. | Code | Subject | Theory | Distribution of Mark | | | Distribution of Classes/Week | | | | Total yearly classes |
|------------|-----------|---------------------------------|---|--------|----------------------|---------|-------|------------------------------|-----------------------------|-------|-----|----------------------|
| | | | | | Practical | Project | Total | Theory | Practical Project/ Tutorial | Total | | |
| Language | 1 | BEN2/ HIN2/ NEP2/ URD2 | First Language:Bengali /Hindi/Nepali/Urdu | 80 | - | 20 | 100 | 2 | 1 | 3 | 108 | |
| | 2 | ENG2 | Second Language: English | 80 | - | 20 | 100 | 2 | 3(1+2*) | 5 | 180 | |
| Vocational | 3. | | Two vocational papers as prescribed under vocational group [to be selected from table under Sl no. IV] i) Vocational Paper I [VP1] | 50 | 40 | 10 | 100 | 3 | 4 | 7 | 252 | |
| | 4. | | ii) Vocational Paper II [VP2] | 50 | 40 | 10 | 100 | 3 | 4 | 7 | 252 | |

| Group | Paper no. | Code | Subject | Theory | Distribution of Mark | | | Distribution of Classes/Week | | | | Total yearly classes |
|---------------------|-----------|------------|---|--------|----------------------|---------|-------|------------------------------|-----------------------------|---------|-----|----------------------|
| | | | | | Practical | Project | Total | Theory | Practical Project/ Tutorial | Total | | |
| Compulsory Academic | 5 | MTH2 | Mathematics [AE1] | 80 | - | 20 | 100 | 4 | 1 | 5 | 180 | |
| | 6 | PHYS/ CHEM | One subject from Academic Electives [to be chosen from sl no. 2 or sl no 3 of list given in table under Sl.No.III i.e. either PHYSICS or CHEMISTRY][AE2] | 70 | 30 | - | 100 | 4 | 2 | 6 | 216 | |
| Optional Elective | 7 | CHEM /PHYS | One subject from Academic Electives [to be chosen from sl no. 2 or sl no 3 of list given below in table underSl.No.III i.e. either CHEMISTRY or PHYSICS] [AE3] | 70 | 30 | - | 100 | 4 | 2 | 6 | 216 | |
| | | or VP3 | OR One vocational subject as prescribed under vocational course [to be selected from table under Sl no. IV][VP3] | 50 | 40 | 10 | 100 | 3 | 4 | 7 | 252 | |
| Common | 8. | ENST | Environmental Studies (**) | 80 | - | 20 | 100 | 24/13 | - 17/19 | 2 41/42 | 72 | |

(*) 2 Periods are kept to develop the communication skill in English.

(**) The theory subject “Environmental Studies” [ENST] is compulsory for all the candidates only to generate awareness among the students. Evaluation will be taken place at the end of the year, but the obtained marks will not be considered for calculation of final marks.

Choice of VP1, VP2 and VP3 is limited to the choice of basic vocational paper as selected in class XI and as described in table under Sl no. IV

Note:

- Paper 7 is optional elective. A Candidate may or may not opt for it. Only if a Candidate opts for paper 7, marks scored will be displayed in final mark sheet.
- A Candidate shall have to appear at all subjects of Class XII and have to pass at least 5 subjects to pass class XII as per below distribution:

| For student opting Paper 7 | For student NOT opting Paper 7 |
|---|--|
| <ul style="list-style-type: none"> - Both subjects of Language group Paper 1 & Paper2) - Both Subjects of Vocational group (Paper3 & Paper4) - Any one paper from Paper5, Paper6 and Paper 7 | <ul style="list-style-type: none"> - Both subjects of Language group (Paper1 & Paper2) - Both Subjects of Vocational group (Paper3 & Paper4) - Any one paper from Paper5, Paper6. |

- In case candidate pass in more than one subjects among Paper 5, 6, and 7 (if opted), paper with highest marks will be considered for calculation of Final Grades. Final Grades will be calculated based on the marks attained only in Class XII.

III. Academic Elective (AE) Subject Package:**For Class XII**

| Sl No. | Subject Name | Subject code | Subject type |
|--------|--------------|--------------|------------------------------|
| 1. | Mathematics | MTH2 | Compulsory Elective |
| 2. | Physics | PHYS | Compulsory/Optional Elective |
| 3. | Chemistry | CHEM | Compulsory/Optional Elective |

IV. Different Vocational subject combinations available under Engineering&Technology [ET] discipline for Class XI and Class XII

| SL | Group code | Vocational subject combinations available in Class XI | Vocational Subjects combination available in Class XII | Remarks |
|----|------------|--|---|---|
| 1 | ETBC | Foundation course on Civil [Basic Civil Theory + Workshop Practice] (FCWK) | 1. Civil Construction & Maintenance Technology (CCMT) 2. Civil Estimation & Material Testing (CEMT) 3. Basic Field Surveying & Levelling (BFSL) | <i>Any paper of this combination can be chosen as VP1 or VP2 as per discretion of the Vocational Training Centre (VTC). For all students of a VTC choice of VP1 & VP2 must be same. Choice of 7th subject of all students for a VTC must be either VP3 or AE3.</i> |

| SL | Group code | Vocational subject combinations available in Class XI | Vocational Subjects combination available in Class XII | Remarks |
|----|------------|--|--|---|
| 2 | ETAT | Foundation course on Mechanical [Basic Mechanical Theory + Workshop Practice] (FMWK) | 1. Motor Vehicle Mechanic – I (MVM1) 2. Motor Vehicle Mechanic – II (MVM2) 3. Fundamentals of Mechanical Technology (FDMT) | <i>Papers mentioned in Sl. No. 1 & Sl. No. 2 of this combination must be chosen as VP1, VP2. Choice of 7th subject of all students for a VTC must be either VP3 or AE3.</i> |
| 3 | ETRA | Foundation course on Mechanical [Basic Mechanical Theory + Workshop Practice] (FMWK) | 1. Principles of Refrigeration & Air Conditioning (PRAC) 2. Applications of Refrigeration & Air Conditioning (ARAC) 3. Fundamentals of Mechanical Technology (FDMT) | <i>Papers mentioned in Sl. No. 1 & Sl. No. 2 of this combination must be chosen as VP1, VP2. Choice of 7th subject of all students for a VTC must be either VP3 or AE3.</i> |
| 4 | ETCM | Foundation course on Computer [Fundamentals of Digital Logic Design + Workshop Practice] (FDWK) | 1. Basic Computer Maintenance and Networking (CMNT) 2. Web Page Development using HTML and ASP (WPDV) 3. Introduction to Visual Basic and its Application (VBIT) | <i>Papers mentioned in Sl. No. 1 of this combination must be chosen as VP1. VP2 can be selected from Sl. 2 & Sl. No 3 of this combination as per discretion of the Vocational Training Centre (VTC). For all students of a VTC, choice of VP2 must be same. Choice of 7th subject of all students for a VTC must be either VP3 or AE3.</i> |
| 5 | ETIA | Foundation course on Computer [Fundamentals of Digital Logic Design + Workshop Practice] (FDWK) | 1. Introduction to Database Management System with SQL (DBMS) 2. Web Page Development using HTML and ASP (WPDV) 3. Introduction to Visual Basic and its Application (VBIT) | <i>Any paper of this combination can be chosen as VP1 or VP2 as per discretion of the Vocational Training Centre (VTC). For all students of a VTC, choice of VP1 & VP2 must be same. Choice of 7th subject of all students for a VTC must be either VP3 or AE3.</i> |
| 6 | ETEM | Foundation course on Electrical [Basic Electrical Theory + Workshop Practice] (FEWK) | 1. Maintenance & Repair of Electrical Domestic Appliances (MRED) 2. Electrical Wiring & Installation of motors (EWIM). | <i>Any paper of this combination can be chosen as VP1 or VP2 as per discretion of the Vocational Training Centre (VTC). For all students of a VTC, choice of VP1 & VP2 must be same. Choice of 7th subject</i> |

| SL | Group code | Vocational subject combinations available in Class XI | Vocational Subjects for Class XII | Remarks |
|----|------------|--|--|--|
| | | | 3. Solar energy & Photovoltaic system and their applications (SPSA) 4. Rural Electrification & Distribution of Power (REDP) | <i>of all students for a VTC must be either VP3 or AE3.</i> |
| 7 | ETCE | Foundation course on Electronics [Basic Electronics Theory + Workshop] | 1. Consumer and Industrial Electronics Appliances (CIEA) 2. Television and Cable TV appliances (TCTA) 3. Computer Hardware and Networking (CHNW) 4. Mobile and Smart phone Repairing (MSPR) | <i>Any paper of this combination can be chosen as VP1 or VP2 as per discretion of the Vocational Training Centre (VTC). For all students of a VTC, choice of VP1 & VP2 must be same. Choice of 7th subject of all students for a VTC must be either VP3 or AE3.</i> |

Common Subject
Class XI & Class XII

Bengali (BEN 1 & BEN 2)

একাদশ ও দ্বাদশ শ্রেণি

| | | |
|---|---------|--------------|
| Total no. of weeks for classes/ Year : 36 | | |
| Classes per week : 3 | Th = 2 | Project = 1 |
| Total classes per year : 108 | Th = 72 | Project = 36 |
| Total marks : 100 | Th = 80 | Project = 20 |

পূর্ণমান-১০০

| | | |
|----------------|---|-------------|
| গদ্য | - | ১৫ |
| কবিতা | - | ১৫ |
| নাটক | - | ১০ |
| ভাষা | - | ২৫ |
| নির্মিতি | - | ১৫ |
| প্রকল্প + প্রফ | - | ২০ (১৫ + ৫) |
| মোট | - | ১০০ |

একাদশ শ্রেণি (BEN 1)

গদ্য -

৩০ (পিরিয়ড)

১. শরৎচন্দ্র চট্টোপাধ্যায় - ইন্দ্রনাথ ও শ্রীকান্ত (অংশবিশেষ)
২. রাণী চন্দ - পূর্ণকুম্ভ (অংশবিশেষ)
৩. তারশংকর বন্দ্যোপাধ্যায় - কালাপাহাড়
৪. নারায়ণ গঙ্গোপাধ্যায় - হাড়
৫. সৈয়দ মুজতবা আলী - নোনামিঠা

কবিতা -

৩০ (পিরিয়ড)

১. মধুসূদন দত্ত - আত্মবিলাপ
২. রবীন্দ্রনাথ ঠাকুর - আগমন

৩. কাজী নজরুল ইসলাম - আমার কৈফিয়ৎ
৪. শক্তি চট্টোপাধ্যায় - যেতে পারি, কিন্তু কেন যাব?
৫. অনন্যদাশংকর রায় - কাজ

নাটক — মেবার পতন — দ্বিজেন্দ্রলাল রায় (নির্বাচিত অংশ)

৮ (পিরিয়ড)

ভাষা/ব্যাকরণ —

২০ (পিরিয়ড)

- ভারতে প্রচলিত ভাষা পরিবার। বাংলাভাষার উৎপত্তি ও ক্রমবিকাশ। বাংলা লিপির উৎস ও ক্রমবিকাশ।
- ভাষাবৈচিত্র্য সম্বন্ধে ধারণা। বাংলাভাষার আঞ্চলিক রূপ, সমাজভাষা ও ব্যক্তিভাষার সাধারণ পরিচয়
- সাধুভাষা ও চলিত ভাষা
বানানবিধি

নির্মিতি -

১০ (পিরিয়ড)

প্রবন্ধ রচনা

প্রতিবেদন/পত্ররচনা

প্রকল্প -

১০ (পিরিয়ড)

প্রফ

মোট পিরিয়ড ১০৮

দ্বাদশ শ্রেণি (BEN 2)

গদ্য :

৩০ পিরিয়ড

- ১) বঙ্কিমচন্দ্র চট্টোপাধ্যায় - সুবর্ণগোলক
- ২) রবীন্দ্রনাথ ঠাকুর - কঙ্কাল
- ৩) বিভূতিভূষণ বন্দ্যোপাধ্যায় - অভিনন্দন-সভা
- ৪) আশাপূর্ণা দেবী - ঈর্ষা
- ৫) মতি নন্দী - অবিনাশের সাড়ে আটচল্লিশ

কবিতা :

৩০ পিরিয়ড

- ১) রবীন্দ্রনাথ ঠাকুর — প্রার্থনা
- ২) কাজী নজরুল ইসলাম - আমি গাই তারি গান
- ৩) জীবনানন্দ দাশ - সেই দিন এই মাঠ
- ৪) সুভাষ মুখোপাধ্যায় - ভুলে যাব না
- ৫) নীরেন্দ্রনাথ চক্রবর্তী - কলকাতার যীশু

নাটক :

৮ পিরিয়ড

রথের রশি - রবীন্দ্রনাথ ঠাকুর

ভাষা/ব্যাকরণ :

২০ পিরিয়ড

- ১) ধ্বনি - বাগযন্ত্র। বাংলাভাষার ধ্বনি ও বৈচিত্র্য। ধ্বনি পরিবর্তন।
- ২) বাংলাভাষার শব্দ তৈরির কৌশল। শব্দ ও অর্থ।
- ৩) বাক্যের আসক্তি, যোগ্যতা, আকাঙ্ক্ষা। বাংলা বাক্যের গঠন ও গঠনগত ভাগ। অর্থগত ভাগ।
- ৪) প্রবাদ প্রবচন।
- ৫) বিরামচিহ্ন

নির্মিতি

১০ পিরিয়ড

প্রবন্ধ রচনা (১০ নম্বর)

ভাবসম্প্রসারণ/ভাবার্থ/তথ্যপঞ্জি অনুযায়ী (অনুচ্ছেদ রচনা/প্রবন্ধ রচনা) / মতের পক্ষে বা বিপক্ষে (প্রবন্ধ রচনা)

অনুচ্ছেদ রচনা — (০৫ নম্বর)

প্রকল্প -

১০ পিরিয়ড

প্রফ

প্রকল্পের বিষয়

১. অনুবাদ (ইংরাজী বা হিন্দি ভাষা থেকে বাংলা)
২. সমীক্ষা (Survey Report)
৩. স্বরচিত গল্প রচনা
৪. চরিত্র নির্মাণ (গল্প বা উপন্যাস থেকে যেমন ফেলুদা, ঘনাদা, ব্যোমকেশ)
৫. সাক্ষাৎকার গ্রহণ
৬. সাহিত্যিকদের জীবন, কর্ম ও অবদান

একাদশ এবং দ্বাদশের জন্য যে
কোনো একটি করে মোট দুটি
প্রকল্প নির্বাচন করবে।

মোট পিরিয়ড - ১০৮

| | MCQ | VSA | ET | TOTAL |
|----------------|--------------------|--------------------|-------------------|-------|
| গদ্য | $3 \times 1 = 3$ | $2 \times 1 = 2$ | $2 \times 5 = 10$ | 15 |
| কবিতা | $3 \times 1 = 3$ | $2 \times 1 = 2$ | $2 \times 5 = 10$ | 15 |
| নাটক | $3 \times 1 = 3$ | $2 \times 1 = 2$ | $1 \times 5 = 5$ | 10 |
| ভাষা | $10 \times 1 = 10$ | $10 \times 1 = 10$ | $1 \times 5 = 5$ | 25 |
| নির্মিতি | | | $10 + 5$ | 15 |
| প্রকল্প + প্রফ | | | $15 + 5$ | 20 |
| | 19 | 16 | | 100 |

MCQ : Multiple Choice Questions

VSA : Very Short Answer Type Questions

ET : Essay Type Questions

HINDI (HIN 1 and HIN 2)**एकादश तथा द्वादश श्रेणी**

| | | |
|---|---------|--------------|
| Total no. of weeks for classes/ Year : 36 | | |
| Classes per week : 3 | Th = 2 | Project = 1 |
| Total classes per year : 108 | Th = 72 | Project = 36 |
| Total marks : 100 | Th = 80 | Project = 20 |

पूर्णमान-१००

| | |
|----------|------------|
| गद्य | 15 |
| काव्य | 15 |
| नाटक | 10 |
| भाषा | 25 |
| रचना | 15 |
| परियोजना | 20 (15+ 5) |
| कुल | 100 |

एकादश श्रेणी (HIN1)**काव्य —****(30 पीरियड)**

सूरदास के पद

भारतेन्दु हरिश्चन्द्र

मैथिलीशरण गुप्त – चारु चन्द्र की चंचल किरणें

बच्चन – अग्नि पथ! अग्नि पथ! अग्नि पथ!

नागार्जुन – अकाल और उसके बाद

गद्य —**(30 पीरियड)**

महावीर प्रसाद द्विवेदी – साहित्य

चन्द्रधर शर्मा गुलेरी – उसने कहा था

अज्ञेय – बहता पानी निर्मला

हरिशंकर परसाई – विकलांग श्रद्धा का दौर

नासिरा शर्मा – सबीना के चालीस चोर

एकांकी —

(8 पीरियड)

उपेन्द्रनाथ अश्क – अधिकार का रक्षक

भाषा / व्याकरण —

(20 पीरियड)

हिन्दी भाषा की उत्पत्ति और विकास

देवनागरी लिपि

हिन्दी की उपभाषाएँ

संज्ञा और उसके भेद

सर्वनाम और उसके भेद

विशेषण और उसके भेद

क्रिया और उसके मुख्य भेद

वाच्य परिवर्तन

वाक्य परिवर्तन

प्रत्यय और उपसर्ग

विराम चिह्न

परिभाषा- प्रशासनिक, कारीगरी (कृषि, वाणिज्य)

रचना विधि —

(10 पीरियड)

निबन्ध

प्रतिवेदन / पत्र

परिभाषिक शब्दावली

परियोजना (Project)

(10 पीरियड)

द्वादश श्रेणी (HIN2)

काव्य —

(30 पीरियड)

तुलसीदास के पद

जयशंकर प्रसाद – अरी बरुणा की शांत कछार

दिनकर – समर शेष है

अज्ञेय – मैंने देखा, एक बूंद

सर्वेश्वर दयाल सक्सेना – प्रार्थना

गद्य —

(30 पीरियड)

हजारीप्रसाद द्विवेदी – शिरीष के फूल

प्रेमचन्द – मंत्र

कृष्णा सोवती – सिक्का बदल गया

राहुल सांकृत्यायन – किन्नर देश की ओर

रवीन्द्रनाथ टैगोर – छुट्टी

नाटक —

(8 पीरियड)

भुवनेश्वर – ताँबे के कीड़े

व्याकरण —

(20 पीरियड)

सन्धि, समास, प्रत्यय, उपसर्ग, वाक्य परिवर्तन, वाक्य विश्लेषण

निबन्ध रचना —

(10 पीरियड)

रिपोर्ट

भाव विस्तार

भाषण – पक्ष / विपक्ष

प्रूफ

परियोजना (Project)

(10 पीरियड)

अनुवाद – (अंग्रेजी या बांग्ला से हिन्दी में)

समीक्षा (Survey Report)

स्व रचित कहानी

कहानी का नाटक में परिवर्तन

साक्षात्कार

प्रमुख साहित्यकारों की जीवनी

| | MCQ | VSA | ET | TOTAL |
|------------------|--------------------|--------------------|-------------------|-------|
| गद्य | $3 \times 1 = 3$ | $2 \times 1 = 2$ | $2 \times 5 = 10$ | 15 |
| पद्य | $3 \times 1 = 3$ | $2 \times 1 = 2$ | $2 \times 5 = 10$ | 15 |
| नाटक | $3 \times 1 = 3$ | $2 \times 1 = 2$ | $1 \times 5 = 5$ | 10 |
| भाषा | $10 \times 1 = 10$ | $10 \times 1 = 10$ | $1 \times 5 = 5$ | 25 |
| रचना | | | $10 + 5$ | 15 |
| परियोजना + प्रूफ | | | $15 + 5$ | 20 |
| | 19 | 16 | | 100 |

MCQ : Multiple Choice Questions

VSA : Very Short Answer Type Questions

ET : Essay Type Questions

नेपाली (NEP 1 and NEP 2)

(एघारौँ र बाह्रौँ श्रेणी)

Total no. of weeks for classes/ Year : 36

Classes per week : 3

Total classes per year : 108

Total marks : 100

Th = 2

Th = 72

Th = 80

Project = 1

Project = 36

Project = 20

पूर्णमान-१००

| | | |
|-----------|---|-----|
| गद्य | – | १५ |
| पद्य | – | १५ |
| नाटक | – | १० |
| भाषा | – | २५ |
| रचना | – | १५ |
| परियोजना | – | २० |
| पूर्णाङ्क | – | १०० |

एघारौँ श्रेणी (NEP1)

पद्य

(३० पिरियड)

- | | | |
|--------------------------|---|------------------------------|
| १. लक्ष्मीप्रसाद देवकोटा | – | जिन्दगीको मौसम |
| २. बालकृष्ण सम | – | स्वर्ग आफै बन्छ |
| ३. धरणीधर कोइराला | – | साहित्य सुधा |
| ४. रवीन्द्रनाथ ठाकुर | – | प्रार्थना (जहाँ मन निर्भय छ) |
| | | अनु. बालकृष्ण सम |

गद्य

(३० पिरियड)

- | | | |
|----------------------|---|-------------|
| १. गुरुप्रसाद मैनाली | – | कर्तव्य |
| २. रूपनारायण सिंह | – | बितेका कुरा |

३. हरिप्रसाद 'गोर्खा' राई – गोर्खाको मोडेल
४. राजनारायण प्रधान – गान्धी

नाटक

(८ पिरियड)

- मनबहादुर मुखिया – 'चिडियाखाना' एकाङ्की मात्र (अँध्यारामा बाँच्नेहरू)
- बाट

भाषा/व्याकरण

(२० पिरियड)

१. भाषा – परिभाषा, भाषा र व्याकरणको सम्बन्ध, नेपाली भाषाको परिचय।
२. लिङ्ग – परिभाषा, प्रकार, पुलिङ्गबाट स्त्रीलिङ्ग बनाउने विधि।
३. वचन – परिभाषा, प्रकार, एकवचनबाट बहुवचन बनाउने विधि।
४. विराम चिन्ह – पूर्णविराम, अर्धविराम, प्रश्नसूचक चिन्ह, विस्मयादिबोधक चिन्ह।

रचना

(१० पिरियड)

- प्रबन्ध रचना
- प्रतिवेदन / पत्ररचना

परियोजना (प्रोजेक्ट)

(१० पिरियड)

(तलका मध्ये कुनै एउटा विषयमा मात्र)

१. एच. आई. भी. एड्स रोग सङ्क्रमण र यसको रोकथामका उपायहरू (एक हजारदेखि पन्ध्र सय शब्दभित्र)
२. दार्जिलिङ पहाडी क्षेत्रमा खानेपानीको समस्या र यसको समाधानका प्रयास, कारबाही र नयाँ उपायहरू (एक हजारदेखि पन्ध्र सय शब्दभित्र)।
३. आफूले गरेको कुनै एउटा रोमाञ्चक यात्राको विवरण (पन्ध्र सय शब्दभित्र)।
४. आफू सहभागी रहेको कुनै एउटा जिल्ला स्तरीय सामाजिक, सांस्कृतिक वा साहित्यिक कार्यक्रमको विवरण (पन्ध्र सय शब्दभित्र)।
५. दार्जिलिङ पहाडी क्षेत्रको पर्यटन व्यवस्था र व्यवसायको स्थिति तथा यसको सुधारको सम्भावना पन्ध्र सय शब्दभित्र)।

बाह्रौँ श्रेणी (NEP2)

पद्य

(३० पिरियड)

- | | |
|--------------------------|-----------------------|
| १. लक्ष्मीप्रसाद देवकोटा | - यात्री |
| २. गोपाल प्रसाद रिमाल | - एक दिन एक चोटी आउँछ |
| ३. भूपि शेरचन | - शहीदहरूको सम्झनामा |
| ४. नरबहादुर दाहाल | - पतझड |

गद्य

(३० पिरियड)

- | | |
|---------------------|---------------------|
| १. रामकृष्ण शर्मा | - प्यारो सपना |
| २. लैनसिंह बाड्देल | - मूर्तिकारको धोको |
| ३. शिवकुमार राई | - माछाको मोल |
| ४. इन्द्रबहादुर राई | - रातभरि हुरी चल्यो |

नाटक

(८ पिरियड)

- | | |
|-----------------|--|
| मनबहादुर मुखिया | - 'अँध्यारामा बाँचेहरू' एकाङ्की मात्र (अँध्यारामा बाँचेहरूबाट) |
|-----------------|--|

भाषा – व्याकरण

(२० पिरियड)

- तत्सम, तद्भव र आगन्तुक शब्द ।
- नेपाली उखान, तुक्का र वाग्धारा ।
- पर्यायवाची, विपरीतार्थक र सार शब्द ।
- नेपाली वर्तनी प्रयोग विधि (हिज्जे) ।

रचना

(१० पिरियड)

- भावविस्तार वा सारांश लेखन
- विज्ञापन लेखन
- प्रबन्ध रचना
- अङ्ग्रेजीबाट नेपाली अथवा नेपालीबाट अङ्ग्रेजीमा अनुवाद

परियोजना (प्रोजेक्ट)

(१० पिरियड)

(तलकामध्ये कुनै एउटा विषयमा मात्र)

- नशालु पदार्थ सेवनले युवावर्गमा पारेको नकारात्मक प्रभाव (एक हजारदेखि पन्ध्र सय शब्दभित्र) ।
- कुनै दुईजना प्रसिद्ध नेपाली साहित्यकारहरूको साहित्यिक परिचय र तिनले पुर्‍याएको योगदानको मूल्याङ्कन (एक हजारदेखि पन्ध्र सय शब्दभित्र) ।
- विश्वधरोहर घोषित दार्जिलिङ हिमालयन रेलको इतिहास र वर्तमान समयमा यसको अवस्था (एक हजारदेखि पन्ध्र सय शब्दभित्र) ।
- दार्जिलिङ पहाडी क्षेत्रमा भल-पैहो, बाटाघाटा र पुल – साँघुहरूको दूरावस्थाले जनजीवनमा ल्याएको सङ्कट निवारण गर्ने उपायहरू (एक हजारदेखि पन्ध्र सय शब्दभित्र) ।
- चामे ('परालको आगो'), गौथली ('परालको आगो'), रने ('माछाको मोल'), मोटा राई ('भ्रमर') कालेकी आमा ('रातभरि हुरी चल्यो') – को चरित्र चित्रण (एक हजारदेखि पन्ध्र सय शब्दभित्र) ।

| | MCQ | VSA | ET | TOTAL |
|----------|---------|---------|--------|-------|
| गद्य | 3×1=3 | 2×1=2 | 2×5=10 | 15 |
| पद्य | 3×1=3 | 2×1=2 | 2×5=10 | 15 |
| नाटक | 3×1=3 | 2×1=2 | 1×5=5 | 10 |
| भाषा | 10×1=10 | 10×1=10 | 1×5=5 | 25 |
| रचना | | | 10 + 5 | 15 |
| परियोजना | | | 15 + 5 | 20 |
| | 19 | 16 | | 100 |

MCQ : Multiple Choice Questions

VSA : Very Short Answer Type Questions

ET : Essay Type Questions

सन्दर्भ

१. प. ब. उच्च माध्यमिक शिक्षा परिषद् – नेपाली 'ए' (एघारौं र बाह्रौं श्रेणीका निम्ति)
२. प. ब. उच्च माध्यमिक शिक्षा परिषद् – नेपाली 'बी' (एघारौं र बाह्रौं श्रेणीका निम्ति)
३. प. ब. माध्यमिक शिक्षा परिषद् – नेपाली 'बी' (नवौं र दसौं श्रेणीका निम्ति)
४. घनश्याम नेपाल र पुष्कर पराजुली – माध्यमिक नेपाली व्याकरण र रचना
५. घनश्याम नेपाल र कविता लामा – उच्च माध्यमिक नेपाली व्याकरण र रचना
६. मनबहादुर मुखिया – अँध्यारामा बाँच्नेहरू (एकाङ्की सङ्ग्रह)
७. जेम्स कार्थक – नेपाली साहित्यका केही प्रतिभाहरू

Urdu (URD 1 & URD 2)**Class XI & XII**

| | | |
|-------------------------------------|--------|--------------|
| Total of weeks for classes/year: 36 | | |
| Classes per week: 3 | Th=2 | Project =1 |
| Total classes per year: 108 | Th=72 | Project = 36 |
| Total marks: 100 | Th= 80 | Project = 20 |

Full Marks - 100

| | |
|----------------|-----------------|
| Prose: | 15 Marks |
| Poetry: | 15 Marks |
| Drama : | 10 Marks |
| Language : | 25 Marks |
| Composition: | 15 Marks |
| Project+Proof: | 20 Marks (15+5) |
| Total : | 100 |

Class – XI (URD 1)**Poetry**

(30 Periods)

1. Faqiron ki sada (Nazm) – Nazir Akbarabadi
2. Mad-o-Jazar-e-Islam (Nazm) – Knwja Altaf Hussain Hali
3. Patta Patta, Boota Boota (Ghazal) - Mir Taqi Mir
4. Phir Mujhe Deeda-e-tar.. (Ghazal) - Mirza Ghalib
5. jab Daagh-e-Bekasi... (Mirthia)- Mir Anis

Prose

(30 Periods)

1. Quissa Khwaja Sag-parast ka- (From “Bagh-o-Bhahar”)-Mir Amman
2. Mir Mehdi Majrooh ke naam (Letter) - Mirza Ghalib
3. Ummeed ki Khushi- (Essay) - Sir Syed
4. Hasan Nizami ki hasti...(From Aap Beeti) - Khwaja Hasan Nizami
5. “Kal raat paani barsa...” (Letter) Faiz Ahmad Faiz

Drama: Said-e-Hawas by Agha Hashr (First Act-two scenes)

(8 Periods)

Language/Grammar

(20 Periods)

- Families of Indian Language
- Origin & Development of Urdu Language in India.
- Dialects of Western Hindi
- Daccani and Gujri urdu. Language of Sufi Saints.
- Characteridtics of Urdu Language in Northern & Southern India.
- Development of Urdu Language in Bengal
- Contributions of Fort William College, Calcutta. Beginning of Simple Urdu, Style of prose writing in Bahar-o-Bahar by Mir Amman & Letters of Mirza Ghalib.

Composition

Easy Writing

Report/Letter Writing

(10 Period)

Project

Proof

(10 Period)

Class – XII (URD2)

Poetry

(30 Periods)

1. Dar Madh Bahadur Shah Zafar (Qasida) - Sk. Ibrahim Zauq
2. Masti mein Farogh-e-Rukh-e-janan (Ghazal) - Asghar Gondvi
3. Isaan aur Bazm-e-Qudrat (Poem) - Sir Md. Iqbal
4. Fakhta ki Awaz-(Poem)-Josh Malihabadi
5. Dard Ayega Dabey Paaon (Poem) - Faiz Ahmad Faiz

Prose

(30 Periods)

1. Bahadur Shah aur Phool walon ki sair- Farhatullah Baig
2. “Guzashta saal jab hum... (From Ghubar-e-Khatir) Maulana Azad
3. Insan kisi haal mein (From” Nairang-e-Khayal”) Md. Hussain Azad

4. Md. Ali jauhar (From Ganj-hai Giran-maya)- Rashid A. Siddiqui

5. Addu-(Short Story)- Jeelani Bano

Drama

Drama “Kheti” By: Prof. Md. Mujeeb (First Two Acts)

(8 Periods)

Language/Grammar

(20 Periods)

- Different parts of Urdu Grammar-Ilm-e-Hijja, Ilm-e-Huroof, Ilm-e-Nahv, Ilm-e-Bayan, Ilm-e-Urooz.
- Types of Huroof-Mufrid & Murakkab.
- Synonym & Antonym
- *I'raab* (sings)
zabar,zer,paish,jazam,mudd,tashdeed, tanveen,hamza,mauqoof.
- Different types of Gender, number, Tense in Urdu.
- Phrases & Proverbs.
- Construction of Sentences in urdu

Composition

(10 Periods)

- Eassy Writting (10 Marks)
- Expression of Thoughts/Summary/Substance/Expand the idea
- Paragraph Writing (5 Marks)

Project

Proof

(10 Periods)

Topic of Project

1. Translation (From English to Urdu)
2. Survey Report
3. Self-composed Story
4. Characterization (From Story or Novel like Asghari Akbari from “Miratul-Uroos”, Mirza Zahirdar Baig from “Taubatun Nasooh”)

For Class XI & XII one each topic will be selected. In total two topics will be selected.

5. Taking Interview
6. Writer’s life, work & achievement.

| | MCQ | VSA | ET | TOTAL |
|---------------|-----------|-----------|--------|------------|
| Prose | 3×1=3 | 2×1=2 | 2×5=10 | 15 |
| Verse | 3×1=3 | 2×1=2 | 2×5=10 | 15 |
| Drama | 3×1=3 | 2×1=2 | 1×5=5 | 10 |
| Language | 10×1=10 | 10×1=10 | 1×5=5 | 25 |
| Composition | | | 10+5 | 15 |
| Project+Proof | | | 15+5 | 20 |
| | 19 | 16 | | 100 |

MCQ : Multiple Choice Questions

VSA : Very Short Answer Type Questions

ET : Essay Type Questions

References:

1. Urdu Selection of Prose & Verse, 2013. Published by W.B. Council of Higher Secondary Education
2. Maquddama-e-Tarikh-e-Zaban-e-Urdu. By: Msood Hussain Khan
3. Drama “Said-e-Hawas”. By Agha Hashr
4. Drama Kheti. By: Prof. Md. Mujeeb
5. Bengal mein Urdu. By: Wafa Rashidi
6. Mashraqi Bengal mein Urdu. By: Iqbal Azim

English (ENG1)**Class XI**

| | | |
|-------------------------------|-----------------|---------------------|
| 1. Total Classes Per Week: 3 | Theoretical: 2 | Project/Tutorial:1 |
| 2. Total Classes Per Year:108 | Theoretical: 72 | Project/Tutorial:36 |
| 3. Total Marks: 100 | Theoretical: 80 | Project:20 |

I. Topics**Theoretical And Project Work****(80 Marks + 20 Marks)**

1. Prose: 20 Marks
2. Poetry: 20 Marks
3. Drama (One-act Play): 10 Marks
4. Rapid Reader (Comprehension): 10 Marks
5. Textual Grammar: 10 Marks
6. ESP (Personal Letter Writing/Official Letter Writing/Paragraph Writing): 10 Marks
7. Project Work : 20 Marks

Total: 100 Marks

II. Detailed Content And Period Allocation**A. Theoretical:****1. Prose** 15 Periods

- i. “Lalajee” By Jim Corbett
- ii. “Cinderella” - Traditional
- iii. “The School That I Would Like” By William

2. Poetry

- i. “The Solitary Reaper” by William Wordsworth 9 Periods
- ii. “In Time of ‘The Breaking of Nations’” by Thomas Hardy
- iii. “The Owl” by Edward Thomas

3. Drama (One-Act Play) 10 Periods

“The Death-trap” By H. H. Munro (Saki)

4. Rapid Reader 12 Periods

“My Boyhood Days” By Rabindranath Tagore

5. Textual Grammar 16 Periods

- i. Narration Change
- ii. Voice Change
- iii. Transformation of Sentences
- iv. Joining / Splitting
- v. Filling in the blanks with correct forms of given verbs

6. English For Special Purpose (ESP) 10 Periods

- i. Personal Letter Writing (Within 120 Words)
- ii. Official Letter Writing (Within 120 Words)
- iii. Paragraph Writing (Within 120 Words)

B. Project/Tutorial:**1. Project Work**

- i. Interview of a teacher / a member of the staff of the school / a member of the family / imaginary interview of a famous person, whether past or present
- ii. Picture description 10 Periods

- iii. Autobiography of a non-living object, e.g. a pen / a coin / a book etc.

Note: For Project Work In Class XI, one out of the three above.

2. Tutorial

26 Periods

On theoretical work, specially Textual Grammar and ESP

III. Question Pattern And Marks Allotment

A. Theoretical: 80 Marks

1. Prose: 20 Marks

| | | |
|-------------------------|---|-------------------------|
| MCQ (4 Alternatives) | Word limit not applicable (4 out of 4) | $1 \times 4 = 4$ Marks |
| SAQ (6 Out of 10) | In a single sentence | $1 \times 6 = 6$ Marks |
| DAQ | In about 75 words (2 out of 3) | $5 \times 2 = 10$ Marks |

2. Poetry: 20 Marks

| | | |
|-------------------------|---|-------------------------|
| MCQ (4 Alternatives) | Word limit not applicable (4 out of 4) | $1 \times 4 = 4$ Marks |
| SAQ | In a single sentence (6 out of 10) | $1 \times 6 = 6$ Marks |
| DAQ | In about 75 words (2 out of 3) | $5 \times 2 = 10$ Marks |

3. Drama: 10 Marks

| | | |
|-------------------------|---|------------------------|
| MCQ (4 Alternatives) | Word limit not applicable (3 out of 3) | $1 \times 3 = 3$ Marks |
| SAQ | In a single sentence (2 out of 4) | $1 \times 2 = 2$ Marks |
| DAQ | In about 75 words (1 out of 3) | $5 \times 1 = 5$ Marks |

MCQ : Multiple Choice Questions

VSA : Very Short Answer Type Questions

ET : Essay Type Questions

4. Rapid Reader: 10 Marks (Only Comprehension Passage)

| | |
|------------------|------------------------|
| Rearrange | 5 Marks |
| True/False | $1 \times 3 = 3$ Marks |
| Table completion | $1 \times 2 = 2$ Marks |

5. Textual Grammar: 10 Marks

| | |
|---|------------------------|
| Narration change | 1 Mark |
| Voice change | 1 Mark |
| Transformation of sentences | $1 \times 3 = 3$ Marks |
| Joining/ Splitting | $1 \times 2 = 2$ Marks |
| Filling in the blanks with correct forms of given verbs | $1 \times 3 = 3$ Marks |

6. ESP: 10 Marks

| | |
|---|----------|
| Personal letter writing (within 120 words) | 10 Marks |
| Official letter writing (within 120 words) | 10 Marks |
| Paragraph writing (within 120 words) | 10 Marks |

All three to be set as questions. Any one to be attempted

B. Project Work: 20 Marks

- i. Interview of a teacher / a member of the staff of the school / a member of the family / imaginary interview of a famous person, whether past or present
- ii. Picture description
- iii. Autobiography of a non-living object, e.g. a pen / a coin / a book etc.

Note: For Project Work in Class XI, one out of the three above.

Word Limit For Project Work: 800 - 1000 Words.

English (ENG2)

Class XII

| | | |
|---------------------------------------|------------------------|--|
| 1. Total Classes Per Week: 5 | Theoretical: 2 | Project/Tutorial: 3(1+2*) <i>*2 periods for developing communicative skills in English</i> |
| 2. Total Classes Per Year: 180 | Theoretical: 72 | Project/Tutorial: 36 Developing communicative skills in English : 72 |
| 3. Total Marks: 100 | Theoretical: 80 | Project: 20 |

I. Topics

Theoretical and Project work

(80 marks + 20 marks)

1. Prose: 20 Marks
2. Poetry: 20 Marks
3. Textual Grammar: 10 Marks
4. ESP (Personal Letter Writing/Official Letter Writing, CV (Curriculum Vitae) Writing/ Report Writing, but no newspaper report): 10 Marks
5. Unseen Comprehension: 15 Marks
6. Project Work (Internal): 20 Marks

TOTAL: 100 MARKS

B. Developing Communicative Skills in English

(No marks allotted)

Beside being an independent area for developing communicative skills, this is also an area for preparation for Project Work and for developing skills in writing ESP items.

1. To develop listening and speaking skills.
 - (i) **Listening Skill** – Teachers will read out a passage to the students three times — first time for listening, second time for writing down and third time for verifying, after which teacher will assess the listening skill of the students by examining the scripts of the students. The passages are to be selected by the teacher from school textbooks of a comparable level, or newspapers, magazines, journals etc., so as to be

accessible by the students within their vocabulary capacity. The scripts of the students should be carefully preserved by the institutions.

- (ii) **Speaking Skill** – Teachers will ask the students to read out a passage, and the teachers will assess the speaking skill of the students. The passages are to be selected by the teacher from school textbooks of a comparable level, or newspaper, magazines, journals etc., so as to be accessible by the students within their vocabulary capacity. Passages given to the students for reading out should be carefully preserved by the institutions.

Note: *Students shall be tested on listening and speaking skills - the two components of the Project Work of 20 marks.* (Refer to B. Project Work under III. Question Pattern and Marks Allotment)

2. To Practise the items in English for Special Purpose (ESP).

- (i) Personal Letter Writing (ii) Official Letter Writing (iii) CV Writing (iv) Report Writing (No Newspaper Report).

Note: *ESP to be tested in the theoretical part of 80 marks.* (Refer to III.A.4)

II. Detailed Content and Period Allocation

A. Theoretical:

1. Prose 15 periods

- i. “Three Questions” by Leo Tolstoy
- ii. “The Parrot’s Training” by Rabindranath Tagore
- iii. “The Face of Judas Iscariot” by Bonnie Chamberlin

2. Poetry 10 periods

- i. “I Remember, I Remember” by Thomas Hood
- ii. “Break, Break, Break” by Lord Tennyson
- iii. “The Send-off” by Wilfred Owen

3. Textual Grammar 20 periods

- i. Narration change
- ii. Voice change
- iii. Transformation of sentences
- iv. Filling in the blanks with articles and prepositions
- v. Correction of errors

4. English for Special Purpose (ESP) 12 periods

- i. Personal Letter Writing (within 120 words)
- ii. Official Letter Writing (within 120 words)
- iii. CV Writing (within 120 words)
- iv. Report Writing (NO *NEWSPAPER REPORT*)
(within 120 words)

5. Unseen Comprehension 15 periods

B. Project/Tutorial:**1. Project Work**

10 Periods

- i. Listening Skill
- ii. Speaking Skill

2. Tutorial

26 Periods

On theoretical work, specially on textual questions and textual grammar

3. Developing Communicative Skills in English:

- i. Developing Listening Skill 24 Periods
- ii. Developing Speaking Skill 24 Periods
- iii. Practice of ESP items 24 Periods

III. Question Pattern And Marks Allotment

Total Marks: 100 (Theoretical:80, Project Works: 20)

A. Theoretical:**1. Prose: 20 Marks**

| | | |
|-------------------------|---|-------------------------|
| MCQ (4 Alternatives) | Word limit not applicable (4 out of 4) | $1 \times 4 = 4$ Marks |
| SAQ | In a single sentence (6 out of 8) | $1 \times 6 = 6$ Marks |
| DAQ | In about 75 words (2 out of 3) | $5 \times 2 = 10$ Marks |

2. Poetry: 20 Marks

| | | |
|-------------------------|---|-------------------------|
| MCQ (4 Alternatives) | Word limit not applicable (4 out of 4) | $1 \times 4 = 4$ Marks |
| SAQ (6 out of 8) | in a single sentence | $1 \times 6 = 6$ Marks |
| DAQ (2 out of 3) | in about 75 words | $5 \times 2 = 10$ Marks |

3. Textual Grammar: 15 Marks

| | |
|--|------------------------|
| Narration Change | $1 \times 2 = 2$ Marks |
| Voice Change | 1 Marks |
| Transformation of Sentences | $1 \times 6 = 6$ Marks |
| Filling in the Blanks With Articles and Preposition | $1 \times 3 = 3$ Marks |
| Correction of Errors | $1 \times 3 = 3$ Marks |

4. ESP: 10 Marks

| | |
|--|----------|
| Personal Letter (within 120 words) | 10 Marks |
| Official Letter (within 120 words) | 10 Marks |
| CV Writing (within 120 words) | 10 Marks |
| Report Writing (No Newspaper report) (within 120 words) | 10 Marks |
| <i>Any three out of the four above to be set as questions, any one to be attempted</i> | |

5. Unseen Comprehension: 15 Marks

| | |
|------------------|------------------------|
| Rearrange | 5 Marks |
| True/False | $1 \times 4 = 4$ Marks |
| Table Completion | $2 \times 3 = 6$ Marks |

B. Project Work : 20 marks

| | |
|----------------------------|----------|
| i. Test of Listening Skill | 10 Marks |
| ii. Test of Speaking Skill | 10 Marks |

Entrepreneurship Development & Computer Application (EDCA)

Class XI

| | | |
|--|---------------|---------------------------------------|
| Total no. of weeks for classes / Year: 36 | | |
| Classes per week: 8 | Th=4 | Practical/Project=4 |
| Total classes per year: 288 | Th=144 | Practical/Project = 144 |
| Total marks: 100 | Th= 50 | Practical = 25 Project = 25 |

Course Contents:

Theory:

Group A (Entrepreneurship Development)

Theory (25 marks, 72 Periods)

Module I : Overview and definition of Entrepreneurship

[Period - 6]

- Content:**
1. Definition of Entrepreneurship
 2. Definition of Entrepreneur
 3. Qualities of an Entrepreneur
 4. Creativity and Risk-taking

Module II : Basic forms of Small Business

[Period -14]

- Content:**
1. Sole Proprietorship - Advantages & disadvantages
 2. Partnership - Advantages & disadvantages
 3. Corporations- Advantages & disadvantages
 4. Special forms of business -
(i) Franchises (Home based and Web bascd), (ii) Self-help Group
 5. Reasons for success / failure of small business

Module III : Legal Requirements for starting a small business

[Period -16]

- Content:**
1. Government Policies
 2. Government incentives to small businesses
 3. Licensing
 4. Clearance from Pollution Control Board
 5. Others

Modulc IV : Managerial Requirements for starting a small business**[Period - 22]**

- Content:**
1. Planning
 2. Financing
 3. Marketing
 4. Human Resource Development
 5. Accounting

Module V : Contents of a Project Report for starting a Business**[Period -14]**

1. Narrc of the Applicant
2. Address of Communication
3. Name ofthe Proposed Enterprise (If Decided)
4. Proposed Location of Enterprise
5. Category of Enterprise
 - (i) Micro
 - (ii) Small
 - (iii) Medium
6. Nature of Activity
 - (i) Manufacture
 - (ii) Service
7. Nature of Operation
 - (i) Perennial
 - (ii) Seasonal
 - (iii) Casual
8. Type of Organisation
 - (i) Proprietary
 - (ii) Partnership
 - (iii) Self-help Groups
 - (iv) Others
9. (a) Main Manufacturing/Service Activity
 - (b) Products to Be Manufactured/Service to Be Provided
10. (a) Proposed Investment In Fixed Assets [Rupees In Lakh]
11. Installed Capacity (Proposed) per Annum
 - (i) Quantity
 - (ii) Unit
12. Power Load (Anticipated)
13. Other Sources of Energy/Power
14. Expected Employment

15. Expected Schedule of Commencement of Production/Activity

16. Entrepreneurs' Profile:

(i) Name (ii) Gender (iii) Community (iv) Knowledge Level

Reference Book :

1. Entrepreneurship Development (in English) - S. Anil Kumar- Jain Book Agency
2. Entrepreneurship Development & Management (in English) - Dr. A. K. Singh
3. Entrepreneurship and Small Business Development (in English) - Kiran Sankar Chakraborty
4. Entrepreneurship Development & Computer Applications (in English & Bengali, bilingual version)- Bhagabati Publications

Group B (Computer Applications)

Theory (25 Marks, 72 Periods)

Unit 1: Introduction to Computer Systems

(Periods 22)

- Definition of Computers
 - Features of Computers
 - Functions of Computers
- Evolution of Computers
 - Abacus, Napiers Bone, Pascaline, The Babbage Machine
- Generations of Computers
 - First, Second, Third, Fourth and Fifth Generations of Computers
- Classifications of Computers (Concept only)
 - Analogue, Digital, Hybrid Computers
 - Mainframe and Super Computers
 - Mini, Micro, Laptop Computers
 - Computer Systems
 - Hardware, Software, Data & Information, People
- Computer Organization
 - Block Diagram of a Computer
 - Central Processing Unit: CU, ALU
 - The Bus : Data and Address Bus

- Input Devices
 - Keyboard, Mouse, Scanner, OMR, OCR, Barcode Reader, Joystick, Light Pen
- Output Devices
 - Monitor, Printer, Plotter
- Computer Memory
 - Cache, Primary, Secondary Memory

Unit 2 : Number Systems and Computer Codes**(Periods 24)**

- Concept Non-positional Number System
 - Roman Number System
- Concept Positional Number System
 - Binary, Octal, Decimal and Hexadecimal Number System
- Inter-conversion between the Number Systems
- Arithmetic
 - Addition, Subtraction, Multiplication and Division of Binary Numbers
- Complements: 1's and 2's Complements, Binary Addition and Subtraction using 1's and 2's Complement methods
- Representation of Numbers: Integer and Floating Point Representation
- Integer and Floating Point Arithmetic
- Computer Codes
 - BCD, ASCII, Gray, Excess-3 Code

Unit 3: Computer Software and Programming Languages**(Periods 26)**

- Definition of Software
- Classification of Softwares
 - System Software
 - Translator: Compiler, Interpreter, Assembler
 - Operating Systems
 - Definition and functions of OS
 - Classification: Single User, Multi User, Multiprogramming, Timesharing Operating System (Definitions only)
 - Booting: Cold and Warm Booting (Definitions only)
 - Concept of GUI and CUI
 - MS DOS: Popular Internal and External Commands only
 - Concept of Windows OS (Windows 2007 and Compatible)

- Application Software
- Concept of Problem Solving
 - Algorithm, Flowchart (Definitions and Examples)
- Concept of High and Low Level Languages

Reference Book:

1. Fundamentals of Computers - McGraw Hill Education, Balagurusamy
2. Fundamentals of Computers - Oxford University Press, by Thareja
3. Fundamentals of Computers - PHI Pvt. Ltd., by Rajaraman

Project - (25 Marks, 36 Periods)**Entrepreneurship Development**

1. Every student should exercise the “Entrepreneurship Readiness Questionnaire” to assess the Entrepreneurial Potential in him.

The assessment is to be made by the student himself or herself, and is required to be ratified by the subject teacher.

Entrepreneurship Readiness Questionnaire

[Period -18, Marks allotted-10]

Purpose :

This exercise is intended to assess the subtle qualities of a student. Not everyone is cut out to be an entrepreneur. The fact is, there are certain traits, however, that seem to separate those who will be successful as entrepreneurs from those who may not be. This questionnaire will help to determine in which category a student fits better.

Each student is required to put a tick (✓) mark for each question which best describes his/her traits.

Markings:

- For Question numbers 01,02,06,08,10,11,16,17,21,22,23
One mark for each tick mark is to be awarded to a student if his/her responses to these questions fall under “Agree Completely” and “Mostly Agree”. No marks will be awarded for this group of questions if the responses fall under “Partially Agree”, “Mostly Disagree” or “Disagree Completely”.
- For Question numbers 03,04,05,07,09,12,13,14,15,18,19,20,24,25
One mark for each tick mark is to be awarded to a student if his/her responses to these questions fall under “Mostly Disagree” and “Disagree Completely”. No marks will be awarded for this group of questions if the responses fall under “Agree Completely”, “Mostly Agree” or “Partially Agree”.

| Ques. No. | The Question | Agree Completely | Mostly Agree | Partially Agree | Mostly Disagree | Disagree Completely |
|------------------|---|-------------------------|---------------------|------------------------|------------------------|----------------------------|
| 01. | I am generally optimistic | | | | | |
| 02. | I enjoy competition and always try to do things better than my competitor | | | | | |
| 03. | In solving a problem, I always try to get the best solution first and do not worry about other solutions of the problem | | | | | |
| 04. | I enjoy association of my friends after school hours and attending local club every evening | | | | | |
| 05. | If I am asked to bet for an event, I try to bet in favour of that outcome which may earn maximum profit for me | | | | | |
| 06. | I like setting my own goals and working hard to achieve them | | | | | |
| 07. | I am generally casual and do not take anything seriously | | | | | |
| 08. | In taking action for any event, I first like to know what is going on in that event: that is I do not take any action without having strong idea on the event | | | | | |
| 09. | I work best under the guidance of someone else | | | | | |
| 10. | I can convince others, if I am in right position | | | | | |
| 11. | I find that other people/friends frequently waste my time | | | | | |
| 12. | I enjoy watching football, cricket and other sports events | | | | | |
| 13. | I tend to communicate about myself openly with other people | | | | | |
| 14. | I do not mind following orders from any person, elder or younger, who has authority to order me (e.g. to follow the order of the captain of your school team, to which you are also a member, and the captain may be older than or younger to you) | | | | | |

| Ques. No. | The Question | Agree Completely | Mostly Agree | Partially Agree | Mostly Disagree | Disagree Completely |
|------------------|---|-------------------------|---------------------|------------------------|------------------------|----------------------------|
| 15. | I enjoy more in planning things and less in executing plans | | | | | |
| 16. | I donot like to bet on any event that has more chance to occur | | | | | |
| 17. | If my attempt to any action fails, I quickly shift to something else and do not stick to the failed action | | | | | |
| 18. | To become successful in business, I think enough time should be kept reserved for my family members/friends | | | | | |
| 19. | When I earn some money, I donot use it for unnecessary causes, rather I keep it secured for use in future emergencies | | | | | |
| 20. | I think that making a lot of money is a turning point in life | | | | | |
| 21. | If a problem has a number of alternatives, solving that problem becomes more effective | | | | | |
| 22. | I enjoy impressing others with the things that I can do very well | | | | | |
| 23. | I enjoy playing carrom, chess, badminton, cards etc. with a person/friend who plays better than me | | | | | |
| 24. | In business dealings, I think moral ethics of a person must be bent a little to get things done | | | | | |
| 25. | I think that good friends always make another good | | | | | |

Result:

| Your Score | Your Entrepreneurial Potential |
|-------------------|---|
| 21- 25 | You have great entrepreneurial potential |
| 16 - 20 | You could be quite successful entrepreneur if your other talents and resources are right |
| 11 - 15 | You are in transitional range. With some serious work you can probably develop the outlook you need for running your own business |
| 06 - 10 | Your entrepreneurial potential is doubtful. It would take considerable re-arrangement of your life philosophy and behavior to make it |
| 00 - 05 | Entrepreneurship is not really for you. |

2. Visit the owner of a small business in your locality. Collect data/information from the business person with regard to the following points -
 1. Type of business
 2. Type of customers (e.g. for business dealing with educational stationery, customers are mainly school and college students etc.)
 3. Sources of raw materials
 4. Monthly / annual sales (approximate figures)
 5. Monthly / annual profit (approximate figures)
 6. Threats to the business (like funding, nearest competitor, obsolescence of the product etc.)
 7. Opportunities to the business
 8. Future plans

OR

3. Collect the story of a successful entrepreneur from magazines, journals or through Internet. Read his/her success stories and write an essay on the fact highlighting following points -
 1. What motivated the person to start his/her own business?
 2. How the entrepreneur selected the type of business?
 3. What were the obstacles the entrepreneur faced at the beginning?
 4. How the entrepreneur overcame the obstacles?
 5. What did you learn from the story?

You can take the examples of Great Indian Entrepreneurs from internet by searching

1. Successful Indian Entrepreneurs
2. Success stories of small entrepreneurs
3. Successful Woman Entrepreneurs and so on

[Period -18, Marks - 15]

Practical : (25 Marks, 108 Periods)

Computer Applications

- Windows OS (MS Windows 2007 or Compatible)
 - Starting and Shuting down Windows
 - Working with Taskbar, Control Panel and Desktop Icons
 - Changing Desktop Background
 - Locking or Unlocking, Hiding or Unhiding Taskbar
 - Working with Windows Search and Help
 - Working with Windows Libraries and Wndows Explorer
 - Managing Files and Folders
 - Working with Windows Accessories
- DOS: Working with MS DOS Commands as in theory part
- Word Processing (MS Word 2007 or Compatible)
 - Creating, Opening, Editing, Formatting and Saving Word Document
 - Working with Page Setup, Headers and Footers
 - Inserting Clip-Art, Word-Art, Auto Shapes, Picture, Symbols, Equation
 - Working with Table Insertion, Spelling and Grammar Check
 - Working with Mail Merge and Macros
 - Working with Printer Setup and Document Printing
- Spread Sheet (MS Excel 2007 or Compatible)
 - Creating, Opening, Editing and Saving Word
 - Changing Rows and Column Width
 - Formatting Cells and Entering values
 - Use of In-built Commands
 - SUM, PRODUCT, AVERAGE, MAX, MIN, COUNT, IF, OR, NOT, DATE, TIME, UPPER, LOWER
 - Working with Auto Fill, Conditional Formatting
 - Sorting and Filtering Data
 - Working with Charts
- The Internet
 - Browsing the Internet
 - Using Search Engines
 - Creating and accessing E-mails
 - Sending /Receiving mails with attachments

Environmental Studies (ENST)**Class XII****Total of weeks for classes/year: 36****Classes per week: 2****Total classes per year:72****Th=58****Project = 14****Total marks: 100****Th= 80****Project = 20****Unit Wise Distribution of Marks and Periods**

| | Unit | Marks | No. of Periods |
|--------------|-------------|--------------|-----------------------|
| | I | 05 | 04 |
| | II | 06 | 05 |
| | III | 08 | 06 |
| | IV | 06 | 04 |
| | V | 08 | 05 |
| | VI | 10 | 08 |
| | VII | 10 | 08 |
| | VIII | 06 | 04 |
| | IX | 07 | 05 |
| | X | 06 | 03 |
| | XI | 06 | 04 |
| | XII | 02 | 02 |
| Total | 12 | 80 | 58 |

Course content :**Theory :****Unit I Introduction**

- i What is environment
- ii Physical, Biological and Social Environment
- iii Perception of environment in ancient India
- iv Indian society and environment: Indian heritage, custom and culture

Unit II Man and Environment-A

- i Origin of Earth - evolution of its land, ocean and atmosphere
- ii Development of Life - its impact on atmospheric composition - emergence of terrestrial life - emergence of homosapien sapiens
- iii Earth - a dynamic system - present day environment is a result of continuing geological and life processes and interaction between them.
- iv Anthropogenic activities and their impact on environment
- v Impact of human activities on environment since industrial revolution.

Unit III Man and Environment-B

- i Urban and rural environment
- ii Impact of urbanisation on environment
- iii Impact of development on environment
- iv Impact of population on environment
- v Impact of poverty on environment
- vi Impact of bad habits (e.g. spitting, responding to nature's call in the open) and superstition on environment
- vii Wanton destruction of environment for personal greed
- viii Degradation of natural wealth by human activities
- ix Importance and need of environmental studies.

Unit IV Disaster and Environment

- i Impact of Natural Disasters - earthquakes, volcanic eruptions, forest fires, cyclones, typhoons, hurricanes, tornados, floods, landslides.
Impact of Man Made Disasters -
Destruction of Hiroshima and Nagasaki by atom bomb,
- ii Bhopal Gas Tragedy, Chernobyl accident and Minamata disease.

Unit V Environmental Pollution - A

- i Pollution and pollutant
- ii Air Pollution - pollutants (solids, liquids and gases) and their sources, adverse effects of air pollution, control of air pollution
AIR QUALITY
Smog - classical smog and photochemical smog, condition for photochemical smog event, selected photochemical smog species, adverse effects of photochemical smog, control
- iii Land Pollution - pollutants and their sources, adverse effects and control
- iv Water Pollution - pollutants and their sources, adverse effects and control.
Quality of drinking water

Unit VI Environmental Pollution - B

- i Acid Rain - causes of acid rain, adverse effects and control
- ii Greenhouse Gases - their sources, greenhouse effect and global warming, effects of global warming, measures to control global warming.
- iii Ozone Layer - its range and importance, how it prevents harmful uv radiation from falling on earth.
Depletion of ozone layer - causes and effects.
Antartic and Arctic so called “ozone hole” - its adverse effects.
- iv Adverse effects of tobacco smoking including indoor tobacco smoking
- v Adverse effects of e-wastes and plastics on environment
- vi Radiation pollution
- vii Noise pollution
- viii Odour pollution, pollen pollution
- ix Thermal pollution
- x Metal pollution - Cr, Cu, Zn, Cd, Hg, Pb - their sources and adverse effects

Unit VII Environment Conservation

- i Importance of environmental conservation
- ii Conservation of biodiversity
- iii Conservation of forests
- iv Conservation of wild life
- v Conservation of soil
- vi Conservation of wet-lands
- vii Role of society in the environmental conservation.

Unit VIII Energy and Environment

- i Energy and civilisation
- ii Use of conventional sources of energy - coal, petrol, diesel, wood adverse effects on the environment.
- iii Use of atomic energy - advantages and disadvantages
- iv Use of non-conventional and renewable sources of energy - advantages.

Unit IX Sustainable Development

- i The concept of sustainable development
- ii Sustainable industry
- iii Sustainable agriculture

Unit X Environment - Related Movements in India

- i Introduction
- ii Chipko movement
- iii Save Normada Movement
- iv “Silent Valley” Movement

Unit XI International Conferences of Human Environment

- i Stockholm Conference, 1972
- ii Earth Summit Conference, 1992
- iii Montreal Protocol, 1987
- iv Kyoto Protocol, 1997
- v Conference of the Parties (Cop21), Paris, 2015

Unit XII The Green Bench

- i What is Green Bench
- ii Jurisdiction of Green Bench

Project :**Full Marks: 20****No. of Periods: 14**

The students will have to undertake a PROJECT. They may choose the topic of PROJECT in consultation with their teachers. As examples, a few topics are given below:-

- 01 Domestic solid and liquid disposals in a specified locality
- 02 Month wise average temperature for the last five years
- 03 Month wise average rain-fall for the last five years
- 04 Drainage system in a specified locality
- 05 Impact of road widening on plant population
- 06 Rain-water harvesting
- 07 TV viewing and exposure to extra radiation
- 08 Hazards of drinking water containing arsenic above safe limit
- 09 Importance of wet land
- 10 Occupational health hazards
- 11 e-waste and plastic disposal
- 12 Impact of urbanisation on biodiversity

Academic Electives for Class XI & XII

Mathematics (MTH1)**Class XI**

| | | |
|--|---------------|-----------------------------|
| Total no. of weeks for classes / Year: 36 | | |
| Classes per week: 4 | Th=3 | Practical/Project=1 |
| Total classes per year: 144 | Th=108 | Practical/Project=36 |
| Total marks:100 | Th= 80 | Project = 20 |

Course contents:**Theory:****Unit I ALGEBRA [Marks : 25, Periods 30]**

- 1.1 Laws of indices and simple application**
- 1.2 Complex numbers** – definition, Cartesian and Polar, Exponential form, Modulus and Amplitude and conjugate of a complex numbers, Algebra of Complex Numbers, cube roots of unity and its properties, D-Moivre's Theorem [statement only] and simple problems.
- 1.3 Sequence and series** – Arithmetic Progression [A.P.], Arithmetic Mean, Geometric Progression [G.P.]; General Term of a G.P.; Sum of n terms of a G.P., Geometric Means [G.M.]; Relation between A.M. & G.M.; Sum of terms of the special series $\sum n$, $\sum n^2$ & $\sum n^3$.
- 1.4 Quadratic equations** – definition, analyzing the nature of the roots using discriminant, relation between roots and coefficients; conjugate roots; Fundamental Theorem of Algebra, Solutions of Quadratic Equation in complex number system.
- 1.5 Binomial th** – definition of factorial notation, definition of permutation – combination with formulae, Binomial Theorem for positive integral index, general term, middle term.

Unit II Trigonometry [Marks : 25, Periods 30]

- 2.1 Trigonometric ratios of associated angles** – compound angles – multiple and sub multiple angles [no deduction] related problems.
- 2.2** General solution of trigonometric equation [no deduction of formulae]
- 2.3** Inverse circular function [basic formulae and elementary problems]

Unit III Co-ordinate geometry [Marks : 20, Periods 40]

- 3.1 Co-ordinate system** – cartesian and polar, distance between two points, section formulae, formulae for area of a triangle – problems.
- 3.2 Straight line** – different forms – angle between two straight lines, condition of parallelism and perpendicularism of two straight lines – distance of a point from a given line, problems.
- 3.3** Standard equation of a circle, General Equation of a circle, Standard equations and simple properties of parabola, ellipse, hyperbola. Introduction of the directrix of an ellipse and hyperbola

Unit IV Calculus**[Marks: 10, Period: 8]**

- 4.1** Real valued function of the real variable, domain and range of these functions, constant, identity polynomial, rational, modulus and signum functions with their graphs even, odd, periodic and parametric functions.

Unit V Project [any two]**[Marks:20, Period: 36]**

- I** Curve tracing with reference to algebraic, signum functions
II Contribution of a mathematician in the relevant field with a historical approach
III Project on history, development and application of complex number
IV Project on properties and application of parabola or ellipse.

Question pattern**Class XI**

| Chapter | No. of question | Marks allotted |
|--|---|--|
| Algebra <ul style="list-style-type: none"> Laws and Indices Complex numbers Sequence and series Quadratic equations Binomial theorem | LA – 2 (out of 4) SA – 2 (out of 4) VSA – 2 (out of 4) MCQ – 3 | <div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: right; margin-right: 10px;"> 10 08 04 03 </div> <div style="font-size: 4em; margin: 0 10px;">}</div> <div style="text-align: left;">25</div> </div> |
| Trigonometry <ul style="list-style-type: none"> Trigonometric ratios of associated angles, compound angles, multiple and sub multiple angles. General Solution Inverse circular function | LA – 1 (Out of 2) SA – 3 (Out of 5) VSA -2 (Out of 4) MCQ – 4 | <div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: right; margin-right: 10px;"> 05 12 04 04 </div> <div style="font-size: 4em; margin: 0 10px;">}</div> <div style="text-align: left;">25</div> </div> |
| Coordinate geometry <ul style="list-style-type: none"> Co-ordinate system Straight lines Circle, Parabola, Ellipse, Hyperbola | LA -1 (Out of 3) SA – 2 (Out of 4) VSA – 2 (Out of 4) MCQ – 3 | <div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: right; margin-right: 10px;"> 5 8 4 3 </div> <div style="font-size: 4em; margin: 0 10px;">}</div> <div style="text-align: left;">20</div> </div> |
| Calculus <ul style="list-style-type: none"> Real valued function of the real variable | LA SA – 2 (Out of 4) VSA – 1 (Out of 2) MCQ | <div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: right; margin-right: 10px;"> - 8 2 - </div> <div style="font-size: 4em; margin: 0 10px;">}</div> <div style="text-align: left;">10</div> </div> |

MCQ – $10 \times 1 = 10$ (No. of alternatives)

VSA – $7 \times 2 = 14$ (Total 14 Questions)

SA – $9 \times 4 = 36$ (Total 17 Questions)

LA – $4 \times 5 = 20$ (Total 9 Questions)

80 Total 50 Questions

Mathematics (MTH2)

Class-XII

| | | |
|--|---------------|-----------------------------|
| Total no. of weeks for classes / Year: 36 | | |
| Classes per week: 5 | Th=4 | Practical/Project=1 |
| Total classes per year: 180 | Th=144 | Practical/Project=36 |
| Total marks: 100 | Th= 80 | Project = 20 |

Course Contents:

Theory:

| Content [Name of the Topic] | | Periods |
|---|--|-----------|
| Unit I : Algebra [Marks : 10] | | 20 |
| 1.1 | Concept, notation, order, equality, types of matrices, zero matrix, transpose, symmetric and skew symmetric matrices, operations on matrices, invertible matrices [upto 3 rd order] | |
| 1.2 | Determinant of a square matrix [upto 3 rd order], properties of determinant, minor, co-factor and application in calculating the area of triangle. Adjoint and inverse of a square matrix, Cramer's rule [unique solution] | |
| Unit II : Differential Calculus [Marks:25] | | 44 |
| 2.1 | Intuitive Idea of Limit And Continuity $\lim_{x \rightarrow a} \frac{(x^m - a^m)}{(x-a)}, \quad \lim_{x \rightarrow 0} \left(\frac{\sin x}{x} \right), \quad \lim_{x \rightarrow 0} \frac{(e^x - 1)}{x}, \quad \lim_{x \rightarrow 0} \frac{a^x - 1}{x}, \quad \lim_{x \rightarrow 0} \frac{\ln(1+x)}{x}$ Testing of continuity problems | |
| 2.2 | Definition : derivative of standard function, rules for differentiation, differentiation of parametric, logarithmic and implicit functions. | |
| 2.3 | Successive differentiation upto 2 nd order problems | |
| 2.4 | Application of derivative: a) Maxima-Minima, simple problems [that illustrate basic principles and understanding of the subject as well as the real life situations]. b) Tangent Normal: Equation of tangent and normal for standard curves and its condition. | |
| Unit III : Integral Calculus [Marks:25] | | 30 |
| 3.1 | Integration as the inverse process of differentiation, list of formulae for integration – substitution, by parts and evaluation of integrals by these methods. | |
| 3.2 | Definite integral – rules and properties of definite integral [statement only] – evaluation of definite integral. | |
| 3.3 | Application of definite integral in finding the area under simple curves [specially lines, circle, parabola, ellipse] area between the two above said curves [region should be clearly identified]. | |

| Content [Name of the Topic] | | Periods |
|---|---|-----------|
| Unit IV : Differential Equation [Marks:10] | | 25 |
| 4.1 | Definition, order and degree of a differential equation – solution of differential equation of 1 st order by the method of separation of variables, solution of homogeneous differential equation of 1 st order and 1 st degree. | |
| Unit V : Vector [Marks:10] | | 25 |
| 5.1 | Vector and scalar, magnitude and direction of a vector, types of vector [equal, unit, zero, parallel and co-linear vectors], position vector of a point, negative of a vector, addition of vectors, multiplication of vectors by scalar, position vector of a point dividing a line segment in a given ratio. Scalar [dot] product of vectors, projection of a vector on a line, vector [cross] product of two vectors. | |
| Unit VI : Project [Marks:20] [Any Two] | | 36 |
| 6.1 | Determination of area bounded by a known curve [straight line, circle, parabola, ellipse] by definite integral [using graph paper]. | |
| 6.2 | Detail discussion on maxima and minima of a given function. | |
| 6.3 | Discussion on origin and formation of differential equation and its solution. | |
| 6.4 | History, development and application of matrix and matrix algebra. | |

Question Pattern

| Chapter | No. of Question | Marks Allotted |
|--|-------------------|----------------|
| Algebra <ul style="list-style-type: none"> Matrices Determinant | LA-1(Out of 2) | 05 |
| | SA – | - |
| | VSA – 1(Out of 2) | 02 |
| | MCQ – 3 | 03 |
| Differential Calculus <ul style="list-style-type: none"> Limit Continuing 1st Order derivative 2nd Order derivative Maxima – minima Tangent Normal | LA – 2 (Out of 4) | 10 |
| | SA – 2 (Out of 4) | 08 |
| | VSA – 2(Out of 4) | 04 |
| | MCQ – 3 | 03 |
| | | |

| Chapter | No. of Question | Marks Allotted |
|--|---|---|
| Integral Calculus <ul style="list-style-type: none"> Indefinite integral Definite integral Area evaluation | LA – 1 (Out of 3) SA – 3 (Out of 5) VSA – 2 (Out of 4) MCQ – 4 | 05 12 04 04 <div style="display: inline-block; vertical-align: middle; margin-left: 10px;"> $\left. \begin{array}{c} \\ \\ \\ \end{array} \right\} 25$ </div> |
| Differential Equation <ul style="list-style-type: none"> Order degree of differential equation Solution of 1st order differential equation by separation of variable. Solution of homogeneous differential equation of 1st order and 1st degree | LA – SA – 2 (Out of 4) VSA – 1 (Out of 2) MCQ- | - 8 2 - <div style="display: inline-block; vertical-align: middle; margin-left: 10px;"> $\left. \begin{array}{c} \\ \\ \\ \end{array} \right\} 10$ </div> |
| Vector <ul style="list-style-type: none"> Magnitude, direction, different types of vector, position vector of a point etc. Scalar (dot) and vector (cross) product of two vectors. | LA – SA – 2 (Out of 4) VSA – 1 (Out of 2) MCQ | - 8 2 - <div style="display: inline-block; vertical-align: middle; margin-left: 10px;"> $\left. \begin{array}{c} \\ \\ \\ \end{array} \right\} 10$ </div> |

$$\text{MCQ} - 10 \times 1 = 10 \text{ (No alternative)}$$

$$\text{VSA} - 7 \times 2 = 14 \text{ (Total 14 Questions)}$$

$$\text{SA} - 9 \times 4 = 36 \text{ (Total 17 Questions)}$$

$$\text{LA} - 4 \times 5 = 20 \text{ (Total 9 Questions)}$$

$$80 \text{ Total 50 Questions}$$

Basic Science (Physics + Chemistry) (BSPC)

Class XI

Total no. of weeks for classes / Year: 36

Classes per week: 6

Th=4

Practical = 2

Total classes per year: 216

Th=144

Practical = 72

Total marks: 100

Th= 70

Practical = 30

Course Contents :

Theory :

Group A (Physics)

Full Marks: 35

Total number of periods : 72

Unit wise distribution of Periods and Marks

| Unit | Title | No. of Periods | Marks |
|------|--|----------------|-----------|
| I | Physical World & Measurement | 04 | 02 |
| II | Kinematics | 08 | 04 |
| III | Laws of Motion | 08 | 04 |
| IV | Work, Energy & Power | 07 | 03 |
| V | Motion of System of Particles | 08 | 04 |
| VI | Gravitation | 06 | 03 |
| VII | Properties of Bulk Matter | 13 | 05 |
| VIII | Thermodynamics | 06 | 03 |
| IX | Behaviour of Perfect Gas & Kinetic Theory of Gases | 07 | 03 |
| X | Oscillations | 05 | 04 |
| | TOTAL | 72 | 35 |

Unit I Physical World & Measurement

[Periods: 04]

Physics – scope and excitement; nature of physical laws; physics, technology and society. Need for measurement; units of measurement; systems of unit; SI units, accuracy and precision of measuring instruments; errors in measurement; significant figures; error analysis.

Dimension of physical quantities, dimensional analysis and its applications, limitation of dimensional analysis.

Unit II Kinematics

[Periods: 08]

Motion in a straight line; position-time graph, speed and velocity. Uniform and non-uniform motion, average speed; average and instantaneous velocity. Acceleration and retardation; uniformly accelerated motion, velocity-time, graphs. Average and instantaneous acceleration. Kinematical equations in one dimension: $s=ut$, $v=u+at$, $s=ut+\frac{1}{2}at^2$, $v^2=u^2+2as$, $S_{nth} = u+\frac{1}{2}a(2t-1)$

Scalar and vector quantities: position and displacement vectors, equality of vectors, multiplication of vector by a real number; addition and subtraction of vectors. Unit vector; resolution of a vector in a plane-rectangular components. Scalar and vector products of vectors.

Unit III **Laws of Motion** **[Periods: 08]**

Frame of reference – inertial and non-inertial; examples; Newton’s first law – concept of force and inertia. Momentum and Newton’s Second Law – $F = ma$. Impulse and Impulsive force. Newton’s third law of motion – action and reaction. Law of conservation of linear momentum and its applications. Static and kinetic friction, minimization of friction. Dynamics of uniform circular motion; centripetal force, examples of circular motion – vehicle on level circular road, vehicle on banked road.

Unit IV **Work, Energy & Power** **[Periods: 07]**

Work done by a constant force; kinetic energy, power-units. Work-energy theorem. Notion of potential energy, potential energy of a spring. Conservative force – conservation of mechanical energy; non conservative forces.

Unit V **Motion of System of Particles** **[Periods: 08]**

Centre of mass of a two particle system - conservation of momentum and centre of mass motion. Moment of a force, torque, angular momentum, conservation of angular momentum with some examples Moment of inertia and radius of gyration.

Unit VI **Gravitation** **[Periods: 06]**

The universal law of gravitation. Acceleration due to gravity and its variation with altitude, depth and rotation due to the earth. Gravitational potential energy; gravitational potential. Kepler’s laws of planetary motion, orbital velocity of satellite, escape velocity, geo-stationary satellite.

Unit VII **Properties of Bulk Matter** **[Periods: 13]**

Elastic behavior, stress-strain relationship, Hooke’s law; Young modules, bulk modulus, shear modulus of rigidity, Poisson’s ratio; elastic energy. Hydrostatic pressure due to a fluid column ; Pascal’s law and its applications [hydraulic lift, hydraulic brakes].

Thermal physics – heat, temperature; thermal expansion of solids, liquids and gases; ideal gas laws, isothermal and adiabatic processes; anomalous expansion and its effect on marine life. Specific heat- calorimetry, change of state, latent heat, C_p , C_v .

Heat transfer – conduction, convection and radiation. Newton’s law of cooling, green house effect, thermal conductivity.

Unit VIII **Thermodynamics** **[Periods: 06]**

Thermal equilibrium, zeroth law of thermodynamics – definition of temperature. Heat, work and internal energy, first law of thermodynamics.

Unit IX **Behaviour of Perfect Gas and Kinetic Theory** **[Periods: 07]**

Equation of state of a perfect gas, work done in compression and expansion of a gas. Kinetic theory of gases- assumptions, concept of pressure, kinetic energy and temperature. RMS speed of gas molecules.

Unit X **Oscillations** **[Periods: 05]**

Periodic motion – period, frequency; displacement as a function of time. Simple harmonic motion [SHM]; restoring force and force constant. Simple pendulum, free, damped and forced vibration, resonance.

Question Pattern [Class XI]

| Units | Titles | MCQ [1 Mark] question [1 mark] | Very short answer type [2 marks] | Short answer type question [3 marks] | Long answer type marks | Total |
|------------------------------|--|---|--|--|---------------------------------|-----------|
| I | Physical World & Measurement | 1 x 1 | 1 x 1 | | | 02 |
| II | Kinematics | | 1 x 1 | | 3 x 1 | 04 |
| III | Laws of Motion | 1 x 1 | | | 3 x 1 | 04 |
| IV | Work, Energy & Power | | 1 x 1 | 2 x 1 | | 03 |
| V | Motion of System of Particles | 1 x 1 | 1 x 1 | 2 x 1 | | 04 |
| VI | Gravitation | 1 x 1 | | 2 x 1 | | 03 |
| VII | Properties of Bulk Matter | | | 2 x 1 | 3 x 1 | 05 |
| VIII | Thermodynamics | 1 x 2 | 1 x 1 | | | 03 |
| IX | Behaviour of perfect gas & Kinetic Theory of Gases | 1 x 1 | 1 x 2 | | | 03 |
| X | Oscillations | 1 x 1 | 1 x 1 | 2 x 1 | | 04 |
| TOTAL NO.OF QUESTIONS | | 08 | 08 | 05 | 03 | 35 |

- MCQ should have 4 options with only one correct answer
- Alternative questions should be from the same unit
- For short answer type questions marks [2] should be divided into smaller parts like 1+1
- For long answer type questions marks [3] should be divided into smaller parts like 1+2 or 1+1+1.

Option Pattern

| Sl No. | Question Pattern | No. of Options |
|--------|----------------------------------|----------------|
| 01 | Very short answer type questions | At least 5 |
| 02 | Short answer type questions | At least 4 |
| 03 | Long answer type questions | 3 |

Group B (Chemistry)**Full Marks: 35****Total number of periods : 72****Unit wise distribution of Periods and Marks**

| | Unit | No. of Periods | Marks |
|--------------|-----------|----------------|-----------|
| | I | 07 | 03 |
| | II | 10 | 05 |
| | III | 09 | 04 |
| | IV | 08 | 04 |
| | V | 10 | 05 |
| | VI | 10 | 05 |
| | VII | 10 | 05 |
| | VIII | 08 | 04 |
| Total | 08 | 72 | 35 |

Unit I : Scope And Chemical Arithmetic**A. Scope Of Chemistry**

Chemical industries [including small scale industries]

1) Inorganic chemical industries 2) Organic chemical industries 3) Pharmaceutical industries. Brief mention of chemical industries in India

B Chemical Equation

Its significance. Mole and molar mass equivalent weight. Weight – weight, weight – volume, volume – volume calculations.

C Percentage composition, empirical formula, molecular formula – including problems.

Unit II

A. Extranuclear Structure Of Atom

Orbital, sub shell, shell. Quantum numbers [n, l, m, s]. Pauli exclusion principle, Hund's rule of maximum multiplicity. Aufbau principle. Ground state electronic configuration of atoms.

B. Classification Of Elements And Periodicity In Properties

Modern periodic law and present form of periodic table

S – block and P – block elements. Periodic trend of the elements – atomic radii, ionization enthalpy, electron – gain enthalpy, electronegativity

C. Chemical Bonding And Molecular Structure

Ionic bond, covalent bond, bond parameters [bond length, bond strength and directional character of covalent bond]. Hybridization involving *s* and *p* orbitals and shapes of some simple molecules – methane, ethane, ethylene, BeCl_2 , BF_3 . Hydrogen Bond: intermolecular and intramolecular.

Unit III

A. States Of Matter

Gaseous State Of Matter

Boyle's Law, Charles's Law, Gay Lussac's Law, Avogadro's Law, Ideal Gas Equation, Universal Gas Constant – its unit, numerical problems. Liquification of gases

Liquid State Of Matter

Vapour pressure, viscosity, surface tension [qualitative idea only]

B. Thermodynamics System

Types of system – open, closed, isolated [definition with example] Work, heat, energy, extensive and intensive property, First Law of Thermodynamics – internal energy and enthalpy $\Delta Q = \Delta H + P \Delta V$ [deduction not required] Entropy and Gibbs Free Energy. Second Law of Thermodynamics. Significance of the relation $\Delta G = \Delta H - T \Delta S$

Unit IV : Equilibrium And Acidimetry – Alkalimetry

A. Dynamic nature of equilibrium

Law of Mass Action. Equilibrium constant, factors affecting equilibrium, Le Chatelier Principle – simple application.

B. Ionic product of water

pH and pH scale. Buffer solution [definition with example of acid and basic buffer solutions]

Universal pH paper and universal indicator. Simple calculation of pH.

C. Acidimetry And Alkalimetry

Normal and molar solution. Neutralization reaction. Indicator and choice of indicator $S_1 V_1 = S_2 V_2$

Unit V**A. Hydrogen**

Large scale preparation[no technical details]. Uses

B. Water

Natural water: hard water and soft water. Expression of hardness of water. Estimation of hardness of water. Water for injection. Important water quality parameters and their significance: total dissolved solid [TDS], dissolved oxygen [DO] BOD, COD. Water purifiers. Rain – water harvesting

C. Hydrogen Peroxide

Preparative reaction. Anti – chlor, bleaching and anti – bacterial property. Volume strength of hydrogen peroxide; stability and preservation. Uses.

D. Preparation And Uses Of

Sodium carbonate, sodium hydroxide, calcium oxide, bleaching powder, borax, industrial use of limestone.

Unit VI : Organic Chemistry And Organic Compounds**Introduction**

A. Detection of elements present in organic compounds [N, S, Cl]. Estimation of nitrogen [Kjeldahl's Method]. Classification of organic compounds. IUPAC nomenclature

B. Alkanes

Physical properties :

Chemical properties: combustion and substitution reaction [reaction of methane with chlorine in diffused sunlight]. Uses

C. Alkenes**Methods of preparation:**

By dehydration of alcohol and dehydro – halogenation of haloalkanes.

Physical properties:

Chemical properties – Addition Reactions [hydrogenation, hydration and addition of bromine], addition of HBr to propene – Markownikoff and Anti Markownikoff addition. Uses

D. Alkynes

Preparation by dehydrohalogenation of vicinal – dihalides.

Physical properties

Chemical properties – addition reaction [hydrogenation including partial hydrogenation]. Uses

E. Arenes**Introduction**

Substitution reaction [Nitration, Friedel – Crafts alkylation and acylation reaction of benzene]. Uses and health hazards of benzene, xylenes.

Unit VII**A. Fuels**

Definition, characteristics of ideal fuel. Domestic and industrial importance of fuel. Calorific value of fuels. Solid Fuel, Liquid fuel: Petrol, Kerosene, Diesel, Biofuel. Gaseous Fuel : Hydrogen, natural gas, coal gas, petrol gas, biogas, LPG, CNG. Important properties of liquid fuels: viscosity, flash point, fire point, octane number, cetane number, knocking and anti knocking properties.

B. Petrochemicals

Some important primary petrochemicals and their uses

C. Lubricants

Lubrication, lubricants, solid, liquid and semi fluid lubricants. Important properties of lubricating oil, additives.

Unit VIII**A. Environmental Chemistry**

Introduction [Environment and Pollution]

B. Air Pollution**Tropospheric Pollution**

Common solid particulates, liquid and solid pollutants – their sources. Smog – photochemical smog. Selected smog species – their sources. PANS – their significance (a) Acid Rain – atmospheric formation of nitric acid and sulfuric acid (b) Green House Gases – green house effect, global warming: danger and control. Stratospheric pollution. Ozone layer and its depletion

Water Pollution

Surface water – major pollutants and their sources [domestic, agricultural, industrial] Ground water – arsenic and fluoride in ground water. Arsenic determination in ground water [simple idea]. Status of arsenic and fluoride in ground water of West Bengal.

Soil Pollution

Major pollutants and their sources. Environmental pollution control strategy

Practical**Physics****Full marks: 15****Total No. of Periods = 36**

Every student has to perform at least 5 (Five) experiments out of the list of following experiments and to carry out one project under the guidance of teacher.

List of Experiments

- 1) To determine the volume of the material of a hollow cylinder by slide calipers.
- 2) To measure the radius of curvature of a spherical surface by spherometer.
- 3) To determine specific gravity of granular substance soluble in water using specific gravity bottle.
- 4) To measure the Young's modulus of the material of a wire.
- 5) To find the force constant of a helical spring by plotting a graph between load and extension.
- 6) To study the variation of volume with pressure for a sample of air at room temperature by plotting graph between P and V and hence to verify Boyle's law.
- 7) To draw $L-T^2$ curve by determining time period of a simple pendulum for at least five different effective lengths and to find the value of the acceleration due to gravity.
- 8) To study the relationship between the temperature of a hot body and time by plotting a cooling curve.

Marks Distribution

| | | |
|--------------|-------------------------------------|-----------------|
| 01 | One experiment is to be performed | 06 marks |
| 02 | Practical record | 02 marks |
| 03 | Project | 05 marks |
| 04 | Viva voce on experiment and project | 02 marks |
| Total | | 15 marks |

Chemistry**Full marks: 15****Total No. of Periods = 36****A. Introduction to Chemical Laboratory****General Acquaintance with The Laboratory**

- 1 Entrance and exit. Solid and liquid reagent racks. Concentrated acid rack. Disposal of solid and liquid wastes. General precautions [A chart should be hanged at a convenient place in the laboratory]
- 2 Acquaintance with Bunsen burner with fuel source / spirit lamp / LPG burner [whichever is used the laboratory]. Lighting the burner. Luminous and non-luminous flames. Controlling the flame height. Strike back – its remedy. Turning off the burner when not required.

2 Periods

B. Actual Experiments**Expt 1**

- 1.1 To cut glass – rod and glass-tube into two different lengths
- 1.2 To bend glass-tubes in different angles
- 1.3 To draw a jet
- 1.4 To bore a cork [both velvet and rubber corks]

Expt 2

To compare pH values of 0.1M HCl, 0.1M CH₃COOH, 0.1M NaCl and 0.1M NaOH solution by universal pH paper or universal indicator.

expt 1 & expt 2 : 6 Periods

Expt 3

To estimate dissolved oxygen [DO] in water

Expt 4

To estimate total hardness of water by EDTA.

expt no. 3 & expt no. 4 : 6 Periods

Expt 5 Qualitative Analysis Of An Inorganic Salt

To identify the basic radical and the acid radical present in a single salt sample by systematic analysis. The salt should be water or dilute hydrochloric acid soluble containing one basic radical and one acid radical from the following lists:-

Basic Radicals

Cu²⁺, Fe²⁺/Fe³⁺, Al³⁺, Ni²⁺, Zn²⁺, Ca²⁺, Mg²⁺, NH₄⁺

Acid Radicals

Cl⁻, NO₃⁻, S²⁻, SO₄²⁻, CO₃²⁻ [The students should be acquainted with the strengths of the reagents. They should not waste the valuable chemicals. They should learn the art of working with small amounts of samples and reagents].

22 Periods

Marks Distribution

| Sl. no. | Particulars | Marks |
|---------|--|-----------|
| 01 | One of the Expts in Expt No.1 and Expt No.2 OR One of the Expts between Expt. No.3 and Expt. No.4 [standard solutions will be supplied] | 2+3 5 |
| 02 | Expt. No.5[Only dry and preliminary tests and confirmatory test [wet test including preparation of the solution for the wet test] for the basic and acid radicals detected are to be written. Writing of group separation table is not required. | 8 |
| 03 | Laboratory Note Book regularly signed by teacher [s] | 2 |
| | Total | 15 |

Physics (PHYS)**Class XII**

| | | |
|--|---------------|------------------------------|
| Total no. of weeks for classes / Year: 36 | | |
| Classes per week: 6 | Th=4 | Practical/Project=2 |
| Total classes per year: 216 | Th=144 | Practical/Project =72 |
| Total marks: 100 | Th= 70 | Practical = 30 |

| Topic | Periods |
|--|----------------|
| Unit I : Electrostatics | 15 |
| Electric charge; conservation of charge, Coulomb's Law – force between two point charges; principle of superposition – force due to multiple charges. Electric field - electric field due to a point charge, electric field lines; electric dipole – field due to a dipole, torque on a dipole placed in uniform electric field. Electric flux – Gauss' theorem and its applications to find field due to uniformly charge infinite plane sheet and uniformly charged thin spherical shell [field inside and outside]. Electric potential, potential difference, relation between intensity of electric field and potential, potential due to a point charge, equipotential surface. Potential energy of two point charges. Conductors and insulators, free charge and bound charge inside a conductor. Dielectrics and electric polarization. Capacitor and capacitance, combination of capacitors in series and in parallel. Parallel plate capacitor, energy stored in a capacitor, Van De Graff generator. | |
| Unit II : Current Electricity | 10 |
| Electric current, flow of electrons in a metallic conductor, drift velocity, and its relation with electric current, volume density of current; Ohm's law, electrical resistance. V-I characteristics [linear and non-linear] electrical energy and power, units of power, electrical resistivity and conductivity. Carbon resistors, colour code for carbon resistors, series and parallel combination of resistors; temperature dependence of resistors. Potential difference and e.m.f. of cells, internal resistance of a cell, series and parallel combination of cells, secondary cell. Kirchhoff's laws and simple applications. Wheatstone bridge, metre bridge, potentiometer-principle and its applications to measure potential difference and for comparing emf of two cells, measurement of internal resistance of a cell. Household wiring, three pin plug point, miniature circuit breaker [MCB]. | |

| Topic | Periods |
|---|---------|
| Unit III : Magnetic Effect of Current & Magnetism | 16 |
| Concept of magnetic field, Oersted's experiment. Biot Savart Law and its application to current carrying circular loop at the centre, magnetic moment due to a current carrying circular loop. Ampere's circuital law and its applications to infinitely long straight wire, straight and toroidal solenoids. Force on a moving charge in uniform magnetic and electric fields. Force on a current carrying conductor in a uniform magnetic field. Force between two parallel current carrying conductors (no deduction) – definition of ampere. Torque on a current carrying loop in uniform magnetic field; moving coil galvanometer and its conversion to ammeter and voltmeter. Earth's magnetic field and magnetic elements. Dia, para-and ferro-magnetic substances. Electro magnet and permanent magnet. | |
| Unit IV : Electromagnetic Induction & Alternating Currents | 16 |
| Electromagnetic induction; Faraday's laws, induced e.m.f. and current; Lenz's law; eddy currents, self and mutual inductance. Alternating current, peak and rms values of alternating current and voltage; reactance and impedance; series LCR circuit, resonance, power in AC circuits, Wattless Current. AC generator and transformers, its different types; power station-thermal and hydel; transmission and distribution of power, renewable energy (basic principle only). | |
| Unit V : Electromagnetic Waves | 7 |
| Need for displacement current; Electromagnetic waves and their characteristics; Transverse nature of electromagnetic waves. Electromagnetic spectrum. | |
| Unit VI : Optics | 25 |
| Reflection of light, spherical mirror, mirror formula, refraction of light, total internal reflection and its application, optical fibres. Refraction at spherical surfaces, lenses, thin lens formula, lens maker's formula, combination of thin lenses in contact. Refraction and dispersion of light through a prism, dispersive power of prism. Scattering of light – blue colour of the sky and reddish appearance of the sun at sun rise and sun set. Optical instruments: Microscopes and astronomical telescopes [reflecting and refracting] and their magnifying powers (no deduction), human eye – image formation and accommodation, correction of eye defects using lenses. Wave optics: wave front and Huygens' principle. Young's double slit experiment and expression for fringe width, coherent sources and sustained interference of light. Diffraction due to a single slit, width of central maxima (no deduction). Polarization: plane polarized light, Brewster's law, uses of plane polarized light and polaroids. | |

| Topic | Periods |
|--|---------|
| Unit VII : Dual Nature of Matter & Radiation | 10 |
| Dual nature of radiation, photoelectric effect, Einstein's photoelectric equation, particle nature of light. Matter waves – wave nature of particles, de Broglie relation. | |
| Unit VIII : Atoms & Nuclei | 10 |
| Bohr's model, energy level, hydrogen spectrum. Continuous and characteristic x rays spectra. Composition and size of nucleus, atomic masses, isotopes, isobars, isotones. Radioactivity – alpha, beta and gamma particles / rays and their properties; radioactive decay law. Mass energy relation, mass defect; binding energy per nucleon and its variation with mass number; nuclear fission and fusion. | |
| Unit IX : Electronic Devices | 20 |
| Energy bands in solids – conductors, insulators and semiconductors; pn junction diodes – I-V characteristics in forward and reverse bias; diodes as rectifier – half wave, full wave and bridge rectifier; filter. I-V characteristics of LED, Zener diode, voltage regulator, three-pin voltage regulator. Junction transistor, transistor action, transistor configurations, input and output characteristics of a transistor in common emitter [CE] configuration. Transistor as an amplifier in CE configuration – diac, triac, SCR, LDR, Photodiode, Phototransistor, solar cell. Logic gates – OR, AND, NOT, NAND and NOR gates. NAND & NOR gate as universal gate. Transistor as a switch. | |
| Unit X : Communication System | 15 |
| Elements of a communication system [block diagram only], band width of signal [audio, video and digital]; bandwidth of a transmission medium, transmission media. Noise, Signal to noise [S/N] ratio. Propagation of electromagnetic waves – ground, sky and space waves. Need for modulation – production and detection of amplitude modulated wave, satellite communication. | |

Unit wise distribution of periods and marks

| Unit | Title | Periods | Marks |
|------|---|---------|-------|
| I | Electrostatics | 15 | 08 |
| II | Current Electricity | 10 | 05 |
| III | Magnetic effect of Current & Magnetism | 16 | 08 |
| IV | Electromagnetic induction and Alternating Current | 16 | 08 |
| V | Electromagnetic Waves | 07 | 03 |

| Unit | Title | Periods | Marks |
|------|-----------------------------------|------------|-----------|
| VI | Optics | 25 | 12 |
| VII | Dual Nature of Radiation & Matter | 10 | 05 |
| VIII | Atoms & Nuclei | 10 | 05 |
| IX | Electronic Devices | 20 | 10 |
| X | Communication Systems | 15 | 06 |
| | Total | 144 | 70 |

Marks Distribution

| Units | Titles | MCQ [1] Mark] | Very short answer type question [1 mark] | Short answer type question [3] marks] | Long answer type question [5] [marks] | Total marks |
|-------|---|---------------------|---|--|--|----------------|
| I | Electrostatics | 1×3 | 1×2 | 3×1 | | 08 |
| II | Current Electricity | 1×4 | 1×1 | | | 05 |
| III | Magnetic effect of current & magnetism | | | 3×1 | 5×1 | 08 |
| IV | Electromagnetic induction and alternating current | 1×1 | 1×1 | 3×2 | | 08 |
| V | Electromagnetic waves | | | 3×1 | | 03 |
| VI | Optics | 1×1 | 1×3 | 3×1 | 5×1 | 12 |
| VII | Dual nature of radiation & matter | 1×1 | 1×1 | 3×1 | | 05 |
| VIII | Atoms & Nuclei | 1×2 | | 3×1 | | 05 |
| IX | Electronic Devices | 1×1 | 1×1 | 3×1 | 5×1 | 10 |
| X | Communication System | 1×2 | 1×1 | 3×1 | | 06 |
| | Total No.of Questions | 15 | 10 | 10 | 03 | 70 |

- MCQ should have 4 options with only one correct answer.
- Alternative questions should be from the same unit.

- For short answer type question, marks [3] should be divided into smaller parts like 1+2 or 1+1+1
- For long answer type question, marks [5] should be divided into smaller parts like 1+4 or 2+3 or 1+1+3.

Option Pattern

| Sl No | Question Pattern | No. Of Options |
|-------|----------------------------------|----------------|
| 01 | Very short answer type questions | At least 5 |
| 02 | Short answer type questions | At least 6 |
| 03 | Long answer type questions | 3 |

Practical :

Every student has to perform at least 10 (Ten) experiments out of the list of following experiments and to carry out one project under the guidance of teacher.

List of Experiments :

- 1) To measure resistance of a given wire using metre bridge and hence to find the specific resistance of its material.
- 2) To compare the emf of two given primary cells using potentiometer.
- 3) To verify the laws of series and parallel combination of resistance using post office box.
- 4) To determine resistance of a galvanometer by half deflection method and to find its figure of merit.
- 5) To convert the given galvanometer of known resistance and figure of merit into an ammeter and voltmeter of desired range and to verify the same.
- 6) To find the focal length of a convex lens by plotting $1/u$ against $1/v$.
- 7) To determine refractive index of a glass slab using a travelling microscope.
- 8) To construct a full wave rectifier using pn junction diodes with capacitor filter and to draw load current – load voltage graph and hence to find percentage regulation using bread board.
- 9) To draw the I-V characteristics of a Zener Diodes in the reverse bias and to find the break down voltage.
- 10) To draw the output characteristics of a pnp/npn transistor in the common –emitter configuration and to find the current gain.
- 11) To verify the truth table of NAND / NOR gate and to show that they are universal gate [using bread board].

- 12) To study the variation of resistance of a LDR with intensity of light from LED as a source [using bread board]
- 13) Use of solar cell as generator of energy.
- 14) To fabricate and test a circuit consisting of two lines, one with two bulbs and a fan and the other with a high current plug point using a MCB and feed by AC mains.

Students should be conversant with the use of multi-meter.

Evaluation Scheme For Practical Examination

| | | |
|----|-------------------------------------|-----------------|
| 01 | One experiment to be performed | 15 marks |
| 02 | Practical record | 05 marks |
| 03 | Project | 05 marks |
| 04 | Viva voce on experiment and project | 05 marks |
| | TOTAL | 30 marks |

Chemistry (CHEM)**Class XII**

| | | |
|--|---------------|-----------------------------|
| Total no. of weeks for classes / Year: 36 | | |
| Classes per week: 6 | Th=4 | Practical/Project=2 |
| Total classes per year: 216 | Th=144 | Practical/Project=72 |
| Total marks: 100 | Th= 70 | Practical = 30 |

Course Content :**Thory :****Unit I : Solid State**

Introduction: Classification of solids based on differences in binding forces: ionic, molecular, covalent, metallic solids (definition with example). Crystalline and amorphous solids (elementary idea with examples) Two dimensional and three dimensional lattices Unit Cell – cubic unit cell [Primitive, body centered and face centered] Number of atoms per unit cell in a cubic cell. Schottky defect and Frenkel defect.

Unit II : Solution

Types of Solutions: Solution of solids in liquids, solubility of gases in liquids, solid solutions. Colligative properties: relative lowering of vapour pressure – Raoult's Law; Elevation of Boiling Point; Depression of Freezing Point; Osmotic Pressure. Reverse Osmosis (qualitative idea) Determination of molar masses using colligative properties.

Unit III : Electro Chemistry

Oxidation – reduction reaction :

Concept of red – ox reaction

Oxidation number and balancing of simple red – ox reactions by oxidation number method.

Red – ox titration :-

Oxalic Acid – KMnO_4

KMnO_4 – Fe^{2+}

$\text{K}_2\text{Cr}_2\text{O}_7$ – Fe^{2+}

Conductance in electrolytic solutions :

Specific and molar conductivity (definition with example)

Electrolysis – Laws of Electrolysis

Electrolytic Cell

Galvanic Cell (Voltaic Cell)

Half – cell reaction, cell reaction, emf of a cell, standard electrode potential

Dry cell (dry cell battery)

Primary dry cell battery
Common dry cell battery
Alkaline battery
Mercury battery
Lithium battery
Secondary dry cell battery
Lead storage battery (lead accumulator)
Nickel – cadmium (“Ni-cd”) battery
(precaution in disposal)
(Only electrodes, cell reactions and emf of cells)
Fuel cell.

Corrosion: Introduction

Cause of corrosion

Factors influencing corrosion

Various methods of corrosion control

Unit IV : Chemical Kinetics**Rate of a reaction (average and instantaneous):**

Factors influencing rate of a reaction: concentration, temperature, catalyst.

Order and molecularity of a reaction.

Rate law of first order, second order and zero order reaction.

Definition of half life of a reaction.

Concept of activation energy of a reaction

Unit V : Surface Chemistry

Adsorption: Physisorption and chemisorption; factors affecting adsorption of gases on solid catalysis: homogeneous and heterogeneous

Colloidal State: Distinction between true solutions, colloids and suspensions; lyophobic and lyophilic colloids.

Properties of Colloids: Tyndal effect, Brownian Movement, electrophoresis, coagulation

Emulsion: Type of emulsion

Unit VI : Extraction of Metals

General principles and methods of extraction

Ores and minerals

Concentration: Froth floatation

Calcination, roasting

Flux and slag

Electrolytic reduction, carbon reduction

Self reduction

Occurrence and principles of extraction of aluminium, copper and iron (no technical details)

Distinction and uses of cast iron, wrought iron and steel.

Alloys: Purpose of making alloys

Composition and uses of Bronze, Brass, Bell Metal, Duralumin, Stainless Steel.

Unit VII : S – Block & P – Block Elements

S – Block Elements (alkali and alkaline earth metals)

Group 1 And Group 2 Elements

General introduction

Elements of groups 1 & 2

Electronic configuration

Trends in variation in ionization enthalpy, atomic and ionic radii.

Trends in chemical reactivity with oxygen and halogens.

P – Block Elements

General introduction

Anomalous behavior of first period elements compared to heavier elements of each group – to highlight differences in oxidation states and composition of compounds.

Group 13 Elements

Elements of Group 13, Valence Shell electronic configuration, possible oxidation states, natural occurrence comparative chemical properties of boron and aluminium - reaction with acids and alkalis.

Uses of some important compounds of boron and aluminium: boric acid, boron trifluoride, diborane, alumina, alums, anhydrous aluminium chloride

Group 14 Elements

Elements of group 14

Valence Shell electronic configuration

Oxidation states

Natural occurrence

Carbon : catenation property; allotropic forms – physical properties and uses. Uses of silicon and carborundum.

Group 15 Elements

Elements of group 15, valence shell electronic configuration, possible oxidation status with examples of respective compounds; natural occurrence; allotropy of phosphorous.

Comparative chemical reactivity of nitrogen and phosphorous with respect to reaction with oxygens & halogens

Important compounds of nitrogen and phosphorous; Nitrous acid & nitric acid; phosphine, phosphorous pentoxide, phosphorous pentachloride, phosphorous acid and phosphoric acid (preparation and uses only)

Group 16 Elements

Elements of group 16, valence shell electronic configuration, possible oxidation status with examples of respective compounds, natural occurrence (chalcogens) (allotropy of Sulphur)

Preparation, physical properties and reaction of ozone (oxidation reaction with mercury, lead sulphide, lead sulphide and acidified KI)

Important compounds of Sulphur : Hydrogen Sulphide – use in analysis of basic radicals.

Sulfur dioxide and sulfur trioxide [preparation and uses]

Sulfur dioxide shows both oxidizing and reducing properties – explanation with examples.

Group 17 Elements

Elements of Group 17, valence shell electronic configuration, possible oxidation status with examples of compounds; natural occurrence (halogens)

Preparation of halogens (only preparative reaction) and comparative reactions of halogens: oxidizing property, reaction with water and alkali.

Hydrohalic acid : preparation and reactions; detection of halides.

Bleaching powder – preparation and uses

Group 18 Elements

Elements of group 18

General electronic configuration, chemical inertness, occurrence, important uses.

Unit VIII : Compounds of xenon : xenon fluorides – preparation and structure only.

d- Block Elements: General introduction and electronic configuration, occurrence and characteristic of transition metals, general trends in properties of the first row transition metals – ionization enthalpy, oxidation states, ionic radii, colour, catalytic property, magnetic property, alloy formation.

Preparation and properties of $K_2Cr_2O_7$ and $KMnO_4$

Unit IX : Coordination Compounds

Coordination compounds: introduction with examples ligands, coordination number, shapes Bonding: Werner's Theory and Simple Isomerism A few important coordination complex (formula, structure, colour): Brown ring compound, sodium nitroprusside, tetraamine copper (II) sulphate. A few examples of coordination compounds, important in biological system: haemoglobin, chlorophyll, Vitamin B₁₂ (nature and function)

Unit X : Haloalkanes and Haloarenes**Haloalkanes:** Introduction

Preparation : Preparation from alcohols by reaction with PX_3 ($X = Cl, Br$), Iodine and red phosphorous thionyl chloride.

Haloform reaction – preparation of chloroform and iodoform [preparative methods not required]

Physical properties

Chemical properties – hydrolysis and dehydrohalogenation

Reaction of methyl iodide with Mg – Grignard reagent

Uses of chloroform and iodoform

Freons:

Introduction, examples, uses and environmental hazards.

DDT and its environmental hazards.

Haloarenes:

Introduction

Preparation of chlorobenzene and bromobenzene Substitution reaction (directive influence of chlorine) : Nitration of chlorobenzene

Unit XI : Alcohols, Phenols And Ethers**Alcohols:**

Aliphatic alcohol and aromatic alcohol (benzyl alcohol)

Introduction

Primary, secondary and tertiary alcohols (examples)

Method of preparation (primary alcohol only): Hydrolysis of alkyl halides

Hydrolysis of esters

Reduction of esters

(Bouveault Blanc Reduction)

Preparation of methanol from water gas and synthesis gas.

Preparation of ethanol by fermentation and hydration of ethene
Preparation of rectified spirit, absolute alcohol, spectroscopic alcohol, “super dry” alcohol.

Identification of methanol and ethanol

Physical properties

Chemical properties : oxidation; reaction with Na, PCl_5 , SOCl_2 , esterification reaction, uses of methanol and ethanol.

Phenols:

Introduction

Preparation (phenol) from aniline (laboratory process) by cumene process (industrial process)

Chemical Properties:

Acidic nature of phenol. Acetylation, Benzoylation reaction with Br_2 – water, Reimer – Tieman reaction. Kolbe-Schmitt reaction. Phenol – formaldehyde resin.

Identification and uses of phenol.

Ethers:

Aliphatic Ether And Aromatic Ether (Anisole)

Introduction

Preparation of diethyl ether from ethanol (no experimental details)

Williamson Synthesis.

Preparation of anisole from phenol

Physical properties

Chemical properties: inflammability of diethyl ether (precaution to be taken)

Reaction with HI
Reaction of diethyl ether with aerial oxygen in the presence of light.

Preparation of peroxide – free diethyl ether
Uses of diethyl ether

Unit XII : Aldehydes, Ketones And Carboxylic Acids And Their Derivatives

Aldehydes:

Aliphatic aldehydes and aromatic aldehyde (benzaldehyde)

Ketones

Aliphatic ketones and aromatic ketone (acetophenone)

Introduction

Preparation from:

Alcohols

Carboxylic acid

Acid chlorides (Rosenmund reduction – aldehydes)

Gatterman – Koch and Gatterman aldehyde

Synthesis (benzaldehyde)

Friedel – craft acylation reaction (acetophenone)

Physical properties

Chemical properties

Oxidation reaction (including reaction of aldehydes with Fehling's and Tollens' Reagents)

Reduction reactions

Reduction with H_2 / Catalysl;

Na – Hg, H_2O ; lithium aluminium hydride, sodium borohydride; clemmensen reduction

Addition reaction : with HCN and $NaHSO_3$

Hemiacetal and acetal formation

Reaction with hydroxylamine, hydrazine, phenylhydrazine, 2,4 – dinitrophenylhydrazine (Brady's Reagent), Semicarbazide

Aldol reaction

Cannizzaro and crossed cannizzaro reaction

Benzoin condensation

Perkin reaction

Distinction between aldehydes and ketones

Identification of acetaldehyde and acetone formation – uses.

Carboxylic Acids:

Aliphatic carboxylic acids and aromatic carboxylic acid (benzoic acid)

Introduction

Preparation

By the oxidation of alcohols and aldehydes, oxidation of toluene (benzoic acid).

By the hydrolysis of alkyl and aryl cyanides

By using Grignard reagent B

By the hydrolysis of esters.

Physical properties

Chemical properties

Acidic properties – reaction with alkali and NaHCO_3 .

Reaction with PCl_3 , PCl_5 and SOCl_2

Esterification reaction

Hunsdiecker reaction

Hell – Volhard – Zelinsky reaction

Identification of formic acid and acetic acid.

Uses of Acetic Acid

Derivatives of Carboxylic Acids:

Acetyl chloride, acetic anhydride, Acetamide ethyl acetate – preparation and uses

Unit XIII : Organic Compounds Containing Nitrogen

Amines:

Introduction

Classification – primary, secondary and tertiary amines (examples with structures) Preparation of primary amines by

reduction of nitro compounds.

Gabriel's phthalimide synthesis.

Hofmann degradation reaction

Aniline

Preparation from nitrobenzene

Physical properties

Chemical properties

Basic nature

Isocyanide (carbylamine) reaction

Diazo reaction.

Benzenediazonium Salts:

Preparation

Reactions involving replacement of diazo group by H, OH, Halogen, CN, NO_2

Coupling reaction

Reduction

Cyanides and Isocyanides: preparation

Nitro Compounds:

Introduction

Preparation of nitroethane

Nitrobenzene and 1,3-di-nitrobenzene

Reduction of nitrobenzene under different conditions.

Unit XIV : Biomolecules

Carbohydrates:

Introduction

Classification (aldose and ketose)

Monosaccharides

Glucose and fructose structure (no elucidation) with D/L nomenclature

Oxidation and reduction reactions

Osazone formation

Identification

Oligosaccharides:

Sucrose structure (no elucidation)

Non reducing sugar, hydrolysis

Identification

Polysaccharides:

Starch, Monomer units, Hydrolysis

Identification

Proteins:

Introduction

Elementary idea of α -amino acids (examples: glycine, alanine, cysteine, serine, methionine, aspartic acid) zwitterionic structure, isoelectric point.

Peptide bond, polypeptides

Primary structure of proteins

Identification

Nucleic Acid:

DNA & RNA

Nucleotides and nucleosides

Unit XV : Polymers

Natural and synthetic polymers

Homopolymer and copolymer

Polymerization reaction : addition and condensation polymerization

Thermoplastics and thermosetting plastics (definition with examples)

Preparation (no technical details) and uses of polyethylene, Teflon, Bakelite, Nylon, Terylene (synthetic fibres)

Hazards of using plastic materials

Biodegradable polymers

Unit XVI : Chemistry in Every Day Life**Chemicals in Medicines:**

Analgesics, antipyretics, tranquilisers, antimicrobials, antifungals, antifertility drugs, anti viral drugs, antacids, antihistamines, antimalarials, antiseptics, disinfectants (examples only) Side effects of aspirin and paracetamol

Chemicals:

In food preservatives, artificial sweetening agents

Cleansing Agents:

Soaps and detergents – their chemical composition and cleansing action.

Unit wise distribution of Marks and Periods

| Unit | Marks | No. of Period |
|------|-------|---------------|
| I | 03 | 08 |
| II | 04 | 08 |
| III | 06 | 10 |
| IV | 04 | 08 |
| V | 04 | 10 |
| VI | 04 | 08 |
| VII | 08 | 16 |
| VIII | 04 | 08 |
| IX | 03 | 08 |

| Unit | Marks | No. of Period |
|-----------|-----------|---------------|
| X | 04 | 10 |
| XI | 05 | 08 |
| XII | 06 | 08 |
| XIII | 04 | 08 |
| XIV | 04 | 10 |
| XV | 04 | 08 |
| XVI | 03 | 08 |
| 16 | 70 | 144 |

Practical :**Chemistry Practical Lab****List of Experiments:****Experiment 1**

- 1.1 To prepare starch sol (hydrophilic sol)
- 1.2 To prepare hydrated ferric oxide sol (hydrophobic sol)

Experiment 2

- 2.1 To prepare potash alum
- 2.2 To prepare ferrous ammonium sulfate (Mohr's Salt)
- 2.3 To prepare acetanilide
- 2.4 To prepare 2-phenylazo-2-naphthol dye (2-naphtholaniline dye)

Experiment 3

To identify one of the following functional groups present in a solid organic sample:

Aromatic primary amino (azodye test)

Phenolic- OH (FeCl_3 test)

Carboxylic acid group (NaHCO_3 test)

Aldehyde and Ketonic groups (Brady's Reagent and Tollen's Reagent test)

Experiment 4

- 4.1 To prepare methyl orange indicator solution
- 4.2 To prepare BDS indicator solution

4.3 To prepare Fehling's Solution A and Fehling's Solution B

4.4 To prepare 0.1 M Mohr's Salt Solution in 0.5 – 1 M H_2SO_4

Experiment 5

To identify carbohydrates, fats and proteins given as pure samples.

Experiment 6

General acquaintance with chemical balance – sartorius / bunge / electronic (preferably electronic)

6.1 To prepare ~ 0.1 N standard sodium carbonate solution

6.2 To determine the strength of unknown ~ 0.1N HCL/ H_2SO_4 (in normality, molarity and g/l) by titration with the standard ~ 0.1 N Na_2CO_3 solution.

6.3 To prepare standard 0.1 N oxalic acid solution

6.4 To determine the strength of unknown 0.1N NaOH solution (in normality, molarity and g/l) by titration with the standard ~ 0.1N oxalic acid solution.

6.5 To determine the strength of unknown ~ 0.1 N KMnO_4 solution (in normality, molarity and g/l) by titration with the standard ~ 0.1 N oxalic acid solution.

6.6 To determine the amount of iron in g/l present in the unknown ~ 0.1N Mohr's Salt Solution by titration with the standardised 0.1N KMnO_4 solution.

6.7 To prepare standard ~ 0.1 N $\text{K}_2\text{Cr}_2\text{O}_7$ solution.

6.8 To determine the amount of iron in g/l in the unknown ~ 0.1N Mohr's Salt Solution by the standard ~ 0.1N $\text{K}_2\text{Cr}_2\text{O}_7$ solution.

Marks Distribution

| Sl No | Description | Marks |
|-------|---|-----------|
| 01 | One Expt. From Expt. 1 (any one) or Expt. 2 (any one) [Both the expts will be set and the candidate will choose one by lottery]. | 6 |
| 02 | One Expt from Expt. 3 or Expt.4 (any one) or Expt.5 [All three Expts. will be set and the candidate will chose one by lottery]. | 5 |
| 03 | Expt. 6 (any one) | 12 |
| 04 | Viva Voce | 3 |
| 05 | Laboratory Note Book | 4 |
| | Total Marks | 30 |

Vocational Subjects for Class XI

Fundamental of Mechanics and Technical Drawing (FMTD)

Class XI

| | | |
|--|------------------------------|------------------------------|
| Total no. of weeks for classes / Year: 36 | | |
| Classes per week: 8 [4+4] | Th=4 [3+1] | Practical = 4 [1+3] |
| [<i>Fundamental of Mechanics (FM) = 4;</i> <i>Technical Drawing (TD) = 4</i>] | [<i>FM = 3; TD = 1</i>] | [<i>FM = 1; TD = 3</i>] |
| Total classes per year: 288 | Th=144 | Practica =144 |
| [<i>FM = 144; TD = 144</i>] | [<i>FM = 108; TD = 36</i>] | [<i>FM = 36; TD = 108</i>] |
| Total marks: 100 Th= 50[FM] | Workshop = 50[TD] | |

Course Contents

I. Fundamentals Of Mechanics

Group-A (54 periods)

1. Introduction: [8Pds]
Concept of Engineering Mechanics – Statics & Dynamics, Scalar quantity, Vector quantity, Basic Units – SI units, Representation of Vector, Addition & subtraction of Vectors.
2. System of Forces: [16Pds]
Definition of Force, System of Co-planner forces, Resultant Force, Graphical methods for determination of resultant Force with simple problems (Parallelogram Law, Triangle Law & Polygon Law of Forces).
3. Moment & its Applications: [15Pds]
Definition & Type, Physical significance, unit, Varignon's theorem, Simple related problems.
4. Equilibrium of Force system : [15Pds]
Lami's theorem, Condition of equilibrium of co-planner & concurrent force system, Condition of equilibrium of co-planner & non-concurrent force system (Both Like & Unlike), Type of Equilibrium. Simple related problems.

Group-B (54periods)

5. Friction: [14Pds]
Concept of Friction & its types, Limiting Friction, Angle of Friction, Co-efficient of Friction, Angle of Repose, Laws of static Friction, Block Friction, Simple related problems.
6. Simple Lifting Machines: [14Pds]
Definition of some common terms related to lifting machine-Mechanical advantage, velocity ratio, input, output & efficiency of a machine, ideal machine, machine friction, frictional load, and effort lost in friction. Law of machine, maximum mechanical advantage & maximum efficiency of a lifting machine, Reversibility

of a machine, condition of Reversibility of a machine, self locking machine. Study of Simple machine: Simple Wheel & Axle, Single Purchase crab, Screw Jack, Pulleys (first & second system of pulleys). [No deduction], Simple related problems.

7. Centre of Gravity: **[13Pds]**

Concept & definition – Centre of Mass & Centroid, Concept of Symmetrical & asymmetrical objects, Axis of Reference, Formulae for centroids of simple area like uniform triangular lamina, uniform rectangular lamina, uniform circular lamina, Simple related problems.

8. Moment of Inertia: **[13Pds]**

Definition & Unit of Moment of Inertia, Parallel axis theorem, Perpendicular axis theorem, Radius of Gyration, [No deduction],

Simple related problems on lamina only (Tee-section, Angle-section, I-section & Circular-section etc) by using formulae.

Marks Allotment:

Objective type: (1X10)=10;

Descriptive type: (8X5)=40;

Total Marks =50;

Total five questions to be answered out of nine questions taking at least two question from each group.

Reference Books:

| Name of Author | Title of the Book | Name of the Publisher |
|-------------------------|-----------------------|-----------------------|
| D.S.Kumar | Engineering Mechanics | S.K. Kataria & Sons |
| R.S.Khurmi | Engineering Mechanics | S. Chand & Co |
| Basu | Engineering Mechanics | Tata McGraw Hill |
| S. S. Bhavikatti, K. G. | | |
| Rajashekarappa | Engineering Mechanics | New Age International |
| R.K. Rajput | Engineering Mechanics | S.K. Kataria & Sons |
| S.Ramamrutham | Applied Mechanics | Dhanpat Rai & Sons |

II. Technical Drawing

Sheet No. I

Module: 1

Introduction of technical drawing and lettering

Lecture -4Pds

Practical-13Pds

- Drawing as a medium of communication.
- Use and care of drawing boards and different drawing instruments. Drawing sheet & their sizes.

- c) How to begin a drawing – Layout of drawing sheet.
- d) Drawing of — i) Horizontal lines, ii) Vertical lines, iii) Inclined lines, iv) Parallel lines, v) Dividing a straight line in to equal no of divisions (with the help of Drawing Board, T-square, Set squares, Pencil Compass & Divider)
- e) Lines – Types of Lines (As per SP:46 – 1988).
- f) Single stroke Lettering (7:4 & 5:4) by conventional method.
- g) Dimensioning—System of Dimensioning (As per SP:46 – 1988& IS 10714-1983)

Module: 2

Lecture - 4Pds

Geometrical Construction

Practical-13 Pds

- a) Finding the center of an arc, Geometrical construction of Polygons (Pentagon, Hexagon & Octagon) by general method.
- b) Concept of various conic sections. Drawing of ellipse, cycloid and involutes.

Module: 3

Lecture - 4Pds

Scale

Practical-13Pds

- a) Concept of using Scales in Drawing – Enlarging, Full Size & Reducing Scale.
- b) Representative fraction – Plain Scale, Diagonal Scale
- c) Construction of – i) Plain Scale, ii) Diagonal Scale

Sheet No. II**Module: 4**

Lecture -4Pds

Orthographic Projection of Line & Lamina

Practical-14Pds

- a) Projector & Plane of projection – Vertical Plane, Horizontal Plane & Profile Plane. Concept of 1st angle Projection & 3rd angle Projection. Reference Line – Symbol of methods of projection. (Demonstration with models).
- b) Projection of Points, Lines & Lamina (Square, rectangular, triangular, hexagonal, pentagonal and circular) parallel to VP and angle with HP & vice versa.

Module: 5

Lecture - 4Pds

Orthographic Projection & Sectional Drawing of Solids

Practical-14Pds

- a) Concept of Right & Oblique solids – Prism, Pyramid—Solids of revolution (Cylinder, Cone).
- b) Projection of the above solids in their simple positions such as –
 - i. Axis perpendicular to HP & parallel to VP & vice versa.
 - ii. Axis parallel to both VP & HP.
- c) Concept of Sectional View – Section Plane – Section Line —Sectional Plan, Sectional Elevation & True shape of the section – Full Section, Half Section of cube, prisms, pyramids, cylinder & cones.

Sheet No. III**Module: 6****Concept of Isometric Views, Isometric Projections & Development of Surfaces**

Lecture -4Pds

Practical-14Pds

- a) Concept of isometric axes in Isometric Drawing – Isometric Scale — Isometric Views & Projections.
- b) Isometric Views & Projections of regular lamina such as square, rectangular, triangular, pentagonal, hexagonal, circular etc.
- c) Isometric Views of right regular solid such as cube, prisms, pyramids, cylinder & cones.
- d) Development of Surface of Right regular solid such as –
 - i) Cube, ii) Prisms, iii) Pyramids, iv) Cylinder, v) Cones, vi) Hollow cylinder.

Sheet No. IV**Module: 7****Freehand Sketch**

Lecture -4Pds

Practical-13 Pds

- a) Introduction – Necessity.
- b) Free hand sketches of rolled steel sections – i) T-section, ii) I-section, iii) Angle section, iv) Channel section, v) Circular section, vi) Rectangular Section, vii) Steel flat, viii) Double ended wrench, ix) Screw driver, x) Nail puller.

Sheet No. V**Module: 8****Discipline based Drawing & Sketching**

Lecture -8Pds

Practical-14Pds

[Student must answer any one category depending upon their Vocational Trade]

Category – A (For Civil Based Vocational Trade)

1. Introduction to civil engineering drawing.
2. Plan, Elevation, Section of a single storied building with RCC slab, RCC beam & masonry wall.

Category – B (For Mechanical Based Vocational Trade)

1. Draw three principal views of Hexagonal headed Nut-Bolt assembly (with lock nut & washer). The size of bolt will be supplied by subject-teacher.
2. Draw two principal views of key & key-way assembly. The size of shaft & type of key will be supplied by subject-teacher.
3. Draw the proportionate sketch of the thread section –
 - i) B.S.W. , ii) Metric (internal & external), iii) Acme & iv) Square thread.

Category – C (For Electrical Based Vocational Trade)

Draw pictorial view of the following items:

1. Field Poles, Armature, Commutator, Lap winding & wave winding of DC machine.
2. Rotor & Stator of squirrel cage induction motor.

Category – D (For Electronics Based Vocational Trade)

Draw pictorial view of the following items:

1. Diode valve, Triode valve, Ordinary diode & Zener diode.
2. Transistor (Both NPN & PNP), SCR

Marks Allotment: Sessional Marks: 50

Each Module should cover in one A3 Drawing sheet in the Practical classes & each plate carry 5marks.

Reference Books:

| Name of Authors | Titles of the Book | Name of the publisher |
|---|---|----------------------------|
| N.D. Bhatt | Engineering Drawing | Charotkar Publishing House |
| R.K. Dhawan | Engineering Drawing | S. Chand & Co. |
| K. Venugopal | Engineering Drawing and Graphics + AutoCAD | New Age publication |
| Basant Agrawal C M Agrawal | Engineering Drawing Education Private Ltd. | Tata McGraw Hill |
| Pal & Bhattacharya 6 th . & 7 th . Edition | Engineering Drawing | Viva Books |
| P S Gill | Engineering Drawing | SK Kataria and sons |
| Kamlesh Chatterjee | Technical Drawing (Bengali & English Version) | Wiley |

Foundation course on Mechanical (FMWK)

Class XI

| | | |
|---|--------|---------------|
| Total no. of weeks for classes / Year: 36 | | |
| Classes per week: 12 | Th=3 | Workshop = 9 |
| Total classes per year: 432 | Th=108 | Workshop =324 |
| Total marks: 100 | Th= 50 | Workshop = 50 |

Basic Mechanical Theory

| | |
|--|---------------|
| Total no. of weeks for classes / Year : | 36 |
| Classes per week: | 3 (Th) |
| Total classes per year: | 108 |
| Total marks: | 50 |

Course Contents:

Module A

1. **Engineering Materials, Their properties & Uses:** **[8 Pds]**
 - a) Classification of steel according to percentage of carbon and their properties & uses, Properties & uses of cast iron, Properties and uses of copper, brass, tin, zinc, lead & aluminum.
 - b) Mechanical Properties: Ductility, Malleability, Hardness, Toughness, Elasticity, Plasticity and Brittleness.
2. **Elements of Power Transmission:** **[10 Pds]**
 - a) Nut & Screw, Key & Key way,
 - b) Different types of Gears, Belts, Pulleys, Keys, Cams, Followers, Couplings & Bearings.
 - c) Journal & Bearing.
 - d) Belt drives (open belt & cross belt only, Velocity Ratio considering belt thickness), Gear drives (Velocity Ratio of Simple gear train and compound gear train), Cam & follower mechanism (rise, fall & dwell for uniform velocity motion only).
3. **Manufacturing Process:** **[18 Pds]**
 - a) Principles of gas welding, arc welding, Equipments required for gas welding and arc welding, Arc welding voltage and current, Electrodes for arc welding, Polarity of arc welding, Principles and uses of electric resistance welding (spot and seam only), Principles and uses of TIG welding & MIG welding, Difference between TIG welding & MIG welding.
 - b) Fitting- different tools (vice, hammer, chisel, file, punch scribe, surface plate, v-block, try square etc.) used for fitting work and their purpose; Specification of file; Purpose of using drill, reamer and tap; Tap drill size.

- c) Forging- materials, forging temperature, heating devices, tools required for forging operations, Examples of smith forging.
- d) Brief idea about Non Destructive Testing, Advantages, Types and their field of applications.

4. Measuring Instruments & Gauges: [10Pds]

- a) Definition, Difference between Measuring Instruments & Gauges, Example of Measuring Instruments & Gauges
- b) Description & Least count of Micrometer, Procedure for taking measurement by using micrometer.
- c) Description & vernier constant of Vernier Caliper, Procedure for taking measurement by using Vernier Caliper.
- d) Uses of following gauges:
Ring Gauge, Plug Gauge, Snap Gauge, Thread Gauge, Screw Pitch Gauge, Feeler Gauge & Radius Gauge.

Module B

Mechanics of materials:

5. Stress & Strain: [24 Pds]

Definition of simple stress & strain & their Unit, Hook's Law, Definition of Young's Modulus, Elongation of a bar under tensile load, Stress in varying section. Simple related problems.

6. Shear Force & Bending Moment : [21 Pds]

Types of load, beam & support, Definition & concept of shear force and bending moment of beam, Idea of SF & BM diagrams of Cantilever & simply supported beam with point load, Idea of SF & BM diagrams of Cantilever & simply supported beam with uniformly distributed load.

Module C

Using any CAD related software following topics is to be practiced: [17pds]

- 1. Introduction to Auto CAD.
- 2. Common 2D command for drawing simple sketch:

Creation of work plane, Line, Circle, Rectangle, arc, Ellipse, curve, Move, Copy, Trim, Fillet, Chamfer, Extend, offset, Array, break, Practice on 2D Drawing.

Marks Allotment:

Objective type: (1×10)=10;

Descriptive type: (8×5)=40;

To be answered any five descriptive question taking at least two from each Module. Module 'C' is provided only for awareness of Auto-CAD software, no question will set from Module- 'C'

Workshop Syllabus is provided separately.

Foundation course on Electrical (FEWK)

Class XI

| | | |
|---|--------|---------------|
| Total no. of weeks for classes / Year: 36 | | |
| Classes per week: 12 | Th=3 | Workshop = 9 |
| Total classes per year: 432 | Th=108 | Workshop =324 |
| Total marks: 100 | Th= 50 | Workshop = 50 |

| Basic Electrical Theory | |
|---|---------------|
| Total no. of weeks for classes / Year: | 36 |
| Classes per week: | 3 (Th) |
| Total classes per year: | 108 |
| Total marks: | 50 |

Course Contents:

| Module – 1 | | Period |
|------------|--|--------|
| 1. | Basic concept of– Force, Work, Energy, Power – Their definition, S.I. Unit and respective mathematical relationship. | 03 |
| 2. | Basic concept of– Conductor, Semiconductor, Insulator- their differences. Charge, Potential, Current, Potential difference, Electrical power, Electrical energy - Their definition, S.I. Unit and respective mathematical relationship. | 09 |
| 3. | Concept of Electrical Energy – Difference between Current electricity and Statical electricity. Concept of D.C. and A.C. power supply and such sources. | 05 |
| 4. | Current Electricity: Ohm’s Law, concept of Resistance, Resistivity, Temperature coefficient. Simple problems on Ohm’s Law. | 05 |
| 5. | Concept of Series resistive circuit, Parallel resistive circuit, their Equivalent resistance. Star to delta and Delta to star transformation. (only formula, no deduction) | 07 |
| 6. | Kirchoff’s Voltage & Current Law. Simple problems. | 04 |
| 7. | Concept of Sinusoidal Voltage & Current – Time period, Frequency, Definition of Peak value, Root mean square (R.M.S) value, Average value, Form factor.(No deduction). Simple problems. | 08 |
| 8. | Basic concept of Inductance, Capacitance – Their definition, Unit of measurement, role of capacitance and inductance as stored energy in electrical circuit, Expression of stored energy.(No deduction) Definition & expression of Reactance for inductance and capacitance. | 08 |

| | | |
|-------------------|---|----|
| 9. | Concept of Impedance, Impedance triangle, Determination of impedance of R-L, R-C, R-L- C series circuit. Definition & expression of Active power, Reactive power, apparent power. Concept of Power triangle & Power factor. | 10 |
| Module – 2 | | |
| 10. | Basic knowledge of Single phase system and Three phase system. | 04 |
| 11. | Types of Domestic wiring system, Schematic diagram of Domestic wiring system (commencing from Energy meter). Accessories used for wiring– Main switch, Distribution board, Fuse, MCB, Cable, Conduit, Casing, Inspection box, One way Switch, Two way switch, Switch board, Plug Socket (only specification and use). | 11 |
| 12. | Basic concept of connections of D.C. and A.C. Ammeter, Voltmeter. Simple connection diagram to measure Current, Voltage of a single phase A.C. circuit. | 07 |
| 13. | Concept (Block Diagram only) of different forms of Energy sources – (a) Conventional – Thermal power, Hydel power, Nuclear power. (b) Renewable – Solar power, Wind power. | 09 |
| 14. | Study with block diagram power flow from generating station to consumer. | 04 |
| 15. | Concept of Earthing, requirement of earthing, types of earthing system – rod, pipe and plate earthing. | 07 |
| 16. | Electrical Safety: Dos & don'ts for electrical work, causes of electrical accidents, Procedure for rescuing the person who has received an electric shock, methods of providing artificial respiration. Types of fire extinguishers to be used for electrical fire. | 07 |

Marks Allotment:

Objective type: $(1 \times 10) = 10$

Descriptive type: $(8 \times 5) = 40$; (To be answered total five questions. At least two question from each Module)

Reference Books:

1. Basic Electrical Engineering (Vol- I & II) – P.S.Dhobal, S.K.Mandal – Tata McGraw Hill Publication.
2. Electrical Technology (Vol- I & II) – S.P.Bali – Pearson Publication.
3. Electrical Technology (Vol.-I) – B.L.Theraja – S.Chand Publication.
4. Electrical Installation Estimating & Costing – J.B.Gupta – S.K.Kataria Publication.

Workshop Syllabus is provided separately.

Foundation course on Civil (FCWK)

Class XI

| | | |
|--|---------------|----------------------|
| Total no. of weeks for classes / Year: 36 | | |
| Classes per week: 12 | Th=3 | Workshop = 9 |
| Total classes per year: 432 | Th=108 | Workshop =324 |
| Total marks: 100 | Th= 50 | Workshop = 50 |

Basic Civil Theory

| | |
|---|---------------|
| Total no. of weeks for classes / Year: | 36 |
| Classes per week: | 3 (Th) |
| Total classes per year: | 108 |
| Total marks: | 50 |

Course Contents:

Module A

Brief discussion on materials used for civil engineering works:

[46pds]

1. Brick: Classification, characteristics & uses.
2. Stone: Sources, Method of Quarrying, Classification, Characteristics of good stone for construction purpose, uses in construction.
3. Sand: Sources, Classification, specification & uses, bulking of sand.
4. Cement: Types & uses, setting& hardening, Storing, Field test, Colour cement.
5. Lime: Sources, Classification, uses, slaked lime, Fat lime, plaster of paris (composition & Use).
6. Mortar: Classification & their preparation, uses.
7. Cement Concrete: Composition & preparation, Placing, Compaction, Curing, Grading of aggregate, Water-Cement ratio, and Reinforced cement concrete.
8. Timber: Classification, uses, defects in timber, diseases in timber and remedies, seasoning of timber, Characteristics of good timber, Different market forms.
9. Tiles: Different types & uses.
10. Paints & Varnish: Ingredients, characteristics, Application to respective surfaces, types.
11. Bituminous material, their functions& uses: Asphalt, Cut back bitumen & tar etc.
12. Composition & use of: Steel, Cast iron, pig iron. Asbestos cement, PVC, Fiber glass.
13. Specification and use of Sanitary & Plumbing materials. Different pipes with joint use in domestic connections, different gaskets.

Module B**Mechanics of materials:**

1. Stress & Strain: [24Pds]
Definition of simple stress & strain & their Unit, Hook's Law, Definition of Young's Modulus, Bulk Modulus, Modulus of Rigidity, Poisson's Ratio, Elongation of a bar under tensile load, Stress in stepped bar, Concept of Composite bar, Stresses induced in composite bars, Simple related problems.
2. Shear Force & Bending Moment: [21Pds]
Types of load, beam & support, Definition & concept of shear force and bending moment of beam, Idea of SF & BM diagrams of Cantilever & simply supported beam with point load, Idea of SF & BM diagrams of Cantilever & simply supported beam with uniformly distributed load, concept of point of Contra flexure.

Module C

Using any CAD related software following topics is to be practiced: [17pds]

3. Introduction to Auto CAD.
4. Common 2D command for drawing simple sketch:
Creation of work plane, Line, Circle, Rectangle, arc, Ellipse, curve, Move, Copy, Trim, Fillet, Chamfer, Extend, offset, Array, break, Practice on 2D Drawing.

Marks Allotment:

Objective type: $(1 \times 10) = 10$;

Descriptive type: $(8 \times 5) = 40$;

To be answered any five descriptive question taking at least two from each of Module A and Module B. Module 'C' is provided only for awareness of Auto-CAD software, no question will set from Module- 'C'

Reference books:- Building Materials

| Titles of the book | Name of authors | Name of the publisher |
|------------------------|-----------------|-----------------------|
| Construction Materials | D.N.Ghose | Tata Mcgraw-Hill |
| Building Materials | S. K. Duggal | New Age International |
| Engineering Materials | Sharma | Phi Publication |

Reference books:- Mechanics of Materials.

| Name of Author | Title of the Book | Name of the Publisher |
|----------------|-----------------------|---------------------------------|
| R.S.Khurmi | Strength of Materials | S.Chand & Co |
| S.S.Bhavikatti | Strength of Materials | Vikas publishing House Pvt.Ltd. |

| | | |
|---------------------------------|---------------------|--------------------------|
| S.Ramamrutham & R. Narayanan | StrengthofMaterials | DhanpatRai&Publication |
| R.K.Rajput | StrengthofMaterials | S.Chand&Co |
| B.K.Sarkar | StrengthofMaterials | TataMcGrawHill |
| R.K.Bansal | StrengthofMaterials | LaxmiPublicationPvt.Ltd. |
| M.Chakraborty | StrengthofMaterials | S.K.kataria |

Workshop Syllabus is provided separately.

Foundation course on Electronics (FLWK)

Class XI

| | | |
|---|------------|----------------------|
| Total no. of weeks for classes / Year: | 36 | |
| Classes per week: | 12 | Th=3 |
| Total classes per year : | 432 | Th=108 |
| Total marks: | 100 | Th= 50 |
| | | Workshop = 9 |
| | | Workshop =324 |
| | | Workshop = 50 |

Basic electronics Theory

| | |
|---|---------------|
| Total no. of weeks for classes / Year: | 36 |
| Classes per week: | 3 (Th) |
| Total classes per year: | 108 |
| Total marks: | 50 |

Course Content :

| | | |
|-----------------|---|---------------|
| Module 1 | Semiconductor and Diode 1.1 Energy level diagrams of insulator, conductor & semiconductor. 1.2 Concept of Intrinsic & Extrinsic semiconductor, Idea of Doping concentration-heavy & light doping. 1.3 Formation of P-Type and N-Type semiconductor and their properties. 1.4 Formation of P-N junction Diode -space charge region- potential barrier. 1.5 P-N junction Diode under forward bias & reverse bias condition with V-I characteristics curve. 1.6 Types of Diodes- Zener diode, Varactor diode & LED. | 30 Periods |
| Module 2 | Rectifier and Power Supply 2.1 Half Wave And Full Wave Rectifiers (Bridge & Centre Tap): Average voltage, R.M.S. voltage, Efficiency and Ripple factor, Percentage voltage regulation, TUF, Peak reverse voltage. 2.2 Necessity of Filter circuit. Types of Filter circuit – Capacitor input Filter – Inductive filter – Inductive filter – Π type filter and Function of bleeder resistor. 2.2 Different IV voltage REgulators: Positive & Negative & their specifications. | 18 Periods |

| | | |
|-----------------|---|---------------|
| Module 3 | Bipolar Transistor | |
| | 3.1 Working of PNP and NPN Transistor. 3.2 Identification of Transistor leads & fault finding. 3.3 Different Transistor configurations like CB, CE & CC, input and output characteristics, Comparison of CB, CE and CC configurations. 3.4 Comparison of α , β , and β_{dc} factors. 3.5 Concept of Q-point, dc load lines. 3.6 Transistor as an Amplifier. 3.5 Concept of Q-point, dc load lines. 3.6 Transistor as an Amplifier. | 18 Periods |
| Module 4 | FET | |
| | 4.1 Construction of N- Channel & P-Channel FET and their symbol. 4.1 Operation of FET & V-I Characteristic Curve. 4.2 Difference between BJT and FET | 12 Periods |
| | OPAMP | |
| Module 5 | 5.1 Features of an ideal OPAMP, Pin configuration of 741, Concept of Virtual Ground & Offset null adjustment. 5.2 Inverting and non-inverting mode and their gain calculation. 5.3 Common mode rejection ratio, Bias current, Offset voltage and current, Slew rate, Open loop and closed loop gain, Input and output impedance. 5.4 APPLICATIONS OF OPAMP: Adder, Differential Amplifier, Subtractor, Voltage Follower, Integrator, & Differentiator circuit. | 30 Periods |

Marks Allotment:Objective type: $(1 \times 10) = 10$ Descriptive type: $(8 \times 5) = 40$ **Reference books :**

| Sl. No. | Title | Author | Publisher |
|---------|-----------------------------|-----------------------|---------------------------|
| 1 | Electronic Principle | Sahadeb | Dhanpat Rai & Sons |
| 2 | Basic Electronics | Prem Singh Jakhar | Dhanpat Rai Publishing Co |
| 3 | Analog Electronics Circuits | Maitreyi Ray Kanjilal | JBBL |
| 4 | Electronic Principles | Sanjay Sharma | Kataria & Sons |

| | | | |
|---|---|-----------------------------|----------------|
| 5 | Electronics devices & Circuits | JB Gupta | Kataria & Sons |
| 6 | Analog Electronics – I & II | Samar Chottopadhyay | NabaPrakashani |
| 7 | Electronic Fundamentals & Applications | Chattapadhyay & Rakhshit | New Age |
| 8 | Principles of Electronics | VK Mehta, Rohit Mehta | S Chand |

Workshop Syllabus is provided separately.

Foundation Course on Computer (FDWK) Class XI

| | | |
|---|--------|---------------|
| Total no. of weeks for classes / Year: 36 | | |
| Classes per week: 12 | Th=3 | Workshop = 9 |
| Total classes per year: 432 | Th=108 | Workshop =324 |
| Total marks: 100 | Th= 50 | Workshop = 50 |

Fundamentals of Digital Logic Design

| | |
|---|---------------|
| Total no. of weeks for classes / Year: | 36 |
| Classes per week: | 3 (Th) |
| Total classes per year: | 108 |
| Total marks: | 50 |

Course Content :

Theory :

Unit 1: Introduction to Boolean Algebra

(38 Periods)

- Introduction
- Definition of Boolean Algebra
- Two Valued Boolean Algebra
- Boolean Operations: AND, OR, NOT
- Basic Properties and Theorems of Boolean Algebra
- De Morgan's Law and Basic Principle of Duality Theorem
- Proof of Theorems using Identities and Truth Tables
- Boolean Expressions and Boolean Functions
- Simplifications of Boolean Expressions using Boolean Algebra
- Canonical and Standard Forms
 - Minterms and Maxterms
 - Sum of Product (SOP) Expressions using Minterms
 - Product of Sum (POS) Expressions using Maxterms
 - Conversion between Canonical Forms

- Karnaugh Map (K-Map)
 - Introduction
 - Simplification of Boolean Functions using K-Map (Upto 4 Variables)

Unit 2: Introduction to Logic Gates and Combinational Circuits (42 Periods)

- Introduction to Logic Gates
- Logical Symbols and Truth Tables of Basic Logic Gates : NOT, AND, OR
- Logical Circuits of Boolean Expressions using Basic Logic Gates
- Definition of Universal Gates
 - Logical Symbols and Truth Tables of Universal Gates
 - Implementation of Basic Logic Gates using Universal Gates
- Introduction to Combinational Circuits
 - Adder : Half Adder (HA) and Full Adder (FA) (Definition and Representation)
 - Implementation of Full Adder (FA) using Half Adder (HA) only
 - Subtractor : Half Subtractor (HS) and Full Subtractor (FS) (Definition and Representation only)
 - Implementation of Full Subtractor (FS) using Half Subtractor (HS) only

UNIT 3 : Introduction to Sequential Logic Circuits

(28 Periods)

- Introduction
- Definition of Flip-Flops
- Logic Diagram of R S Flip-Flop using NAND Gates
- Truth Table of R S Flip-Flop
- Logic Diagram of J K Flip-Flop using NAND Gates
- Truth Table of J K Flip-Flop
- Symbol , Working and Truth Table of D and T Flip- Flops

Marks Allotment :

Objective type: $(1 \times 10) = 10$

Descriptive type: $(8 \times 5) = 40$; (Total five questions to be answered)

Reference Books :

1. Digital Design - Pearson Publisher, by Mano, Ciletti
2. Digital Circuit & Design - Vikash Publisher , by Salivahanan
3. Fundamentals of Digital Circuits - PHI , by Anand Kumar

Workshop Practice

[Practical Part of Basic Vocational Group of Class XI]

[House Wiring/Fitting/Welding/Carpentry (Any three)]

| | | |
|---|-----------------------|------------------------|
| Total no. of weeks for classes/year : 36 | | |
| Classes Per Week: 9 | Theoretical: 0 | Practical : 9 |
| Total Classes Per Year: 324 | Theoretical: 0 | Practical : 324 |
| Total Marks: 50 | Theoretical: 0 | Practical : 50 |

Carpentry Shop :

1. **Demonstration of common wood** available in the market e.g. Teak, Sal, Deodar, Gummer, Mehogany, Jarul etc.
2. **Identification and use of :**
 - a) **Various hand tools used in carpentry shop** – Try square, Folding Rule, Scriber, Mortise Gauge, Straight Edge.
 - b) **Various cutting and planning tools used in carpentry shop** – Cross cut saw, Rip saw, Tenon saw, Wood jack plane, Iron jack plane, Smoothing plane.
 - c) **Various chisel used in carpentry shop** – Firmer Chisel, Mortise Chisel, Dovetail Chisel.
 - d) **Various holding & supporting tools used in carpentry shop** – Carpenter's Vice, Working Bench, Bench hook, Bar-clamp, G-cramp.
 - e) **Various boring tools used in carpentry shop** – Augur, Gilmet, Bradawl, Wheel brace & bits (Twist bit, Centre bit, Counter sink bit, Expansion bit).
 - f) **Miscellaneous tools used in carpentry shop** – Warrington hammer, Claw hammer, Mallet, Screw driver, Pincer, Rasp File.
 - g) **Auxiliary materials used in carpentry shop** – Nails, Dowels, Screw, Bolt, Nut & Glue.
3. **Practical Job :**
 - i. Layout, marking, sawing & planing as shown in figure 1.
 - ii. Preparation & construction of any two of the following joints –
 - a) T-lap joint (figure -2)
 - b) Cross lap joint (figure- 3)

- c) Mortise & Tenon joint (figure -4)
 d) Lap-Dovetail joint (figure-5)

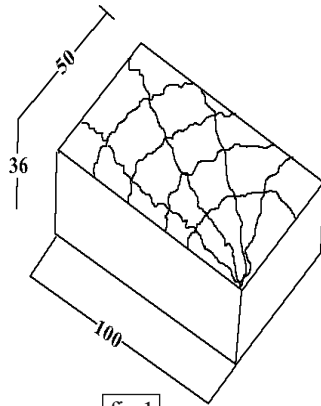


fig 1

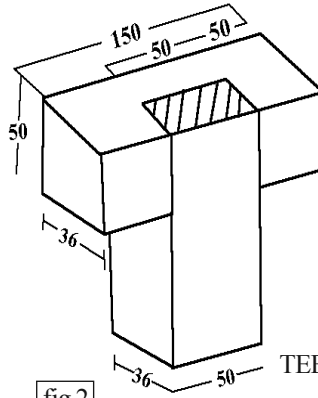


fig 2

TEE-LAP JOINT

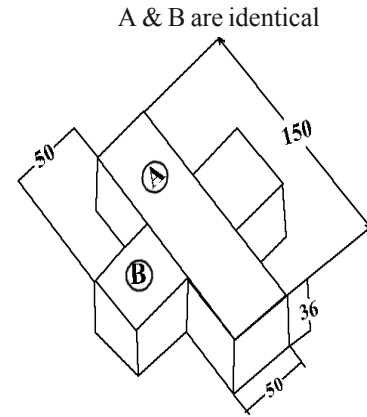
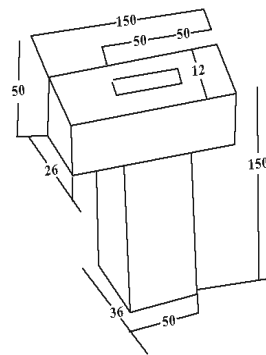
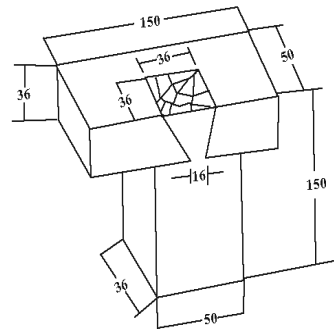


fig 3



MORTISE & TENON JOINT

fig 6



TEE-DOVETAIL JOINT

fig 5

Welding Shop

1. Identification of AC & DC welding machine, their characteristics & field of applications.
2. Knowledge of safety precautions to be taken during arc welding.
3. Identification of various tools & accessories used in arc welding.
4. Demonstration of the connections of various accessories with the welding machine.
5. Demonstration of various methods of cleaning before welding & their importance.
6. Meaning of polarity & their use to be demonstrated. Duty cycle of welding machine.
7. Identification of different types of coated electrode.
8. Demonstration & practice of various arc (Short, long & normal) and effect of arc length on welding performance.
9. Removing of slag after arc welding.

10. Selection of electrode and current rating for the welding of various plate thicknesses.

| Plate thickness in mm | Size of electrode in mm | Current rating in amp |
|-----------------------|-------------------------|-----------------------|
| 1.6 | 1.6 | 40-60 |
| 2.5 | 2.5 | 50-80 |
| 4.0 | 3.2 | 90-130 |
| 6.0 | 4.0 | 120-170 |
| 8.0 | 5.0 | 180-270 |
| 25 | 6.0 | 300-400 |

11. Straight beading by arc welding.

12. **Practical Job:** (Any three of the following)

- Lap joint by parallel fillet welding (Figure-1).
- Lap joint by combined parallel fillet and transvers welding (Figure – 2)
- Square butt joint by arc welding (Figure-3)
- T-fillet joint by arc welding (figure-4)

parallel fillet

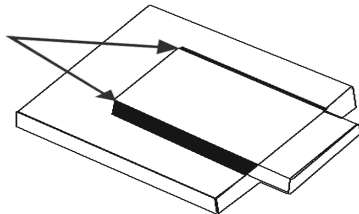
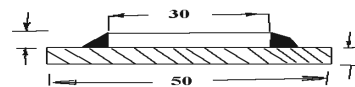


fig 1



PARALLEL FILLET WELDING

Transverse fillet welding Parallel fillet welding

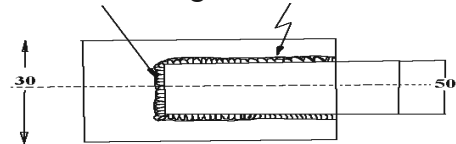


fig 2

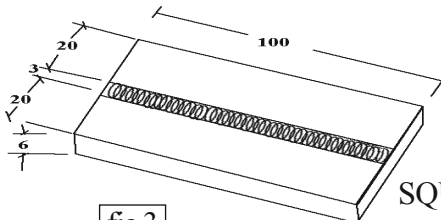
COMBINED TRANSVERSE AND
PARALLEL FILLET WELDING

fig 3

SQUARE BUTT JOINT

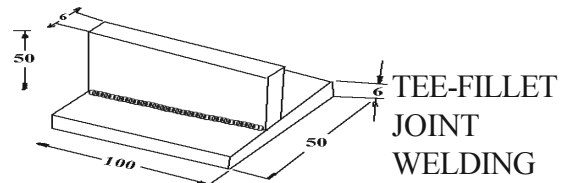
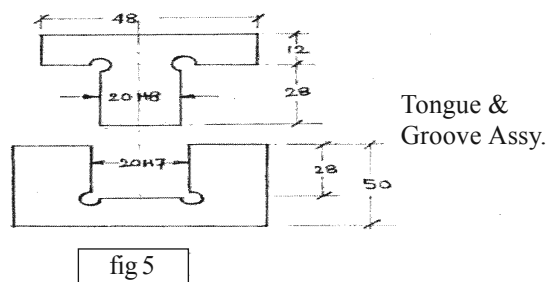
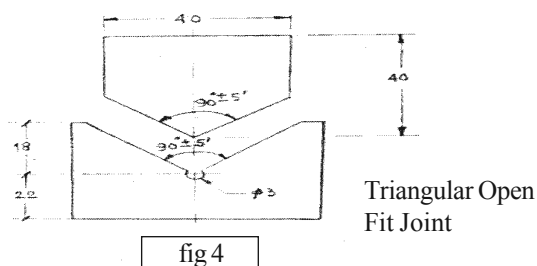
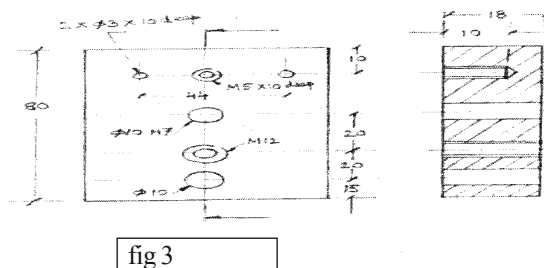
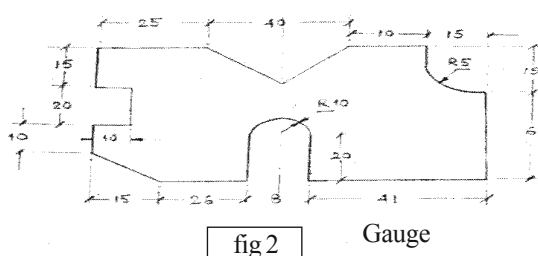
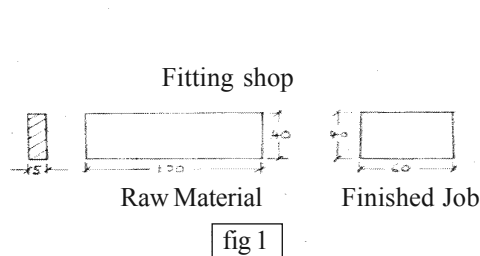


fig 4

TEE-FILLET
JOINT
WELDING

Fitting Shop:

1. Identification & use of various types of file, hacksaw, vice, hammer, tap used in fitting shop.
2. Purpose of limit system, Classification of fits as per BIS system, Hole basis system & shaft basis system.
3. Practice on measuring of heights with Vernier Height Gauge.
4. Practice on measuring of angles with Bevel Protector.
5. **Practical Job:** (Any three of the following)
 - a) Sawing and filing practice (Figure-1).
 - b) Preparing of any two of the following jobs:
 - i) Making of a gauge (Figure-2).
 - ii) Making of a job as shown in Figure-3.
 - iii) Making of a “Triangular open fit joint” (Figure-4).
 - iv) Making of a “Tongue & Groove assembly” (Figure-5).



Reference Books:

| Name of Authors | Title of the Book | Name of the Publisher |
|-----------------------|--|------------------------|
| S.K. Hazra | Work Shop Technology Volume I & II Latest | Mediapromoters, Mumbai |
| Raghuwanshi | Work Shop Technology Volume I & II Latest | Dhanpath Rai & Sons |
| Gupta | Production Technology | Sayta Prakasani |
| Bawa | Manufacturing Processes | Tata McGraw-Hill |
| Ali Hasan & R.A. Khan | Manufacturing Processes | ScitechPub. Chennai |

House Wiring:

(Item 1 & 2 are compulsory and Any one from 3, 4, 5)

Job-1 Study & Use of Wiring Accessories – P.V.C wire, Grade of wire, Size of wire, Main switch (ICDP, ICTP&N), Solid & Stranded conductor, Single pole & Double pole switch, Different types of switches, Miniature circuit breaker (M.C.B), Different types of fuses, Cut-out, Fuse-grip, Ceiling rose, Lamp holder, Different types of plug, Size of PVC Conduit, Size of PVC Casing, Saddle, Conduit bend, Conduit coupler, Inspection box, Distribution board (ICDB), Bus bar chamber, Rising main, Live wire, Neutral wire, Earth wire, Switchboard, Various symbols associated with various components of wiring.

Job-2 Testing of Electrical Installation – Continuity test of wiring, Continuity test of conduit, Polarity test of single pole switch by test lamp, Polarity test of single pole switch, Earth continuity test, Insulation resistance test between conductors, Insulation resistance test between conductor and earth by Megger. Study the necessary I.E. rules for domestic wiring and earthing.

Job-3 To make Domestic Wiring – To make a wiring circuit using PVC wire and Conduit for one Lamp point, one Fan point with regulator and one 3-pin plug point. The wiring includes Main switch & Switchboard. Prepare a chart for listing of the materials used with their specification and symbols.

Job-4 Application of different types of switch connections – Control of a light/fan point using one switch, Control of a light point from two different places, Control of a light point from more than two different places, Switching of two or more lamps by a single switch, Connection of bed switch, Series & Parallel connection of lamps.

Job-5 To make Fluorescent lamp connection –

- To study and make the circuit of single Fluorescent lamp and connect it through a switch using casing wiring. Function of Choke coil and Starter. Use of electronic ballast and electromagnetic ballast to make the circuit. Check the circuit with necessary tests before giving supply.
- To study and make the circuit of two Fluorescent lamps together and connect it through a switch using casing wiring. Check the circuit with necessary tests before giving supply.

Reference Books:

- Electrical Installation Estimating & Costing – J.B. Gupta – S.K. Kataria Publication.
- Electrical Installation Estimating & Costing – S. Singh – Dhanpat Rai Publication.
- Basic Electrical Engineering (Vol-I) – P.S. Dhogal, S.K. Mandal – Tata McGraw Hill Publication.
- Electric Wiring – S. Samaddar – New Central Book Agency (P) Ltd.

Vocational Subjects for Class XII

Building Construction & Maintenance (ETBC)

Basic Field Surveying & Levelling (BFSL)

Class - XII

| | | | |
|--|---------------|------------------------------|---------------------|
| Total no. of weeks for classes / Year: 36 | | | |
| Classes per week: 7 | Th=3 | Practical/Project=4 | |
| Total classes per year: 252 | Th=108 | Practical/Project=144 | |
| Total marks: 100 | Th= 50 | Practical = 40 | Project = 10 |

Objective : For the future Entrepreneurs, the subject Surveying as well as Survey Practical will take important role in Technical development.

Aims : To develop an overall concept about the properties of Surveying & knowledge as well as skill of Surveying also.

Course Contents:

Theory:

| Sl. No. | Topic |
|---------|---|
| 1. | Definition, Importance of surveying, Classification of Surveying. |
| 2. | Chain Surveying & its application: Instruments required in brief & operation of chain surveying. |
| 3. | Compass Surveying & its application: Instruments required in brief, details of prismatic compass & its operation, Steps & correction in Compass Surveying |
| 4. | Plane Table Surveying & its application: Instruments required in brief & their operation. |
| 5. | Levelling: Instruments required Different part of Dumpy level, Operation. |
| 6. | Study of Mouza map, |

Marks Allotment:

Objective type: $(1 \times 10)=10$ (To be answered total ten questions out of Twelve)

Descriptive type: $(8 \times 5)=40$ (To be answered total five questions out of Eight).

Practical :

Basic Field Surveying and Levelling Lab

1. Field Survey Practice (Chain Survey, Compass Traverse Survey, Plane Table Survey, Leveling).
2. Measurement of land
3. Layout of Building.

Project work:

Preparation of Project Report of any two of the following business -

- (i) Construction of 1KM. two lane road,
- (ii) Construction of two storied residential building.
- (iii) Sanitary & Plumbing work of a school building.

Reference book :

| Name | Authors | Publisher |
|--|----------------------------------|-------------------------------------|
| Surveying and Levelling | N.N.Basak | Tata Mc Graw-Hill |
| Surveying and Levelling part I and II | T .P. Kanetkar & S.V.Kulkarni | Pune Vidhyarthi Griha Prakashan |
| Surveying and Levelling vol. I and II | Dr. B. C. Punmia | Laxmi Publication |
| Text book of Surveying | S.K.Husain, M.S. Nagaraj | S. Chand and company |
| Surveying and Levelling vol. I and II | S. K. Duggal | Tata Mc Graw-Hill |
| Fundamental of surveying | S.K.Roy | PHI |
| Plane surveying | A.M.Chandra | New age international Publishers |

Civil Construction & Maintenance Technology (CCMT)

Class - XII

| | | | |
|--|---------------|------------------------------|---------------------|
| Total no. of weeks for classes / Year: 36 | | | |
| Classes per week: 7 | Th=3 | Practical/Project=4 | |
| Total classes per year: 252 | Th=108 | Practical/Project=144 | |
| Total marks: 100 | Th= 50 | Practical = 40 | Project = 10 |

Objective : For the future Entrepreneurs, the subjects of Building Materials and Surveying as well as Survey Practical will take important role in Technical development. The Civil Construction & Maintenance comprises of those two subjects i.e. Building Materials and Surveying

Aims: To develop an overall concept about the properties of Building Materials & knowledge as well as skill of Surveying

Course Contents:

Theory:

| Sl. No. | Topic | Periods |
|---------|---|---------|
| 1. | Introduction History of Civil Construction Work : <ul style="list-style-type: none"> i) Building Construction, ii) Road Construction (NH, SH, District Road, Rail-Road), iii) Irrigation (Diversion head work) | 15 |
| 2. | Construction Materials Reinforcing Materials : Tor Steel, Plain Steel & their quality. <ul style="list-style-type: none"> a) Structural Steel Section (name only). b) Admixture in Cement Concrete, Plaster for improving Setting time, Strength, Waterproofing quality. | 33 |
| 3. | Building Construction : <ul style="list-style-type: none"> a) Bengal Municipality Act, Amendment by municipalities, panchayats, Building Planning Rules, Planning of a Building, Considerations during Building Planning-Layout. | 42 |

| Sl. No. | Topic | Periods |
|---------|---|---------|
| | b) Parts of a Building, Idea about Bearing Capacity of soil for selection of Foundation, Method of excavation with or without shoring, Sub-structure & Super-structure. c) Types , Function & Method of Construction of: i) Masonry Walls, ii) PCC under Foundation & Floor, iii) RCC column, iv) Slabs, v) Beams, vi) Lintels & vii) Tie beams, viii) Earth work, ix) Pilling Shoring, x) Brick Flat Soling, xi) Damp-proofing, xii) Flooring, xiii) Skirting & Dado, xiv) Stair (Relation between Tread & Riser). d) Calculation of Dead & Live Load of a Simple Structure. e) Method of Construction including Precaution & Curing: i) Form-work, ii) Casting, iii) Plastering, iv) Painting. f) Brief discussion on Sanitary & Plumbing work. | |
| 4. | Maintenance Maintenance of a Building - i. Constructional parts maintenance, Electrical maintenance, Sanitary & Plumbing maintenance. ii. Plinth protection maintenance, Door-window maintenance, Painting maintenance, Floor maintenance & Wall maintenance. iii. Patch Repairing, Guniting, Short Creating, Crack Repairing, Roof Treatment. | 18 |

Marks Allotment:

Objective type: $(1 \times 10) = 10$ (To be answered total ten questions out of Twelve)

Descriptive type: $(8 \times 5) = 40$ (To be answered total five questions out of Eight).

Practical :**Civil Construction & Maintenance Technology Lab**

- Wooden Work (Different wooden Joints)
- Test of Concrete. (Slum Test, Compacting Factor Test).
- Testing of Compressive Stress of Cube & Cylinder after 28 days curing.
- Reinforcement Work (Bar Bending, Hooking, Anchoring, Lapping, Stirrups Binding, Dowel Bar, Extra Top & Extra Bottom Binding)

Project:

- a) Preparation of Design mix.
- b) Site Visit to develop idea of construction work.

Reference books:

| Titles of the book | Name of authors | Name of the publisher |
|---------------------------------------|------------------------|------------------------------|
| Construction Materials | D.N. Ghose | Tata Mcgraw-Hill |
| Building Materials | Amarjit Agrawal | New India Publication |
| Building Materials | S. K. Duggal | New Age International |
| Engineering Materials | Sharma | Phi Publication |
| Building Construction | S. P. Arora And Bindra | Dhanpat Rai Publication |
| Building Construction | B. C. Punmia | Laxmi Publication |
| Building Construction | S.K. Sharma | Tata Mcgraw-Hill |
| Building Construction | Sushil Kumar | Standard Publication |
| Building Construction Vol. I to IV | W. B. Mackay | Longman (Elbs) |
| A to z of Building Construction | Mantri Construction | Mantri Publication |
| Building materials | | NITTTR |

Civil Estimation and Material Testing (CEMT)

Class - XII

| | | | |
|--|---------------|------------------------------|---------------------|
| Total no. of weeks for classes / Year: 36 | | | |
| Classes per week: 7 | Th=3 | Practical/Project=4 | |
| Total classes per year: 252 | Th=108 | Practical/Project=144 | |
| Total marks: 100 | Th= 50 | Practical = 40 | Project = 10 |

Objective : For achieving knowledge in professional area of Civil Engineering Stream, it is very essential to study this subject

Aims : To develop an overall concept & skill for setting up a civil contractor firm.

Course Contents:

Theory :

| Sl. No. | Topic | Periods |
|---------|--|---------|
| 1. | Estimate of Land & Building: <ol style="list-style-type: none"> Brief details of method of Estimating, Calculation of Plinth Area, Covered Area, Carpet Area, Service Area, Detail estimate of (i) a Wall with uniform spread footing, (ii) a Boundary Wall with eccentric footing, (iii) a single storied Building, (iv) a Septic Tank, (v) Semi-underground Water Reservoir, | 30 |
| 2. | Estimate for quantity of material required to construct the following item of works for a building: <ol style="list-style-type: none"> Earth work in excavation, Brick flat soling, Plain Cement concrete. Brick work with cement mortar, Plastering. RCC work Wood work calculation, Painting. | 54 |
| 3. | Booking of item of work in measurement book. | 12 |
| 4. | Tendering & Tender Documents, Contract & its types. | 12 |

Marks Allotment:

Objective type: $(1 \times 10) = 10$ (To be answered total ten questions out of Twelve)

Descriptive type: $(8 \times 5) = 40$ (To be answered total five questions out of Eight).

Practical :**Civil Estimation and Material Testing Lab**

1. Method of measurement of a finished work.
2. Estimating & Costing:

Method of estimating & costing of construction, repairing & maintenance work like Brick work, mass concrete, Brick flat soling, mass concrete, reinforced cement concrete, centering, shuttering, plastering, painting. Preparation of bar bending schedule (of RCC Beam, Slab, Column, Column footings) and Rate analysis of item of work (earth work, brick flat soling, mass concrete, brick work, reinforced cement concrete, centering, shuttering, different flooring, plastering, painting).

Project :

Estimate a two storied residential building having two flat per floor of 200m² covered area per floor.

(Estimate of Items of work, Different materials, Cost involved)

Reference Books:-

| Name of Authors | Titles of the Book | Name of the Publisher |
|-----------------|--|---------------------------|
| B.N. Datta | Estimating & costing in Civil engineering | UBS Publishers |
| M. Chakraborti | Estimating & costing, Specification and Valuation in Civil Engineering | M. Chakraborti , Calcutta |
| S.C. Rangwala | Estimating & costing | Charotar Publication |
| B.S. Patil | Civil Engineering Contracts and Accounts Vol I , II | Orient Longman |
| G. S. Birdie | Estimating & Costing | Dhanpat Rai and Sons |

Electrical Maintenance & Installation (ETEM)

Electrical Wiring and Installation of Motors (EWIM)

Class - XII

| | | | |
|--|---------------|-------------------------------|---------------------|
| Total no. of weeks for classes / Year: 36 | | | |
| Classes per week: 7 | Th=3 | Practical/Project=4 | |
| Total classes per year: 252 | Th=108 | Practical/Project =144 | |
| Total marks: 100 | Th= 50 | Practical = 40 | Project = 10 |

Course Contents:

Theory:

| Sl. No. | Topic | Periods |
|--|-------|---------|
| Unit – 1 | | 6 |
| Safety: Safety Practices; Fires in electrical Circuits & Precautions, Fire Extinguishers & its Types, General Safety of Tools & equipment, Rescue of person who is in contact with live wire, Treat a person for electric shock/ injury | | |
| Unit – 2 | | 12 |
| Classification of Electrical Engineering Materials: Classification of electrical materials, Properties of conducting materials, Name different conducting materials used for electrical engineering. Different dielectric materials and Factors affecting dielectric strength. General properties of insulating material, Name different insulating materials used for electrical purposes. Classification of magnetic materials according to the permeability, magnetization curve. Introduction to Electronics: Familiarization of working with electronic components like resistors, Capacitor, Choke coil, Diode, Transistor. | | |
| Unit – 3 | | 8 |
| Symbols, Diagram & Rules: Studies of diagram & Symbols used in basic Electrical Circuits, Wiring & installations Colour Code of carbon Resistors | | |
| Unit – 4 | | 10 |
| Different Tools and Equipments: Screw driver pliers, cutting pliers, nose pliers, hammer, hand drill, hacksaw, wooden saw, knife, chisel, files, wrench & spanner, pipe wrench, standard wire gauge, bench vice, pipe vices, conduit pipe cutters, micrometer, plumb bob, max puller, hand gloves blow lamp, Earthing rod with chain, test lamp, neon tester, Crimping Tools Ammeter, tungtester, volt meter, multimeter (A V O). Soldering iron, DE soldering pump. | | |

| Sl. No. | Topic | Periods |
|--|-------|---------|
| Unit – 5 | | 10 |
| <p>Different Types of Wires and Protective Devices: Types of wires, size of wire, Concept of gauge of wire, current carrying capacity, comparison between copper and aluminium wire, Choice of conductor material.</p> <p>Different types of switches for electrical purposes.</p> <p>Ordinary fuse, cartridge fuse, HRC fuse, cut out, Determination of Fuse size according to the load of circuit and its location, Use of Miniature circuit breaker (MCB), Earth leakage circuit breaker (ELCB).</p> | | |
| Unit – 6 | | 10 |
| <p>Different Wiring System: Cleat wiring, PVC casing and capping wiring, Concealed conduit and Surface conduit wiring. Comparative discussion of above types of wiring and selection of specific type.</p> | | |
| Unit – 7 | | 10 |
| <p>Domestic Wiring Installation: Wiring accessories, Main switch, Distribution board, Junction box, Switch board.</p> <p>Sub circuit, Positioning of wiring accessories, Simple light & Fan circuit, Power circuit, Staircase lighting circuits, Electrical wiring installation in buildings.</p> <p>Estimation of wiring materials. (For domestic wiring up to two rooms)</p> | | |
| Unit – 8 | | 10 |
| <p>Testing of Installation: Insulation resistance test between installation & earth, Insulation resistance test between conductors.</p> <p>Polarity test of single pole switch, Earth continuity test, Earth resistance test.</p> <p>Use of test lamp and meggar in fault location</p> | | |
| Unit – 9 | | 12 |
| <p>Illumination: Laws of illumination, Luminous intensity, Illuminance, Luminous flux.</p> <p>Factors affecting good illumination, Computation of illuminance at any point on working plane.</p> <p>Different lighting schemes, Connection diagram of sodium vapour lamp & Mercury discharge lamp</p> | | |

| Sl. No. | Topic | Periods |
|---|-------|---------|
| Unit – 10 | | 10 |
| <p>Electrical Installation of Motors: Rules for installation of power circuit, Guidelines for power circuit wiring in small industries.</p> <p>Concept of three phase supply, Phase voltage, line voltage, testing of three phase voltage with test lamp and multimeter.</p> <p>Wiring diagram and single line diagram for A.C. motor installation, Materials required for single phase & 3-phase A.C. motor installation.</p> | | |
| Unit – 11 | | 10 |
| <p>Leakage current, Cause of earthing. Resistance of earth conductor.</p> <p>Pipe earthing, Plate earthing.</p> | | |

Marks Allotment:

Objective type: $(1 \times 10) = 10$ (To be answered total ten questions out of Twelve)

Descriptive type: $(8 \times 5) = 40$ (To be answered total five questions out of Eight).

Practical :**Electrical Wiring and Installation of Motors Lab**

1. To Skin different types of cable ends, Making various joints like twist joint, married joint, Tee joint in stranded conductors, Prepare T.W. Board for fixing Flush type accessories.
2. To assemble and make connection for single and twin fluorescent tube with electrical and electronic choke. Understand various faults and their remedies.
3. To make necessary connection for a ceiling fan and run it with necessary power supply, understand various faults and their remedies
4. To make wiring of lighting & power circuits using batten wiring. Test the installation before giving supply.
5. To make wiring of lighting & power circuits using conduit wiring. Test the installation before giving supply.
6. To make connections for controlling of light/ fan load from two or more points.
7. Measurement of earth resistance by earth tester.
8. To make wiring of D.C. motor using 4-point starter and run the motor.
9. To make wiring of single phase A.C. motor using D.O.L. starter and run the motor.
10. To measure phase and line voltage of a three phase supply and measure three phase current with a tong tester.

11. To make wiring of 3-phase A.C. motor using D.O.L. starter and run the motor.
12. Measurement of illuminance at different working places by Lux meter. Hence make a comparative table from the above study.
13. To study the electrical connections of sodium vapour lamp & mercury vapour lamp.
14. To study the electrical connections of ELCB and connect it for testing.
15. To calculate resistance values of colour coded resistors and check the values using a multimeter

Project :

1. Install an A.C. single phase one H.P motor using D.O.L starter & run it. The distance of the motor is 2 m. from the main distribution board. Draw the installation plan & make a list of materials with specification required for the installation.
2. Take the plan of two consecutive class rooms of your Institution with lights and fans as placed. Draw the wiring diagram (batten /conduit) of the two rooms for electrification starting from mains and make a list of the materials with specification required for the wiring.

Reference Books:

1. Electrical Estimating & costing – J.B.Gupta- S.K.Kataria Publication
2. Electrical Estimating & costing – S.R.Chakraborty
3. Electrical Estimating & costing – S.Singh- Dhanpat Rai Publication
4. Installation Commissioning & Maintenance of Electrical equipment – Tarlok singh - S.K.Kataria Publication

Maintenance & Repair of Electrical Domestic Appliances (MRED)

Class - XII

| | | | |
|--|---------------|-------------------------------|---------------------|
| Total no. of weeks for classes / Year: 36 | | | |
| Classes per week: 7 | Th=3 | Practical/Project=4 | |
| Total classes per year: 252 | Th=108 | Practical/Project =144 | |
| Total marks: 100 | Th= 50 | Practical = 40 | Project = 10 |

Course Contents:

Theory:

| Sl. No. | Topic | Periods |
|---------|---|---------|
| 1. | General idea on Electrical Maintenance: Safety rules, Indian safety standard regarding electrical appliances (brief idea), various symbols used in electrical appliances. | 4 |
| 2. | General idea on Various Component: Different types of switches, fuse, thermostat, heating elements, conductors, insulators, capacitors, wires and cables (for up to 15 amp) symbol of various components | 6 |
| 3. | Maintenance of heating appliances: Identification, working and specification of each part. Repairing for some common problems, replacement of coil, insulators, thermostat etc. for the following: (a) Room Heater (with/ without variable thermostat) (b) Electric iron (with/without variable thermostat) (c) Electric stove, electric kettle, electric rice cooker, electric toaster (d) Electric immersion heater, Geyser. | 15 |
| 4. | Maintenance of motorised appliances: 4.1 Maintenance of Ceiling and Table fan: Construction, Identification of various parts, electrical diagram, regulator. Connection Wiring of a fan with switch and regulator, maintenance of fan (overhauling), repair of some common problems like low speed, fan not starting, fan rotating in reverse direction, any other as suggested by concerned teacher. 4.2 Maintenance of Domestic Pump motor: Identification of pump motor, type & specification, electrical connection, of switch, cable etc. Routine check up of motor (e.g. meggar test, checking of winding resistance.) repairing of some common fault like starting problem, tripping of motor or any other as suggested by concerned teacher. 4.3 Maintenance of domestic Mixer grinder, food processor: Identification of various parts, identification of motor used, its type and specification. Study of selector switch and its repairing, thermostat connection and its replacement and operation, repairing for some common fault (e.g. motor not starting, motor abnormal noise etc). | 43 |

| Sl. No. | TOPIC | PERIODS |
|---------|---|---------|
| | <p>4.4. Maintenance of washing machine : Identification of various parts of a semi-automatic washing machine like (a) motor, (b) water valve, (f) timer, (g) Brake arrangement, working of all parts for various mode of operation, replacement of various parts of a washing machine. Troubleshooting for various faults.</p> <p>4.5 Vacuum Cleaner: Identification of various constructional parts, motor specification, type, electrical connection. Common faults, repair and maintenance of vacuum cleaner.</p> | |
| 5. | <p>Maintenance of Other Appliances:</p> <p>5.1 Identification of various components and trouble shooting of electric bell, buzzer, emergency light,</p> <p>5.2 Identification of various components and general troubleshooting of voltage stabilizer, Inverters and UPS for some common problems.</p> | 20 |
| 6. | <p>Rewinding of fan motors:</p> <p>6.1 General Procedure for Rewinding: Tools required for rewinding, Removing of stator, rotor and old coils, collecting of winding information, Preparation of stator & rotor coils, End connections & testing of winding, Varnishing, baking and re assembling of motor.</p> <p>6.2 Fan Motor Winding: Placing of coils – starting winding and running winding. Connection.</p> | 20 |

Marks Allotment:

Objective type: $(1 \times 10)=10$ (To be answered total ten questions out of Twelve)

Descriptive type: $(8 \times 5)=40$ (To be answered total five questions out of Eight).

Practical :**Electrical Domestic Appliances Lab**

1. To be familiar with testing of domestic appliances.
2. Dismantling, re-assembling and troubleshooting of electric room heater (rod type)
3. Dismantling, re-assembling and troubleshooting of ordinary/automatic electric iron, Immersion Heater, kettle etc.
4. Dismantling, re-assembling and troubleshooting of Electric geyser
5. Dismantling, re-assembling and troubleshooting of Table fan and Ceiling fan
6. Dismantling, re-assembling and troubleshooting of Room air cooler
7. Dismantling, re-assembling and troubleshooting of Voltage stabilizer

8. Dismantling, re-assembling and troubleshooting of Florescent Tube
9. Dismantling, re-assembling and troubleshooting of Emergency light.
10. Testing of burnt/faulty motor like (ceiling fan, 3-ph motor and mixer motor).
12. Preparation of single phase ac motor for re-winding.
 - a. -name plate details
 - b. -dismantling the motor
 - c. -noting the winding data,
 - d. -connections
 - e. -stripping off the winding
 - f. -slot insulation
13. Imparting Basic skills on re-winding the ceiling fan .

Project :

Rewinding of a ceiling fan motor / mixer grinder motor.

Reference Books:

1. Study of Electrical Appliances and Devices, Khanna Publishers, New Delhi – K.B.Bhatia
2. Electrical Appliances (Hindi & English), New Heights Publication, New Delhi – M.L.Anwani and Hans
3. Electrical Appliances Repairer & Maintenance, Hind Pocket Books, G.T. Road, New Delhi – K.Nath
4. House Hold Repairer, Hindi Pocket Books, G.T. Road, New Delhi – Prakash Shukla
5. How to repair Electrical Appliances ‘AUDEL SERIES’ Taraporewala and Sons Co.Pvt. Ltd. – Gershon J.Sheeler
6. Electrical Gadgets and their repair, Pitamber Book Depot, New Delhi – S.R.Roy
7. Electrical Gadgets, Dhanpat Rai and Sons, New Delhi – H.Pratap
8. Electric Motor Winding and repair, Dhanapat Rai and Sons, New Delhi – M.L.Anwani, I.M.Anwani
9. Electrical wiring and Industrial and Domestic Wiring, New Heights, New Delhi – Arora and B.Das
10. Home appliances Servicing ‘AUDELS’, D.B. Taraporewala and Sons Co.Pvt. Ltd. – Adwin P.Anderson
11. How to repair Electrical appliances, D.B. Taraporewala and Sons Co.Pvt. Ltd. – Garshon J.Wheeler
12. Study of Electrical appliances and devices, Khanna publishers – K.B. Bhatia
13. Electrical Motor winding and Repair, New Heights Publication, New Delhi – M.L. Anwani, I.M.Anwan
14. Practical A.C. Motor winding. Hindi Pocket Books, New Delhi – Narendranath.

Rural Electrification and Distribution of Power (REDP)

Class - XII

| | | | |
|--|---------------|------------------------------|---------------------|
| Total no. of weeks for classes / Year: 36 | | | |
| Classes per week: 7 | Th=3 | Practical/Project=4 | |
| Total classes per year: 252 | Th=108 | Practical/Project=144 | |
| Total marks: 100 | Th= 50 | Practical = 40 | Project = 10 |

Course Contents:

Theory:

| Sl. No. | TOPIC | PERIODS |
|---|-------|---------|
| Unit – 1 | | 6 |
| Introduction: Structure of power transmission in rural area, Definition of standard Low, Medium, High & Extra high voltage, Concept of power in AC transmission systems, Single phase & 3-phase line, Concept of 3-phase balanced & unbalanced load, Concept of 3-phase 3-wire & 4-wire system, Classification of transmission lines - Short, Medium & Long transmission line. | | |
| Unit - 2 | | 11 |
| Distribution systems: Difference between feeder & distributor, Types of A.C Distribution - Primary & Secondary distribution System, Overhead vs. Underground system, Connection schemes of distribution system - Radial, Ring main, Interconnected system, Importance of load power factor improvement, Identification of power factor improvement equipments. | | |
| Unit - 3 | | 14 |
| Materials used in Transmission & Distribution System: Different types of Pole, Towers, X-arms, Timbers, Sky pin, Arm pin, Clevis, Insulators- Pin, Strain, Disc, Shackle, Gay, Post etc., Conductors- their size & types, Guying materials, Anchoring materials, different Connectors, Lightning arrester, different types of Fuses, Isolators, various Nuts & Bolts used for erection, Different materials for Street Lighting. | | |
| Unit - 4 | | 17 |
| Erection of transmission line components: Selection of site & route for erection, Detail survey of line route & transmission system, Fixation of pole locations and height of overhead lines as per I.E rules, Erection procedures of pole, Stay wire, Cross arm, Insulators etc. | | |

| Sl. No. | Topic | Periods |
|-----------------|---|---------|
| | Selection of conductor material as per I.E. rules, Procedure of making different types of Joints and Jumper as per I.E. rules, Calculation of Sagging of transmission line, Conductor Spacing, Line Guard materials & their fixing as per I.E. rules, Earthing of all metal supports of overhead lines as per I.E. rules. | |
| Unit - 5 | | 19 |
| | <p>Installation of Underground cable: Classification of cables and its selection, Planning the route for cable laying, Different methods of cable laying (in brief), Cable drawn-in system, Methods of cable jointing & termination.</p> <p>Installation of Street lighting: Planning the route for light pole erection, Selection of pole size/height and distance between poles considering uniform illumination as per BIS, Procedure of erection of poles, Earthing of poles, Selection of luminaries, lamps & accessories.</p> <p>Installation of Solar Street lighting: Selection of pole size/height and distance between poles, Selection of solar cell and its accessories considering illumination as per BIS.</p> <p>Installation of Distribution Transformer (upto 100 KVA): Selection of site, Erection of - fittings, fixing of insulator, Main switch, Fuse, Distribution transformer, Earthing.</p> | |
| Unit - 6 | | 7 |
| | Service connection: Types of service connection, Materials for service connection - PVC wire, Insulator, G.I wire, Stay wire, Stay bow, Stay rod, Egg insulator, Conduit, Calculation of cable length for service connection. | |
| Unit - 7 | | 10 |
| | Tariff and Billing: Types of load on power station - Base load & Peak load, Definition of Maximum demand, Demand factor, Diversity factor, Load factor, Cost of electrical energy - Fixed cost, Running cost, Types of Tariff, Specification of Single phase & 3-Phase Energy meter, Cut-out, Use of TPIC with Neutral & DPIC main switch. | |
| Unit - 8 | | 14 |
| | IE Rules: 2, 3, 6, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 41, 42, 43, 44, 45, 46, 47, 48, 50, 50A, 51, 54, 55, 56, 57, 59, 60, 61, 64, 74, 76, 77, 78, 80, 81, 82A, 84, 85, 87, 88, 89, 90, 91, 92. | |
| Unit - 9 | | 7 |
| | Safety & Precaution:- Protection against lightning, Safety and protective devices for overhead lines, Protection against unused overhead lines, Safety measures for Line supports as per I.E. Rules, Safety measures for erection of Distribution transformer & Transmission lines as per I.E. Rules. | |

Marks Allotment:

Objective type: $(1 \times 10) = 10$ (To be answered total ten questions out of Twelve)

Descriptive type: $(8 \times 5) = 40$ (To be answered total five questions out of Eight).

Practical :**Rural Electrification and Distribution of Power Lab**

1. Familiarization of different tools & equipments for erection and testing of overhead transmission lines.
2. Familiarization of different tools & equipments for erection and testing of underground transmission lines.
3. Physical identification of different transmission line components.
4. Practical observations of different line safety parameters of overhead line in a rural area.
5. Practical observations of different parameters of street lighting in a rural area.
6. To study the construction of overhead and underground cable.
7. Practical exposure of underground cable laying, jointing and earthing system.
8. Installation of single phase Energy meter for domestic purpose.
9. Installation of Three phase Energy meter for commercial purpose.
10. To study the reading of Energy meter and calculate energy bill of given load.
11. Practical demonstration of Fuse replacement and checking of healthy line.
12. To study plate and pipe earthing.
13. Installation of lightning arrester.
14. Installation and repairing of panel board of low voltage distribution.
15. To study different types of fuses and M.C.B.
16. Installation of different types of overhead insulator.
17. To identify the Safety measures while working on low/medium/high voltage transmission line.

Project work :

18. Design Rural electrification scheme for small village maintaining I.E. Rules. Make a list of materials for the scheme.
19. Practical observation on installation of low/medium voltage transmission line in rural area. Draw the layout diagram of the installation & make a list of materials for the scheme.
20. Practical exposure on solar lighting system using solar panel and its components for rural electrification for a certain rural area. Draw the layout diagram of the installation & make a list of materials for the scheme.
21. Practical observation of erection & commissioning of Distribution transformer. Make a report of the complete job.

Reference Books:

1. Installation Commissioning & Maintenance of Electrical Equipment - Tarlok Singh - S.K.Kataria Publication
2. Power System - J.B. Gupta - S.K.Kataria Publication.
3. Principles of Power System - V.K.Mehta - S.Chand Publication.

Solar Energy & Photovoltaic System & their Applications (SPSA)

Class - XII

| | | | |
|--|---------------|-------------------------------|---------------------|
| Total no. of weeks for classes / Year: 36 | | | |
| Classes per week: 7 | Th=3 | Practical/Project=4 | |
| Total classes per year: 252 | Th=108 | Practical/Project =144 | |
| Total marks: 100 | Th= 50 | Practical = 40 | Project = 10 |

Course Contents:

Theory:

| Sl. No. | Topic | Periods |
|--|-------|-----------|
| Unit - 1 | | 10 |
| An Introduction to Energy Sources: <ul style="list-style-type: none"> ● Introduction to Conventional & Non-conventional sources of energy. ● Difference between conventional & Non-conventional energy & their limitations. ● Advantages & Disadvantages of Non-conventional energy ● Reasons for Non-conventional energy being not so popular. ● Chances for development of Non-conventional energy in India ● Various applications of solar energy and scope of employment and entrepreneurship in solar energy sector. | | |
| Unit - 2 | | 12 |
| Solar cooker: <ul style="list-style-type: none"> ● Basic working principle ● Designs available in the market ● Information on solar cookers manufacturers in India ● Introduction to solar cookers for house hold & community applications ● Operation & maintenance. ● Serving schedule. ● Disadvantages & Limitations. | | |

| Sl. No. | Topic | Periods |
|--|-------|---------|
| Unit - 3 | | 20 |
| Solar Water Heaters (SWH): <ul style="list-style-type: none"> ● Basic working principle of solar hot water system - copper flat plate & Evacuated tube collectors (ETC) ● Parts of a SWH. ● Types of system - Thermo Siphon / systems operating under pressure / no pressure / heat exchangers. ● Classification of solar collectors: Flat plate collector - Description, Working principle, Application. Concentrating collectors - Focusing type, Cylindrical parabolic type collector. ● Importance of insulation & insulation materials. ● Sun movement over the day, shadowing effects, carrying out site survey to identify suitability & location. Recommending correct size & type of system. | | |
| Unit - 4 | | 14 |
| Solar Energy Storage: <ul style="list-style-type: none"> ● Solar energy storage systems ● Brief idea of heat storage- Sensible heat & Latent heat ● Solar pond - Description, Working principle, Application | | |
| Unit - 5 | | 20 |
| Solar Photo-voltaic Cell. <ul style="list-style-type: none"> ● Advantages & dis-advantages of photo-voltaic conversion. ● Use of solar cell in various applications. ● Photo-voltaic array & its connections, arrangements of array according to the voltage. ● Module & its connections. ● Faults & their effects in photo-voltaic cell, array & module (connection of cell, connection of array, connection of module) ● General Concept of solar geometry (sun movement, summer solstice, winter solstice) ● Solar energy resources (solar insolation, capacity, use of solar light, need of light strength, efficiency (variation with longitude) | | |

| Sl. No. | Topic | Periods |
|---|-------|---------|
| Unit - 6 | | 12 |
| Storage Battery: <ul style="list-style-type: none"> ● Introduction to storage battery: construction, parts & working. Anode, cathode & electrolyte. ● Construction & working of Hydrometer. ● Working of a battery capacity tester. ● Connection of battery (series & parallel). Faults in a battery (battery box, negative & positive plates, cell connector, terminal, electrolyte, specific gravity, battery voltage) | | |
| Unit - 7 | | 20 |
| Solar lighting system: <ul style="list-style-type: none"> ● Description of main parts of solar photovoltaic lighting system: Solar Lantern, street light, home light. ● Charge controller ● Storage battery ● Inverter ● Luminaire ● Maintenance of solar lighting system. ● Major solar lighting manufacturers in India. ● Comparative study of Conventional lighting system & solar lighting system. Different energy efficient lighting elements (LED, CFL etc) and their operation | | |

Marks Allotment:

Objective type: $(1 \times 10) = 10$ (To be answered total ten questions out of Twelve)

Descriptive type: $(8 \times 5) = 40$ (To be answered total five questions out of Eight).

Practical :**Solar Energy & Photovoltaic System & their Applications Lab**

1. Demonstration of Conventional & Non-conventional energy sources.
(Visit to actual installation of any non conventional energy source - solar, wind, biomass etc)
2. To measure Solar Radiation (Direct & Diffuse) with the help of Pyranometer.
3. Solar cooker: Study solar cookers designs / components, Assemble solar cookers, General maintenance schedule for solar cooker components, Fault finding & trouble shooting.
4. Solar Water Heaters (SWH): Distinguish between copper based flat plate collector & Evacuated tube collectors (ETC), Flow diagrams - reading & understanding various systems / drawings / animated representation.

5. To study Parabolic Disc Reflector used for water heating.
6. Make an array using photo-voltaic cell in solar electricity. Prepare modules of various capacities with the help of array.
7. Perform servicing of storage cell (deep discharge battery) in the charging system of solar electricity, measure specific gravity & voltage. Note the capacity of the cell.
8. Assemble a solar lighting system
9. Wiring plan & location of loads & charge controllers & modules to avoid loss
10. Various tests before and after commissioning the Solar Electric system

Project

1. Preparation of Project Report of ANY ONE business -
 - (i) Installation of SPV module along street,
 - (ii) Installation of Flat plate collector in a hotel/office building,
 - (iii) Installation of Solar air heater in a multistoried building.

Following statements are required to be prepared for the project work:

Calculation of working capital requirement, Cost of Purchase / Production, Profitability Statement, Means of Financing, Land and site Development, Plant and Machinery requirement, Preliminary and Pre-operative Expenses, Estimation of Manpower - Staff and Labour, Administrative Overheads, Calculation of Depreciation, Interest Calculation, Project Implementation Schedule.

Consumer Electronics (ETCE)

Computer Hardware and Networking (CHNW)

Class - XII

| | | | |
|--|---------------|------------------------------|---------------------|
| Total no. of weeks for classes / Year: 36 | | | |
| Classes per week: 7 | Th=3 | Practical/Project=4 | |
| Total classes per year: 252 | Th=108 | Practical/Project=144 | |
| Total marks: 100 | Th= 50 | Practical = 40 | Project = 10 |

Course Contents:

Theory:

| Sl. No. | Topic | Periods |
|---|---|---------|
| Unit - 1 | | 6 |
| PC Hardware Overview: | | |
| 1.1 | PC Evolution: Computers through generations, Basic computer Hardware structure, different types of computer systems, | |
| 1.2 | Features of computer system: Feature of Desk top, Server, laptops and Tablets | |
| Unit - 2 | | 15 |
| Main Memory System & Storage Devices : | | |
| 2.1 | Concept of Main Memory, Cache memory and its operations. | |
| 2.2 | Idea of CD ROM and DVD drives, static memory, ROM, PROM, EPROM, EEPROM - Storage capacity - Subassembly components and installation. | |
| 2.3 | Hard Disk Drive: Hard disk construction and working, Formatting, Low level formatting, High level formatting, Partitioning, Hard disk drive interface : features of parallel AT attachment (PATA), Serial ATA (SATA), ATA devices jumper selections : Master, slave, cable select, ATA cables | |
| 2.4 | Concept of FPM, EDO, SDRAM, SIMM, DIMM, pen drive | |
| Unit - 3 | | 15 |
| Inside the system unit and Motherboards: | | |
| 3.1 | Inside The System Unit: Block diagram of the PC system, system box types, system main components and their overview including the rear side connectors. | |
| 3.2 | Motherboard: Motherboard Selection criteria & layouts, up-grades, functional description of important blocks and their interconnection. | |
| 3.3 | Idea of Buses & Expansion Slots:PCI-Xpress, AGP, PCMCIA, AGP, Processor BUS, PCI versus PCI Express, | |

| Sl. No. | Topic | Periods |
|--|--|---------|
| 3.4 | BIOS: Basic ROM BIOS organization, services, BIOS, DOS, CMOS Setup, configuration and utility | 15 |
| 3.5 | Common problems, Trouble shooting and maintenance of motherboards | |
| Unit - 4 | | 15 |
| Monitors and Interfacing: | | |
| 4.1 | Feature of Monitors, CRT | 15 |
| 4.2 | CRT Monitors: Working, Specification and Setting up and Installation | |
| 4.3 | LCD Monitor : Functional Block Diagram of LCD Monitor, Working, specification and setting up and installation | |
| 4.4 | Maintenance and trouble shooting of LCD and CRT Monitors | |
| 4.5 | Touch Screen Solution | |
| Unit - 5 | | 15 |
| Input & Output Devices and Ports: | | |
| 5.1 | Keyboard : Types , features, interfaces and installation and trouble shooting | 15 |
| 5.2 | Mouse : Types, features, interfaces and installation and trouble shooting | |
| 5.3 | Scanner : Types , features, interfaces and installation and troubleshooting, specifications, OCR, twain, resolution, interpolation | |
| 5.4 | Idea of modem : Internal and external | |
| 5.5 | Idea of modem printer : Dot matrix, inkjet, laser self test of printer, Interface requirements. Use of tonner and ink cartridge | |
| 5.6 | Port: Serial port: Features, signals, connector specification | |
| 5.7 | Parallel port: Features, signals, connector specification, U.S.B.: Features - specification.. | |
| Unit - 6 | | 20 |
| Software Installation & Network: | | |
| 6.1 | OS installation - DOS, WIN XP (SP 2 or SP3)/ WINDOWS 7/WINDOWS 8 | 20 |
| 6.2 | 2008 server, linux/unix installation, device driver commissioning | |
| 6.3 | Application software installation - anti virus, office management etc | |
| 6.4 | LAN hardware components - features and specifications, cable laying, I/O | |
| 6.5 | Box, patch cord, hub and switch installation, jack panel, rack installation | |
| 6.6 | LAN commissioning with performance tuning, protocol and service | |
| 6.7 | Configuration with IP address and configuration | |

| Sl. No. | Topic | Periods |
|---|---|---------|
| Unit - 7 | | 6 |
| Network basics: | | |
| 7.1 | Definition of computer network - network components | |
| 7.2 | Distinguish between network classifications - classify networks by their geography- LAN, MAN & WAN; classify networks by their network role- peer to peer, server based networks. | |
| 7.3 | Network features- file sharing; printer sharing, application services- e-mail; remote access | |
| Unit - 8 | | 6 |
| Transmission media and networking devices: | | |
| 8.1 | Classification of transmissions media: Guided media- UTP, STP; coaxial cable; optical fiber: Advantages and disadvantages of optical fiber and light source (brief idea) , brief idea of unguided media | |
| 8.2 | Network control devices - hubs; switches; routers; bridges; repeaters; Gateways; media types | |
| Unit - 9 | | 10 |
| Network Infrastructure - Internet, Intranet, and Extranet: | | |
| 9.1 | Idea of network topology | |
| 9.2 | Concept of layered architecture of network system - seven layer OSI model and TCP / IP layer structure, comparison of the OSI and TCP/IP reference models | |
| 9.3 | Protocols and services | |
| 9.4 | Understand IP v4 & IP v6 | |
| 9.5 | Addressing names resolution & networking services | |

Marks Allotment:

Objective type: $(1 \times 10)=10$ (To be answered total ten questions out of Twelve)

Descriptive type: $(8 \times 5)=40$ (To be answered total five questions out of Eight).

Practical/Project :**Computer Hardware and Networking Lab**

- 1 Identification of different components and assembling of computers
- 2 Installation of softwares, configuration and trouble shooting of computers
- 3 Replacing of battery, Hard disk, memory, optical drive, dismantling of laptops and troubleshooting and maintenance of laptops
- 4 Draw layout of LAN Network and assess the network requirements and prepare a practice setting up of wired and wireless LAN using both optical fiber and CAT 6 cable

5 Create a Network cable using RJ45 connectors

6 Prepare set up for step by step procedure for File sharing & Printer sharing

Reference books :

| Sl. No. | Name of the Author | Title of the Book | Name of the Publisher |
|---------|---|---|---------------------------|
| 1. | Data Communication and Networking | B.A. Forouzan | T.M.H Publishing Co. Ltd. |
| 2. | Data Communication & Networking | DP Nagpal | S . Chand |
| 3. | Data Communication & Computer Networking | Ajit Pal | PHI |
| 4. | Kodanda Ramaiah | I T Workshop (Computer Hardware & Networking) | Scitech |
| 5. | Communication Network | Leon, Garcia, Widjaja | Tata McGraw-Hill |
| 6. | Computer Network | Tanenbaum Prentice | Hall of India |
| 7. | Data Communications | F. Halsall | Pearson Edu. |
| 8. | Computer Network | U. Black | Prentice Hall of India |
| 9. | Peter Norton's Introduction to Computer | P. Norton | Tata McGraw-Hill |
| 10. | Local Area Network | Ahuja | Tata McGraw-Hill |
| 11. | Elements of Computer Science & Engineering | Prof. A.K. Mukhopadhyay | |
| 12. | Computer Networks Fundamentals and Applications | Rajesh, Easwarakumar & Balasubramanian. | |
| 13. | Vikash Gupta | Comdex hardware and Networking Course Kit | Dreamtech press |
| 14. | Brenner | IBM PC troubleshooting & repair guide | BPB |
| 15. | R. Gilster | PC Hardware a Beginner's Guide | Tata McGraw-Hill |
| 16. | Govindrajalu IBM PC Clone | Tata McGraw Hill | |
| 17. | Norton | Peter Norton's Problem | Prentice Hall of India |

| Sl. No. | Name of the Author | Title of the Book | Name of the Publisher |
|---------|-----------------------|--|----------------------------------|
| 18. | Subhodeep Chowdhury | A to Z of PC Hardware Maintenance | Dhanpat Rai & Co |
| 19. | Thompson and Thompson | PC Hardware in a Nutshell | Shroff Pub. & Distrib. Pvt. Ltd. |
| 20. | Biglow's | Troubleshooting, maintaining and repairing | PCs Tata McGraw-Hill |
| 21. | Mueller | Upgrading and repairing | PC Tata McGraw Hill |

Consumer and Industrial Electronics Appliances (CIEA)**Class - XII**

| | | |
|--|---------------|---|
| Total no. of weeks for classes / Year: 36 | | |
| Classes per week: 7 | Th=3 | Practical/Project=4 |
| Total classes per year: 252 | Th=108 | Practical/Project =144 |
| Total marks: 100 | Th= 50 | Practical = 40 Project = 10 |

Course Contents:**Theory:**

| | Group - A | Periods |
|---------------|---|----------------|
| Unit 1 | SMPS, Inverters, battery maintenance and UPS | 20 |
| | 1.1 Block Diagram of Switch mode power supplies and their working principles, introduction to DC-DC Converters (choppers), Applications of DC-DC converters 1.2 Concept and block diagram of automatic and servo voltage stabilizer, buck and boost 1.3 The principle, operation, power rating and change over period of single and 3 phase inverter, protection circuits used in inverters- battery level, over load, over charging etc. 1.4 Concept, operation principle of different types of UPS & its specification, Difference between inverters & UPS, UPS battery, inverter, static transfer switch, 1.5 Types of indications and protections, UPS battery charging circuits, power circuits. | |
| Unit 2 | Microphone , Loud speaker and stereos | 15 |
| | 2.1 Discuss the characteristics of Microphones 2.2 Discuss the Principle of operation, construction, advantages and disadvantages of Carbon Microphone -- Capacitance Microphone -- Moving Coil Microphone - Wireless Microphone. 2.3 Constructions and working principles of Moving Coil loudspeaker - Impedance and Power Level of loudspeaker 2.4 Explain the concept of monophonic & stereo phonic sound system 2.5 Details of Stereo Components: Tone control, Bass, Treble, Balance & Control - Crossover Networks - Graphic Equalizer - Noise Reduction Techniques | |

| | | |
|---------------|---|----|
| Unit 3 | Advanced Sound Systems | 10 |
| | 3.1 Basic principles of Magnetic Recording, Playback. 3.2 Basic principles of digital recording & block diagram of MP3 player & explanation. 3.3 Working principle of CD recording and CD playing - Explain 3.4 Block diagram and working principle of VCD and DVD Player | |
| | Group-B | |
| Unit 4 | Microwave Ovens | 16 |
| | 4.1 Brief idea of Microwaves 4.2 Microwave Oven Block Diagram 4.3 Identification of different components of Microwave Ovens 4.4 LCD Timer with alarm 4.5 Single chip controller 4.6 Feature Diagram 4.7 Wiring instruction 4.8 Microwave cook ware 4.9 Operating problems 4.10 Care and cleaning 4.11 Removal parts 4.12 Special care 4.13 Metal Rack Care 4.14 Safety precautions | |
| Unit 5 | Washing Machine | 15 |
| | 5.1 Electronic controller for washing machines- a concept 5.2 Types of Washing Machines 5.3 Washing machine hardware 5.4 Washing cycle 5.5 Concept of Fuzzy Logic Washing machine 5.6 Miscellaneous features 5.7 Safety precautions | |
| Unit 6 | In-Car Computers | 17 |
| | 6.1 Application 6.2 Electronic Ignition | |

| | Group - A | Periods |
|---------------|--|---------|
| | 6.3 Electronic Ignition Lock system 6.4 Antilock Braking System (ABS) 6.5 Electronically Controlled suspension (ECS) 6.6 Instrument panel Displays 6.7 Ultrasonic Car Safety Belt System 6.8 Air Bag System 6.9 Vehicle Proximity Detection System 6.10 Car Navigation System (Travel Pilot) | |
| Unit 7 | Air Conditioners and Refrigerators 15 | |
| | 8.1 Concept of Air Conditioning 8.2 Components of Air Conditioning systems 8.3 All-Water Air, All-Air Air Conditioning systems 8.4 Remote Control-buttons 8.5 Unitary Conditioning Systems 8.6 Split & window Air Conditioners 8.7 Refrigeration & Refrigerants: Refrigeration Systems, Domestic refrigerators 8.8 Idea fault finding and repairing of typical faults | |

Marks Allotment:

Objective type: $(1 \times 10) = 10$ (To be answered total ten questions out of Twelve)

Descriptive type: $(8 \times 5) = 40$ (To be answered total five questions out of Eight).

Practical/Project :**Consumer and Industrial Electronics Appliances Lab**

| | |
|----|--|
| 1. | Idea of PCB, different components, fault finding, repairing of typical faults of SMPS, Inverters, UPS systems and safety precautions |
| 2. | Idea of PCB, different components, fault finding and repairing of typical faults of Microphone , Loud speaker and stereos |
| 3. | Idea of PCB, different components, fault finding and repairing of typical faults of MP3, VCD and DVD player |
| 4. | Dismantling, Testing, Reassembling, fault finding and repairing the typical faults of Microwave Ovens |
| 5. | Dismantling, Testing, Reassembling , fault finding and repairing of typical faults of Washing Machine |
| 6. | Idea fault finding and repairing of typical faults of In-Car Computers |
| 7. | Idea fault finding and repairing of typical faults of Air Conditioners and Refrigerators |

Reference books :

| Sl. No. | Name of the Author | Title of the Book | Name of the Publisher |
|---------|--------------------|---------------------------------------|-----------------------|
| 1. | Bali | Consumer electronics | Pearson |
| 2. | B.R.Gupta, | Consumer Electronics | Sk Kataria & Sons. |
| 3. | Ajay Sharma | Audio and Video systems | Dhanpat Ray & Sons |
| 4. | R.G. Gupta | Audio and Video Systems | Tata McGraw-Hill |
| 5. | Newness | Book View | BPB |
| 6. | Manohar Lotia | Modern CD Player Servicing Manual | BPB Publication |
| 7. | R.G. Gupta | Electronic Instruments and Systems | Tata MCGraw-Hill |

Mobile and Smart Phone Repairing (MSPR)

Class - XII

| | | | |
|--|---------------|-------------------------------|---------------------|
| Total no. of weeks for classes / Year: 36 | | | |
| Classes per week: 7 | Th=3 | Practical/Project=4 | |
| Total classes per year: 252 | Th=108 | Practical/Project =144 | |
| Total marks: 100 | Th= 50 | Practical = 40 | Project = 10 |

Course Contents:

Theory:

| | Group - A | Periods |
|---------------|--|---------|
| Unit 1 | Review of Basics of Electricity Components | 6 |
| | 1.1 Electric current-conductors-insulators, semi-Conductors, Electric potential-Resistance 1.2 Ohm's law-Resistances in Series and parallel simple problem. 1.3 Idea of Energy consumption - DC, AC power, Measurement of power of an Appliance / Circuit. 1.4 Practical use of various mobile repairing tools, soldering implements and materials | |
| Unit 2 | Mobile Communication | 20 |
| | 2.1 Introduction of Mobile Communication. 2.2 Introduction to Cellular Mobile Telephone Service. 2.3 Service Information of Mobile Phone-Base Band Module, Base Band 2.4 Block Diagram of Mobile phones and idea of mobile Receiver, Transmitter, Headset, Display Circuit / Monitor, Batteries. 2.5 Idea of different IC's used in mobile phone, supply voltage Regulator, Powering UP & Down the Phone. 2.6 Brief idea of Memory, SRAM, EEPROM, FLASH 2.7 Comparison of mobile phone with computer. 2.8 Ball IC Practice, How to fix the Ball IC. | |
| Unit 3 | Typical Mobile Handset | 20 |
| | 3.1 Different section and components of mobile phone -description -power supply section, network section, processing section, audio section, charging section, memory section, logic section, antenna and antenna switch, Controller IC- | |

| | | |
|---------------|--|----|
| | <p>SIM IC , light IC, sound IC , keypad IC , memory IC ,charger IC, blue tooth IC, description</p> <p>3.2 Brief idea of following typical mobile handset of Nokia Mobile</p> <p>3.3 Handset and their architecture and components of-</p> <p>a) DCT-3:-3310 and its few latest series</p> <p>b) DCT-4:-1100 and its few latest series.</p> <p>c) DCT-4(MODERN)-1110 and its few latest series</p> <p>d) DCT-4(MODERN):-1220 and its few latest series</p> <p>e) WD-2:- 3230 and its few latest series</p> <p>f) BB-5:-3110 and its few latest series</p> <p>3.4 SIM and SIM related problems of GSM & CDMA Phones, GSM Codes.</p> <p>3.5 Flashing and its need- precautions to be taken while flashing</p> | |
| | Group B | |
| Unit 4 | Basics Mobile Repairing Techniques | 20 |
| | <p>4.1 Idea of CRO, Bread Board,</p> <p>4.2 How to use (SMD), PCB, General Purpose PCB.</p> <p>4.3 Concept of Parts (Speaker, Buzzer, Earphone, PFO).</p> <p>4.4 Concept and Identification of SMD Resistors, SMD coils, SMD Capacitor, SMD Transistors and Diodes</p> <p>4.5 Study of Diodes and application of diodes as Rectifiers</p> <p>4.6 Idea of BGA components on Mobile trainer PCB's.</p> <p>4.7 Idea of different sections of mobile phones.</p> <p>4.8 Idea of DCT4 Models like Color display, Camera or FM models.</p> | |
| Unit 5 | Smart Phone Repair | 20 |
| | <p>5.1 Smartphone - Types, different sections, their model</p> <p>5.2 Specifications, new product specifications and spares, idea of Apple / Blackberry Phone</p> <p>5.3 Basics of PC Hardware & Device Driver, Concept of Internet Browsing and WinZip/ WinRar, Games, MP3</p> <p>5.4 Idea of Micro UFS, & Flashing</p> <p>5.5 Terminologies and procedures mentioned in repair manual</p> <p>5.6 Frequently encountered problems in Smartphone and their repair procedures</p> <p>5.7 Estimate cost of repair and verify Beyond Economic Repair (BER) value</p> | |

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|---------------|---|----|
| | 5.8 Check and test various electronic components on their functionality | |
| | 5.9 Smartphone Repair Case, Quality standards to be followed | |
| Unit 6 | Typical mobile Software | 22 |
| | 6.1 Concept of Software and operating system related to mobile Phone and Smartphone | |
| | 6.2 Idea of Applications including games that can be installed in and the authentic source to download them | |
| | 6.3 Licensed versions of software and application, its terms and conditions associated with it | |
| | 6.4 Software:-flashing and other software fault, S.E. Tool, Installation of UFS 3 dongle and flash files , INF dongle, ATF GOLD, Z3X, SPT etc. | |
| | 6.5 Use of computer for cell phone servicing | |
| | 6.6 Knowledge of downloading of add-on software, ring tones, wall papers, themes, etc. on non multimedia and multimedia handsets, window based handsets | |

Marks Allotment:

Objective type: $(1 \times 10)=10$ (To be answered total ten questions out of Twelve)

Descriptive type: $(8 \times 5)=40$ (To be answered total five questions out of Eight).

Practical/Project :**Mobile and Smart Phone Repairing Lab****Any Ten from the following:**

1. Idea of safety materials such as gloves, goggles, masks, etc., safety procedures followed while handling hazardous materials or tools of Mobile/ Smart phones and safety measures while on work to prevent accidents, Electrostatic Discharge (ESD) measures for electronic components
2. Identification and usage of tools such as electric screwdrivers, multimeter, soldering station, hot air blower, BGA workstation, SMD Rework Station Practice on Working Phones
3. Check and test various Checking of PCB Prints, electronic components including SMD resistors, SMD capacitors, SMD coils, SMD diodes, SMD transistors, batteries on their functionality
4. Basic electronic repairing and reworking such as desoldering, soldering, removal and fixing components
5. Assembling and disassembling Smartphone/ cell phone, removing the key pad and cleaning , test for the continuity of the matrix/tracks
6. Checking track continuity and use jumpers for track problems.
7. Test and rectify the problems in antenna and antenna switch

8. Frequently encountered problems in Cell phone/ Smartphone including , Touching Screen, Handling procedure of display systems (LCD & LCD) and their repair procedures
9. Troubleshooting Power failures, Audio Section, Network section and Charging Section, Review PC hardware and Installation device driver
10. Internet Browsing and WinZip/ WinRar, Downloading - Games, MP3
11. Interface the cell phone/smart phone to the PC and the data
12. Installing Desktop Manager and updating firmware BB
13. Demonstration of Micro UFS installation & Flashing concept
14. Tracking:-positive,ringer,microphone,speaker,charge,logic,sim,light,network,of above type only one set each type.
15. Trouble shooting:-not charging, no not work; insert sim, no light, display change, touch screen connection & change, short set etc.

Reference books :

| Sl. No. | Name of the Author | Title of the Book |
|---------|-----------------------------------|--|
| 1. | Mr Victor Emeka | Smartphone Troubleshooting & Repair Paperback |
| 2. | Timothy L. Warner | The Unauthorized Guide to iPhone, iPad, and iPod |
| 3. | Lionel Ni Pei Zheng N I Zheng | Smart Phone and Next-Generation Mobile Computing |
| 4. | | Modern Mobile PhoneRepairing : Using Computer Software |
| 5. | Burkhard Schmitz, Carola Zwick | Designing for SmallScreens Studio: Mobile Phones, Smar |
| 6. | Kateregga | A Comprehensive Mobile Phone Repair Guide - DIY For All Phone Types - Androids, iPhones, iPads, iPods, 1st Gen.. |
| 7. | Hassan A. Karimi | Universal Navigation on Smartphones |
| 8. | ZHANG XING WEI | Graphic smart mobile phone repair |

Television & Cable TV Appliance (TCTA)**Class - XII****Total no. of weeks for classes / Year: 36****Classes per week: 7****Th=3****Practical/Project=4****Total classes per year: 252****Th=108****Practical/Project =144****Total marks: 100****Th= 50****Practical = 40****Project = 10****Course Contents:****Theory:**

| | Topic | Periods |
|-----------------|--|----------------|
| Module 1 | Modulation | 16 |
| | 1.1 Modulation & its necessity. 1.2 Concept of AM, FM& PM 1.3 Classification of different types of AM like DSBFC, DSBSC, SSBSC & VSB & its application 1.4 Classification of different types of FM like-NBFM, WBFM Difference between AM& FM & its applications | |
| Module 2 | Monochrome or Black and White TV System | 35 |
| | Types of Modulation used in T.V 2.2 Concept of 2.2.1 Blanking & Synchronization. 2.2.2 Aspect ratio. 2.2.3 Flicker. 2.2.4 Resolution. 2.2.5 Video bandwidth. 2.2.6 Interlaced scanning 2.2.7 Frame, Field & Line frequency 2.3 Monochrome picture tube, Vidicon camera tube. 2.4 Working principle of B&W TV transmitter and receiver with block diagrams | |

| | | |
|-----------------|--|----|
| | <p>2.5 Brief description with circuit diagram: TV Tuner - Video IF stage - Sound stage - Picture tube & its associated circuit - Synchronizing circuits - Automatic Gain Control (AGC)-Horizontal & Vertical deflection circuits - EHT section.</p> <p>2.6 TV standards followed in India.</p> | |
| Module 3 | Colour TV System | 35 |
| | <p>Concepts of RGB colour systems and RGB drivers of a colour picture tube.</p> <p>3.2 Elementary idea of colour picture tube and camera tube.</p> <p>3.3 Different colour systems like</p> <ul style="list-style-type: none"> (a) NTSC (b) SECAM (c) PAL system and their comparison <p>3.4 Working principal of Colour TV transmitter and receiver with block diagram</p> <p>3.5 Working principle of PAL encoder and decoder.</p> <p>3.6 Concept of chroma section.</p> <p>3.7 Basic concept on</p> <ul style="list-style-type: none"> (a) Plasma Display (b) LCD display (c) LED display (d) Flat panel Display | |
| Module 4 | Principle of Cable, Satellite and HDTV System | 22 |
| | <p>4.1 Block diagram of Modern cable TV system - Head end processor - Trunk & cable distribution system with block diagram - scrambling - descrambling</p> <p>4.2 Satellite for TV Broadcasting.</p> <p>4.3 HDTV system.</p> <p>4.4 Transmitter and Receiver of TV Remote control system.</p> <p>4.5 Introduction & Block Diagram of Direct to Home System (DTH)</p> <p>4.6 Concept of set top box.</p> | |

Marks Allotment:

Objective type: $(1 \times 10) = 10$ (To be answered total ten questions out of Twelve)

Descriptive type: $(8 \times 5) = 40$ (To be answered total five questions out of Eight).

Practical :**Television and Cable TV Appliances Lab**

1. Identification of different sections of B&W TV trainer board & common fault findings.
2. Identification of different sections of Colour TV trainer board.
3. Demonstration on assembling of a B&W TV.
4. Demonstration on assembling of a Colour TV.
5. Fault finding of Colour TV like
 - i) No raster, No Sound ii) No color iii) Blue color only iv) Green color only v) Magenta color only vi) Yellow only vii) Cyan only viii) Red Colour only
6. Transmitter and Receiver kit of a TV Remote control system.
7. Identification of different sections of set top box kit.

Projects**List of Projects**

| |
|--|
| 1. To design a Transmitter and Receiver kit of a TV Remote control system. |
| 2. To design a set top box. |

Reference Books :

| Sl. No. | Name of the Author | Title of the Book | Name of the Publisher |
|---------|--------------------|---|-----------------------|
| 1. | R.G. Gupta | Audio and Video Systems | Tata McGraw-Hill |
| 2. | R.R Gulati | Colour Television Principles and Praticce | New age International |
| 3. | A.K. Maini | Colour Television and Video Technology | Wiley |
| 4. | B.R. Gupta | Consumer Electronics | Sk Kataria & Sons. |
| 5. | Ajay Sharma | Audio and Video systems | Dhanpat Ray & Sons |
| 6. | Gulati | Monochrome and colour TV | New Age International |
| 7. | Bartlett | Cable TV Technology and Operation | Tata McGraw-Hill |
| 8. | S. Sharma | Basic Radio and Television | Tata McGraw-Hill |

**Automobile Technology (ETAT)
and
Refrigeration & Air Conditioning
(ETRA)**

Applications of Refrigeration & Air-conditioning (ARAC)

Class-XII

| | | | |
|--|---------------|------------------------------|---------------------|
| Total no. of weeks for classes / Year: 36 | | | |
| Classes per week: 7 | Th=3 | Practical/Project=4 | |
| Total classes per year: 252 | Th=108 | Practical/Project=144 | |
| Total marks: 100 | Th= 50 | Practical = 40 | Project = 10 |

Course Contents:

Theory:

| Sl. No. | Topic | Periods |
|---------|---|---------|
| 1. | Refrigeration System : 1.1 The Domestic refrigerator & Freezer - Construction, components required, capacity and field of application, Fault detection and remedies. 1.2 The Drinking Water -Cooler - Construction, components required, capacity and field of application, fault detection and remedies. 1.3 Purpose of Food preservation, Spoilage agents and their control. 1.4 Low- Temperature applications : 1.4.1 Multi Cold-storage system - Components required, construction, Capacity, Operational features with execution. 1.4.2 Milk Processing - Components required, construction, Operational features with execution. 1.4.3 Ice - Making Plant - Components required, construction, Operational features with execution. 1.4.4 Ice -cream Plant - Components required, construction, Operational features with execution. 1.4.5 Transport Refrigeration. | 36 |
| 2. | Air - Conditioning System : 2.1 Air - Cooler - Construction, Operation, Field of Application, Installation, minor fault findings and remedies. 2.2 Window - type and Split- type Air- conditioner - Construction, Operation, Capacity, Field of Application, Installation, minor fault findings and remedies. 2.3 Package- type Air- conditioner - Construction, Operation, Capacity, Field of Application, Installation, minor fault findings and remedies. | 24 |

| Sl. No. | Topic | Periods |
|---------|--|---------|
| | 2.4 Central Air- conditioning Plant - Construction, Operation, Capacity, Field of Application, Installation, fault findings and remedies. 2.5 Car Air-conditioning system - Construction, Installation, minor fault findings and remedies | |
| 3. | Concept On Miscellaneous Topics Related To Refrigeration & Air- Conditioning : Charging procedure of refrigerant. 3.2 Control Devices (identification, location and purpose of use only) 3.2.1 Operating Controls: Electrical type proportioning thermostat. 3.2.2 Fluid flow controls: Solenoid valve. 3.2.3 Evaporator or back pressure regulating valve. 3.2.4 Safety Controls: Pressure Switch (High Pressure & Low Pressure), Fusible plug, Pressure relief valve, Oil-safety switch, Anti-freeze thermostat, Flow switch, Time delay relay (TDR), Electrical overloads protectors (Bimetal type) and Motor winding protection thermostat. | 24 |
| 4. | Special Tools & Measuring Instruments : 4.1 Pressure gauge 4.2 Electronic leak detector, 4.3 Voltmeter, 4.4 Dial Thermometer | 12 |
| 5. | Electrical Concept : Brief idea of motor, 5.2 Identification and use of Multi-meter, Clamp-meter, LRC meter, 5.3 Specification, function, location and connection of capacitor & Starter. | 12 |

Marks Allotment :

Objective type: $(1 \times 10) = 10$ (To be answered total ten questions out of Twelve)

Descriptive type: $(8 \times 5) = 40$ (To be answered total five questions out of Eight).

Practical :**Applications of Refrigeration & Air-conditioning Lab**

(any eight of the following)

1. Cutting, bending & joining of copper tube, Flaring, Swaging & Silver Soldering.
2. Servicing of Evaporator: Removal of oil from Evaporator, Checking of leakage, repair & testing.

3. Checking of capillary tube, Automatic & thermostatic expansion valves & their servicing & testing.
4. Checking of Thermostatic switch, HP & LP switches their servicing & testing.
5. Checking of Suction Regulating Valve, Solenoid valve, Pilot Control Valve, their servicing & testing.
6. Charging of Compressor oil.
7. Gas charging in the refrigerator and air - conditioner including vacuumising and drying the systems. Study of gauge reading, Effect of overcharging & undercharge of gas.
8. Servicing of refrigerating cabinet, checking of door liner and body inside liner, repairing of defects.
9. Replacement of inside thermal insulating material, replacement of door liners and door gasket, Adjustment of door alignment.
10. Checking of thermal overload protector, motor starting relays and capacitor, their servicing & testing.

Projects:

[Any two of the following]

1. Assembly of Room Air - cooler by collecting the various components of the machine from the market.
2. Assembly of Window type Room Air - conditioner by collecting the various components of the machine from the market.
3. Assembly of Split-type Air - conditioner by collecting the various components of the machine from the market.

Reference Books :

| Titles of the book | Name of authors | Name of the publisher |
|--|-------------------------------|-----------------------|
| A Text book of Refrigeration & Air- conditioning | R.S. Khurmi & J.K. Gupta | S. Chand & Co. Ltd |
| Refrigeration & Air- conditioning | S. Sarao, Gabbi & D. P. Singh | Satya Prakashan |
| Refrigeration & Air- conditioning | R. K. Rajput | S. K. Kataria & Sons. |
| Refrigeration & Air- conditioning | Anantanarayan | Tata McGraw Hill |
| Modern Refrigeration & Air- conditioning | Sujit Kr. Basu | Blue Star Ltd. |

Fundamentals of Mechanical Technology (FDMT)

Class-XII

| | | | |
|--|---------------|-------------------------------|---------------------|
| Total no. of weeks for classes / Year: 36 | | | |
| Classes per week: 7 | Th=3 | Practical/Project=4 | |
| Total classes per year: 252 | Th=108 | Practical/Project =144 | |
| Total marks: 100 | Th= 50 | Practical = 40 | Project = 10 |

Course Contents :

Theory :

| Topic | Periods |
|--|---------|
| Module I: Fundamentals of Thermodynamics | |
| <p>Introduction : System, Boundary, Surroundings, State, Path Cycle, Properties-Intensive & Extensive, Absolute pressure, Atmospheric pressure and Gauge pressure, N.T.P & S.T.P, Heat ,Work, Internal Energy, Enthalpy, Entropy and their units, Specific heat at constant pressure(C_p), Specific heat at constant volume (C_v) and their relationship, Simple related problem Zeroth law of thermodynamics, First law of thermodynamics and Second law of thermodynamics (statement only, no problems)</p> <p>Thermodynamic Processes : Non-Flow process, Flow process, Reversible & Irreversible process, Concept on- Constant Volume process, Constant Pressure process, Constant Temperature process, Adiabatic process, Polytropic process and representation of these processes on P-V and T-S plane (no deduction, no problems)</p> | 18 |
| <p>Air Compressor : Carnot cycle, Representation of Carnot cycle on P-V and T-S plane (no deduction), Expression of efficiency, Simple related problem, Function, types and field of applications of compressors, Difference between Reciprocating & rotary compressor, Some important definitions related to compressor: Suction pressure, Delivery pressure, swept volume, Free air delivery & Capacity, Constructional features , P-V & T-S diagram and working of reciprocating compressor (no problems)</p> | 18 |
| Module II: Fundamentals of Hydraulics | |
| <p>Introduction : Properties of fluid (mass density, specific weight, viscosity etc.), Pressure of fluid, Pressure head of liquid, Datum head of liquid, Hydrostatic equation ($p=wH$), Manometer, Piezometer and their uses, Pascal's law and its application.</p> <p>Fluid in Motion : Type of fluid flow (laminar, turbulent, steady, unsteady, uniform and non- uniform), Theorem of Continuity, simple related problem, Kinetic head of liquid, Bernoulli's equation for ideal flow of fluid through pipe (no deduction), simple related problem, Reynolds's number and its significance.</p> | 18 |

| Topic | Periods |
|---|---------|
| Concept on Valves And Hydraulic Circuits : Flow control valve, Proportional valve, Pressure relief valve, Solenoid valve- their field of applications, working and trouble shooting, Simple Hydraulic circuits (open and close type)- components, seals, fittings and connections | |

Marks Allotment:

Objective type: (1 x 10)=10 (To be answered total ten questions out of Twelve)

Descriptive type: (8 x 5)=40 (To be answered total five questions out of Eight).

Practical :**Fundamentals of Mechanical Technology Lab**

(Any four of the following)

1. Identification of different types of pumps (Reciprocating, Centrifugal, Jet etc,)
2. Identification of various parts of Centrifugal pump.
3. Practice on dismantling of various parts of Centrifugal pump, cleaning, changing gaskets and refitting them.
4. Identification of different types of valves (like overflow valve, gate valve, check valve etc.) used in water delivery line from ground reservoir and to select their location for fitment.
5. Various troubles shooting of the Centrifugal pump in operation and find their remedial measures.
6. Identification of various parts of Reciprocating air-compressor
7. Various troubles shooting of the Reciprocating air-compressor in operation and find their remedial measures.
8. Practice on fitting pressure gauge, valves and various pipe fittings to a hydraulic circuit.

Project :

(any two of the following)

1. Installation of reciprocating pump.
2. Installation of Centrifugal pump.
3. Installation of Jet pump and
4. Installation of reciprocating air compressor.

Reference book :

| Titles of the book | Name of authors | Name of the publisher |
|---|------------------------|------------------------------|
| A Text Book of Hydraulics, Fluid Mechanics & Fluid Machines | R.K.Bansal | LaxmiPublicationPvt.Ltd. |
| A Text Book of Thermal Engineering | R S Khormy | S Chand & Sons |
| Pneumatic Controls | P.joji | Wiley |
| Oil Hydraulic System-Principle and maintenance | S.R. Majumdar | Tata McGraw Hill |
| Pneumatics Systems-Principles and maintenance | S.R. Majumdar | Tata McGraw Hill |

Motor Vehicle Mechanic - I (MVM I)**Class-XII**

| | | | |
|--|---------------|------------------------------|---------------------|
| Total no. of weeks for classes / Year: 36 | | | |
| Classes per week: 7 | Th=3 | Practical/Project=4 | |
| Total classes per year: 252 | Th=108 | Practical/Project=144 | |
| Total marks: 100 | Th= 50 | Practical = 40 | Project = 10 |

Course Contents:**Theory:**

| Sl. No. | Topic | Periods |
|----------------|--|----------------|
| 1. | Introduction : 1.1 Working Principle of IC engine. 1.2 Classifications of IC engine based on various parameters. 1.3 Concept of two-stroke Petrol engine & Diesel engine, their difference. 1.4 Concept of four-stroke Petrol engine & Diesel engine, their difference. | 12 |
| 2. | Constructional Features : 2.1 Location, Function & Materials of the following parts: Cylinder block, Cylinder liners, Cylinder head, Gasket, Piston, Piston ring, Piston pin, Connecting rod, Crank shaft, Cam shaft, Fly-wheel & Dampers. 2.2 Working of overhead valve actuating mechanism. | 9 |
| 3. | Cooling System : 3.1 Purpose & types of cooling. 3.2 Water cooling system, its components and field of application. 3.3 Air cooling system, its components and field of application. 3.4 Comparison between air-cooling & water-cooling system. 3.5 Use of anti-freeze solution. | 9 |
| 4. | Lubrication System : 4.1 Purpose & types of Lubrication system. 4.2 Types of Lubricants. 4.3 Petrol, wet sump & dry sump Lubrication system. 4.4 Crankcase ventilation. | 12 |

| Sl. No. | Topic | Periods |
|---------|--|---------|
| 5. | Fuel System of Petrol Engine : 5.1 Working of Pump feed type fuel supply system. 5.2 Working of Mechanical & electrical fuel pump. 5.3 Location & working of simple carburetor, its drawbacks. 5.4 Working of multipoint fuel injection system (MPFI), its advantages over conventional carburetion system. | 12 |
| 6. | Fuel System of Diesel Engine : 6.1 Location & working of fuel injection pump. 6.2 Location & function of fuel injectors. 6.3 Purpose of governing, types of governing used. 6.4 Working of Governor. | 9 |
| 7. | Transmission System : Purpose, Location and function of automobile clutch, 7.2 Type of clutch. 7.3 Working of single plate clutch. 7.4 Purpose, Location and function of gearbox. 7.5 Types of gearbox (names only) 7.6 Gear ratio. 7.7 Function of Synchromesh gearbox. 7.8 Location & function of Propeller shaft. 7.9 Location & function of Final drive. | 15 |
| 8. | Front Axle & Steering : 1.1 Front axle assembly & its function. 1.2 Steering linkage mechanism. 1.3 Steering geometry and its importance. | 12 |
| 9. | Brakes : 1 Purpose, function and types of automobile brakes. 9.2 Drum brake, Disc brake, comparison between them. 9.3 Layout of air-brake and its components. 9.4 Layout of hydraulic-brake and its components | 9 |
| 10. | Electrical System : Function of battery and starter motor. 10.2 Identification, Function and location of Spark plug. 10.3 Circuit diagram and brief description of ignition system of Petrol Engine. | 9 |

Marks Allotment:

Objective type: $(1 \times 10) = 10$ (To be answered total ten questions out of Twelve)

Descriptive type: $(8 \times 5) = 40$ (To be answered total five questions out of Eight).

Practical :**Motor Vehicle Mechanic - I**

(any eight of the following)

1. Gasket cutting practice (car/bus/truck).
2. Over hauling of single plate clutch (diaphragm type).
3. Over hauling of constant mesh type gear box.
4. Over hauling of simple carburetor.
5. Over hauling of cylinder head of diesel engine (bus/truck).
6. Valve re-facing by grinding.
7. Cleaning of Petrol fuel injector (MPFI).
8. Servicing of wet type air-cleaner.
9. De-carbonizing of multi-cylinder four stroke petrol engine and fitting of piston & piston rings.
10. Replacing of oil-filter element of 'full flow' and 'by-pass' oil filter.

Projects :

[Any two of the following]

1. Dismantling and assembling of four stroke four cylinder petrol engine.
2. Dismantling and assembling of four stroke four cylinder diesel engine.
3. Dismantling, overhauling and assembling of latest synchromesh gear box used in Bus/Truck.

Reference Books :

| Titles of the book | Name of authors | Name of the publisher |
|---------------------------------------|------------------------------|-----------------------|
| Automobile Engineering Vol. I & II | Kirpal Singh | Standard Publication |
| Automobile Engineering | G.B.S. Narang | Khanna Publication |
| Automobile Mechanics | William Crouse | TataMcGrawHill |
| Automobile Engineering Practical | N Malhotra | Asian Publishers |
| Automobile Engineering | Sujit Kr. BasuBlue Star Ltd. | |

Motor Vehicle Mechanic II (MVM II)**Class-XII**

| | | | |
|--|---------------|------------------------------|---------------------|
| Total no. of weeks for classes / Year: 36 | | | |
| Classes per week: 7 | Th=3 | Practical/Project=4 | |
| Total classes per year: 252 | Th=108 | Practical/Project=144 | |
| Total marks: 100 | Th= 50 | Practical = 40 | Project = 10 |

Course Contents:**Theory:**

| Sl. No. | Topic | Periods |
|----------------|--|----------------|
| 1. | Maintenance Management : 1.1 Preventive maintenance system. 1.2 Breakdown maintenance system. 1.3 Comparison between them. | 12 |
| 2. | Maintenance of Multi- Cylinder Engine (Both Petrol & Diesel) 2.1 Engine Tune - up (Tappet & Slow running setting) 2.2 Removal of Piston & Piston rings from cylinder for checking, cleaning, setting and refitting. 2.3 Inspection of cylinder liners for taperness and ovality and their removal. 2.4 Removal of cylinder head of diesel engine for cleaning, checking of damaged gasket of cylinder head a burned out valve seat, replacement and refitting. 2.5 Inspection of crankshaft - for taperness and ovality, checking of crank pins and main journals and free play of crankshaft. 2.6 Injector testing chart of various vehicles. 2.7 Removal of Injectors - testing, adjusting and refitting. 2.8 Fuel Injection Pump- Common faults finding and their remedies. 2.9 Common faults finding and their remedies - of various type of carburetors. 2.10 Tuning of Carburetor. 2.11 Removal of Petrol fuel injector of MPFI system, cleaning, leakage testing and refitting. | 27 |

| Sl. No. | Topic | Periods |
|---------|---|---------|
| 3. | Maintenance of Chasis of Commercial Vehicles : 3.1 Adjustment of Mechanical Brake. 3.2 Adjustment of hydraulic Brake - (wheel cylinder, brake shoe lining etc.) 3.3 Adjustment of Single Plate Clutch (Release Lever type). 3.4 Checking of Single Plate Clutch (Diaphragm type). 3.5 Types of tyre, factors affecting tyre life. 3.6 Tyre pressure of various types of vehicles, maintenance & repairing of various tyres, repairing of punctured tube. 3.7 Study of shock absorber, maintenance & repairing of telescopic type shock absorber (double acting) 3.8 Dismantling and assembling of leaf spring & coil spring. 3.9 Maintenance of electrical accessories like horn, wipers, head light, indicator light etc. 3.10 Chassis lubrication & lubrication chart. | 27 |
| 4. | Maintenance of Two Wheeler : 4.1 Tuning of two-wheeler engine, 4.2 Tuning of carburetor. 4.3 Common faults finding of the two-wheeler engine and their remedies. 4.4 Periodical adjustment of clutch. 4.5 Periodical adjustment of brake. | 15 |
| 5. | Tools & Equipments for Overhauling and Maintenance of Motor Vehicle : 5.1 Elementary idea and functions of commonly employed tools & equipments like - Out-side micrometer, inside micrometer, vernier caliper, telescopic gauge, feeler gauge, torque wrench, spark plug tester, tachometer, air-compressor, ring expander, ring compressor, combination pliers. Valve seat cutter set, dial gauge & hydraulic jack. | 27 |

Marks Allotment:

Objective type: $(1 \times 10) = 10$ (To be answered total ten questions out of Twelve)

Descriptive type: $(8 \times 5) = 40$ (To be answered total five questions out of Eight).

Practical :**Motor Vehicle Mechanic II Lab***(any eight of the following)*

1. Overhauling of double acting type telescopic shock absorber.
2. Overhauling of semi-elliptical type leaf spring (TATA/ Ambassador car)
3. Overhauling of steering assembly (Rack & pinion type).
4. Overhauling of wheel cylinder.
5. Overhauling of master cylinder.
6. Overhauling of hydraulic brake.
7. Riveting of Brake-shoe lining.
8. Overhauling of differential gear box.
9. Overhauling of distributor assembly.
10. Ignition time setting.
11. Overhauling of gear type oil pump.
12. Removing & checking of thermostat valve.

Projects :*[Any two of the following]*

1. Dismantling, Complete reconditioning and refitting of a differential unit (Bus Truck).
2. Major overhauling of a multi-cylinder MPFI engine.
3. Major overhauling of a multi-cylinder diesel engine.
4. Starting of a two-wheeler repairing shop.
5. Starting of a tyre repairing unit.

Reference Books :

| Titles of the book | Name of authors | Name of the publisher |
|---------------------------------------|-----------------|-----------------------|
| Automobile Engineering Vol. I & II | Kirpal Singh | Standard Publication |
| Automobile Engineering | G.B.S. Narang | Khanna Publication |
| Automobile Mechanics | William Crouse | TataMcGrawHill |
| Automobile Engineering Practical | N Malhotra | Asian Publishers |
| Automobile Engineering | Sujit Kr. Basu | Blue Star Ltd. |

Principles of Refrigeration & Air-conditioning (PRAC)

Class-XII

| | | | |
|--|---------------|------------------------------|---------------------|
| Total no. of weeks for classes / Year: 36 | | | |
| Classes per week: 7 | Th=3 | Practical/Project=4 | |
| Total classes per year: 252 | Th=108 | Practical/Project=144 | |
| Total marks: 100 | Th= 50 | Practical = 40 | Project = 10 |

Course Contents :

Theory:

| Sl. No. | Topic | Periods |
|---------|---|---------|
| 1 | Introduction : 1.6 Definition of Refrigeration & Air-conditioning. 1.7 Methods of Refrigeration. 1.8 Definition of Refrigerator & Heat Pump, Difference between Refrigerator & Heat Pump. 1.9 Ton of Refrigeration, COP, Simple numerical problems. | 9 |
| 2 | Vapour Compression Refrigeration System : 2.1` Flow diagram, Function and location of the various components of the system. 2.2 Pressure -Enthalpy diagram, Temperature-Entropy diagram and various processes related to vapour compression cycle. 2.3 Effect of Super Heating & Sub Cooling. 2.4 Refrigerating capacity & COP of the system. 2.5 Components required and working of domestic refrigerator. 2.6 Components required and working of Water cooler. | 18 |
| 3 | Refrigerants & Brines : 3.1 Definition, Classification & nomenclature of refrigerants. 3.2 Desirable properties of refrigerants in common use- (Boiling point, Freezing point, Toxicity, Flammability, Di-electric strength, Chemical stability, Cost & availability. | 9 |

| Sl. No. | Topic | Periods |
|---------|--|---------|
| | 3.3 Effect of refrigerant on lubricating oil, Impact on environment-(depletion of Ozone layer, Green house effect) 3.4 Characteristics, Safety precautions & use of refrigerants- (R-11, R-12, R- 22, R-717, R-134a, R-410A, R-407C), Selection of refrigerants. 3.5 Salt brines (Sodium chlorides and Calcium chlorides), Corrosive effect of brines and glycol solutions. | |
| 4 | Lubrications : 4.1 Properties of lubricating oil, Specifications of lubricating oil, 4.2 Methods of lubrications. 4.3 Problems with lubricants. 4.4 Location, Function and brief description of oil separator. | 6 |
| 5 | Drier : 5.1 Causes of presence of moisture in refrigeration system. 5.2 Functions of drier. 5.3 Types of drier. 5.4 Construction of a drier. 5.5 Drying agents | 6 |
| 6 | Components of The Mechanical Vapour Compression In Refrigeration System : 6.1 Compressor <ul style="list-style-type: none"> 6.1.1 Classification & field of application of each type of compressor. 6.1.2 Open & hermetically sealed type reciprocating compressor, their relative dvantages and disadvantages. 6.1.3 Various parts of reciprocating compressor, brief description and field of application. 6.1.4 Various parts of rotary compressor, brief description and field of application. 6.1.5 Various parts of centrifugal compressor, brief description and field of application. | 39 |

| Sl. No. | Topic | Periods |
|---------|---|---------|
| | <p>6.2 Condenser</p> <p>6.2.1 Classification & field of application of each type of Condenser.</p> <p>6.2.2 Air-cooled condenser-types, brief description and field of application.</p> <p>6.2.3 Water-cooled condenser-types, brief description and field of application.</p> <p>6.2.4 Evaporative type condenser- brief description and field of application.</p> <p>6.3 Expansion devices</p> <p>6.3.1 Types, Function of expansion devices.</p> <p>6.3.2 Brief description and field of application of Capillary tube.</p> <p>6.3.3 Brief description and field of application of Thermostatic expansion valve.</p> <p>6.3.4 Brief description and field of application of High side float valve & Low side float valve.</p> <p>6.4 Evaporator</p> <p>6.4.1 Types, brief description and field of application of each type of evaporator.</p> <p>6.4.2 Types of chillers, its construction and working principle.</p> | |
| 7 | <p>Psychrometry</p> <p>7.1 Definition of - dry-air, dry-bulb temperature, wet-bulb temperature, wet-bulb depression, relative humidity, Specific humidity.</p> <p>7.2 Use of sling psychrometer, hygrometer, humidistat etc.</p> <p>7.3 Psychrometric chart & its use.</p> | 9 |
| 8 | <p>Air-conditioning System</p> <p>8.1 Definition & application.</p> <p>8.2 Factors affecting the human comfort.</p> <p>8.3 Classification of air-conditioning system.</p> <p>8.4 Components of air-conditioning system.</p> <p>8.5 Working of summer & winter type air-conditioner.</p> | 12 |

Marks Allotment:

Objective type: $(1 \times 10) = 10$ (To be answered total ten questions out of Twelve)

Descriptive type: $(8 \times 5) = 40$ (To be answered total five questions out of Eight).

Practical :**Principles of Refrigeration & Air-conditioning Lab**

1. Identification of various service tools and their uses, safety, care and maintenance.
2. Identification of various components of domestic refrigerator, fault findings, servicing and testing.
3. Identification of various components of split type air- conditioner, fault findings, servicing and testing.
4. Identification of various components of room air-cooler, fault findings, servicing and testing.
5. Identification of various components of water- cooler, fault findings, servicing and testing.
6. Dismantling of reciprocating type of compressor(open type) and identification, checking and servicing of various components like Cylinder, Piston, Piston ring, Crankshaft, Cylinder head Valve plate assembly, Shaft seal, Connecting rod etc and assemble them.
7. Servicing of Air-cooled Condenser, checking leak, repair of leakage and testing.
8. Method of using Psychrometric chart, Sling Psychrometer, Hygrometer and Humidistat.

Projects:

[Any two of the following]

1. Preparation of a report based on industrial tour to a Multi- Cold Storage system.
2. Preparation of a report based on industrial tour to a Ice Plant and
3. Preparation of a report based on industrial tour to a Central Air-Conditioning Plant.

Reference Books :

| Titles of the book | Name of authors | Name of the publisher |
|--|-------------------------------|-----------------------|
| A Text book of Refrigeration & Air- conditioning | R.S. Khurmi & J.K. Gupta | S. Chand & Co. Ltd |
| Refrigeration & Air- conditioning | S. Sarao, Gabbi & D. P. Singh | Satya Prakashan |
| Refrigeration & Air- conditioning | R. K. Rajput | S. K. Kataria & Sons. |
| Refrigeration & Air- conditioning | Anantanarayan | TataMcGrawHill |
| Modern Refrigeration & Air- conditioning | Sujit Kr. Basu | Blue Star Ltd. |

**Computer Maintenance
& Networking (ETCM)
and
IT Application (ETIA)**

Basic Computer Maintenance and Networking (CMNT)

Class XII

| | | | |
|--|---------------|------------------------------|---------------------|
| Total no. of weeks for classes / Year: 36 | | | |
| Classes per week: 7 | Th=3 | Practical/Project=4 | |
| Total classes per year: 252 | Th=108 | Practical/Project=144 | |
| Total marks: 100 | Th= 50 | Practical = 40 | Project = 10 |

Course Contents :

Theory :

| Sl. No. | Topic | Periods |
|-----------------|---|-----------|
| Unit – 1 | | 30 |
| ➤ | Introduction to Data Communication Networking a) Data Communications: Components, Data representation. b) Basic concepts: Servers, Client, Workstation, Hosts (Definition & Applications). c) Types of computer networks: LAN, MAN and WAN. d) Types network architecture: Peer-to-peer, Client-Server and Distributed. e) Transmission Types: Simplex, Half duplex and Full duplex | |
| ➤ | Network Topologies and Networking Devices : a) Type of Topology - Bus Topology; Ring Topology; Star Topology; Mesh Topology; Tree Topology; Hybrid Topology. b) Network Control Devices -Hubs; Switches; Routers; Bridges; Repeaters; Gateways; Modems. | |
| ➤ | Transmission Media : a) Guided Media -Twisted Pair - UTP, STP; Coaxial Cable; Optical Fiber. Advantages of optical fiber and Disadvantages of optical fiber. b) Un-Guided Media: Wireless Communication- Communication Band; c) Microwave Communication; Satellite Communication. | |
| Unit - 2 | | 30 |
| ➤ | Standardization of Network Model : a) Basic idea on OSI Reference Model. b) Physical layer; Data link layer; Network layer; Transport layer; Session layer; Presentation layer; Application layer. | |

| Sl. No. | Topic | Periods |
|-----------------|--|---------|
| | <ul style="list-style-type: none"> c) TCP/IP Reference Model. d) Comparison of the OSI and TCP/IP reference models. ➤ Multiplexing & Switching : <ul style="list-style-type: none"> a) FDM, TDM, WDM, ADM. b) Circuit Switching: Time division & space division switch, Packet Switching, Message Switching. ➤ IP Addressing : <ul style="list-style-type: none"> a) IP Address Assignments; b) IP Address Classes; Subnet Masking; c) Registered and unregistered Addresses. | |
| Unit - 3 | | 24 |
| | <ul style="list-style-type: none"> ➤ Brief idea about BIOS : Typical Motherboard BIOS, BIOS Features, BIOS & Boot Sequences, BIOS Shortcoming & Compatible Issues, BIOS Troubleshooting, BIOS Upgrades. ➤ Introduction to the Hard Disk : Introduction, Disk Basics, Disk Performance & Characteristics, Hard Disk Partitioning, Drive Testing & troubleshooting. ➤ Motherboard & Buses : Introduction, Motherboard Components, Expansion Slots system Bus Functions & Features. Upgrading & Troubleshooting Motherboard, General Bus Troubleshooting. | |
| Unit - 4 | | 24 |
| | <ul style="list-style-type: none"> ➤ Basic Memory Concepts: Introduction, Installing Memories, Upgrade Options & Strategies, Replacing Memories with Higher Capacities. Troubleshooting with memory. ➤ Printers: Printer Technology, Types of Printer, How Printer Works, Attaching Printer, Installing Printer Drivers. ➤ Solution of Error Code (s): Fault findings and Common Printer Problems with Beep Code, Post Code, and Post Reader Card. | |

Marks allotment :

Objective type: (1 x 10)=10 (To be answered total ten questions out of Twelve)

Descriptive type: (8 x 5)=40 (To be answered total five questions out of Eight).

Practical :**Basic Computer Maintenance and Networking Lab****Laboratory Works on Network**

- Identify and Compare Network directing devices i.e. Hub, Switch, Router.
- To study crimping: RJ-45, RJ-11, Cross-over Cable and Create a Network cable using RJ45 connectors.
- To study the different expansion slots of a motherboard, set the NIC to expansion slot and to install the driver.
- To locate MAC address of computer and other networking devices.
- To make a peer-to-peer Network System.
- Implementing a TCP/IP Network configuring
- To run the following application in a network system and get knowledge: (i) FTP, (ii) Telnet, (iii) mail.
- To use the ping utility in order to understand its use in a troubleshooting environment.

Laboratory Works on Computer Maintenance

- Study the motherboard layout of Pentium IV and studying the chipset through data books or Internet.
- CMOS setup of Pentium.
- Hard Disk Partitioning.
- Study of HDD: Identify various components of HDD and write their functions.
- Study and installation of any one display cards: VGA or SVGA display cards.
- Installation of Scanner, Printers and Modems.
- Study of SMPS (ATX).
- Assembling and disassembling of Personal Computer.
- Fault findings:
 - i) Problems related to RAM.
 - ii) Problems related to CPU.
 - iii) Problems related to monitor.

Project :

Project 1: Inserting and Removing a Processor In this project, you remove and install a processor. As you work, be very careful to not bend pins on the processor socket and protect the processor against ESD. Do the following:

1. Verify the computer is working. Turn off the system, unplug it, and open the computer case. Remove the cooler assembly and processor. Be extra careful not to damage the assembly.
2. You are now ready to reinstall the processor and cooler. But first have your instructor check the thermal compound. You might need to install a small amount of compound to account for compound lost when you removed the cooler.
3. Reinstall the processor and cooler. Power up the system and verify all is working. Have your instructor check your work for credit.

Project 2a : Inserting and Removing Motherboards Using your old assigned computer, practice inserting and removing the expansion cards and motherboard. Use the Project 6-5 diagram to re-connect the wires. Have your instructor check your computer at each step of the process.

1. After removal of expansion cards and motherboard.
2. After the motherboard and expansion cards are re-installed and wires are connected.
3. After case is fastened and computer is power on.

Project 2b : Inserting and Removing RAM and CMOS Battery Using your old assigned computer, practice inserting and removing the RAM and the CMOS Battery. Examine the RAM and determine the size and speed of the modules in your computer. Have your instructor check your computer at each step of the process.

1. After removal of both the battery and RAM. Tell the instructor the size and speed of your modules.
2. After both are reinstalled.
3. After case is fastened and computer is power on.

Project 3: Understanding Hardware Documentation

1. Obtain the manual for the motherboard for your PC. (You will need to download it from the motherboard manufacturer's Web site.)
2. List at least three functions of jumpers on the board as well as the corresponding jumper settings.
3. List the processors that the board supports.
4. What type of RAM does the motherboard support?
5. Print a copy of the page that shows where wires connect to the Motherboard.

Be sure it includes the On/Off Power Switch, Power LED, HD LED and Reset wires.

Reference Books:

| Sr. No | Subject | Preferred books | Author | Publication |
|---------------|--|--|---------------|--------------------|
| 01 | Basic Computer Maintenance and Networking. | i) Computer Hardware: Installation, Interfacing, Trouble Shooting and Maintenance. | James | PHI |
| | | ii) Data Communication & Network | S. Chand | Nagpal |
| | | iii) Computer Networks | Poorna | SCITECH |
| | | iv) Comdex Hardware & Networking Course Kit | Gupta | Dreamtech |

Introduction to Database Management System with SQL (DBMS)

Class - XII

| | | | |
|--|---------------|-------------------------------|---------------------|
| Total no. of weeks for classes / Year: 36 | | | |
| Classes per week: 7 | Th=3 | Practical/Project=4 | |
| Total classes per year: 252 | Th=108 | Practical/Project =144 | |
| Total marks: 100 | Th= 50 | Practical = 40 | Project = 10 |

Course contents:

Theory:

| Sl. No. | Topic | Periods |
|----------|---|---------|
| Unit - 1 | | 38 |
| | Introduction to Database ■ Introduction <ul style="list-style-type: none"> ● Features of Computers ● Functions of Computers ■ Characteristics of Database Approach <ul style="list-style-type: none"> ● Abacus, Napier's Bone, Pascaline, The Babbage Machine ● Concept of Stored Program, Von Neumann Architecture ■ Data Abstraction <ul style="list-style-type: none"> ● Physical, Logical and view level Abstraction ■ Instances and Schema ■ Data Independence ■ Advantages and disadvantages of DBMS ■ Database Languages <ul style="list-style-type: none"> ● DDL ● DML ● DCL ■ Various Data Models <ul style="list-style-type: none"> ● ER Model ● Hierarchical Model ● Network Model ● Relational Model | |

| Sl. No. | Topic | Periods |
|--|---|---------|
| ■ | Data Dictionary, Metadata | |
| ■ | Database Administrator (Definition and Functions) | |
| ■ | Database User | |
| Unit - 2 | | 40 |
| Data Modeling using ER Model and Relational Model | | |
| ■ | Concept of Entities, Entity sets | |
| ■ | Concept of Relations, Attributes, Tuples, Degree, Cardinality | |
| ■ | Concept of Relationship and Relationship sets | |
| ■ | Concept of Keys <ul style="list-style-type: none"> ● Key, Superkey, Candidate key, Primary key, Alternate key, Foreign key | |
| ■ | Concept of mapping constraints <ul style="list-style-type: none"> ● One-to-One, One-to-Many, Many-to-One and Many-to-Many | |
| ■ | E-R Diagram <ul style="list-style-type: none"> ● Naming, Conventions, Notations ● Examples of Design of Simple E-R Diagrams with relationships for different databases | |
| ■ | Database Constraints <ul style="list-style-type: none"> ● Equity Integrity Constraint ● Domain Constraint ● Referential Integrity Constraint ● Concept of Foreign Key | |
| ■ | Functional Dependency <ul style="list-style-type: none"> ● Full, Partial, Transitive and Trivial Dependency | |
| ■ | Database Anomalies: Insertion, Deletion and Updating Anomalies | |
| ■ | Normalization : 1NF ,2NF, 3NF and BCNF (Definition only) | |
| Unit - 3 | | 30 |
| Relational Algebra and Introduction to SQL | | |
| ■ | Introduction | |
| ■ | Fundamental Operators of Relational Algebra <ul style="list-style-type: none"> ● Select, Project and Rename Operations | |

| Sl. No. | Topic | Periods |
|---------|---|---------|
| ■ | Other Operations <ul style="list-style-type: none"> ● Set Operation ● Cartesian Product ● Natural Join Operation | |
| ■ | SQL <ul style="list-style-type: none"> ● CREATE TABLE and ALTER TABLE Statements ● INSERT, DELETE and UPDATE Commands ● Aggregate Functions, DATE and TIME Functions ● Simple SELECT Queries (SELECT, FROM, WHERE, DISTINCT, AND< OR, IN, NOT IN, BETWEEN, LIKE, ORDER BY, HAVING, GROUP BY) | |

Marks allotment :

Objective type: (1 x 10)=10 (To be answered total ten questions out of Twelve)

Descriptive type: (8 x 5)=40 (To be answered total five questions out of Eight).

Practical :**Database Management System with SQL lab**

- Creating & Executing DDL in SQL.
- Creating & Executing Integrity constraints in SQL.
- Creating & Executing DML in SQL.
- Executing relational, logical and mathematical set operators using SQL.
- Executing group functions
- Executing string operators & string functions.
- Executing Date & Time functions.
- Executing Data Conversion functions.
- Executing DCL in SQL.
- Executing different types of simple SQL queries (using operators, functions, clauses, join concepts)

Project :

Design following Projects using Access/ SQL/ VB

- Design Calculator with facility of mathematical operations, factorial, power functions etc.
- Design Payroll System of a School (With the facilities of Insertion of Employees, Deletion of Employees, Salary according to the Modified pay scale)

- Design Admission Procedure(Counselling) in Higher Secondary Vocational Education System (With the facilities of Insertion, Deletion an Upgradation)

Reference Books :

| Book name | Author | Publisher |
|--|--------------|-----------|
| i) Database Management System, Oracle. SQL and PLSQL | Dasgupta | PHI |
| ii) Database System Concepts | Priyadarsini | SCITECH |
| iii) Database Concepts of Beginners | Ivan Bayross | SPD |

Introduction to Visual Basic and Its Applications (VBIT)

Class XII

| | | | |
|--|---------------|------------------------------|---------------------|
| Total no. of weeks for classes / Year: 36 | | | |
| Classes per week: 7 | Th=3 | Practical/Project=4 | |
| Total classes per year: 252 | Th=108 | Practical/Project=144 | |
| Total marks: 100 | Th= 50 | Practical = 40 | Project = 10 |

Course contents:

Theory:

| Sl. No. | Topic | Periods |
|---|--|---------|
| Unit - 1 | | 34 |
| Introduction to Visual Basic (Version 6 or Compatible) | | |
| ■ | Introduction | |
| ■ | Getting familiar with VB User Interface | |
| ● | Opening VB Screen, Pull Down Menus and their Uses, Toolbar, Toolbox, project Explorer, Properties Window, Form Layout Window, Form immediate Window, Opening and Closing Window, Quitting VB | |
| ■ | Controls and Toolbox | |
| ● | Standard Window Controls and their Uses | |
| ● | Working with Controls, Label, Textbox, Command Button, Frame, Checkbox, Option Button, List-box, Combo-box, Picture-box, Timer Control, Shapes | |
| ● | Basic Properties of Controls | |
| ● | Placing Controls to the Forms | |
| ● | Resizing Controls and Enabling different Controls | |
| ● | Making Executable Files | |
| Unit - 2 | | 40 |
| Programming Fundamentals | | |
| ■ | Introduction | |
| ■ | Steps of Problem Solving | |
| ● | Algorithm, Flowchart (Definitions and simple Examples) | |

| Sl. No. | Topic | Periods |
|--|---|---------|
| ■ | Variables, Constants , Keywords | |
| ■ | Operators: Arithmetic, Assignment, Relational and Logical Operators | |
| ■ | Controls Statements | |
| ● | Branching : If, If-then-else, Switch Statements | |
| ● | Looping | |
| ■ | For-Next | |
| ■ | While | |
| ■ | Do-while | |
| ■ | One Dimensional Array (Definition and Simple examples) | |
| ■ | Examples of simple Problem solving | |
| Unit - 3 | | 34 |
| Using Database Controls and Database Connectivity | | |
| ■ | Introduction | |
| ■ | Database Controls | |
| ● | DBgrid, DBcombo, Textbox, Combo, List | |
| ■ | Connecting the data controls to a data source | |
| ■ | Selecting tables from the database | |
| ■ | Connecting ADO data controls to a data source | |
| ■ | Creating Tables | |
| ■ | Inserting Records into the Table | |
| ■ | Selecting data From Tables | |
| ■ | Deleting, Updating and Modifying Tables | |
| ■ | Executing Simple Queries | |

Marks allotment :

Objective type: (1 x 10)=10 (To be answered total ten questions out of Twelve)

Descriptive type: (8 x 5)=40 (To be answered total five questions out of Eight).

Practical:**Visual Basic and Its Applications Lab**

- Study of VB environment with following details:
 - Textbox, Label, Combo, List , Check box and Option Buttons
 - Form and their Types
- Design of Forms to perform mathematical operations :

- Addition, Subtraction, Multiplication and Divisions using Text box, Labels, Command buttons
- Design of Forms to perform following operations :
 - Use of Date, Time and Mathematical functions using Text box, Labels, Combo box, Command buttons
- Design of Forms to perform following Programs :
 - To find the simple interest
 - To find the greatest numbers among three numbers
 - To find the greatest and smallest among a list of numbers
 - To calculate the sum of N numbers
 - To check whether a given number is even or odd
 - To find the factorial of a given integer
 - To find the sum of digits of a given integer
 - To check whether a given integer is prime or not
 - To find the HCF of two given integers
 - To find the LCM of two given integers
 - To find the sum of series
 - $1+2+3+4+ \dots +N$
 - $1+3+5 + \dots +N$
 - $2+4+ 6 + \dots +N$
 - $5+10+15 + \dots +N$
 - $1+ 1/2 + 1/3 + \dots +1/N$
- Design interface to perform following with ADO data control :
 - Creating Tables
 - Inserting Records into the Table
 - Selecting data From Tables
 - Deleting, Updating and Modifying Tables
 - Executing Simple Queries

Project :

- Design stop watch with facility of start, stop, reset using time control, option, label, text box etc.
- Design Library Management System(Making Catalogue, Searching books, Issuing books, Calculating fines (if happens))

- Design Hospital Management System(Doctor's list, Availability of Doctors with date, Maintaining accounts of Outdoor system)

Reference Books

| Preferred books | Author | Publication |
|---|------------------------|-------------|
| i) Visual Basic 2010 Programming (Black Book) | | Dreamtech |
| ii) Beginning Visual Basic 2012 | Newsome | Wiley India |
| iii) Visual Basic 6.0 in 30 DaysN.Krishnan | Scitech N.Saravanan | |

Web Page Development using HTML and ASP (WPDV)

| | | | |
|--|---------------|------------------------------|---------------------|
| Total no. of weeks for classes / Year: 36 | | | |
| Classes per week: 7 | Th=3 | Practical/Project=4 | |
| Total classes per year: 252 | Th=108 | Practical/Project=144 | |
| Total marks: 100 | Th= 50 | Practical = 40 | Project = 10 |

Course contents:

Theory:

| Sl. No. | Topic | Periods |
|---|-------|---------|
| Unit - 1 | | |
| ➤ Internet basics: <ol style="list-style-type: none"> Familiarity with internet browser (Internet Explorer, Netscape Navigator etc.). Working with browser window tool bar, menu bar, Browsing a given web site address, searching a particular topic through search engines. Familiarity with E-Mail, sending viewing printing e-mail message, Use of mailbox (inbox, outbox) in outlook express. Use of attachment facility available in e-mailing. Concept and familiarity of various internet services (www, http, ftp). | | |
| ➤ Web server: <ol style="list-style-type: none"> Familiarity with web server - IIS, PWS etc. Configuring web server - Creating virtual directory. | | |
| Unit - 2 | | |
| ➤ HTML: <ol style="list-style-type: none"> Creation of simple web pages using different basic tags - viz <body>, , <href>, <table> etc. Creating simple HTML file using different suitable tags place it in web server and access it from client Browser. Creating a HTML form incorporating GUI components (Command button, text box, radio button, check box, combo box etc). | | |
| Unit - 3 | | |
| ➤ Active server pages / ASP.NET: <ol style="list-style-type: none"> Introduction to Active Server Pages. Elements of ASP (Scripts, Objects, Components). Making your first Active Server Page. | | |

| Sl. No. | Topic | Periods |
|--|-------|---------|
| <p>➤ Introducing VB script:</p> <p>a) Variables, Mathematical operators, functions - Logical operators, Loop, Conditional statements - String Function, Date and Time Function.</p> <p>b) Subroutine - Formatting Display, Adding Components to scripts - Handling Event driven programming.</p> <p>➤ Database management through ASP:</p> <p>a) Brief overview of ActiveX Data Objects.</p> <p>b) Using ADODB to access a database from ASP (Simple Problem) - Opening, closing database connection</p> <p>c) Executing simple SQL statements with select, from, where clause in ASP.</p> | | |

Marks allotment:

Objective type: (1 x 10)=10 (To be answered total ten questions out of Twelve)

Descriptive type: (8 x 5)=40 (To be answered total five questions out of Eight).

Practical**Web Page Development using HTML and ASPLab**

- Create a static web page using simple related tags like body with background colour, picture etc., align, font, br etc.
- Embed an image within the page using Src, height, width, border, align, alt etc.
- Implement hyperlinking between two html pages.
- Implement a table with size 4 X 4 on a page and insert some textual as well as numeric data into the cells. Use proper tags for alignment.

Project :

- Create a Web page for the following:

WELCOME TO XYZ COLLEGE OF ENGINEERING (scroll Horizontally)

STUDENT DETAILS (Blink)

| S. No. | S. Name | BRANCH /SEM | Address | Marks | | |
|--------|---------|-------------|---------|-------|----|----|
| | | | | M1 | M2 | M3 |
| | | | | | | |

- ✓ Design Login form with validation.
- ✓ Create a login page with user_id and password field that will check whether an user is valid or not. If the user is valid then Loginsuccess page will be displayed otherwise Loginunsuccess page will be generated.
- ✓ Create a short project regarding the maintenance of login page. It should detect an existing user, displays invalid user_id and/or password. Create a new user, update information of an existing user etc.

Reference Books :

| Sr. No | Subject | Preferred books | Author | Publication |
|--------|---|---|--------------|-------------|
| 02 | Web Page Development using HTML and ASP | i) Internet and web TechnologyNarayanan | Lakshmi | SCITECH |
| | | ii) Web Technologies | Uttam K Roy | OXFORD |
| | | iii) Practical ASP | Ivan Bayross | BPB |