**Panjab University, Chandigarh**
**Scheme of Examination and Syllabi for**
**B.E. (Biotechnology Engineering)**
**1st and 2nd Semesters for Academic Year 2023-2024**

**Year: First** **Semester: First**

| Course Code | Course Name | Option | Hours per week | | | Credits | Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | Internal Assessment | University Exam | Total |
| | Choice based Physics course | Theory | 3 | 1 | 0 | 4 | 50 | 50 | 100 |
| | Choice based Physics course (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **ASM 101** | Calculus | Theory | 4 | 1 | 0 | 5 | 50 | 50 | 100 |
| **HSMC X01** | Professional Communication | Theory | 2 | 0 | 0 | 2 | 50 | 50 | 100 |
| **HSMC X51** | Professional Communication (P) | Practical | 0 | 0 | 2 | 1 | 50 | - | 50 |
| **ESC X53/** | #Workshop/ | Practical | 0 | 0 | 4 | 2 | 50 | - | 50 |
| **BTBS X01** | Fundamentals of Biotechnology | Theory | 2 | 0 | 0 | | 50 | 50 | 100 |
| **EEC X01** | Basic Electrical and Electronics Engineering | Theory | 3 | 0 | 0 | 3 | 50 | 50 | 100 |
| **EEC X51** | Basic Electrical and Electronics Engineering (P) | Practical | 0 | 0 | 2 | 1 | 50 | 0 | 50 |
| **UHV01** | Universal Human Values* | Theory | 0 | 0 | 0 | 3* | Satisfactory / Unsatisfactory | - | - |
| **Total** | | | **12 / 14** | **2** | **11 / 7** | **19+3*** | **400** | **200 / 250** | **600/650** |

#Various branches can offer any one of the following two subjects Workshop/ Fundamentals of Biotechnology depending upon their branch specific requirements.

**Year: First** **Semester: Second**

| Course Code | Course Name | Option | Hours per week | | | Credits | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | Internal Assessment | University Exam | Total |
| **ASC X01** | Applied Chemistry | Theory | 4 | 0 | 0 | 4 | 50 | 50 | 100 |
| ASC X51 | Applied Chemistry (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **ASM 201** | Differential Equations and Transforms | Theory | 4 | 1 | 0 | 5 | 50 | 50 | 100 |
| **ESC X01** | Programming fundamentals | Theory | 3 | 0 | 0 | 3 | 50 | 50 | 100 |
| **ESC X51** | Programming fundamentals (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **ESC X04** | Engineering Graphics | Theory | 1 | 0 | 0 | 1 | 50 | 50 | 100 |
| **ESC X54** | Engineering Graphics (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **BTBS 201** | Fundamentals of Bioengineering | Theory | 3 | 0 | 0 | 3 | 50 | 50 | 100 |
| **BTBS 251** | Fundamentals of Bioengineering (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **HSMC X01** | Environment Sciences* | Theory | 0 | 0 | 0 | 1* | Satisfactory / Unsatisfactory | - | - |
| **Total** | | | **15** | **1** | **12** | **20+1*** | **450** | **250** | **700** |

**Summer Training:**

| Subject Code | Subject Name | L-T-P | Contact hrs/week | Credits | Assessment |
|---|---|---|---|---|---|
| **ST 251** | **Product Re-engineering and Innovation** | 0-0-20 | 20 | Nil | Satisfactory / Unsatisfactory |

**Note: The students will undergo a mandatory "Summer Training" of two weeks in their respective departments after their second-semester exams. It will be a non-credited mandatory course, the result of which (satisfactory/unsatisfactory) will be reflected in their second-semester mark sheet.**

***Two value-added course namely, Universal Human Values and Environment Sciences with special credits (not to be included in CGPA evaluation) will be offered as self-study courses in BE first year. The results of these subjects as satisfactory/unsatisfactory will be reflected in the mark sheet.**

**Panjab University, Chandigarh**
**Scheme of Examination and Syllabi for**
**B.E. (Computer Science and Engineering)**
**1st and 2nd Semesters for Academic Year 2023-2024**

**Year: First** **Semester: First**

| Course Code | Course Name | Option | Hours per week | | | Credits | Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | Internal Assessment | University Exam | Total |
| | Choice based Physics course | Theory | 3 | 1 | 0 | 4 | 50 | 50 | 100 |
| | Choice based Physics course (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **ASM 101** | Calculus | Theory | 4 | 1 | 0 | 5 | 50 | 50 | 100 |
| **HSMC X01** | Professional Communication | Theory | 2 | 0 | 0 | 2 | 50 | 50 | 100 |
| **HSMC X51** | Professional Communication (P) | Practical | 0 | 0 | 2 | 1 | 50 | - | 50 |
| **ESC X53/** | #Workshop/ | Practical | 0 | 0 | 4 | 2 | 50 | - | 50 |
| **BTBS X01** | Fundamentals of Biotechnology | Theory | 2 | 0 | 0 | | 50 | 50 | 100 |
| **ESC X01** | Programming fundamentals | Theory | 3 | 0 | 0 | 3 | 50 | 50 | 100 |
| **ESC X51** | Programming fundamentals (P) | Practical | 0 | 0 | 3 | 1 | 50 | 0 | 50 |
| **UHV01** | Universal Human Values* | Theory | 0 | 0 | 0 | 3* | Satisfactory / Unsatisfactory | - | - |
| **Total** | | | **12 / 14** | **2** | **12 / 8** | **19+3*** | **400** | **200 / 250** | **600/650** |

#Various branches can offer any one of the following two subjects Workshop/ Fundamentals of Biotechnology depending upon their branch specific requirements.

**Year: First** **Semester: Second**

| Course Code | Course Name | Option | Hours per week | | | Credits | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | Internal Assessment | University Exam | Total |
| **ASC X01** | Applied Chemistry | Theory | 4 | 0 | 0 | 4 | 50 | 50 | 100 |
| ASC X51 | Applied Chemistry (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **ASM 201** | Differential Equations and Transforms | Theory | 4 | 1 | 0 | 5 | 50 | 50 | 100 |
| **EEC X01** | Basic Electrical and Electronics Engineering | Theory | 3 | 0 | 0 | 3 | 50 | 50 | 100 |
| **EEC X51** | Basic Electrical and Electronics Engineering (P) | Practical | 0 | 0 | 2 | 1 | 50 | - | 50 |
| **ESC X04** | Engineering Graphics | Theory | 1 | 0 | 0 | 1 | 50 | 50 | 100 |
| **ESC X54** | Engineering Graphics (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **CSC 201** | Object Oriented Programming | Theory | 3 | 0 | 0 | 3 | 50 | 50 | 100 |
| **CSE 251** | Object Oriented Programming (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **HSMC X01** | Environment Sciences* | Theory | 0 | 0 | 0 | 1* | Satisfactory / Unsatisfactory | - | - |
| | | | **15** | **1** | **11** | **20+1*** | **450** | **250** | **700** |

**Summer Training:**

| Subject Code | Subject Name | L-T-P | Contact hrs/week | Credits | Assessment |
|---|---|---|---|---|---|
| **ST 251** | **Product Re-engineering and Innovation** | 0-0-20 | 20 | Nil | Satisfactory / Unsatisfactory |

**Note: The students will undergo a mandatory "Summer Training" of two weeks in their respective departments after their second-semester exams. It will be a non-credited mandatory course, the result of which (satisfactory/unsatisfactory) will be reflected in their second-semester mark sheet.**

***Two value-added course namely, Universal Human Values and Environment Sciences with special credits (not to be included in CGPA evaluation) will be offered as self-study courses in BE first year. The results of these subjects as satisfactory/unsatisfactory will be reflected in the mark sheet.**

**Panjab University, Chandigarh**
**Scheme of Examination and Syllabi for**
**B.E. (Information Technology)**
**1st and 2nd Semesters for Academic Year 2023-2024**

**Year: First** **Semester: First**

| Course Code | Course Name | Option | Hours per week | | | Credits | Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | Internal Assessment | University Exam | Total |
| | Choice based Physics course | Theory | 3 | 1 | 0 | 4 | 50 | 50 | 100 |
| | Choice based Physics course (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **ASM 101** | Calculus | Theory | 4 | 1 | 0 | 5 | 50 | 50 | 100 |
| **HSMC X01** | Professional Communication | Theory | 2 | 0 | 0 | 2 | 50 | 50 | 100 |
| **HSMC X51** | Professional Communication (P) | Practical | 0 | 0 | 2 | 1 | 50 | - | 50 |
| **ESC X53/** | #Workshop/ | Practical | 0 | 0 | 4 | 2 | 50 | - | 50 |
| **BTBS X01** | Fundamentals of Biotechnology | Theory | 2 | 0 | 0 | | 50 | 50 | 100 |
| **ESC X01** | Programming fundamentals | Theory | 3 | 0 | 0 | 3 | 50 | 50 | 100 |
| **ESC X51** | Programming fundamentals (P) | Practical | 0 | 0 | 3 | 1 | 50 | 0 | 50 |
| **UHV01** | Universal Human Values* | Theory | 0 | 0 | 0 | 3* | Satisfactory / Unsatisfactory | - | - |
| **Total** | | | **12 / 14** | **2** | **12 / 8** | **19+3*** | **400** | **200 / 250** | **600/650** |

#Various branches can offer any one of the following two subjects Workshop/ Fundamentals of Biotechnology depending upon their branch specific requirements.

**Year: First** **Semester: Second**

| Course Code | Course Name | Option | Hours per week | | | Credits | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | Internal Assessment | University Exam | Total |
| **ASC X01** | Applied Chemistry | Theory | 4 | 0 | 0 | 4 | 50 | 50 | 100 |
| ASC X51 | Applied Chemistry (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **ASM 201** | Differential Equations and Transforms | Theory | 4 | 1 | 0 | 5 | 50 | 50 | 100 |
| **EEC X01** | Basic Electrical and Electronics Engineering | Theory | 3 | 0 | 0 | 3 | 50 | 50 | 100 |
| **EEC X51** | Basic Electrical and Electronics Engineering (P) | Practical | 0 | 0 | 2 | 1 | 50 | - | 50 |
| **ESC X04** | Engineering Graphics | Theory | 1 | 0 | 0 | 1 | 50 | 50 | 100 |
| **ESC X54** | Engineering Graphics (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **ITC 201** | Object Oriented Programming using C++ | Theory | 3 | 0 | 0 | 3 | 50 | 50 | 100 |
| **ITC 251** | Object Oriented Programming using C++(P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **HSMC X01** | Environment Sciences* | Theory | 0 | 0 | 0 | 1* | Satisfactory / Unsatisfactory | - | - |
| | | | **15** | **1** | **11** | **20+1*** | **450** | **250** | **700** |

**Summer Training:**

| Subject Code | Subject Name | L-T-P | Contact hrs/week | Credits | Assessment |
|---|---|---|---|---|---|
| **ST 251** | **Product Re-engineering and Innovation** | 0-0-20 | 20 | Nil | Satisfactory / Unsatisfactory |

**Note: The students will undergo a mandatory "Summer Training" of two weeks in their respective departments after their second-semester exams. It will be a non-credited mandatory course, the result of which (satisfactory/unsatisfactory) will be reflected in their second-semester mark sheet.**

***Two value-added course namely, Universal Human Values and Environment Sciences with special credits (not to be included in CGPA evaluation) will be offered as self-study courses in BE first year. The results of these subjects as satisfactory/unsatisfactory will be reflected in the mark sheet.**

**Panjab University, Chandigarh**
**Scheme of Examination and Syllabi for**
**B.E. (Electrical and Electronics Engineering)**
**1st and 2nd Semesters for Academic Year 2023-2024**

**Year: First** **Semester: First**

| Course Code | Course Name | Option | Hours per week | | | Credits | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | Internal Assessment | University Exam | Total |
| **ASC X01** | Applied Chemistry | Theory | 4 | 0 | 0 | 4 | 50 | 50 | 100 |
| ASC X51 | Applied Chemistry (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **ASM 101** | Calculus | Theory | 4 | 1 | 0 | 5 | 50 | 50 | 100 |
| **EEC X01** | Basic Electrical and Electronics Engineering | Theory | 3 | 0 | 0 | 3 | 50 | 50 | 100 |
| **EEC X51** | Basic Electrical and Electronics Engineering (P) | Practical | 0 | 0 | 2 | 1 | 50 | - | 50 |
| **ESC X04** | Engineering Graphics | Theory | 1 | 0 | 0 | 1 | 50 | 50 | 100 |
| **ESC X54** | Engineering Graphics (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **ESC X01** | Programming fundamentals | Theory | 3 | 0 | 0 | 3 | 50 | 50 | 100 |
| **ESC X51** | Programming fundamentals (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **HSMC X01** | Environment Sciences* | Theory | 0 | 0 | 0 | 1* | Satisfactory / Unsatisfactory | - | - |
| **Total** | | | **15** | **1** | **11** | **20+1*** | **450** | **250** | **700** |

**Year: First** **Semester: Second**

| Course Code | Course Name | Option | Hours per week | | | Credits | Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | Internal Assessment | University Exam | Total |
| | Choice Based Physics Course | Theory | 3 | 1 | 0 | 4 | 50 | 50 | 100 |
| | Choice Based Physics Course (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **ASM 201** | Differential Equations and Transforms | Theory | 4 | 1 | 0 | 5 | 50 | 50 | 100 |
| **HSMC X01** | Professional Communication | Theory | 2 | 0 | 0 | 2 | 50 | 50 | 100 |
| **HSMC X51** | Professional Communication (P) | Practical | 0 | 0 | 2 | 1 | 50 | - | 50 |
| **ESC X53/** | [#]Workshop/ | Practical | 0 | 0 | 4 | 2 | 50 | - | 50 |
| **BTBS X01** | Fundamentals of Biotechnology | Theory | 2 | 0 | 0 | | 50 | 50 | 100 |
| **EEE201** | Fundamentals of Electrical Engineering | Theory | 3 | 0 | 0 | 3 | 50 | 50 | 100 |
| **EEE251** | Fundamentals of Electrical Engineering (P) | Practical | 0 | 0 | 3 | 1 | 50 | 0 | 50 |
| **UHV01** | Universal Human Values* | Theory | 0 | 0 | 0 | 3* | Satisfactory / Unsatisfactory | - | - |
| **Total** | | | **12 / 14** | **2** | **12 / 8** | **19+3*** | **400** | **200 / 250** | **650 / 700** |

**Summer Training:**

| Subject Code | Subject Name | L-T-P | Contact hrs/week | Credits | Assessment |
|---|---|---|---|---|---|
| **ST 251** | **Product Re-engineering and Innovation** | 0-0-20 | 20 | Nil | Satisfactory / Unsatisfactory |

**Note: The students will undergo a mandatory "Summer Training" of two weeks in their respective departments after their second-semester exams. It will be a non-credited mandatory course, the result of which (satisfactory/unsatisfactory) will be reflected in their second-semester mark sheet.**

***Two value-added course namely, Universal Human Values and Environment Sciences with special credits (not to be included in CGPA evaluation) will be offered as self-study courses in BE first year. The results of these subjects as satisfactory/unsatisfactory will be reflected in the mark sheet.**

[#]Various branches can offer any one of the following two subjects Workshop/ Fundamentals of Biotechnology depending upon their branch specific requirements.

**Panjab University, Chandigarh**
**Scheme of Examination and Syllabi for**
**B.E. (Electronics and Communications Engineering)**
**1st and 2nd Semesters for Academic Year 2023-2024**

**Year: First** **Semester: First**

| Course Code | Course Name | Option | Hours per week | | | Credits | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | Internal Assessment | University Exam | Total |
| **ASC X01** | Applied Chemistry | Theory | 4 | 0 | 0 | 4 | 50 | 50 | 100 |
| ASC X51 | Applied Chemistry (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **ASM 101** | Calculus | Theory | 4 | 1 | 0 | 5 | 50 | 50 | 100 |
| **EEC X01** | Basic Electrical and Electronics Engineering | Theory | 3 | 0 | 0 | 3 | 50 | 50 | 100 |
| **EEC X51** | Basic Electrical and Electronics Engineering (P) | Practical | 0 | 0 | 2 | 1 | 50 | - | 50 |
| **ESC X04** | Engineering Graphics | Theory | 1 | 0 | 0 | 1 | 50 | 50 | 100 |
| **ESC X54** | Engineering Graphics (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **ESC X01** | Programming fundamentals | Theory | 3 | 0 | 0 | 3 | 50 | 50 | 100 |
| **ESC X51** | Programming fundamentals (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **HSMC X01** | Environment Sciences* | Theory | 0 | 0 | 0 | 1* | Satisfactory / Unsatisfactory | - | - |
| | | | **15** | **1** | **11** | **20+1*** | **450** | **250** | **700** |

**Year: First** **Semester: Second**

| Course Code | Course Name | Option | Hours per week | | | Credits | Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | Internal Assessment | University Exam | Total |
| | Choice Based Physics Course | Theory | 3 | 1 | 0 | 4 | 50 | 50 | 100 |
| | Choice Based Physics Course (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **ASM 201** | Differential Equations and Transforms | Theory | 4 | 1 | 0 | 5 | 50 | 50 | 100 |
| **HSMC X01** | Professional Communication | Theory | 2 | 0 | 0 | 2 | 50 | 50 | 100 |
| **HSMC X51** | Professional Communication (P) | Practical | 0 | 0 | 2 | 1 | 50 | - | 50 |
| **ESC X53/** | [#]Workshop/ | Practical | 0 | 0 | 4 | 2 | 50 | - | 50 |
| | Fundamentals of Biotechnology | Theory | 2 | 0 | 0 | | 50 | 50 | 100 |
| **EC 203** | Digital Design | Theory | 3 | 0 | 0 | 3 | 50 | 50 | 100 |
| **EC 253** | Digital Design (P) | Practical | 0 | 0 | 3 | 1 | 50 | 0 | 50 |
| **UHV01** | Universal Human Values* | Theory | 0 | 0 | 0 | 3* | Satisfactory / Unsatisfactory | - | - |
| **Total** | | | **12 / 14** | **2** | **12 / 8** | **19+3*** | **400** | **200 / 250** | **600/650** |

**Summer Training:**

| Subject Code | Subject Name | L-T-P | Contact hrs/week | Credits | Assessment |
|---|---|---|---|---|---|
| **ST 251** | **Product Re-engineering and Innovation** | 0-0-20 | 20 | Nil | Satisfactory / Unsatisfactory |

**Note: The students will undergo a mandatory "Summer Training" of two weeks in their respective departments after their second-semester exams. It will be a non-credited mandatory course, the result of which (satisfactory/unsatisfactory) will be reflected in their second-semester mark sheet.**

***Two value-added course namely, Universal Human Values and Environment Sciences with special credits (not to be included in CGPA evaluation) will be offered as self-study courses in BE first year. The results of these subjects as satisfactory/unsatisfactory will be reflected in the mark sheet.**

[#]Various branches can offer any one of the following two subjects Workshop/ Fundamentals of Biotechnology depending upon their branch specific requirements.

**Panjab University, Chandigarh**
**Scheme of Examination and Syllabi for**
**B.E. (Mechanical Engineering)**
**1st and 2nd Semesters for Academic Year 2023-2024**

**Year: First** **Semester: First**

| Course Code | Course Name | Option | Hours per week | | | Credits | Internal Assessment | University Exam | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | | | |
| **ASC X01** | Applied Chemistry | Theory | 4 | 0 | 0 | 4 | 50 | 50 | 100 |
| ASC X51 | Applied Chemistry (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **ASM 101** | Calculus | Theory | 4 | 1 | 0 | 5 | 50 | 50 | 100 |
| **HSMC X01** | Professional Communication | Theory | 2 | 0 | 0 | 2 | 50 | 50 | 100 |
| **HSMC X51** | Professional Communication (P) | Practical | 0 | 0 | 2 | 1 | 50 | - | 50 |
| **ESC X53/** | #Workshop/ | Practical | 0 | 0 | 4 | 2 | 50 | - | 50 |
| **BTBS X01** | Fundamentals of Biotechnology | Theory | 2 | 0 | 0 | | 50 | 50 | 100 |
| **MEC 101** | Engineering Mechanics | Theory | 3 | 0 | 0 | 3 | 50 | 50 | 100 |
| **MEC 151** | Engineering Mechanics (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **HSMC X01** | Environment Sciences* | Theory | 0 | 0 | 0 | 1* | Satisfactory / Unsatisfactory | - | - |
| | | | **13/15** | **1** | **12/8** | **19+1*** | **400** | **200/250** | **600/650** |

#Various branches can offer any one of the following two subjects Workshop/ Fundamentals of Biotechnology depending upon their branch specific requirements.

**Year: First** **Semester: Second**

| Course Code | Course Name | Option | Hours per week | | | Credits | Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | Internal Assessment | University Exam | Total |
| | Choice Based Physics Course | Theory | 3 | 1 | 0 | 4 | 50 | 50 | 100 |
| | Choice Based Physics Course (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **ASM 201** | Differential Equations and Transforms | Theory | 4 | 1 | 0 | 5 | 50 | 50 | 100 |
| **EEC X01** | Basic Electrical and Electronics Engineering | Theory | 3 | 0 | 0 | 3 | 50 | 50 | 100 |
| **EEC X51** | Basic Electrical and Electronics Engineering (P) | Practical | 0 | 0 | 2 | 1 | 50 | - | 50 |
| **ESC X04** | Engineering Graphics | Theory | 1 | 0 | 0 | 1 | 50 | 50 | 100 |
| **ESC X54** | Engineering Graphics (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **ESC X01** | Programming fundamentals | Theory | 3 | 0 | 0 | 3 | 50 | 50 | 100 |
| **ESC X51** | Programming fundamentals (P) | Practical | 0 | 0 | 3 | 1 | 50 | 0 | 50 |
| **UHV01** | Universal Human Values* | Theory | 0 | 0 | 0 | 3* | Satisfactory / Unsatisfactory | | |
| **Total** | | | **14** | **2** | **11** | **20+3*** | **450** | **250** | **700** |

**Summer Training:**

| Subject Code | Subject Name | L-T-P | Contact hrs/week | Credits | Assessment |
|---|---|---|---|---|---|
| **ST 251** | **Product Re-engineering and Innovation** | 0-0-20 | 20 | Nil | Satisfactory / Unsatisfactory |

**Note: The students will undergo a mandatory "Summer Training" of two weeks in their respective departments after their second-semester exams. It will be a non-credited mandatory course, the result of which (satisfactory/unsatisfactory) will be reflected in their second-semester mark sheet.**

***Two value-added course namely, Universal Human Values and Environment Sciences with special credits (not to be included in CGPA evaluation) will be offered as self-study courses in BE first year. The results of these subjects as satisfactory/unsatisfactory will be reflected in the mark sheet.**

**Panjab University, Chandigarh**
**Scheme of Examination and Syllabi for**
**B.E. (Civil Engineering)**
**1st and 2nd Semesters for Academic Year 2023-2024**

**Year: First** **Semester: First**

| Course Code | Course Name | Option | Hours per week | | | Credits | Marks | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | Internal Assessment | University Exam | Total |
| | Choice Based Physics Course | Theory | 3 | 1 | 0 | 4 | 50 | 50 | 100 |
| | Choice Based Physics Course (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **ASM 101** | Calculus | Theory | 4 | 1 | 0 | 5 | 50 | 50 | 100 |
| **EEC X01** | Basic Electrical and Electronics Engineering | Theory | 3 | 0 | 0 | 3 | 50 | 50 | 100 |
| **EEC X51** | Basic Electrical and Electronics Engineering (P) | Practical | 0 | 0 | 2 | 1 | 50 | - | 50 |
| **CIV 101** | Fluid Mechanics | Theory | 3 | 0 | 0 | 3 | 50 | 50 | 100 |
| **CIV 151** | Fluid Mechanics (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **ESC X04** | Engineering Graphics | Theory | 1 | 0 | 0 | 1 | 50 | 50 | 100 |
| **ESC X54** | Engineering Graphics (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **UHV01** | Universal Human Values* | Theory | 0 | 0 | 0 | 3* | Satisfactory / Unsatisfactory | - | - |
| **Total** | | | **14** | **2** | **11** | **20+3*** | **450** | **250** | **700** |

**Year: First** **Semester: Second**

| Course Code | Course Name | Option | Hours per week | | | Credits | Internal Assessment | University Exam | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | | | |
| **ASC X01** | Applied Chemistry | Theory | 4 | 0 | 0 | 4 | 50 | 50 | 100 |
| ASC X51 | Applied Chemistry (P) | Practical | 0 | 0 | 3 | 1 | 50 | - | 50 |
| **ASM 201** | Differential Equations and Transforms | Theory | 4 | 1 | 0 | 5 | 50 | 50 | 100 |
| **HSMC X01** | Professional Communication | Theory | 2 | 0 | 0 | 2 | 50 | 50 | 100 |
| **HSMC X51** | Professional Communication (P) | Practical | 0 | 0 | 2 | 1 | 50 | - | 50 |
| **ESC X01** | Programming fundamentals | Theory | 3 | 0 | 0 | 3 | 50 | 50 | 100 |
| **ESC X51** | Programming fundamentals (P) | Practical | 0 | 0 | 3 | 1 | 50 | 0 | 50 |
| **ESC X53/** | #Workshop/ | Practical | 0 | 0 | 4 | 2 | 50 | - | 50 |
| **BTBS X01** | Fundamentals of Biotechnology | Theory | 2 | 0 | 0 | | 50 | 50 | 100 |
| **HSMC X01** | Environment Sciences* | Theory | 0 | 0 | 0 | 1* | Satisfactory / Unsatisfactory | - | - |
| | | | **13/15** | **1** | **12/8** | **19+1*** | **400** | **200/250** | **600/650** |

**Summer Training:**

| Subject Code | Subject Name | L-T-P | Contact hrs/week | Credits | Assessment |
|---|---|---|---|---|---|
| **ST 251** | **Product Re-engineering and Innovation** | 0-0-20 | 20 | Nil | Satisfactory / Unsatisfactory |

**Note: The students will undergo a mandatory "Summer Training" of two weeks in their respective departments after their second-semester exams. It will be a non-credited mandatory course, the result of which (satisfactory/unsatisfactory) will be reflected in their second-semester mark sheet.**

***Two value-added course namely, Universal Human Values and Environment Sciences with special credits (not to be included in CGPA evaluation) will be offered as self-study courses in BE first year. The results of these subjects as satisfactory/unsatisfactory will be reflected in the mark sheet.**

#Various branches can offer any one of the following two subjects Workshop/ Fundamentals of Biotechnology depending upon their branch specific requirements.

| | |
|---|---|
| **Course Code** | **ASP X01** |
| **Course Title** | **Applied Physics** |
| **Type of Course** | **Core** |
| **L T P** | **3 1 0** |
| **Credits** | **4** |
| **Course Assessment Methods**<br>End Semester Assessment (University Exam)<br>Continuous Assessment (Minors, Assignments, Quiz) | <br>**50**<br><br>**50** |
| **Course Prerequisites** | Physics and mathematics at 10+2 level |
| **Course Outcomes (CO)** | After the completion of this course the students will be able to<br>1. Understand the free, damped and forced oscillations theoretically as well as analytically.<br>2. Understand the development of Maxwell's equations, electromagnetic wave theory and propagation of EM waves in various media; extending the EM theory to laws of optics.<br>3. Understand the concept of polarization, methods of production of polarized light and applications of polarization.<br>4. Understand the working principle and applications of laser; optical fibers and their applications. |

## SYLLABUS

**Note for the examiner:** The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

### Section A

**Oscillations:** Complete mathematical treatment for mechanical as well as electrical free, damped and forced oscillators.Simple harmonic oscillator: differential and linear equation of motion, Physical characteristics of SHM. Superposition of two SHMs executing in the same and perpendicular direction of same frequency and different frequencies, Lissajous figures. Superposition of n-SHMs

Damped Oscillations: differential equation of a damped oscillator and different kinds of damping, Methods of describing damping of an oscillator - logarithmic decrement, relaxation time, quality factor.

Forced Oscillations: differential and linear equation of motion, dependence of oscillation parameters on driving frequency, power, bandwidth, Quality factor and amplification of forced oscillator, resonance in forced oscillators, vibration insulator

**[CO1]** (13 hours)

**Electromagnetic Waves:** Introduction to vector calculus, Maxwell equations (derivations and physical significance). Electromagnetic waves in vacuum and conducting medium, Poynting vector and Poynting theorem, Reflection and transmission of electromagnetic waves for oblique and normal incidence.

**[CO2]**(11 hours)

### Section B

**Polarization:** Methods of polarization, double refraction, quarter and half wave plates, analysis of polarized light, Fresnel theory for optical activity, polarimeter (biquartz and laurent's half-shade devices), babinet compensator,

Kerr effect, applications of polarization in testing of materials, LCDs, 3D movies **[CO3]**(8 hours)

**Lasers and Optical Fibers:** Elementary idea of LASER production, spontaneous emission, stimulated emission, Einstein's coefficients, Helium-Neon, Ruby and semiconductor lasers, Applications of lasers in optical communication and storage, defence, geophysical sciences.

Basics of optical fiber - its numerical aperture, coherent and incoherent bundle, step index and graded index fiber, material dispersion, applications of fibers in sensors and communication.

[**CO4]**(8 hours)

**Reference Books:**

1. Physics of Vibrations and Waves (5th Edition, John Wiley & Sons) – H.J.Pain
2. Optics – Ajoy Ghatak
3. Fundamentals of Optics by F. Jenkins and H.E. White
4. Introduction to Electrodynamics, David J. Griffiths

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 1 | | | 1 | 1 | 2 | 1 | | 2 |
| CO2 | 3 | 2 | 1 | 1 | | | 1 | 1 | 2 | 1 | | 2 |
| CO3 | 3 | 3 | 1 | 1 | | | 1 | 1 | 2 | 1 | | 2 |
| CO4 | 3 | 2 | 2 | 1 | | | 1 | 1 | 2 | 1 | | 2 |

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|---|---|
| **Course Code** | **ASP X51** |
| **Course Title** | **Applied Physics (P)** |
| **Type of Course** | **Core** |
| **L T P** | **0 0 3** |
| **Credits** | **1** |
| **Course Assessment Methods** (Continuous and end semester evaluation) | **50** |
| **Course Prerequisites** | Physics and mathematics at 10+2 level |
| **Course Outcomes (CO)** | After the completion of this course the students will be able to<br>1. Work with measuring instruments like vernier calipers, screw gauge, spectrometer, spherometer and cathode ray oscilloscope etc..<br>2. Perform data analysis and interpretations such as significant figures, error calculations, graphical representation of the data, calculation of slope and intercept using least square fitting method.<br>3. Understand the concepts of oscillatory motion using experimental demonstrations.<br>4. Understand the concepts of optical phenomena by performing related experiments. |

**List of Experiments**: Students need to perform a minimum of six experiments selecting at least three experiments each from **Group A** and **Group B**

**Group A: Oscillations and Waves**

1. To determine the velocity of ultrasonic waves in different liquids using ultrasonic interferometer. **[CO1, CO2, CO3]**
2. To study the frequency response and to find resonant frequencies of LCR series and parallel circuits. Also to find the quality factor and bandwidth in LCR. **[CO1, CO2, CO3]**
3. To determine the value of acceleration due to gravity and radius of gyration using bar pendulum. **[CO1, CO2, CO3]**
4. Study of transverse and longitudinal standing waves and the measurement of the frequency of the electrically maintained Tuning fork. **[CO1, CO2, CO3]**
5. To study damping effects in the spring mass system. **[CO1, CO2, CO3]**
6. To study Lissajous figures obtained by superposition of oscillations with different frequencies and phases. **[CO1, CO2, CO3]**

**Group B: Optics**

7. To find the wavelength of sodium light using Fresnel's biprism. **[CO1, CO2, CO4]**
8. (i) To determine the wavelength of He-Ne laser using transmission grating. **[CO1, CO2, CO4]**
   (ii) To determine the slit width using the diffraction pattern.
9. To determine the wavelength of sodium light by Newton's rings method. **[CO1, CO2, CO4]**
10. To determine the wavelength of sodium light using a diffraction grating. **[CO1, CO2, CO4]**

11. To find the specific rotation of sugar solution using a Laurant's Half shade/ Bi-quartz Polarimeter. **[CO1, CO2, CO4]**
12. To find the refractive index of a prism using spectrometer. **[CO1, CO2, CO4]**
13. To determine the wavelength of a laser using Michelson interferometer. **[CO1, CO2, CO4]**

**Reference Books: (To understand the concepts of experiments and related theories)**


1. B. Sc. Practical Physics by C. L. Arora
2. Physics of Vibrations and Waves (5th Edition, John Wiley & Sons) – H.J.Pain
3. Optics – Ajoy Ghatak
4. Fundamentals of Optics by F. Jenkins and H.E. White


| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 1 | | | 1 | 1 | 2 | 1 | | 2 |
| CO2 | 3 | 2 | 1 | 1 | | | 1 | 1 | 2 | 1 | | 2 |
| CO3 | 3 | 3 | 1 | 1 | | | 1 | 1 | 2 | 1 | | 2 |
| CO4 | 3 | 2 | 1 | 1 | | | 1 | 1 | 2 | 1 | | 2 |

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|---|---|
| **Course Code** | **ASP X02** |
| **Course Title** | **Quantum Physics** |
| **Type of Course** | **Core** |
| **L T P** | **3 1 0** |
| **Credits** | **4** |
| **Course Assessment Methods**<br>End Semester Assessment (University Exam)<br>Continuous Assessment (Minors, Assignments, Quiz) | <br>**50**<br><br>**50** |
| **Course Prerequisites** | Physics and mathematics at 10+2 level |
| **Course Outcomes (CO)** | After the completion of this course the students will be able to<br>1. Understand the basics of the special theory of relativity and its applications. Students will be familiarized with various relativistic effects like Lorentz transformations, simultaneity, length contraction, time dilation, Doppler effect, addition of velocities, variation of mass with velocity and mass-energy relation.<br>2. Understand historical development of quantum mechanics; concepts of duality and uncertainty principle; wave function and its interpretation; Schrodinger equation.<br>3. Apply Schrödinger equation to various modular systems and solve for simple potentials such as potential step, infinite and finite potential well, potential barrier; linear harmonic oscillator (one-dimensional) and 3-D rigid box.<br>4. Apply quantum mechanical concepts to understand the origin of some of the properties exhibited by solids like energy bands in solids and specific heat of solids. |

## SYLLABUS

**Note for the examiner:** The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

### Section A

**Unit I: Special Theory of Relativity**

Inertial and non-inertial frames of reference, Galilean transformation, Michelson Morley Experiment, Postulates of special theory of relativity, Lorentz transformation, Simultaneity, Length contraction, Time dilation, Doppler effect, Addition of velocities, variation of mass with velocity, mass-energy relation, Relativistic momentum, Minkowski space

(Section 1.1 to 1.5, 1.7 to 1.9 of Book 1) **[CO1]**
**(8 hrs)**

**Unit II: Origin and Postulates of Quantum Mechanics**

Quantum theory of light, Blackbody Radiation, Photoelectric effect, Compton effect, X-rays production, spectrum & diffraction (Bragg's law), pair production, photons & gravity, Gravitational Red Shift, Black holes, de-Broglie hypothesis, particle diffraction, uncertainty principle and its applications

Postulates of quantum mechanics, wave function, Born interpretation and normalization, Schrodinger theory, Time-dependent and Time-independent Schrodinger equation, Operators (Adjoint operator, Identity operator, Hermitian operator, unitary operator etc.), expectation values, Ehrenfest theorem

(Sections 2.1-2.10, 3.1-3.5, 3.7-3.10, 5.1-5.7 of Book 1) **[CO2]**
**(16 hrs)**

**Section B**

**Unit III: Applications of Quantum Mechanics**

Particle in a box (infinite potential well), Potential step, Finite Potential Well and Barrier, Tunneling, Linear harmonic oscillator (one-dimensional), 3-D rigid box and degeneracy

(Sections 5.8 – 5.11 of Book 1) **[CO3]**
**(8 hrs)**

**Unit IV: Application of Quantum Mechanics to Crystalline Solids**

Free Electron theory of Metals (Classical and Sommerfield), Bloch's theorem for particles in a periodic potential, Kronig-Penney Model and origin of energy bands, conductors, insulators and semiconductors, Fermi level, density of states, Effective mass, Specific heat of solids

(Sections 6.35-6.38, 6.40, 6.41, 7.1-7.5 of book 4 and Section 1 of Chapter 10 of Book 3) **[CO4] (10 hrs)**

**References:**


1. Concepts of Modern Physics, by Arthur Beiser (McGraw-Hill)
2. Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles by Eisberg and Resnick
3. Introduction to Solids by Leonid V. Azaroff
4. Elementary Solid state Physics by M.Ali Omar (Pearson Education)
5. Solid State Physics, by C. Kittel (Wiley Eastern)
6. Solid State Physics, by S.O. Pillai (New Age International)


| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 1 | | | 1 | 1 | 2 | 1 | | 2 |
| CO2 | 3 | 2 | 1 | 1 | | | 1 | 1 | 2 | 1 | | 2 |
| CO3 | 3 | 3 | 1 | 1 | | | 1 | 1 | 2 | 1 | | 2 |
| CO4 | 3 | 2 | 2 | 1 | | | 1 | 1 | 2 | 1 | | 2 |

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|---|---|
| **Course Code** | **ASP X52** |
| **Course Title** | **Quantum Physics (P)** |
| **Type of Course** | **Core** |
| **L T P** | **0 0 3** |
| **Credits** | **1** |
| **Course Assessment Methods** (Continuous and end semester evaluation) | **50** |
| **Course Prerequisites** | Physics and mathematics at 10+2 level |
| **Course Outcomes (CO)** | After the completion of this course the students will be able to<br>1. Understand the construction and working of<br>● Measuring devices like vernier calipers, screw gauge, spherometer etc..<br>2. Electrical instruments like ammeter, voltmeter, galvanometer, gaussmeter etc.<br>3. Perform experiments using specialized tools and techniques to probe the phenomena of quantum mechanics like uncertainty priniciple, quantization of energy etc. and to verify the laws of probability and quantum statistics.<br>4. Experimentally determine quantum parameters like energy band gap, excitation energy, hydrogen spectrum wavelengths in visible region, Planck's constant etc.<br>5. Carry out the error analysis of their results and provide their theoretical interpretation. |

**List of Experiments**

1. To study the quantized energy level of the first excited state in the Argon using the Frank-Hertz setup. **[CO2, CO3, CO4]**
2. To find the value of Planck's constant and evaluate the work function of cathode material by used of photoelectric cell. **[CO1, CO2, CO3, CO4]**
3. To study various characteristics of photo-voltaic cell: (a) Voltage-current characteristics, (b) loading characteristics, (c) power-resistance characteristics and (d) inverse square law behavior of the photo-current with distance of source of light from photo-voltaic cell **[CO1, CO2, CO4]**
4. To study the response of a photo-resistor to varying intensity of light falling on it and deduce spectral sensitivity of its semiconductor material. **[CO1, CO3, CO4]**
5. To study the Balmer Series of Hydrogen spectrum using diffraction grating and calculate Rydberg constant. **[CO1, CO3, CO4]**
6. To evaluate charge on an oil drop using Millikan's oil drop method. **[CO1, CO2, CO4]**
7. To verify Rutherford's alpha scattering formula using a mechanical model. **[CO1, CO2, CO4]**
8. To calculate charge to mass ratio of an electron using Thomsonś method. **[CO1, CO2, CO4**]
9. To determine Hall coefficient of a given semiconductor material and evaluate charge carrier type, density and mobility of charge carriers. **[CO1, CO3, CO4]**
10. To study temperature dependence of resistivity of a semiconductor using four probe method and determine the energy band gap of a given semiconductor. **[CO1, CO3, CO4]**
11. To determine the velocity of ultrasonic waves in different liquids using ultrasonic interferometer. **[CO1, CO2, CO4]**
12. To study probability theory using coins. **[CO1, CO2, CO4]**
13. To study probability and statistics using two dice. **[CO1, CO2, CO4**]

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 1 | | | 1 | 1 | 2 | 1 | | 2 |
| CO2 | 3 | 2 | 1 | 1 | | | 1 | 1 | 2 | 1 | | 2 |
| CO3 | 3 | 3 | 1 | 1 | | | 1 | 1 | 2 | 1 | | 2 |
| CO4 | 3 | 2 | 1 | 1 | | | 1 | 1 | 2 | 1 | | 2 |

| | |
|---|---|
| **Course Code** | **ASP X03** |
| **Course Title** | **Physics of Materials** |
| **Type of Course** | **Core** |
| **L T P** | **3 1 0** |
| **Credits** | **4** |
| **Course Assessment Methods**<br>End Semester Assessment (University Exam)<br>Continuous Assessment (Minors, Assignments, Quiz) | <br>**50**<br><br>**50** |
| **Course Prerequisites** | Physics and mathematics at 10+2 level |
| **Course Outcomes (CO)** | After the completion of this course the students will be able to<br>1. Classify materials; understand bonding forces and energies, primary and secondary bonds.<br>2. Understand types of unit cells; naming schemes for directions and planes; close packings and voids; structure of polymers and ceramics; crystal imperfections and crystal structure determination using X-Ray diffraction.<br>3. Identify diffusion processes and their applications; elastic, anelastic and viscoelastic behavior of materials.<br>4. Understand plastic deformation by dislocation motion; slip system; strengthening mechanisms; fracture mechanics, Fatigue and generalized creep behavior.<br>5. Understand phase diagrams, phase transformations, importance of phase transformations for controlling microstructure and properties in engineering alloys. |

## SYLLABUS

**Note for the examiner:** The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

### SECTION - A

**Crystal structure:** Bonding forces and energies, Primary and Secondary bonds, Space Lattices, Symmetries in a cubic lattice, Crystal Structures (cubic and hexagonal cells), Assignment of coordinates, directions and planes in crystals, Linear, Planar and Space densities in crystals, close packed morphology (Hexagonal and cubic close packing), single and polycrystalline structures, interstitial spaces (trigonal, tetrahedral and octahedral voids)

Structure of ceramics (NaCl, Zinc blende, silica and silicates, diamond crystal, Graphite, Fullerenes and carbon nanotubes)

Structure of polymers, crystallinity of long chain polymers

Crystal Structure analysis, X-ray diffraction and Bragg's law, Experimental methods for study of X-ray diffraction pattern, Crystal Defects (Point, line, surface and volume imperfections)

**[CO1,CO2]** (14 hours )

**Diffusion:** Diffusion mechanisms, steady state diffusion, non-steady state diffusion, factors affecting diffusion, applications based on diffusion (corrosion resistance of Duralumin, carburization of steel, decarburization of steel,

doping of semiconductors) **[CO3]**
**( 3 hours )**

**Elastic, Anelastic and Viscoelastic Behaviour** Elastic behaviour and its atomic model, rubber like elasticity, anelastic behaviour, relaxation processes, viscoelastic behaviour. **[CO3] ( 3 hours )**

**SECTION - B**

**Plastic Deformations and strengthening mechanisms :** Tensile properties (Yield strength, Tensile Strength, Ductility, Resilience, Toughness), Dislocations and plastic deformation, characteristics of dislocations, slip systems, slip in single crystals and polycrystalline materials, mechanisms of strengthening in metals (grain size reduction, solid-solution strengthening, strain hardening), recovery, recrystallization and grain growth **[CO4] (5 hours)**

**Fracture, Fatigue and Creep :** Fracture (Ductile and brittle fractures), principles of fracture mechanics, fracture toughness, ductile to brittle transitions Cyclic stresses, S-N curve, crack initiation and propagation, factors that affect fatigue life, environmental effects, generalized creep behavior, stress and temperature effect **[CO4] ( 5 hours )**

**Phase Diagrams :** One-Component (or Unary) Phase Diagrams, Binary Isomorphous Systems, Interpretation of Phase Diagrams, Development of Microstructure in Isomorphous Alloys, Mechanical Properties of Isomorphous Alloys ,Binary Eutectic Systems, Development of Microstructure in Eutectic Alloy, Equilibrium Diagrams Having Intermediate Phases or Compounds, Eutectic and Peritectic Reactions, the Iron-Carbon system. **[CO5] (6 hours )**

**Phase Transformations:** Kinetics of phase transformation, kinetics of solid state reactions, Isothermal transformation diagrams, continuous cooling transformation, temper embrittlement
**[CO5] ( 4 hours )**

| **RECOMMENDED BOOKS** | | | |
|---|---|---|---|
| **S.No.** | **NAME** | **AUTHORS** | **PUBLISHER** |
| 1. | Material science and engineering – An Introduction | William D Callister | 6Th edition, John Willey and Sons. |
| 2. | Material Science and Engineering – A First Course | V. Raghvan | 4th edition, Eastern economy edition |
| 3. | Solid State Physics | S. O. Pillai | New Age International |
| 4. | Introduction to Solids | Leonid V Azaroff | Tata McGraw Hill, 3rd edition. |

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
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| CO1 | 3 | 2 | 1 | 1 | 1 | | | | 1 | | | 1 |
| CO2 | 3 | 2 | 1 | 1 | 2 | | | | 1 | | | 2 |
| CO3 | 3 | 2 | 2 | 1 | 2 | | | | | | | 2 |
| CO4 | 3 | 2 | 1 | 2 | 1 | 2 | 1 | | | | | 2 |
| CO5 | 3 | 2 | 2 | 2 | 1 | 2 | 1 | | | | | 2 |

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|---|---|
| Course code | **ASP X53** |
| **Course Title** | **Physics of Materials (P)** |
| **Type of Course** | **Core** |
| **L T P** | **0 0 3** |
| **Credits** | **1** |
| **Course Assessment Methods** (Continuous and end semester evaluation) | **50** |
| **Course Prerequisites** | Physics and mathematics at 10+2 level |
| **Course Outcomes (CO)** | After the completion of this course the students will be able to<br>1. Understand the construction and working of<br>● Measuring devices like vernier calipers, screw gauge, spherometer etc..<br>● Electrical instruments like ammeter, voltmeter, galvanometer, gaussmeter etc..<br>2. Identify and differentiate the materials based on their electrical, magnetic, thermal and optical properties.<br>3. Experimentally determine parameters like thermal conductivity, electrical resistivity, Hall coefficient, Curie temperature, retentivity and coercivity etc. of various materials.<br>4. Carry out the error analysis of their results.<br>5. Provide a theoretical explanation of their results and make a complete and cogent report of their findings. |

**List of Experiments**

1. To study the quantized energy of the first excited state in Argon using the Frank-Hertz Set-up. **[CO1, CO2, CO3, CO4, CO5]**
2. To find the value of Planck's constant and evaluate the work function of cathode material by use of photoelectric cell.**[CO1, CO2, CO3, CO4, CO5]**
3. To study various characteristics of photovoltaic cell: (a) Voltage-current characteristics (b) loading characteristics (c) power-resistance characteristics and (d) inverse squarelaw behavior of photocurrent with distance of source of light from photovoltaic cell.**[CO1, CO2, CO3, CO4, CO5]**
4. To study the response of a photoresistor to varying intensity of light falling on it and deduce spectral sensitivity of its semiconductor material.**[CO1, CO2, CO3, CO4, CO5]**
5. To determine Hall coefficient of a semiconductor material and then evaluate the type, density and mobility of charge carrier in a given semiconductor material.**[CO1, CO2, CO3, CO4, CO5]**
6. To study the hysteresis loop of magnetic material (iron, nickel and steel) and determine its retentivity, coercivity and energy dissipated per unit volume per cycle of hysteresis.**[CO1, CO2, CO3, CO4, CO5]**
7. To study temperature dependence of resistivity of a semiconductor material using four probe method and further deduce the band gap of this semiconductor.**[CO1, CO2, CO3, CO4, CO5]**
8. To determine the Curie temperature of a ferroelectric material by measuring dielectric constant as a function of temperature.**[CO1, CO2, CO3, CO4, CO5]**

9. To determine thermal conductivity of bad conductor by using guarded plate method (Lee's disc method).**[CO1, CO2, CO3, CO4, CO5]**
10. To study the diamagnetic, paramagnetic and ferromagnetic behaviour of magnetic materials.**[CO1, CO2, CO3, CO4, CO5]**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 |
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| CO1 | 3 | 2 | 1 | 1 | | | 1 | 1 | 2 | 1 | | 2 |
| CO2 | 3 | 2 | 1 | 1 | | | 1 | 1 | 2 | 1 | | 2 |
| CO3 | 3 | 3 | 1 | 1 | | | 1 | 1 | 2 | 1 | | 2 |
| CO4 | 3 | 2 | 1 | 1 | | | 1 | 1 | 2 | 1 | | 2 |
| CO5 | 3 | 1 | 1 | 1 | | | 1 | 1 | 2 | 1 | | 2 |

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|---|---|
| **Course Code** | **ASC X01** |
| **Course Title** | **Applied Chemistry** |
| **Type of Course** | **Core** |
| **L T P** | **4 0 0** |
| **Credits** | **4** |
| **Course Assessment Methods**<br>End Semester Assessment(University Exam)<br>Continuous Assessment (Minors, Assignments, Quiz) | <br>50<br>50 |
| **Course Prerequisites** | Chemistry at 10+2 level |
| **Course Objectives (CO)** | To teach the fundamentals of basic chemical sciences essential for the development of new technologies to all branches of engineering. |
| **Course Outcome** | 1. The geometry and bonding in homonuclear, heteronuclear molecules and coordination compounds. Splitting of d-orbital in octahedral, tetrahedral and square planar field along with different properties of the coordination compounds.<br>2. How the molecules are arranged in three dimensional structure and how it leads to the phenomena of various types of isomerism.<br>3. The basic principles of spectroscopy and its use to determine the chemical structure.<br>4. The different thermodynamic laws, heat changes and energy calculations.<br>5. The role and mechanism of various heterogeneous and homogeneous catalysts in increasing reactions rate of many synthetically important chemical reactions.<br>6. The sustainable technology in design and synthesis of polymers for its variety of applications. |

**Note for the examiner:** The end semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

## SYLLABUS

### SECTION - A

**Chemical Bonding**

Molecular orbital theory and its applications to the formation of homonuclear ($H_2$, $N_2$) and heteronuclear diatomic molecules (NO, CO, CN), Valence bond theory as applicable to coordination compounds and its limitations. Crystal Field Theory, Splitting of octahedral, tetrahedral and square planner complexes, crystal field stabilization energies of octahedral and tetrahedral complexes and its application. **[CO 1] (6 hours)**

**Stereochemistry of Organic Compounds**

Concept of isomerism. Types of isomerism. Optical isomerism–enantiomers, optical activity, properties of enantiomers, diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization, R & S systems of nomenclature. Geometric isomerism– determination of configuration of geometric isomers, E & Z system of nomenclature Conformational isomerism – conformational analysis of ethane and n-butane; conformations of cyclohexane, Newman projection. **[CO 2] (8 hours)**

**Spectroscopy**

Spectroscopy: UV- Introduction, Lambert-Beer's Law, selection rules, electronic transitions, Application to simple organic molecules (auxochrome, chromophore), effect of conjugation and solvent on transition of organic molecules, Woodward-Fieser Rules for calculating λmax for dienes. Infrared Spectroscop- Introduction, Principle of IR spectroscopy-Fundamental vibrations, Application to simple organic molecules (effect of masses of atoms, bond strength, nature of substituent, hydrogen bonding on IR frequency), sample preparation for IR. **[CO 3] (9 hours)**

**SECTION - B**

**Thermodynamics (10 hrs)**

Review of objectives and limitations of chemical thermodynamics, State functions, Thermodynamic equilibrium, work, heat, internal energy, enthalpy, heat capacity. Zeroth law of thermodynamics, First law of thermodynamics Reversible, isothermal and adiabatic expansion & compression of an ideal gas. Irreversible isothermal and adiabatic expansion of an ideal gas. Carnot cycle and efficiency of reversible engines, Enthalpy change and its measurement. Flame temperature, Second and third law of thermodynamics. Concept of entropy. Gibb's and Helmholtz equations. Simple numericals for calculating w, q, ΔE, ΔH and entropy. **[CO 4] (10 hours)**

**Catalysis (6 hrs)**

Catalysis and general characteristics of a catalytic reactions, Homogeneous catalysis, Heterogenous catalysis, Acid base catalysis and Enzyme catalysis – Michealis Menten equations, Application of catalysis for industrially important processes – Hydrogenation (Wilkinson's catalyst), Hydroformylation, Acetic acid process, Wacker process. **[CO 5] (6 hours)**

**Polymers (6 hrs)**

General introduction, classification of polymers, Mechanism of addition and condensation polymerization, Idea of number average and weight average molecular masses of polymers, Properties and uses of polystyrene, polyester, polyamide, epoxy, phenol-formaldehyde and silicon resins. **[CO 6] (6 hours)**

**Books suggested:**

| **RECOMMENDED BOOKS** | | | |
|---|---|---|---|
| **S.No.** | **NAME** | **AUTHOR(S)** | **PUBLISHER** |
| 1. | Atkin's Physical Chemistry | Peter Atkins, Julio de Paula | 7th Ed., Oxford University Press |
| 2 | Concise Inorganic Chemistry | J D Lee | $5^{th}$ Edition, Chapman & Hall, 2003 |
| 3 | Organic Chemistry | Joseph M. Hornback | Brooke Cole Publishing Company U.S.A. |
| 4 | A Textbook of Engineering Chemistry | Shashi Chawla | Dhanpat Rai & Co. Pvt. Ltd., Delhi (2008) |
| 5 | Principles of Physical Chemistry | Puri, Sharma and Pathania | W.H. Freeman & Co. 2008. |
| 6 | Introductory Polymer Chemistry | G.S.Mishra | John Wiley & Sons, New York, 1993 |

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|---|---|---|---|
| 7 | Introduction to spectroscopy | D. S. Pavia, G.M. Lasmpman and G.S. Kriz | 4th Edition, Thomson learning, Indian Edition 2012. |
| 8 | Basic Inorganic Chemistry. | F.A. Cotton, G. Wilkinson and P.L. Gaus | 3rd Ed., John Wiley & Sons |
| 9 | Inorganic Chemistry- Principles of structure and reactivity | James E. Huheey, Ellen A. Keiter and Richard L. Keiter | 4th Ed. Pearson Edu. Asia |
| 10 | Organic Chemistry | S. M. Mukherji, S. P. Singh & R. P. Kapoor | 1st Edition, Vol. 2, 1985, New Age International Pvt. Ltd |

| **CO** | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** | **PO 11** | **PO 12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | | | | 2 | | | | | 1 |
| **CO2** | 3 | 2 | | | | | | | | | | 1 |
| **CO3** | 3 | | 2 | | | | 1 | | | | | 1 |
| **CO4** | 3 | 2 | | 2 | | | | | | | | 1 |
| **CO5** | 2 | | | | | | | | | | | 1 |
| **CO6** | 3 | 2 | | | | | | | | | | 1 |

| | |
|---|---|
| **Course Code** | **ASC X51** |
| **Course Title** | **Applied Chemistry (P)** |
| **Type of Course** | **Core** |
| **L T P** | **0 0 3** |
| **Credits** | **1** |
| **Course Objectives** | To teach the fundamentals of chemical sciences essential for the development of new technologies to all branches of engineering. |
| **Course Prerequisites** | Chemistry at 10+2 level |
| **Course Assessment Methods Practical (Continuous and end semester evaluation)** | 50 |
| **Course Outcome : After completion of this course, students will be able to learn about** | 1. Students will learn how to determine the concentration of chloride ion, concentrations of calcium ions, magnesium ions, copper ions in water even at the microscale level or at the industrial scale, and measurement of dissolved oxygen content required for the biological activity of water bodies using volumetric titrations.<br>2. Students will understand the principles of spectroscopy and learn how to apply them for the determination of concentration of unknown samples.<br>3. Students will learn and become familiar with the principles of thermochemistry and learn how to apply them to measure the heat of chemical reactions.<br>4. Students will be able to perform conductometric titrations and will learn how to determine the strength of acid/base by knowing the conductance value.<br>5. Students will learn how to set up an organic/inorganic reaction in the laboratory and will be able to perform reactions such as saponification of oil.<br>6. Students will also acquire a brief knowledge about the relationship between the molecular structure and material behavior of the polymer in the context of its appliance.<br>7. Students will learn the basic principles of thin layer chromatography and how it is used in separation of individual components from mixtures in chemical/biochemical samples. |

Instruction for Students: The candidate will be attending a laboratory session of three hours weekly and has to perform any eight experiments.

**List of Experiments:**

1. Verify Lambert Beer's law using spectrophotometer and CoCl2
or K2Cr2O7 solution. **CO1**
2. To determine the strength of an acid solution by using a conductivity meter. **CO4**
3. Determination of saponification number of oil. **CO5**
4. Preparation of a phenol formaldehyde resin. **CO6**
5. Experiments on TLC (determination of Rf values and identification of various compounds). **CO7**
6. To determine the heat of neutralization of reaction. **CO3**
7. Determination of total hardness of a water sample. **CO1**
8. Determination of copper. **CO1**
9. Determination of chloride ion and dissolved O2 in water. **CO1**
10. Preparation of an inorganic complex/organic compound.**CO5**

**Books Recommended:**


1. A. I. Vogel : A textbook of Quantitative Inorganic Analysis, 2000, Published by Longman Gp. Ltd, 4th edition.
2. Shashi Chawla: Essentials of Experimental Engineering Chemistry. Published by Dhanpat Rai & Co. Delhi (2001).

3. Vogel's text book of quantitative chemical analysis, 6th Ed by J. Mendham, R. C. Denny, J. D. Barnes and M. J. K. Thomas, Pearson Education.

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | | 1 | | 1 | 2 | | | | | 1 |
| **CO2** | 3 | 2 | | 1 | 3 | 1 | 1 | | | | | 1 |
| **CO3** | 3 | | | 1 | | 1 | 1 | | | | | 1 |
| **CO4** | 3 | 2 | | 1 | | 1 | 1 | | | | | 1 |
| **CO5** | 2 | | | 1 | | 1 | 1 | | | | | 1 |
| **CO6** | 3 | 2 | | 1 | | 1 | 1 | | | | | 1 |

| | |
|---|---|
| **Course Code** | **ASM 101** |
| **Course Title** | **Calculus** |
| **Type of Course** | **Core** |
| **L T P** | **4 1 0** |
| **Credits** | **5** |
| **Course Assessment Methods**<br>End Semester Assessment(University Exam)<br>Continuous Assessment (Minors, Assignments, Quiz) | <br>50<br>50 |
| **Course Prerequisites** | Mathematics at 10+2 level |
| **Course Objectives (CO)** | 1. To understand the behaviour of infinite series and its use.<br>2. To learn the concepts of functions of two and more than two variables and their applications.<br>3. To learn the methods to evaluate multiple integrals and their applications to various problems.<br>4. To understand the concepts of Vector calculus and their use in engineering problems. |
| **Course Outcome** | 1. The students are able to test the behaviour of infinite series.<br>2. Ability to analyze functions of more than two variables and their applications.<br>3. Ability to evaluate multiple integrals and apply them to practical problems.<br>4. Ability to apply vector calculus to engineering problems. |

**SYLLABUS**

**Note for the examiner:** The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

**SECTION-A**

**FUNCTIONS OF ONE VARIABLE**

Sequences and Series: Sequences, Limits of sequences, Infinite series, series of positive terms, Integral test, Comparison test, Ratio test, Root test. Alternating series, Absolute and Conditional Convergence, Leibnitz test. Power series: radius of convergence of power series, Taylor's and Maclaurin's Series. (Scope as in Chapter 10, Sections 10.1 – 10.9 of Reference 1).

Integral Calculus: Length of curves, Volume (disk and washer method) and surface areas of revolution (Scope as in Chapter 6, 6.1, 6.3, 6.4 of Reference 1).

**DIFFERENTIAL CALCULUS OF FUNCTIONS OF TWO AND THREE VARIABLES**

Concept of limit and continuity of a function of two and three variables, Partial derivatives, total derivative, composite function, differentiation of an implicit function, chain rule, Taylor's theorem (statement only), Maxima and minima of a function of two and three variables, Lagrange's method of multipliers (Scope as in Chapter 14, Sections 14.1-14.4, 14.6-14.10 of Reference 1).

**SECTION-B**

**INTEGRAL CALCULUS OF FUNCTIONS OF TWO AND THREE VARIABLES**
Double and triple integrals, Change of order of integration, Applications to area and volumes. (Scope as in Chapter 15, Sections 15.1-15.5, 15.7-15.8 of Reference 1).

**VECTOR DIFFERENTIAL CALCULUS**
Vector-valued functions and space curves and their tangents, integration, arc lengths, unit tangent vector, Curvature and torsion of a curve, Gradient of a Scalar field, Directional Derivative (Scope as in Chapter 13, Sections 13.1-13.5 Chapter 14, Section 14.5 of Reference 1).

**VECTOR INTEGRAL CALCULUS**
Line integrals, Vector fields, Work, Circulation and Flux, Path Independence, Potential functions and Conservative fields, Green's theorem in the plane, Surface Areas and Surface Integrals, Stoke's Theorem, Gauss Divergence Theorem (Statements only) (Scope as in Chapter 16 of Reference 1).

| **RECOMMENDED BOOKS** | | | |
|---|---|---|---|
| **S. No.** | **NAME** | **AUTHORS** | **PUBLISHER** |
| 1. | Calculus | Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas | 12th edition, Pearson Education. |
| 2. | Advanced Engineering Mathematics | E. Kreyszig. | 8th edition , John Wiley. |
| 3. | Advanced Engineering Mathematics | Michael D. Greenberg | 2nd edition, Pearson Education. |
| 4. | Advanced Engineering Mathematics | Wylie and Barrett | Tata McGraw Hill |
| 5. | Higher Engineering Mathematics | B. V. Ramana | Tata McGraw Hill. |

| **CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 2 | 3 | | | | | | | | 1 |
| CO2 | 3 | 2 | 2 | 2 | | | | | | | | 1 |
| CO3 | 3 | 2 | 3 | 3 | | | | | | | | 1 |
| CO4 | 2 | 3 | 2 | 2 | | | | | | | | 1 |

| | |
|---|---|
| **Course Code** | **ASM 201** |
| **Course Title** | Differential Equations and Transforms |
| **Type of Course** | **Core** |
| **L T P** | **4 1 0** |
| **Credits** | **5** |
| **Course Assessment Methods**<br>End Semester Assessment(University Exam)<br>Continuous Assessment (Minors, Assignments, Quiz) | <br>50<br>50 |
| **Course Prerequisites** | Mathematics at 10+2 level |
| **Course Outcome** | 1. The student will learn to solve Ordinary Differential equations and their applications to engineering problems.<br>2. The students will be able to apply the tools of Laplace Transforms to model engineering problems and solve the resulting differential equations.<br>3. Students will understand the nature and behaviour of trigonometric (Fourier) series and apply it to solve boundary value problems.<br>4. Students will be able to understand the formulation of partial differential equations and its solution techniques. |

**SYLLABUS**

Note for the examiner: The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

**SECTION – A**

**ORDINARY DIFFERENTIAL EQUATIONS**

Review of geometrical meaning of the differential equation, directional fields, exact differential equations( scope as in chapter 8, sections 8.1 – 8.10 of reference 5), solution of differential equations with constant coefficients; methods of differential operators (scope as in chapter 9, sections 9.1 – 9.5 of reference 5). Non-homogeneous equations of second order with constant coefficients: Solution by method of variation of parameters, reduction by order (scope as in chapter 9, section 9.7, 9.10 of reference 5). Power series method of solution (scope as in chapter 10, section 10.2 of reference 5)

**Laplace Transforms**

Laplace transform, Inverse transforms, shifting, transform of derivatives and integrals. Unit step function, second shifting theorem, Dirac's Delta function. Differentiation and integration of transforms. Convolution Theorem on Laplace Transforms. Application of Laplace transforms to solve ordinary differential equations with initial conditions (Scope as in Chapter 6, Sections 6.1 – 6.6 of Reference 2).

**SECTION – B**

**Fourier Series and Transforms:** Periodic functions, Fourier series, Even and odd series, half range expansions, Complex Fourier Series, Approximation by trigonometric polynomials. Fourier integrals, Fourier Cosine and Sine transforms, Fourier Transforms (Scope as in Chapter 11, Sections 11.1 – 11.2, 11.4-11.5, 11.7 – 11.9 of Reference 2).

**Partial Differential Equations:** Partial differential equations of first order, origin, solution of linear partial differential equations of first order, Integral surfaces passing through a given curve (Scope as in Chapter 2, Sections 1, 2, 4, 5 of Reference 1).

**Boundary Value Problems:** D'Alembert's solution of wave equation, separation of variables: one dimension heat and wave equation (Scope as in Chapter 12, Sections 12.1, 12.3 – 12.4, 12.6, 12.9 of Reference 2).

| **RECOMMENDED BOOKS** | | | |
|---|---|---|---|
| **S.No.** | **NAME** | **AUTHORS** | **PUBLISHER** |
| 1. | Elements of Partial Differential Equations | Ian N. Sneedon | McGraw Hill,Singapore 1957. |
| 2. | Advanced Engineering Mathematics | E. Kreyszig. | 10th edition , John Wiley. |
| 3. | Advanced Engineering Mathematics | Michael D. Greenberg | 2nd edition, Pearson Education. |
| 4. | Advanced Engineering Mathematics | Wylie and Barrett | Tata McGraw Hill |
| 5. | Higher Engineering Mathematics | B.V.Ramana | Tata McGraw Hill. |
| 6. | Advanced Engineering Mathematics | R. K. Jain, S. R. K. Iyenger | Narosa Publications |
| 7. | Theory and problems of Differential Equations | Frank Ayers | Shuam outline series, McGraw-Hill, Singapore, 1957 |

| **CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 3 | | | | | | | | 1 |
| CO2 | 2 | 3 | 2 | 2 | | | | | | | | 1 |
| CO3 | 2 | 2 | 3 | 2 | | | | | | | | 1 |
| CO4 | 2 | 2 | 3 | 2 | | | | | | | | 1 |

| | |
|---|---|
| Course Code | **HSMC X01** |
| **Course Title** | **Professional Communication** |
| **Type of Course** | **Core** |
| **L T P** | **2 0 0** |
| **Credits** | **2** |
| **Course Assessment Methods**<br>End Semester Assessment (University Exam)<br>Continuous Assessment (Minors, Assignments, Quiz) | <br>**50**<br><br>**50** |
| **Course Prerequisites** | Basic knowledge of English Language and Grammar |
| **Course Outcomes (CO)** | After the completion of this course the students will be able to<br>1. Understand sentence formation in English language and based on the context, to express oneself in formal and informal communication.<br>2. Understand and develop the four fundamental skills namely speaking , writing , listening and reading skills in English language.<br>3. Understand as to how communication takes place in organizations. Understand various documents used in official communication in different situations.<br>4. Understand as to how to use the latest channels to build a stronger and effective communication system. Understand the importance and components of Non-verbal communication and how to handle Cross-culture communication. |

Syllabus

**Note for the examiner:** The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

Section A

**English Grammar :** Subject-verb agreement , Noun-pronoun agreement , Misplaced modifiers , Articles , Prepositions , Tenses, One word substitutes , Idioms and Phrases , Active-Passive , Synonyms –Antonyms

**Basic Writing Skills :** Sentence Structures, Use of phrases and clauses in sentences , Importance of proper punctuation , Creating coherence , Organizing principles of paragraphs in documents, Techniques for writing precisely , Paragraph , Essay and Letter writing.

[CO 1 ] ( 11 hours )

**Communication details :** Four Fundamental communication methods namely Writing, Speaking, Listening and Reading ,7 Cs of Communication , Barriers to Communication

[CO 2 ] (3 hours )

Section B

**Communication in Organizations :** Formal- Informal Communication, Communication Networks, Intra and Inter Firm Communication

**Communication methods :** Reports and their types , Layout of a report , writing a report ,Office notice , Memo ,Business proposals, Minutes of meeting

[CO 3 ] ( 6 hours )

**Modes of Communication:** Emerging channels of communication , Telephone and Email Etiquettes, Non-Verbal Communication, Cross culture communication, Formal Presentations

[CO 4 ] ( 3 hours )

**Reference Books**


1. Practical English Usage. Michael Swan. OUP. 1995.

2. Remedial English Grammar. F.T. Wood. Macmillan.2007

3. On Writing Well. William Zinsser. Harper Resource Book. 2001

4. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.

5. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.

6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press


| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | - | 2 | 2 | 2 | - | 2 | 1 | - | 3 | 3 | 3 | 2 |
| CO2 | - | 2 | 2 | 2 | - | 2 | 1 | - | 3 | 3 | 3 | 2 |
| CO3 | - | 2 | 2 | 2 | - | 2 | 1 | - | 3 | 3 | 3 | 2 |
| CO4 | - | 2 | 2 | 2 | - | 2 | 1 | - | 3 | 3 | 3 | 2 |

| | |
|---|---|
| **Course Code** | **HSMC X51** |
| **Course Title** | **Professional Communication (P)** |
| **Type of Course** | **Core** |
| **L T P** | **0 0 2** |
| **Credits** | **1** |
| **Course Assessment Methods** (Continuous and end semester evaluation) | **50** |
| **Course Prerequisites** | Basic knowledge of English Language and Grammar |
| **Course Outcomes (CO)** | After the completion of this course the students will be able to:<br><br>1. Develop their English speaking skills and will learn how to speak clearly and effectively.<br>2. Overcome stage fear and communicate with people without hesitation.<br>3. Handle communication in various formal and informal settings<br>4. Handle communication as team member. Listen and understand. |

Practical Oral Communication (This unit involves interactive practice sessions in Language Lab)

1. Telling something about oneself [ CO1 , CO2, CO3 ]
2. Story Telling and Event [CO1 , CO2 ]
3. Listening Comprehension [CO4 ]
4. Pronunciation, Intonation, Stress and Rhythm [CO1, CO2, CO3 ]
5. Common Everyday Situations: Conversations and Dialogues [CO1, CO2,CO3]
6. Communication at Workplace [CO3 , CO4]
7. Facing an Interview [CO1, CO2 ]
8. Formal Presentations [CO1, CO2, CO3, CO4 ]

**Reference Books**

1. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | - | 2 | 2 | 2 | - | 2 | 1 | - | 3 | 3 | 3 | 2 |
| CO2 | - | 2 | 2 | 2 | - | 2 | 1 | - | 3 | 3 | 3 | 2 |
| CO3 | - | 2 | 2 | 2 | - | 2 | 1 | - | 3 | 3 | 3 | 2 |
| CO4 | - | 2 | 2 | 2 | - | 2 | 1 | - | 3 | 3 | 3 | 2 |

| | |
|---|---|
| **Course Code** | **ESC X53** |
| **Course Title** | **Workshop (P)** |
| **Course Type** | Core |
| **Course LTP** | 0 0 4 |
| **Course Credits** | 2 |
| **Course Assessment**<br>● **Continuous** | 50 (Practical Performance, Report Writing, and Viva Voce) |
| **Course Prerequisites** | Basic workshop practices |
| **Course Objectives** | 1. Know different machines, tools and equipment, Identify different Engineering materials, metals and non-metals.<br>2. Understand different Mechanisms, Use of Machines, Tools and Equipment.<br>3. Knowledge of basic Manufacturing Processes in Electronics, Electrical, Machine, Welding, Fitting, Sheet Metal.Smithy, Foundry and Carpentry Workshops. |
| **Course Outcomes** | 1. Identification of hand tools.<br>2. Introduction of machines.<br>3. Application of hand tools in engineering practices.<br>4. Application of machines in different manufacturing processes.<br>5. Introduction of safety precautions/health hazards/environment effect in engineering.<br>6. On hand training of tools and machines. |

List of Experiments

1. Welding Shop :
   Joining Processes, Welding and its Classification, Welding Processes, Fusion Welding, Pressure Welding, Electric Arc Welding, Gas Welding, Resistance Welding, Metal Inert gas Welding, Welding Joints, Welding Positions, Welding defects, Welding Applications, Basic welding design and Procedures, identification of materials,
   Jobs: Butt Joint in Flat Position using SMAW, Lap Joint using Spot Welding, Edge Joint in Horizontal Position using SMAW, Tee Joint in Flat position using SMAW, Corner Joint in vertical position using SMAW.
   Defect Identification and marking, Edge preparation and Fillet making, Tacking, Distortion identification.

2. Electronics Shop:
   To know about Soldering mechanism and techniques, Familiarity with Electronic Components / symbols, Testing of electronic components, Application of Soldering, Circuit Assembly
   Jobs : Practice of Soldering and desoldering, Identification and testing of a) passive electronic components b) Active electronic components, Assembly of Regulated Power supply circuit/Soldering of Full wave rectifier..

3. Electrical Shop:
   Introduction of Various Electric wirings, Wiring Systems, Electrical wiring material and fitting, different type of cables, Conduit pipe and its fitting, inspection points, switches of all types, Distribution boards, M.C.B's etc., Electric Shock and its management. Electric Tools: Conversance with various tools and to carry out the following: Measurement of wire sizes using SWG and micrometer
   Identification of Phase and neutral in single phase supply
   Jobs: To control a lamp with a single way switch.To control a lamp from two different places,To assemble a fluorescent lamp with its accessories
   To control a lamp, fan and a three pin socket in parallel connection with single way switches

4. Fitting Shop:
   Introduction of Fitting, different type of operations, Tools, materials, precision instruments like Vernier caliper and Micrometer etc, Safety precautions and Practical demonstration of tools and equipments
   Jobs:To make a square from MS Flat, Punching, Cutting, Filling techniques and practice, Tapping, Counter Drilling.

5. Smithy Shop:
   Introduction of Smithy and Forging process, Tools and Equipment, Operations, Heat Treatment processes, Advantages, Dis-advantages, Defects and Safety precautions.
   Jobs: Drawing and Upsetting Practice using Open Hearth Furnace, Cold working process practice, Heat Treatment \: Annealing and hardening process

6. Machine Shop:
   Application, Function and different parts, Operations of Lathe, Type of Cutting Tools and their materials, Drill machine Types, applications and Functions. Hacksaw machines and functions, Work Holding devices and tools, chucks, Vices, machine Vices, V Block, Measuring Instruments uses, Shaper and Milling machine Applications.
   Jobs: To perform Marking, Facing, Turning,taper Turing, Grooving, Knurling, parting, Drilling, Reaming operations on lathe machine,Hacksawing practice on Power hacksaw,Shaping operation practice on Shaper.

7. Carpentry Shop:
   Classification of Tree, Timber. Advantages and uses of Timber, Seasoning of Wood, Tools Used, Defects and Prevention of Wood,
   Jobs: Tee Joint, Cross Joint,Tenon Joint, L Shape Joint, Practice of Wood Working Lathe, Practice on multi-purpose Planer.

8. Foundry Shop:
   Introduction to Foundry, Advantages and Disadvantages of castings process, Introduction to pattern and various hand tools, Ingredients of Green sands, Various Hand Molding processes, Introduction to Casting Defects.
   Jobs: Identification and uses of hand tools, Preparation of Green sand in Muller, Preparation of Sand Mould of Single piece solid pattern, Split pattern, Preparation of Green sand Core, casting of a Mould and study its defects.

Textbooks

| Title | Author | Publisher |
|---|---|---|
| Introduction to Basic Manufacturing Processes and Workshop Technology | Rajender Singh | New Age International Publication |
| Workshop Technology Part 1-3 | Chapman | CBS Publishers |

| | PO 1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | 1 | 2 | 3 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 3 | 3 |
| CO2 | 1 | 2 | 1 | 1 | - | 2 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 3 |
| CO3 | 3 | - | 1 | 2 | 3 | 3 | 1 | 2 | 3 | 1 | 1 | 3 | 3 | 3 |
| CO4 | 1 | 2 | 1 | 1 | - | 2 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 3 |
| CO5 | 3 | 1 | 1 | 2 | 3 | 3 | - | 3 | 3 | 2 | - | 3 | - | 2 |
| CO6 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |

| | |
|---|---|
| **Course Title** | **Basic Electrical and Electronics Engineering** |
| **Course Code** | **EEC X01** |
| **Type of Course** | Core |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Assessment Methods**<br>End Semester Assessment (University Exam.)<br>Continuous Assessment (Sessional, Assignments, Quiz) | <br>50<br>50 |
| **Course Objectives** | 1. To understand basic theorems and concept of DC/AC supply in electrical circuits.<br>2. To understand the basics of transformers.<br>3. To understand the basic concepts of semiconductor diodes.<br>4. To understand the basic concepts of Bipolar Junction Transistors. |
| **Course Outcome (s)** | Students will be able to<br>1. Solve electric circuits using theorems and analyse AC electrical circuits.<br>2. Explain the basics of transformers in electric systems.<br>3. Explain the working principle and characteristics of semiconductor diodes.<br>4. Explain the working principle and characteristics of Bipolar Junction Transistors. |

**Note for Examiner-** Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

**PART-A**

**DC circuits:** Voltage and current sources, KCL, KVL, Network analysis by mesh and node analysis, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum-power transfer theorem (numerical based on these theorem).

(7 hours)

**AC Fundamentals:**Average and RMS values of alternating quantities, solution and phasor diagram of single phase ac circuits with sinusoidal source excitation, voltages and currents in star and delta connected systems, power in a three phase system, solution of three phase balanced circuits, power and power factor measurement by two watt-meters method.

(8 hours)

**Transformers:** Introduction, Basic Principle, EMF equation, losses, efficiency and condition for maximum efficiency, voltage regulation, open circuit and short circuit tests.

(7 hours)

**PART-B**

**Semiconductor Diodes:**Ideal Diode, Semiconductor materials, Energy Levels, Extrinsic materials: n and p type, Semiconductor diode: working principle, silicon semiconductor diode characteristics, Zener region and Zener diode, Si vs Ge diode characteristics, effect of temperature on the characteristics, Light Emitting Diode (working principle).

(8 hours)

**Diode Applications:** Load Line Analysis, Series Diode Configurations with DC inputs, Parallel and Series-Parallel configurations, AND/OR gates, Sinusoidal inputs: Half wave and full wave rectifications, Clipper and clampers.

(7 hours)

**Bipolar Junction Transistors:**Transistor construction and operation, Common-Base configuration: working principle, characteristics and applications, Common-Emitter configuration: working principle, characteristics and applications, Common-Collector configuration: working principle, characteristics and applications

(8 hours)

| Recommended Books: | | | |
|---|---|---|---|
| S. No. | Name | Author | Publisher |
| 1 | Basic Electrical Engineering | T.K. Nagsarkar and M.S. Sakhija | Oxford University Press, 2004 |
| 2 | Electric and Electronics Technology | Edward Hughes | Pearson education Publication Asia, 2003. |
| 3 | Electronics Devices and Circuit Theory | ROBERT BOYLESTAD LOUIS NASHELSKY | PRENTICE HALL Upper Saddle River, New Jersey Columbus, Ohio |

| CO | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 3 | 3 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 2 | 2 | 0 | 3 | 1 | 1 |
| **2** | 3 | 3 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 2 | 2 | 0 | 3 | 1 | 1 |
| **3** | 3 | 3 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 2 | 2 | 0 | 3 | 1 | 1 |
| **4** | 3 | 3 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 2 | 2 | 0 | 3 | 1 | 1 |

| | |
|---|---|
| **Course Title** | **Basic Electrical and Electronics Engineering (P)** |
| **Course Code** | **EEC X51** |
| **Type of Course** | Core |
| **L T P** | 0 0 2 |
| **Credits** | 1 |
| **Course Assessment Methods**<br>Practical (Continuous and end semester evaluation) | 50 |
| **Course Objectives** | 1. To understand basic theorems and concept of DC/AC supply in electrical circuits.<br>2. To understand the basics of transformers.<br>3. To understand the basic concepts of semiconductor diodes.<br>4. To understand the basic concepts of Bipolar Junction Transistors. |
| **Course Outcomes** | Students will be able to<br>1. Solve electric circuits using theorems and solve AC electrical circuits.<br>2. Perform the basic tests of transformers in electric systems.<br>3. Find characteristics of semiconductor diodes.<br>4. Find characteristics of Bipolar Junction Transistors. |

**Note: Any eight experiments are to be done.**

1. Measure resistance and inductive reactance of a choke coil, make a series RLC circuit using the choke coil and obtain its phasor diagram.
2. To prove Superposition and Maximum Power Transfer theorem.
3. To prove Thevenin's and Norton's theorem.
4. To find out the relationship between line current & phase current, between line voltage & phase voltage for star and delta connected loads supplied from balanced three phase supply.
5. Perform Open circuit and short circuit tests on a single phase transformer and to draw its equivalent circuit.
6. To study the V-I characteristics of a semiconductor diode.
7. To study the characteristics of a Zener diode.
8. To study the characteristics of Common-Base configuration of a BJT.
9. To study the characteristics of Common-Emitter configuration of a BJT.
10. To study the characteristics of Common-Collector configuration of a BJT.

| CO | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 2 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 3 | 2 | 1 | 2 | 3 | 0 | 1 |
| **2** | 2 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 3 | 2 | 1 | 2 | 3 | 0 | 1 |
| **3** | 2 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 3 | 2 | 1 | 2 | 3 | 0 | 1 |
| **4** | 2 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 3 | 2 | 1 | 2 | 3 | 0 | 1 |

| | |
|---|---|
| **Course Code** | **ESC X01** |
| **Course Title** | Programming Fundamentals |
| **Type of Course** | Core |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Assessment Methods**<br>End Semester Assessment (University Exam.)<br>Continuous Assessment (Sessional, Assignments, Quiz) | <br>50<br>50 |
| **Course Prerequisites** | None |
| **Course Outcomes (CO)** | 1. To develop simple algorithms for solving arithmetic and logical problems.<br>2. To translate the algorithms to programs using C language and their execution.<br>3. To implement conditional branching, iteration and recursion.<br>4. To demonstrate the decomposition of a problem into functions and synthesize a complete program.<br>5. To examine the use of arrays, pointers and structures for various problems.<br>6. To implement programs for use of various file handling operations. |

**SYLLABUS**

**Note for Examiner**- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

**SECTION-A**

**Unit–1: Introduction to Programming** **[06]**

**Introduction to components of a computer system:** Memory, processor, I/O devices, storage, operating system, concept of assembler, compiler, interpreter, loader and linker.

**Concept of algorithm:** Representation of an algorithm, flowchart, Pseudocode with examples, converting algorithms to programs.

**Programming Basics:** Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language, standard I/O in C, data types, variables and constants, memory storage, storage classes.

**Unit –2: Expressions and Statements** **[10]**

**Expressions and their evaluation:** Operands and Operators, formation of expressions using arithmetic, relational, logical and bitwise operators, precedence and associativity rules , mixed operands, type conversion and evaluation of expressions.

**Statements:** Simple and compound statements, Conditional Branching: if and switch statements, nested if-else, dangling else problem, use of break and default with switch. Iteration and loops: use of while, do while and for loops, nested loops, use of break and continue statements.

**Unit– 3: Arrays & Basic Algorithms** **[07]**

**Arrays:** Array notation and representation, manipulating array elements, using multi-dimensional arrays, character arrays and strings.

**Basic Algorithms:** Searching and Sorting Algorithms (Bubble, Insertion and Selection), finding roots of equations, notion of order of complexity through example programs.

**SECTION-B**

**Unit–4: Functions** **[09]**

Introduction, advantages of modularizing a program into functions, types of functions, passing parameters to functions: call by value, call by reference, passing arrays to functions, recursion with example programs.

**Unit – 5: Structures , Union, Enums and Bit-fields** **[06]**
Defining, declaring and usage of structures, unions and their arrays, passing structures and unions to functions, introduction to enums and bit-fields.

**Unit – 6: Pointers and File handling** **[07]**
**Pointers:** Introduction, declaration, applications, dynamic memory allocation (malloc, calloc, realloc, free), use of pointers in self-referential structures.
**File handling:** File I/O functions, standard C pre-processors, defining and calling macros, command-line arguments.

**TEXT BOOKS**

| S. No. | NAME | AUTHOR(S) | PUBLISHER |
|---|---|---|---|
| 1. | Schaum's Outline of Programming with C | Byron Gottfried | McGraw-Hill |
| 2 | Programming in C: A practical approach | Dr. Ajay Mittal | Pearson Education, 2010 |
| 3 | The C programming | Kernighan Brain W. and Ritchie Dennis M | Pearson Education |
| 4 | Computer Basics and C Programming | V. Rajaraman | PHI Learning, 2015 |
| 5 | Computer Concepts and Programming in C | E Balaguruswamy | McGraw Hill |
| 6 | Computer Science- A Structured Programming Approach Using C | Behrouz A.Forouzan, Richard F. Gilberg, Thomson, Third Edition | Cengage Learning - 2007 |

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | | 1 | | | 1 | 1 | - |
| CO2 | 2 | 2 | 1 | 1 | 1 | | | 1 | 1 | | | | 1 | - |
| CO3 | 2 | 1 | 2 | 1 | | | | | | | | 2 | | |
| CO4 | 3 | 3 | 1 | 1 | | | | 2 | | | | 1 | 1 | 1 |
| CO5 | 3 | 2 | 2 | 1 | | | | | 1 | | | | 1 | 1 |
| CO6 | 2 | 3 | 1 | 1 | 1 | | | 1 | 1 | | | 2 | 1 | 1 |

| | |
|---|---|
| **Course Code** | **ESC X51** |
| **Course Title** | Programming Fundamentals **(P)** |
| **Type of Course** | Core |
| **L T P** | 0 0 3 |
| **Credits** | 1 |
| **Course Assessment Methods**<br>Practical (Continuous and end semester evaluation) | 50 |
| **Course Prerequisites** | None |
| **Course Outcomes (CO)** | 1. To formulate algorithms for simple problems and translate given algorithms to a working and correct program<br>2. To be able to develop programs using arithmetic expressions and if-then else constructs<br>3. To be able to execute iterative as well as recursive programs<br>4. To be able to demonstrate use of arrays, strings and structures for representing data and manipulate them through a program<br>5. To be able to implement various pointers operations and use them in defining self-referential structures.<br>6. To be able to create, read and write to and from simple text files |

Lab1: Familiarization with programming environment

Lab 2: Simple computational problems using arithmetic expressions

Lab 3: Problems involving if-then-else structures

Lab 4: Iterative problems e.g., sum of series

Lab 5: 1D Array manipulation, Arrays: searching, sorting

Lab 6: Matrix problems, String operations

Lab 7: Simple functions and parameter passing

Lab 8: Numerical methods (Root finding, numerical differentiation, numerical integration)

Lab 9: Recursive functions

Lab 10: Pointers and structures

Lab 11: File operations

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | | 1 | | | 1 | 1 | - |
| CO2 | 2 | 2 | 1 | 1 | 1 | | | 1 | 1 | | | | 1 | - |
| CO3 | 2 | 1 | 2 | 1 | | | | | | | | 2 | | |
| CO4 | 3 | 3 | 1 | 1 | | | | 2 | | | | 1 | 1 | 1 |
| CO5 | 3 | 2 | 2 | 1 | | | | | 1 | | | | 1 | 1 |
| CO6 | 2 | 3 | 1 | 1 | 1 | | | 1 | 1 | | | 2 | 1 | 1 |

| | |
|---|---|
| **Course Code** | **ESC X04** |
| **Course Title** | **Engineering Graphics** |
| **Course Assessment Methods**<br><br>End Semester Assessment(University Exam)<br><br>Continuous Assessment (Minors, Assignments, Quiz) | <br><br>50<br><br>50 |
| **Course Objectives (CO)** | 1. To learn computer-aided-drafting skills using computer software.<br>2. To communicate ideas using engineering drawings.<br>3. To be able to interpret and express using standard symbols and conventions of engineering drawing. |
| **Course Outcomes** | 1. Students will gain the ability to draw engineering views of products.<br>2. Ability to turn their ideas into sketches and drawings for good communication.<br>3. Ability to read and understand drawing symbols and conventions.<br>4. Ability to learn fundamental of 2 D construction related to projections of points, lines and planes.<br>5. Ability to draw isometric view of a given orthographic projections.<br>6. Ability to draw and read sectional and auxiliary drawings. |

**SYLLABUS**

**Note for the examiner:** The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

**Section A**

**1. Introduction:** Demonstrating knowledge of the theory of CAD software, Tabs and Panels, The Command Line Box, Command Tools, Starting a New Drawing , Naming a Drawing , Drawing Units, Drawing Limits, Grid and Snap, Save and Save As, Open, Close, Terminology and Conventions, Linear Dimension, Dimension Styles, Units, Aligned Dimensions, Radius and Diameter Dimensions, Angular Dimensions, Ordinate Dimensions, Baseline Dimensions, Continue Dimension, Quick Dimension, Center Mark, MLEADER and QLEADER, Text, Dimensioning Holes, Placing Dimensions, Fillets and Rounds, Polar Dimensions, Chamfers, Symbols and Abbreviations.

**2. Fundamentals of 2D Construction and Advanced Commands:** Line-Random Points, Erase, Line-Snap Point, Line-Dynamic Inputs, Construction Line, Circle, Circle Centerlines, Polyline, Spline, Ellipse, Rectangle, Polygon, Point, Text, Move, Copy, Offset, Mirror, Array, Rotate, Trim, Extend, Break, Chamfer, Fillet, Table, OSNAP, Layer command.

3. **Orthographic Projections**: Principles of Orthographic Projections-Conventions - Projections of Points, Projection of line- Parallel to both H.P. and V.P., Parallel to one and inclined to other, and inclined to both, contained in profile plane. True length and angle determination of straight line: Rotation method and Auxiliary plane method, Traces of a line, Difference between plane and lamina, Projection of lamina- Parallel to one and perpendicular to other, Perpendicular to one and inclined to other, Inclined to both reference planes.

4. **Projection of Regular Solids:** Definition of Solids, Types of solids, and elements of solids, Projection of solids in first quadrant- with axis parallel to one and perpendicular to other, axis parallel to one inclined to other and axis inclined to both the principle planes.

**Section B**

5. **Section of Solids:** Theory of Sectioning, Cutting Plane Lines, Section Lines, Hatch, Styles of Section Lines, Sectioning of Prism, Pyramid, Cone and Cylinder (Simple Cases).

**6. Development of Surfaces:** Purpose of development, Methods of development of prism, cylinder, cone and pyramid surfaces (for right angled solids only).

**7. Isometric Projection:** Classification of pictorial views, Basic Principle of Isometric projection, Difference between isometric projection and isometric drawing. Isometric projection of solids such as cube, prism, pyramid and cylinder.

| **Suggested Books** | | | |
|---|---|---|---|
| **Title** | **Author** | **Publisher** | **Edition** |
| Engineering Graphics with AutoCAD | James Bethune | Pearson | 2016 |
| Fundamentals of Engg. Drawing | Warren J. Luzadder | Literary Licensing, LLC | 2015 |
| Engineering Drawing and Design | Cecil Jensen | Mc-Graw Hill | 2012 |
| Manual of Engineering Drawing | T.E. French | WENTWORTH Press | 2016 |

| **CO** | **PO1** | **PO 2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | - | 1 | 1 | 1 | | 2 | 3 | 2 | 1 | 3 | 2 |
| CO2 | 3 | 2 | 3 | 1 | 1 | 1 | 1 | - | 2 | 3 | 1 | 1 | 3 | 1 |
| CO3 | 3 | 2 | 3 | 1 | 3 | 1 | 1 | - | 2 | 3 | 1 | 1 | 2 | 3 |
| CO4 | 3 | 1 | 3 | 1 | 3 | 1 | 1 | - | 2 | 3 | 1 | 1 | 3 | 1 |
| CO5 | 2 | 1 | 3 | - | 3 | - | - | - | 1 | 3 | - | 1 | 2 | 1 |
| CO6 | 2 | 1 | 3 | - | 3 | - | - | - | 1 | 3 | - | 1 | 2 | 1 |

| | |
|---|---|
| **Course Code** | **ESC X54** |
| **Course Title** | **Engineering Graphics (P)** |
| **Course Assessment Methods**<br><br>Practical (Continuous and end semester evaluation) | <br><br>**50** |
| **Course Objectives** | 1. To learn computer-aided-drafting skills using computer software.<br>2. To be able to apply computer aided drafting tools to create 2D engineering drawings |
| **Course Outcomes** | 1. Ability to learn and understand basic and advanced commands of AutoCAD.<br>2. Ability to draw the two-dimensional drawings using different toolbars of AutoCAD.<br>3. Ability to understand and draw the orthographic projections.<br>4. Ability to draw isometric, sectional and auxiliary views using AutoCAD.<br>5. Ability to draw basic solid models using AutoCAD.<br>6. Ability to learn and use solid editing toolbars and related commands. |

The candidates will be required to make AutoCAD drawing sheets covering the following as per B.I.S. SP46-2003 for general engineering drawing:

1. To draw two dimensional drawings in AutoCAD by using draw, modify, dimension, layers and object-snap toolbars.
2. To draw orthographic views of points.
3. To draw orthographic views of lines and to find traces of the lines.
4. To find true length of lines using rotation as well as trapezoidal method.
5. To draw orthographic views of laminas in different positions.
6. To draw orthographic views of polyhedral solids in different positions.
7. To draw orthographic views of solids of revolution in different positions.
8. To draw sectional views of solids, true sections and apparent sections.
9. To draw isometric views of laminas and solids.
10. To draw development of polyhedral solids.
11. To draw development of solids of revolution.
12. To draw basic solid models using AutoCAD by using solids and solid editing toolbars and related commands.

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | - | 1 | 1 | 1 | | 2 | 3 | 2 | 1 | 3 | 2 |
| CO2 | 3 | 2 | 3 | 1 | 1 | 1 | 1 | - | 2 | 3 | 1 | 1 | 3 | 1 |
| CO3 | 3 | 2 | 3 | 1 | 3 | 1 | 1 | - | 2 | 3 | 1 | 1 | 2 | 3 |
| CO4 | 3 | 1 | 3 | 1 | 3 | 1 | 1 | - | 2 | 3 | 1 | 1 | 3 | 1 |
| CO5 | 2 | 1 | 3 | - | 3 | - | - | - | 1 | 3 | - | 1 | 2 | 1 |
| CO6 | 2 | 1 | 3 | - | 3 | - | - | - | 1 | 3 | - | 1 | 2 | 1 |

| | |
|---|---|
| **Course Code** | **EC 203** |
| **Course Title** | **Digital Design** |
| **Type of Course** | **Core** |
| **L T P** | **3 0 0** |
| **Credits** | **3** |
| **Course Assessment Methods**<br>End Semester Assessment(University Exam)<br>Continuous Assessment (Minors, Assignments, Quiz) | <br>50<br><br>50 |
| **Course prerequisites** | None |
| **Course Objectives (CO)** | 1. To apply minimization techniques for reducing the functions up to six variables.<br>2. To design various combinational circuits<br>3. To write the truth table, excitation table, characteristic equations of various flip flops and to design the sequential circuits using Flip flops.<br>4. To familiarize the various A/D, D/A Converters, Logic families and their characteristics. |
| **Course Outcomes** | 1. Understand the functioning of logic gates, and flip-flops.<br>2. Design and implementation of combinational circuits using different minimization techniques.<br>3. Design counters and shift-registers.<br>4. Understand the working of different data converters and digital logic families. |

**SYLLABUS**

Note for Examiner: The semester question paper will be of 50 marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

**SECTION – A**

**Introduction** (5 hours)

Digital logic, Number Systems and Conversions for Binary, Octal, Decimal, Hexadecimal, Binary Arithmetic, Basic and Universal gates, Boolean Alegbra, Binary addition and subtraction.

**Minimization Techniques** (6 hours)

Sum of Products and Products of Sum forms, Minterms & Maxterms, Karnaugh Map for two, three, four five and six variables, Quine-McCluskey method.

**Combinational Circuit Design** (6 hours)

Half adder, full adder, subtractor, BCD adder, comparator, code converter, encoder decoder, multiplexer, demultiplexer, parity detector and generator, PLA, PAL and ROM

**Flip Flops** (5 hours)

1-bit memory cell, clocked and unclocked flip flops, S-R Flip flop, D flip flop, JK Flip flop, T flip flop, edge triggered flip flop, race around condition , Master slave flip flop, conversion of flip flops using excitation table.

**SECTION - B**

**Counters** (5 hours)

Ripple counter, design of Mod-N ripple counter, design of synchronous counter with and without lockout condition, decade counter, ring counter, Johnson counter

**Shift Registers** (5 hours)

Serial in serial out shift register, serial in parallel out shift register, parallel in serial out shift register and parallel in parallel out shift register, bidirectional shift register, universal shift register.

**A/D and D/A Converters** (6 hours)

Weighted resistor D/A converter, Binary ladder D/A converter. A/D Converters- flash type, successive approximation, counter ramp type, dual slope type, characteristics of ADC and DAC.

**Logic Families** (7 hours)

Characteristics of logic families: fan-out, noise margin, propagation delay, power dissipation. Circuit diagrams and working of DTL, DCTL, $I^2L$, HTL, TTL, Totem pole TTL, ECL, CMOS logic families.

| **RECOMMENDED BOOKS** | | | |
|---|---|---|---|
| **S. No.** | **NAME** | **AUTHORS** | **PUBLISHER** |
| 1. | Digital Design | Morris Mano | PHI, 4th edition |
| 2. | Digital principles and Applications | Malvino Leach | Tata-McGraw Hill |
| 3. | Digital System Principles and Applications | R J Tocci | PHI |
| 4. | Modern Digital Electronics | R P Jain | Tata-McGraw Hill |
| 5. | Digital Integrated Electronics | Taub Schilling | Tata-McGraw Hill |

| **CO** | **PO1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO10** | **PO11** | **PO12** | **PSO 1** | **PSO 2** | **PSO 3** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 2 | 3 | 1 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 3 | 2 | 1 |
| **2** | 3 | 3 | 3 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 3 | 2 | 1 |
| **3** | 3 | 3 | 3 | 3 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 3 | 2 | 1 |
| **4** | 2 | 3 | 2 | 3 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 3 | 3 | 1 |

| | |
|---|---|
| **Course Code** | **EC 253** |
| **Course Title** | **Digital Design (P)** |
| **Type of Course** | **Core** |
| **L T P** | **0 0 3** |
| **Credits** | **1** |
| **Course Assessment Methods**<br>Practical (Continuous and end semester evaluation) | 50 |
| **Course prerequisites** | **None** |
| **Course Objectives (CO)** | 1. To apply minimization techniques for reducing the functions up to six variables.<br>2. To design various combinational circuits<br>3. To write the truth table, excitation table, characteristic equations of various flip flops and to design the sequential circuits using Flip flops.<br>4. To familiarize the various A/D, D/A Converters, Logic families and their characteristics. |
| **Course Outcomes** | 1. Understand the functioning of logic gates, and flip-flops.<br>2. Design and implementation of combinational circuits using different minimization techniques.<br>3. Design counters and shift-registers.<br>4. Understand the working of different data converters and digital logic families. |

**List of Experiments**

1. To Study the data sheets of TTL and ECL gates
2. Implementation of Adder and Subtractor using Logic Gates.
3. Implementation of Binary Adder/Subtractor.
4. Implementation of BCD Adder.
5. Design & implementation of Combinational circuits using Multiplexers
6. Design and implement a Universal shift register having shift-right, shift-left, SISO, PIPO capabilities.
7. Implementation of Flip-flops using Logic Gates.
8. Implementations of Ripple counter.
9. Implementation of Modulo-N Synchronous Counter.
10. Implementation of Synchronous counters with unused states and/or avoiding Lock Out condition.
11. To convert 8 bit Digital data to Analog value using DAC
12. To convert Analog value into 8 bit Digital data using ADC.

| CO | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 2 | 3 | 1 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 3 | 2 | 1 |
| **2** | 3 | 3 | 3 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 3 | 2 | 1 |
| **3** | 3 | 3 | 3 | 3 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 3 | 2 | 1 |
| **4** | 2 | 3 | 2 | 3 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 3 | 3 | 1 |

| | |
|---|---|
| **Course Code** | **EEE 201** |
| **Course Title** | **Fundamentals of Electrical Engineering** |
| **Type of Course** | **Core** |
| **L T P** | **3 0 0** |
| **Credits** | **3** |
| **Course Assessment Methods**<br>End Semester Assessment(University Exam)<br><br>Continuous Assessment (Minors, Assignments, Quiz) | <br>50<br><br>50 |
| **Course prerequisites** | Basic Electrical and Electronics Engineering |
| **Course Objectives (CO)** | 1. To understand basics of measurement of electrical quantities.<br>2. To understand magnetic characteristics of magnetic materials.<br>3. To understand role of instrument transformers.<br>4. To understand basics of electrical machinery.<br>5. To understand basics of power system. |
| **Course Outcomes** | 1. Students will be able to measure quantities accurately using analog instruments.<br>2. Students can apply fundamentals of magnetic circuits in electrical systems.<br>3. Students can analyse the performance of instrument transformers in electrical systems.<br>4. Students will be able to evaluate performance of transformers and understand basic concept of DC and induction machines.<br>5. Students will understand the basic concepts of power system. |

**Note for Examiner-** Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

**PART-A**

**General Theory of Analog Measuring Instruments:** Operating torque, damping & controlling torque, T/W ratio, Pointers & Scales. Principles of operation of various types of electro mechanical indicating / registering instruments viz. PMMC, moving iron, dynamometer for DC & AC measurement of V, I, W, frequency, phase & power factor etc., energy meter.

(8 hours)

**Magnetic Circuits:** Introduction to magnetic circuit, comparison of electric and magnetic circuits, B/H curve, magnetic circuits calculations, self and mutual inductance, flux meter, iron loss measurement by Wattmeter and Bridge methods.

(7 hours)

**Instrument Transformers:** Theory and construction of current and potential transformers, ratio and phase angle errors and their minimization, characteristics of CT and PT, their testing.

(7 hours)

**PART-B**

**Transformers:** Working of transformers under various loading conditions with phasor diagrams, parameter evaluation of transformers.

(7 hours)

**Electric Machines:** Operating principle, working and applications of DC machines. Operating principle, working and applications of three phase induction motors.

(8 hours)

**Introduction to Power System:** Introduction to Resources of electrical power, Conventional Power Plants: Thermal, Hydro, Nuclear, Principle of operation and analysis of fuel cell, photovoltaic systems and wind generation technologies, supply systems: DC/AC supply, AC transmission voltage levels, Single Line Diagram of Power transmission network, Distribution networks and Single Line Diagram of Distribution Networks.

(8 hours)

| Recommended Books: | | | |
|---|---|---|---|
| S. No. | Name | Author | Publisher |
| 1 | A course in electrical and electronics measurements and instruments | A.K. Sawhney | Dhanpat Rai and Sons |
| 2 | Electrical Machines | I.J Nagrath, D.P. Kothari | TMH Publishing Company, 2002. |
| 3 | Electrical Power Systems | Ashfaq Husain | CBS Publishers and Distributors Pvt Limited, 5th Edition |

| CO | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO 11 | PO 12 | PSO 1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3 | 3 | 1 | 1 | 1 | 2 | 1 | | 1 | 2 | 2 | 3 | 3 | 1 | 1 |
| 2 | 3 | 3 | 1 | 1 | 1 | 2 | 1 | | 1 | 2 | 2 | 3 | 3 | 1 | 1 |
| 3 | 3 | 3 | 1 | 1 | 1 | 2 | 1 | | 1 | 2 | 2 | 3 | 3 | 1 | 1 |
| 4 | 3 | 3 | 1 | 1 | 1 | 2 | 1 | | 1 | 2 | 2 | 3 | 3 | 1 | 1 |
| 5 | 3 | 3 | 1 | 1 | 1 | 2 | 1 | | 1 | 2 | 2 | 3 | 3 | 1 | 1 |

| | |
|---|---|
| **Course Code** | **EEE 251** |
| **Course Title** | **Fundamentals of Electrical Engineering (P)** |
| **Type of Course** | **Core** |
| **L T P** | **0 0 3** |
| **Credits** | **1** |
| **Course Assessment Methods**<br>Practical (Continuous and end semester evaluation) | 50 |
| **Course prerequisites** | Basic Electrical and Electronics Engineering |
| **Course Objectives (CO)** | 1. To understand the basics of measurement of electrical quantities.<br>2. To understand the working of AC supply.<br>3. To understand the basics of transformers and induction machines.<br>4. To understand role of instrument transformers in electrical systems. |
| **Course Outcomes** | 1. Students will be able to measure quantities accurately using analog instruments.<br>2. Students can do parameter evaluation on AC supply.<br>3. Students will be able to evaluate basic performance of transformers and induction machines.<br>4. Students can analyse the performance of instrument transformers in electrical systems. |

**Note: Any eight experiments are to be done.**

1. Study of principle of operation of moving iron type and PMMC instruments.
2. To measure power and power factor using wattmeter in single phase circuit.
3. To measure power and power factor using two- wattmeter method in 3-phase load.
4. Plotting of Hysteresis loop for a magnetic material using flux meter.
5. To study phase sequence of 3-phase AC supply.
6. To perform polarity test on transformer.
7. To find self inductance and mutual inductance of 1-phase transformer.
8. Perform Open circuit and short circuit tests on a single phase transformer and to draw its equivalent circuit.
9. To connect, start and reverse the direction of a 3 Phase Induction Motor and measure its speed / torque.
10. To study the connections and use of CT and PT and to find their ratio error.
11. Visit to UIET substation.

| CO | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | | 1 | 2 | 2 | 1 | 3 | 1 | 1 |
| 2 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | | 1 | 2 | 2 | 1 | 3 | 1 | 1 |
| 3 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | | 1 | 2 | 2 | 1 | 3 | 1 | 1 |
| 4 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | | 1 | 2 | 2 | 1 | 3 | 1 | 1 |

| | |
|---|---|
| **Course Code** | **ITC201** |
| **Course Title** | **Object Oriented Programming using C++** |
| **Type of Course** | **PC** |
| **L T P** | **3 0 0** |
| **Credits** | **3** |
| **Total Lectures** | **45** |
| **Course Assessment Methods**<br>End Semester Assessment (University Exam.)<br><br>Continuous Assessment (Minors, Assignments, Quiz) | <br>**50**<br><br>**50** |
| **Course prerequisites** | Programming Fundamentals |
| **Course Objectives (CO)** | 1. To provide students in-depth theoretical base and fundamentals of Object Oriented Programming paradigm.<br>2. To prepare students to design and code various projects using C++. |
| **Course Outcomes** | After completion of this course, the students are able to:<br>1. Understand the fundamentals of Object Oriented Programming paradigm.<br>2. Learn and apply core object oriented concepts like classes, objects, constructors and destructors.<br>3. Demonstrate overloading and type conversion.<br>4. Use the concepts of Inheritance and Pointers.<br>5. Describe and implement various generic programming and file handling operations.<br>6. Analyze information systems in real-world settings and prepare an Object Oriented design for the same. |

**SYLLABUS**

**Note: The examiner shall set seven questions of 10 marks each. First question has to be compulsory, having sections covering the whole syllabus. Three questions have to be set from Section A and three questions from Section B of the syllabus. Candidate is required to attempt at least two questions from each section. All the course outcomes must be covered by the question paper.**

| SECTION-A | Hours |
|---|---|
| **Principles of Objected Oriented Programming**<br>Advantages of OOP, comparison of OOP with Procedural Paradigm | **(3)** |
| **C++ Constructs**<br>Tokens, Expressions and control structures, various data types, and data structures, Variable declarations, Dynamic Initializations, Operators and Scope of Operators, Typecasting, Unformatted and formatted console I/O Operations. | **(3)** |
| **Functions**<br>Classes and Objects: Prototyping, Referencing the variables in functions, Inline, static and friend functions. Memory allocation for classes and objects. Arrays of objects, pointers to member functions. | **(5)** |
| **Constructors and Destructors**<br>Characteristics and its various types, Dynamic Constructors, Applications, Order of Invocation, C++ garbage collection, dynamic memory allocation. | **(5)** |

| | |
|---|---|
| **Polymorphism**<br>Using function and Operator overloading, overloading using friend Functions, type conversions from basic data types to user defined and vice versa | **(5)** |
| **SECTION-B** | |
| **Inheritance**<br>Derived classes, types of inheritance, various types of classes, Invocation of Constructors and Destructors in Inheritance, aggregation, composition, classification hierarchies, metaclass/abstract classes. | **(6)** |
| **Pointers**<br>Constant pointers, Use of this Pointer, Pointer to derived and base classes, virtual functions, Bindings, Pure virtual Functions and polymorphism | **(5)** |
| **I/O Operations and Files**<br>Classes for files, Operations on a file, file pointers | **(4)** |
| **Generic Programming With Templates**<br>Definition of class template, Function Templates, Overloading Template Functions, Class templates and member functions templates with parameters, Standard C++ classes, persistent objects, streams and files, namespaces, exception handling, generic classes, standard template library: Library organization and containers, standard containers, algorithm and Function objects, iterators and allocators, strings, streams, manipulators, user defined manipulators and vectors | **(6)** |
| **Introduction to object oriented Analysis and Design**<br>Object Oriented System, Analysis and Design | **(3)** |

| **RECOMMENDED BOOKS** | | | |
|---|---|---|---|
| **S.No.** | **Name** | **Author** | **Publishers** |
| 1 | Programming with C++, 2nd Edition | Bala Guruswamy | Tata McGraw Hill |
| 2 | C++ Primer Plus | Prata | Pearson Education |
| 3 | The C++ Programming Language | Bjarne Stroutstrup | Prentice Hall of India |
| 4 | The Complete Reference to C++ | Schildt | Tata McGraw Hill |
| 5 | OOPs Using C++ | Sanjeev Sofat | Khanna Publishers |

| **PO/PSO CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 1 | | | | | | | | | | 1 | 1 |
| CO2 | 3 | 3 | 2 | | 3 | | | | | | | | 3 | 2 |
| CO3 | 3 | 3 | 2 | 1 | 3 | | | | | | | | 3 | 2 |
| CO4 | 3 | 3 | 2 | 1 | 3 | | | | | | | | 3 | 2 |
| CO5 | 3 | 3 | 2 | 1 | 3 | | | | | | | | 2 | 2 |
| CO6 | 3 | 3 | 3 | 1 | 3 | | | | | | | | 2 | 2 |

| | |
|---|---|
| **Course Code** | **ITC251** |
| **Course Title** | **Object Oriented Programming using C++ (Practical)** |
| **L T P** | **0 0 3** |
| **Credits** | **1** |
| **Course Assessment Methods**<br>Practical (Continuous and end semester evaluation) | **50** |
| **Course prerequisites** | Programming Fundamentals |
| **Course Objectives** | To enable students to understand the concepts of object oriented programming using C++ by designing and implementing moderately complex problems. Students should master modern tools for computer aided software engineering along with good program documentation. |
| **Course Outcomes** | On completion of this course, the students will be able to:<br>1. Execute programs using basics of C++ e.g. basic data types, operators, loops, arrays, functions, pointers, strings etc.<br>2. Test the concepts of classes, objects and constructors using programs in C++.<br>3. Apply concept of overloading, type casting, inheritance and polymorphism using C++.<br>4. Demonstrate use of file handling in C++.<br>5. Apply concept of templates in C++.<br>6. Demonstrate use of exception handling in C++. |

**List of Experiments**

**To write and implement program on:**

1. Functions, Classes and Objects
2. Constructors and Destructors
3. Operator Overloading and Type Conversion
4. Inheritance and Virtual Functions
5. File Handling
6. Exception Handling and Generic Programming

| PO/ PSO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | | | | | | | | | | 2 | 1 |
| CO2 | 3 | 3 | 3 | 1 | 1 | | | | | | | | 3 | 3 |
| CO3 | 3 | 3 | 3 | 1 | 1 | | | | | | | | 3 | 3 |
| CO4 | 3 | 3 | 3 | 1 | 1 | | | | | | | | 3 | 3 |
| CO5 | 3 | 3 | 3 | 1 | 1 | | | | | | | | 3 | 3 |
| CO6 | 3 | 3 | 3 | 1 | 1 | | | | | | | | 3 | 3 |

| | |
|---|---|
| **Course Code** | **CSC 201** |
| **Course Title** | **Object Oriented Programming** |
| **Type of Course** | Core |
| **L T P** | 3 0 0 |
| **Credits** | 3 |
| **Course Assessment Methods**<br>End Semester Assessment (University Exam.)<br>Continuous Assessment (Sessional, Assignments, Quiz) | <br>50<br><br>50 |
| **Course Prerequisites** | Programming for Problem solving (ESC X01) |
| **Course Outcomes (CO)** | 1. Understand core concepts of OOPs, data types, operators in program design.<br>2. Apply concepts of classes, inheritance, friend function, constructors & destructors, and polymorphism in C++.<br>3. Able to create file handling, various stream classes, and I/O operations.<br>4. Differentiate different types of errors in program design. Understand the exception handling mechanism in programming.<br>5. Examine the given problem and select suitable logic for solving the problem based on Standard Template Library.<br>6. Create/Develop applications for a range of problems using object-oriented programming techniques. |

**SYLLABUS**

**Note for Examiner-** Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

**SECTION-A**

Principles of Objective Oriented Programming. (2 hours )

Tokens, Expressions and control structures, various data types, and data structures, Variable declaration, Operators and scope of operators. (4 hours)

Pointers, Functions, Classes and Objects: Prototyping, referencing the variables in functions, memory allocation for classes and objects, Array of objects, pointers to member functions.

(8 hours )

Constructors and Destructors, Operator Overloading and type conversion. ( 4 hours )

Inheritance: Derived classes, types of inheritance, and various types of classes. ( 5 hours )

**SECTION – B**

Virtual functions and Polymorphism. (5 hours)

I/O operations on files: Classes for files, Operations on a file, file pointers. (8 hours)

Exception Handling and Generic programming with templates: Introduction to templates, Overloading of template functions and Inheritance. Introduction to standard Template Library. (9 hours)

| **TEXT BOOKS** | | | |
|---|---|---|---|
| **S. No.** | **NAME** | **AUTHOR(S)** | **PUBLISHER** |
| 1. | Turbo C++ | Robert and Lafore | Galgotia Publications |
| 2 | C++ Primer Plus | Stephan & PRAT | Galgotia Publications |
| 3 | Object oriented programming with C++ | Bala Guruswamy | Tata McGraw Hill |
| 4 | Object oriented Programming with ANSI and Turbo C++ | Ashok N. Kamthane | Pearson Education |

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 2 | - | - | 2 | - | - | - | 1 | 1 | - | 2 | 3 | 1 |
| 2 | 2 | 3 | 2 | 1 | 2 | - | - | - | 1 | 1 | - | 2 | 3 | 1 |
| 3 | 1 | 3 | 2 | 3 | 3 | - | - | - | 1 | 1 | - | 2 | 3 | 2 |
| 4 | 1 | 3 | 2 | 2 | 3 | - | - | - | 1 | 1 | 1 | 2 | 3 | 2 |
| 5 | | 2 | 2 | 2 | 2 | - | - | - | 2 | - | - | 2 | 3 | 3 |
| 6 | | 3 | 3 | 3 | 3 | 1 | 1 | - | 1 | 1 | 1 | - | 3 | 1 |

| | |
|---|---|
| **Course Code** | **CSC 251** |
| **Course Title** | **Object Oriented Programming (P)** |
| **Type of Course** | Core |
| **L T P** | 0 0 3 |
| **Credits** | 1 |
| **Course Assessment Methods**<br>Practical (Continuous and end semester evaluation) | 50 |
| **Course Prerequisites** | Programming Fundamentals (ESC X01) |
| **Course Objectives** | 1. To provide students in-depth theoretical base and fundamentals of Object Oriented Programming paradigm.<br>2. To prepare students to design and code various projects using C++. |
| **Course Outcomes (CO)** | 1. Understand and create simple programs using object-oriented features such as classes and objects in C++.<br>2. Create classes and extend them for code reuse.<br>3. Develop applications using file stream & I/O.<br>4. Apply template classes and exception handling in programming practice.<br>5. Analyze the problem statement, design, and build C++ application programs using good programming constructs of OOPs.<br>6. Create programs to solve complex application-oriented problems based on OOP concepts |

**List of Experiments:**

**Note: Practical should be covered based on the following directions:**

1. Functions, Classes and Objects
2. Constructors and Destructors
3. Operator Overloading and Type Conversion
4. Inheritance and Virtual Functions
5. Files
6. Exception Handling and Generic Programming

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 2 | - | - | 2 | - | - | - | 1 | 1 | - | 2 | 3 | 1 |
| 2 | 2 | 3 | 2 | 1 | 2 | - | - | - | 1 | 1 | - | 2 | 3 | 1 |
| 3 | 1 | 3 | 2 | 3 | 3 | - | - | - | 1 | 1 | - | 2 | 3 | 2 |
| 4 | 1 | 3 | 2 | 2 | 3 | - | - | - | 1 | 1 | 1 | 2 | 3 | 2 |
| 5 | - | 2 | 2 | 2 | 2 | - | - | - | 2 | - | - | 2 | 3 | 3 |
| 6 | - | 3 | 3 | 3 | 3 | 1 | 1 | - | 1 | 1 | 1 | - | 3 | 1 |

| | |
|---|---|
| **Course Code** | **MEC101** |
| **Course Title** | **Engineering Mechanics** |
| **Course Type** | **Core** |
| **Course LTP** | 3 0 0 |
| **Course Credits** | 3 |
| **Course Assessment**<br>• **Continuous**<br>• **End of Semester** | <br>50 (Sessionals, Assignments, Quizzes)<br>50 (University Examination) |
| **Course Prerequisites** | Physics, Calculus |
| **Course Objectives** | 1. The objective of this course is to present the basic principles of statics and dynamics<br>2. Develop proficiency in applying these principles to formulate and solve statics and dynamics problems.<br>3. Develop sound understanding of the principles of mechanics as these are prerequisites to understanding courses such as - mechanics of deformable bodies, mechanics of fluids, and mechanics of machines. |
| **Course Outcomes** | On successful completion of this course, students are expected to be able to:<br>1. Perform vector analysis<br>2. Analyze forces and moments<br>3. Calculate equilibrium of rigid body reactions and internal forces<br>4. Evaluate the performance of trusses under static **loading** conditions<br>5. Evaluate the planar motion of rigid bodies<br>6. Analyze the rotational motion of rigid bodies |

Syllabus

Note - The examiner will set seven questions of equal marks. The first question, which is compulsory, will cover the entire syllabus, having ten conceptual questions of one mark each or five questions of two marks each. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

Part A

1. Equilibrium of a Particle : Vector Addition of Forces, Position Vectors, Dot Product, Conditions for Equilibrium of a Particle, Free Body Diagram, Coplanar Force Systems. (3)
2. Equilibrium of a RIgid Body : Moment of a Force, cross product, Principle of Moments, Moment of a Force about an axis, Moment of a Couple,
   Centre of Mass, Centre of Gravity, Centroid, Resultant of General Distributed Loading, Area Moment of Inertia, Mass Moment of Inertia.
   Conditions for Rigid Body Equilibrium, Free Body Diagrams, Equations of Equilibrium, Constraints and Statical Determinacy. (7)
3. Structural Analysis : Simple Trusses, Method of Joints, Zero-Force Members, Method of Sections, Frames and Machines, Internal Forces, Shear and Moment. (6)
4. Friction : Characteristics and Problems involving Dry Friction. (4)

Part B

5. Kinematics of a Particle : Rectilinear Motion, Curvilinear Motion, Relative Motion. (3)
6. Kinetics of a Particle : Force and Acceleration - Newton's Second Law of Motion, Equation of Motion,

Equation of Motion for a System of Particles. || Work and Energy - Work of a Force, Principle of Work and Energy (and also for a System of Particles), Power and Efficiency, Conservative Forces and Potential Energy, Conservation of Energy. || Impulse and Momentum - Principle of Linear Impulse and Momentum (and also for a System of Particles), Conservation of Linear Momentum for a System of Particles, Impact, Angular Momentum, Principle of Angular Impulse and Momentum. (9)

7. Plane Kinematics of a RIgid Body : Planar RIgid Body Motion, Translation, Rotation about a fixed axis, Absolute Motion Analysis, Relative Motion Analysis. (3)
8. Planar Kinetics of a RIgid Body : Equations of Motion - Mass Moment of Inertia, Equations of Motion for Translation, Rotation, and General motion || Work and Energy - Kinetic Energy, Work of a Force, Work of a Couple, Principle of Work and Energy. || Impulse and Momentum - Linear and Angular Momentum, Principle of Impulse and Momentum, Conservation of Momentum.(5)

Textbooks

| Title | Author | Publisher |
|---|---|---|
| Engineering Mechanics - Statics and Dynamics ($14^{th}$ ed.) | Hibbeler | Pearson |

References

| Title | Author | Publisher |
|---|---|---|
| Vector Mechanics for Engineers - Statics and Dynamics ($12^{th}$ ed.) | Beer | McGrawHill |

| **CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO 10** | **PO 11** | **PO 12** | **PSO1** | **PSO2** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 2 | 1 | | | | | 1 | 1 | 1 | 2 | 2 |
| CO2 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | | | 1 | 1 | 1 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 3 | 2 | 1 | 1 | | | 1 | 1 | 1 | 2 | 2 |
| CO4 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | | | 1 | 1 | 1 | 2 | 2 |
| CO5 | 2 | 3 | 3 | 2 | 1 | 1 | 1 | | | 1 | 1 | 2 | 2 | 2 |
| CO6 | 2 | 2 | 3 | 1 | 2 | 1 | 1 | | | 1 | 1 | 1 | 2 | 2 |

| | |
|---|---|
| **Course Code** | **MEC151** |
| **Course Title** | **Engineering Mechanics Practical** |
| **Course Type** | **Core** |
| **Course LTP** | 0 0 3 |
| **Course Credits** | 1 |
| **Course Assessment**<br>• **Continuous** | 50 (Practical Performance, Report Writing, and Viva Voce) |
| **Course Prerequisites** | Physics and Calculus |
| **Course Objectives** | 1. To teach students the basic principles underlying the statics and dynamics of particles and rigid bodies.<br>2. To train students to identify, formulate and solve engineering problems in statics and rigid body dynamics.<br>3. To introduce students to the concepts of work-energy and impulse-momentum for rigid bodies and body systems. |
| **Course Outcomes** | 1. To draw free body diagrams to solve engineering problems.<br>2. Determine resultant of various force systems.<br>3. Formulate and solve the equations of equilibrium<br>4. Determine centroid, moment of inertia and solve problems related to friction.<br>5. Students will demonstrate the ability to relate kinematics with kinetic equations on linear displacement, velocity and acceleration.<br>6. Understand the impact of engineering solutions in a global and societal context |

List of Experiments

1. Fundamentals of Statics - Accumulation and resolution of forces with force Parallelogram.
2. Equilibrium of forces.
3. Law of levers - Determination of moments and equilibrium of moments.
4. Inclined Plane and Friction - Determination of the friction coefficient.
5. To verify the law of Moments using Parallel Force apparatus (simply supported type) and bell crank lever.
6. To find CG and moment of Inertia of an irregular body using the Computation method.
7. Forces in a Simple Bar Structure – Measurement and Calculation of bar forces by the method of joints
8. To determine the mechanical advantage, Velocity ratio and efficiency of simple machines (screw jack,wheel and axle)
9. To find the time period of a simple and compound pendulum.
10. To determine the velocity ratio of a simple , compound and epicyclic gear trains
11. Determination of parameters of system of pulleys.

Textbooks

| Title | Author | Publisher |
|---|---|---|
| Engineering Mechanics - Statics and Dynamics ($14^{th}$ ed.) | Hibbeler | Pearson |
| Vector Mechanics for Engineers - Statics and Dynamics ($12^{th}$ ed.) | Beer | McGrawHill |

References

| Title | Author | Publisher |
|---|---|---|
| https://www.gunt.de/en/ | | |
| https://www.tecquipment.com/ | | |

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | | | 1 | 1 | 2 | 2 | 1 |
| CO2 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | | | 1 | 1 | 2 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 2 | 2 | 1 | 1 | | | 1 | 1 | 2 | 2 | 2 |
| CO4 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | | | 1 | 1 | 2 | 1 | 1 |
| CO5 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | | | 1 | 1 | 2 | 2 | 2 |
| CO6 | 3 | 3 | 3 | 3 | 2 | 3 | 1 | 3 | 2 | 2 | 2 | 3 | 3 | 3 |

| | |
|---|---|
| **Course Code** | **CIV 101** |
| **Course Title** | **Fluid Mechanics** |
| **Course Type** | Core |
| **Course LTP** | 3 0 0 |
| **Course Credits** | 3 |
| **Course Assessment Methods**<br>**End Semester Assessment(University Exam)**<br>**Continuous Assessment (Minors, Assignments, Quiz)** | <br>**50**<br>**50** |
| **Course Prerequisites** | |
| **Course Objectives (CO)** | 1. To introduce the students with various types of Fluids and their properties,<br>2. To understand the concept of Fluid Statics<br>3. To understand the concept of Fluid Dynamics,<br>4. to study various types of Flows.<br>5. to study dimensional analysis and model studies |
| **Course Outcome** | 1. Ability to study various types of Fluids and their properties<br>2. To apply concept of Fluid Statics in various engineering problems<br>3. To apply concept of Fluid Dynamics in various engineering problems<br>4. To understand behaviour of various types of Flows.<br>5. To apply dimensional analysis and model studies in engineering problems. |

**Note for the examiner:** The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

**SECTION - A**

**FLUID AND THEIR PROPERTIES** **[4 Lectures]**

Concept of fluid, difference between solids, liquids and gases; ideal and real fluids; Continuum concept of fluid: density, specific weight and relative density; viscosity and its dependence on temperature; surface tension and capillarity, vapor pressure and cavitation: compressibility and bulk modulus; Newtonian and non-Newtonian fluids.

**FLUID STATICS** **[6 Lectures]**

Concept of pressure, Pascal's law and its engineering hydrostatic paradox. Action of fluid pressure on plane (horizontal, vertical and inclined) submerged surface, resultant force and center of pressure, force on a curved surface due to hydrostatic pressure.
Buoyancy and floatation, stability of floating and submerged bodies, Metacentric height and its determination.

**FUNDAMENTALS OF FLUID FLOW** **[5 Lectures]**

Types of fluid flow, Basic Principles of Fluid Flow, Continuity Equation, Acceleration of a Fluid Particle, Rotational and Irrotational Motions, Circulation and Vorticity, Velocity Potential, Stream Function, Streamlines, Equipotential Lines and Flow Net, Uses of Flow Net .

**FLUID DYNAMICS** **[5 Lectures]**

Forces acting on Fluid in motion, Euler's equation of motion, Bernoulli's equation, Impulse momentum equation, kinetic energy and momentum correction factors, flow along a curved streamline, free and forced vortex motions.

**SECTION –B**

**LAMINAR FLOWS** **[4 Lectures]**

Flow regimes and Reynolds number, critical velocity and critical Reynolds number, laminar flow in circular cross section pipes. Navier-stokes equations in Cartesian coordinates (no derivation), meaning of terms, flow between parallel plates, Stoke's law.

**TURBULENT FLOWS** **[5 Lectures]**

Turbulent flows, scale and intensity, Effects of turbulent flow in pipes and flow losses in pipes, Darcy equation, Minor head losses in pipe fittings.. Equation for velocity distribution in smooth and rough pipes (no derivation).

**BOUNDARY LAYER ANALYSIS** **[6 Lectures]**

Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and turbulent boundary layers on a flat plate; laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control.

**DIMENSIONAL ANALYSIS AND SIMILITUDE** **[6 Lectures]**

Fundamental and derived units and dimensions, dimensional homogeneity, Rayleigh's and Buckingham's Pi method for dimensional analysis, dimensionless number and their significance, geometric, kinematic and dynamic similarity, model studies.

**BOOKS:**


| | | | |
|---|---|---|---|
| 1. | Fluid Mechanics | : | Dr. Baljeet S. Kapoor, New Age Publisher |
| 2. | Fluid Mechanics & Hydraulic Power Engineering: | | D.S Kumar, Kataria & Sons |
| 3. | Fluid Mechanics | : | Victor Streeter, McGraw Hill. |
| 4. | Elementary Mechanics of Fluids | : | Hunter Rouse, J. Willey & Sons |
| 5. | Fluid Mechanics | : | Frank M White, McGraw Hill. |
| 6. | Fluid Mechanics & Hydraulic Machines | : | S.C. Gupta, Pearson Education |
| 7. | Hydraulics & Fluid Mechanics | : | Modi And Seth, Standard Book House. |

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 1 | 1 | 1 | - | - | 1 | | 2 | 1 | 1 |
| CO2 | 3 | 3 | 3 | 2 | 2 | 1 | 2 | 1 | - | 1 | 1 | 2 | 2 | 2 |
| CO3 | 3 | 3 | 2 | 2 | 1 | 1 | 1 | - | - | 1 | | 2 | 1 | 2 |
| CO4 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | - | - | 1 | 1 | 2 | 2 | 1 |
| CO5 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 3 | 2 | 2 |

| | |
|---|---|
| **Course Code** | **CIV 151** |
| **Course Title** | **Fluid Mechanics (P)** |
| **Course Type** | Core |
| **Course LTP** | 0 0 3 |
| **Course Credits** | 1 |
| **Course Assessment Methods**<br>**Practical**<br>**(Continuous and end semester evaluation)** | **50** |
| **Course Prerequisites** | **None** |
| **Course Objectives (CO)** | **This Lab course will enable the students to:**<br>1. Enrich the concept of fluid mechanics and hydraulic devices.<br>2. Demonstrate the classical experiments in fluid mechanics.<br>3. Correlate various flow measuring devices such as Venturimeter, orifice meter and notches etc.<br>4. Develop the understanding of fluid kinematics and dynamics. |
| **Course Outcomes** | 1. Understanding of basic physics of fluids.<br>2. Gaining knowledge to calculate and design engineering applications involving fluids.<br>3. Understanding of analyzing flow systems in terms of mass, momentum, and energy balance.<br>4. Having knowledge about practical applications of fluid mechanics in real life engineering problems. |

**List of experiments**

1. To determine the metacentric height of the ship model.
2. To verify Bernoulli's theorem.
3. To determine coefficient of discharge for an Orifice meter.
4. To determine coefficient of discharge of a venturimeter.
5. To determine the various hydraulic coefficients of an Orifice (Cd, Cc, Cv).
6. To determine coefficient of discharge for an Orifice under variable head.
7. To calibrate given rectangular and triangular notches.
8. To determine coefficient of discharge for a mouth piece.
9. Drawing of a flow net by Viscous Analogy Model and Sand Box Model.
10. To study development of boundary layer over a flat plate.
11. To study velocity distribution in a rectangular open channel.
12. Velocity measurements by current meter, float, and double float (demonstration only).
13. Experiment on Vortex formation (demonstration only).

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | - | - | 1 | 1 | 2 | 2 | 1 |
| CO2 | 3 | 3 | 3 | 2 | 2 | 2 | 1 | - | - | 1 | 1 | 2 | 2 | 2 |
| CO3 | 2 | 2 | 3 | 2 | 1 | 1 | 1 | - | - | 1 | - | 2 | 1 | 2 |
| CO4 | 3 | 3 | 3 | 2 | 1 | 1 | 1 | - | 1 | 1 | - | 2 | 2 | 2 |

| | |
|---|---|
| **Course Code** | **BTBS X01** |
| **Course Title** | Fundamentals of Biotechnology |
| **Type of Course** | **Core** |
| **L T P** | **2 0 0** |
| **Credits** | **2** |
| **Course Assessment Methods**<br><br>End Semester Assessment (University Exam)<br><br>Continuous Assessment (Minors, Assignments, Quiz) | <br><br>50<br><br>50 |
| **Course Prerequisites** | None |
| **Course Objectives** | 1. To build on the foundation of biological aspects with emphasis on origin and propagation of various life forms and their constituent molecules.<br><br>2. To develop the concept of biosafety, GLP, GMP and biological waste disposal. |
| **Course Outcome (CO)** | 1. To develop basic understanding about applications of biotechnology.<br><br>2. To understand the components of living systems, cells, tissues and organs.<br><br>3. To be apply the concepts of GLP and GMP in industry settings.<br><br>4. To understand and be able to apply the concept of biosafety, transport and disposal of biomedical waste. |

**Note:** The semester question paper will be of 50 Marks having 7 questions of equal marks. Candidates are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two sections having three questions each and the candidate is required to attempt at least two questions from each section.

**SECTION A**

**Introduction to Biotechnology**: definition, scope, applications in agriculture medical, food industry, bioremediation and future prospects **[CO1]** 2

**Origin of Life:** theories of evolution, chemical evolution, organic evolution, Oparin-Haldane hypothesis, Miller's experiment **[CO1]** 4

**Cell structure and function**: prokaryotic and eukaryotic cell (plant and animal cell), various cell organelles, their structure and functions **[CO2]** 4

## SECTION B

**Types of Animal Tissues:** Basic structure and function of epithelial tissue, connective tissue, muscular tissue and nervous tissue **[CO2]** 4

**Biological Systems:** outlines of the major biological systems – digestive, circulatory, nervous, endocrine, and reproductive system **[CO2]** 4

**Introduction to biosafety, bioethics and IPR in biotechnology:** concept of biosafety, need and application of biosafety in laboratories and industries, international and national norms regarding biosafety, GLP, GMP, bio-medical wastes, transportation of biological materials 3 **[CO3, CO4]**

**Books Recommended:**


| | |
|---|---|
| 1 | Campbell, NA, Reece, JB, Urry, LA, Cain, ML, Wasserman, SA, Minorsky, PV and Jackson, RB: Biology, Pearson/Benjamin Cummings, 8th edition,2008 |
| 2 | Pelczar MJ and Chan ECS (Jr): Microbiology, Tata McGraw Hill Pub. Co., 5th edition,2003 |
| 3 | Nelson DL and Cox MM: Lehninger Principles of Biochemistry, W.H. Freeman and Company, USA. 6th edition,2013 |
| | 4. Singh BD: Biotechnology: Expanding Horizons, Kalyani Publishers, 4th edition,2012 |


| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 1 | - | 1 | - | - | 2 | 1 | 1 | - | - |
| CO2 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | 1 | - | - |
| CO3 | 3 | 1 | 1 | 1 | - | - | - | - | - | - | 1 | 1 | 1 | - | - |
| CO4 | 2 | 2 | 3 | 3 | 1 | 2 | - | - | - | - | 1 | 1 | 1 | - | - |

| | |
|---|---|
| **Course Code** | **BTBS 201** |
| **Course Title** | Fundamentals of Bioengineering |
| **Type of Course** | **Core** |
| **L T P** | **3 0 0** |
| **Credits** | **3** |
| **Course Assessment Methods**<br>End Semester Assessment (University Exam)<br>Continuous Assessment (Minors, Assignments, Quiz) | <br>50<br>50 |
| **Course Prerequisites** | None |
| **Course Objectives (CO)** | 1. To introduce students to the engineering aspect applicable to biological systems for their efficient utilization for product development and make them aware of tools available to achieve the same.<br>2. To introduce students about the principles of engineering, science, and mathematics to solve biological problems. |
| **Course Outcome** | 1. To familiarize the students with the basic biological concepts and their engineering applications.<br>2. To develop critical thinking and problem-solving skills related to bioengineering<br>3. To enable the students with an understanding of basic tools and techniques used in biotechnology<br>4. To familiarize the students about the applications of computers and nanotechnology in biology<br>5. To enable the students develop the interdisciplinary vision of biological engineering |

**Note:** The semester question paper will be of 50 Marks having 7 questions of equal marks. Candidates are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two sections having three questions each and the candidate is required to attempt at least two questions from each section.

**SECTION A**

**Introduction to Engineering Calculations**: System of units, conversion of units, dimensional consistency, scientific notations, mole concept, mixtures and solutions **[CO1]** 4

**Basic Tools in Biotechnology**: types and principles of spectrophotometer, pH meter, autoclave, incubator, lyophilizer, microscope **[CO3]** 10

**Introduction to separation techniques in Biotechnology**: Centrifugation, electrophoresis, chromatography **[CO3]** 7

**Introduction to radioactivity**: types of radionuclides and their applications **[CO3]** 2

## SECTION B

**Concepts in Bioengineering and Bioinstrumentation:** biosensors-concept and construction, bioreactors-design and operation, biomedical instruments-construction and applications of ECG, EEG, MRI, ultrasound **[CO2, CO3]** 12

**Application of Computers to Biology:** concepts of bioinformatics, types of databases, biochips **[CO4]** 6

**Introduction of nano-bioengineering**: Introduction of nano-biotechnology and biological systems at nanoscale, applications of nano-biotechnology in medicine and healthcare. **[CO4, CO5]** 4

**Books Recommended:**


1. Himmelblau, DM and Riggs, JB: Basic Principles and Calculations in Chemical Engineering, PHI Learning Private Limited, 8th edition,2013
2. Wilson K and Walker J: Principles and Techniques of Practical Biochemistry, Cambridge University Press, 5th edition,2000
3. Khandpur RS: Handbook of Biomedical Instrumentation, Tata McGraw Hill, 2nd edition, 2003
4. Attwood, TK, Parry-Smith, DJ and Phukan, S: Introduction to Bioinformatics, Pearson Education Ltd, 1st edition,2007
5. Vo-Dinh, T (Ed.): Nanotechnology in Biology and Medicine: Methods, Devices, and Applications, CRC Press, Taylor & Francis Group,2007


| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | 2 | 2 | 1 | - | - |
| **CO2** | 1 | 3 | 3 | 2 | 1 | 1 | 1 | 1 | - | - | - | - | 1 | - | - |
| **CO3** | 2 | 2 | 2 | 2 | 3 | 1 | 1 | 1 | - | - | - | - | 1 | - | - |
| **CO4** | 2 | 2 | - | - | - | - | 1 | 2 | 3 | - | - | 1 | 1 | - | - |
| **CO5** | 1 | 1 | - | - | - | - | 1 | 2 | 3 | - | - | 1 | 1 | 1 | - |

| | |
|---|---|
| **Course Code** | **BTBS 251** |
| **Course Title** | Fundamentals of Bioengineering (P) |
| **Type of Course** | **Core** |
| **L T P** | **0 0 3** |
| **Credits** | **1** |
| **Course Assessment Methods**<br>Practical (Continuous and end semester evaluation) | 50 |
| **Course Objectives** | 1. To introduce students to the engineering aspect applicable to biological systems for their efficient utilization for product development and make them aware of tools available to achieve the same.<br><br>2. To introduce students about the principles of engineering, science, and mathematics to solve biological problems. |
| **Course Outcomes** | 1. To familiarize the students with the basic biological concepts and their engineering applications.<br><br>2. To develop critical thinking and problem-solving skills related to bioengineering<br><br>3. To enable the students with an understanding of basic tools and techniques used in biotechnology<br><br>4. To enable the students develop the interdisciplinary vision of biological engineering |

**List of experiments**

1. To verify the validity of Beer Lambert law using a spectrophotometer **[CO1, CO2, CO3]**
2. To prepare the standard curve of Bovine Serum Albumin (BSA) **[CO1, CO2]**
3. To observe epithelial tissue under a microscope **[CO3]**
4. To study the working and components of a $CO_2$ incubator **[CO3]**
5. To study the working and components of an autoclave **[CO3]**
6. Acquaintance to NCBI database **[CO4]**
7. To learn the preparation of glycerol stocks **[CO1]**
8. Case study of *Bt* cotton **[CO4]**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | 2 | 2 | 1 | - | - |
| **CO2** | 1 | 3 | 3 | 2 | 1 | 1 | 1 | 1 | - | - | - | - | 1 | - | - |
| **CO3** | 2 | 2 | 2 | 2 | 3 | 1 | 1 | 1 | - | - | - | - | 1 | - | - |
| **CO4** | 1 | 1 | - | - | - | - | 1 | 2 | 3 | - | - | 1 | 1 | 1 | - |

| | |
|---|---|
| Course Code | **HSMC X01** |
| **Course Title** | **Professional Communication** |
| **Type of Course** | **Core** |
| **L T P** | **2 0 0** |
| **Credits** | **2** |
| **Course Assessment Methods**<br>End Semester Assessment (University Exam)<br>Continuous Assessment (Minors, Assignments, Quiz) | <br>**50**<br><br>**50** |
| **Course Prerequisites** | Basic knowledge of English Language and Grammar |
| **Course Outcomes (CO)** | After the completion of this course the students will be able to<br>1. Understand sentence formation in English language and based on the context, to express oneself in formal and informal communication.<br>2. Understand and develop the four fundamental skills namely speaking , writing , listening and reading skills in English language.<br>3. Understand as to how communication takes place in organizations. Understand various documents used in official communication in different situations.<br>4. Understand as to how to use the latest channels to build a stronger and effective communication system. Understand the importance and components of Non-verbal communication and how to handle Cross-culture communication. |

Syllabus

**Note for the examiner:** The semester question paper will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt two questions from each section.

**Section A**

**English Grammar :** Subject-verb agreement , Noun-pronoun agreement , Misplaced modifiers , Articles , Prepositions , Tenses, One word substitutes , Idioms and Phrases , Active-Passive , Synonyms –Antonyms

**Basic Writing Skills :** Sentence Structures, Use of phrases and clauses in sentences , Importance of proper punctuation , Creating coherence , Organizing principles of paragraphs in documents, Techniques for writing precisely , Paragraph , Essay and Letter writing.

[CO 1 ] ( 11 hours )

**Communication details :** Four Fundamental communication methods namely Writing, Speaking, Listening and Reading ,7 Cs of Communication , Barriers to Communication

[CO 2 ] (3 hours )

**Section B**

**Communication in Organizations :** Formal- Informal Communication, Communication Networks, Intra and Inter Firm Communication

**Communication methods :** Reports and their types , Layout of a report , writing a report ,Office notice , Memo ,Business proposals, Minutes of meeting

[CO 3 ] ( 6 hours )

**Modes of Communication:** Emerging channels of communication , Telephone and Email Etiquettes, Non-Verbal Communication, Cross culture communication, Formal Presentations

[CO 4 ] ( 3 hours )

**Reference Books**


1. Practical English Usage. Michael Swan. OUP. 1995.

2. Remedial English Grammar. F.T. Wood. Macmillan.2007

3. On Writing Well. William Zinsser. Harper Resource Book. 2001

4. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.

5. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.

6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press


| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | - | 2 | 2 | 2 | - | 2 | 1 | - | 3 | 3 | 3 | 2 |
| CO2 | - | 2 | 2 | 2 | - | 2 | 1 | - | 3 | 3 | 3 | 2 |
| CO3 | - | 2 | 2 | 2 | - | 2 | 1 | - | 3 | 3 | 3 | 2 |
| CO4 | - | 2 | 2 | 2 | - | 2 | 1 | - | 3 | 3 | 3 | 2 |

| | |
|---|---|
| **Course Code** | **HSMC X51** |
| **Course Title** | **Professional Communication (P)** |
| **Type of Course** | **Core** |
| **L T P** | **0 0 2** |
| **Credits** | **1** |
| **Course Assessment Methods** (Continuous and end semester evaluation) | **50** |
| **Course Prerequisites** | Basic knowledge of English Language and Grammar |
| **Course Outcomes (CO)** | After the completion of this course the students will be able to:<br><br>1. Develop their English speaking skills and will learn how to speak clearly and effectively.<br>2. Overcome stage fear and communicate with people without hesitation.<br>3. Handle communication in various formal and informal settings<br>4. Handle communication as team member. Listen and understand. |

Practical Oral Communication (This unit involves interactive practice sessions in Language Lab)

1. Telling something about oneself [ CO1 , CO2, CO3 ]
2. Story Telling and Event [CO1 , CO2 ]
3. Listening Comprehension [CO4 ]
4. Pronunciation, Intonation, Stress and Rhythm [CO1, CO2, CO3 ]
5. Common Everyday Situations: Conversations and Dialogues [CO1, CO2,CO3]
6. Communication at Workplace [CO3 , CO4]
7. Facing an Interview [CO1, CO2 ]
8. Formal Presentations [CO1, CO2, CO3, CO4 ]

**Reference Books**

1. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | - | 2 | 2 | 2 | - | 2 | 1 | - | 3 | 3 | 3 | 2 |
| CO2 | - | 2 | 2 | 2 | - | 2 | 1 | - | 3 | 3 | 3 | 2 |
| CO3 | - | 2 | 2 | 2 | - | 2 | 1 | - | 3 | 3 | 3 | 2 |
| CO4 | - | 2 | 2 | 2 | - | 2 | 1 | - | 3 | 3 | 3 | 2 |

| | |
|---|---|
| **Course Code** | **HSMC X01** |
| **Course Title** | **Environment Sciences** |
| **Type of Course** | **HSMC** |
| **L T P** | **0 0 0** |
| **Credits** | **1** |
| **Total lectures** | - |
| **Course Assessment Methods:**<br>End Semester Assessment (University Exam.)<br>Continuous Assessment (Sessional) | **-**<br>**Satisfactory/unsatisfactory** |
| **Course Prerequisites** | |
| **Course Objectives** | 1. Create awareness among students about environmental problems,<br>2. Evaluate the scale of degradation of the environment and its allied problems,<br>3. Reflect on the role and responsibility of everyone in the interconnected world<br>4. Encourage social participation towards conservation of environment |
| **Course Outcomes** | 1. Create awareness about the importance of the environment, its basic components and identify the role of individuals in environmental conservation and sustainability.<br>2. Give an overview on the concept of ecology. Describe various parts and structures of ecology. Understand the interaction between social and environmental processes. Introduce methods of ecological and social science knowledge in solving environmental problems.<br>3. Define air pollution, list the source, and scale its effects on living and nonliving things. Evaluate the amounts of air pollutants emitted by monitoring and sampling. Find measures to substantially control the emission of air pollutants and minimize its hazardous impacts on the society.<br>4. Introduce key terms related to water pollution. Explain different types of water pollutants and its adverse impact on human health. Social remedies to control water pollution.<br>**5.** Discuss various types of pollutants (municipal, industrial, commercial, agricultural, hazardous solid wastes): their origin and effects. Solid waste management from collection, segregation, and disposal methods. Role of organized and unorganized sectors towards solid waste management and conservation of land above and below ground level.<br>**6.** To introduce and build an understanding of the various types of noise pollution. Explore questions relating to human activities responsible for it pollution and its socio-economical impacts. Various ways to monitor and curtain the disastrous outcomes due to noise pollution. |

**SYLLABUS**

**This value-added course may be offered as a self-study course via MOOCs/Swayam/NPTEL portal etc. There will be internal assessment for this subject on the basis of presentation/report submission, etc.**

| |
|---|
| **General**<br>Introduction, components of the environment, environmental degradation. |
| **Ecology**<br>Elements of ecology: Ecological balance and consequences of change, principles of environmental impact assessment. |
| **Air pollution and control**<br>Atmospheric composition, energy balance, climate, weather, dispersion, sources and effects of pollutants, primary and secondary pollutants, green house effect, depletion of ozone layer, standards and control measures. |
| **Water pollution and control**<br>Hydrosphere, natural water, pollutants their origin and effects, river/lake/ground water pollution, standards and control. |
| **Land Pollution**<br>Lithosphere, pollutants (municipal, industrial, commercial, agricultural, hazardous solid wastes): their origin and effects, collection and disposal of solid waste, recovery and conversion methods. |
| **Noise Pollution**<br>Sources, effects, standards and control. |

| **RECOMMENDED BOOKS** | | | |
|---|---|---|---|
| **S.No.** | **NAME** | **AUTHORS** | **PUBLISHER** |
| 1. | Introduction to Environmental Engineering and Science | C. M. Masters | Prentice Hall of India Pvt. Ltd., 1991 |
| 2. | Environmental Science | B. J. Nebel | Prentice Hall Inc., 1987 |

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 1 | | 1 | | | | | | | 1 |
| CO2 | 2 | | | | | | | 1 | | | | 1 |
| CO3 | 2 | | 2 | | | | | | | | | 1 |
| CO4 | 2 | 1 | | 1 | | | | | | | | 1 |
| CO5 | 2 | 2 | | | | | | | 1 | | | 1 |
| CO6 | 1 | 1 | | | | | | | | | | 1 |

| | |
|---|---|
| **Course Code** | UHV01 |
| **Course Title** | Universal Human Values |
| **Course Type** | Core |
| **Course LTP** | 0 0 0 |
| **Course Credits** | 3 |
| **Course Assessment Methods:**<br>**End Semester Assessment (University Exam.)**<br><br>**Continuous Assessment (Sessional)** | --<br><br>Satisfactory/Unsatisfactory |
| **Course Prerequisites** | None.<br>Desirable – UHV-I: Universal Human Values-Introduction |
| **Course Objectives** | 1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence .<br>2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.<br>3. Strengthening of self-reflection.<br>4. Development of commitment and courage to act. |
| **Course Outcomes** | On the completion of the course, the students are expected<br>1. To become aware of themselves, and their surroundings (family, society, nature)<br>2. They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relations and human nature in mind.<br>3. To have better critical ability.<br>4. To become sensitive to their commitment towards what they have understood (human values, human relationship and human society).<br>5. To apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction. |

**This value-added course may be offered as a self-study course via MOOCs/Swayam/NPTEL portal etc. There will be internal assessment for this subject on the basis of presentation/report submission, etc.**

The course has 28 lectures and 14 practice sessions in 5 modules:

**Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**

1. Purpose and motivation for the course
2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

**Module 2: Understanding Harmony in the Human Being - Harmony in Myself!** 7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'

8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of 'I' and harmony in 'I'

11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail

12. Programs to ensure Sanyam and Health.

**Module 3: Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship**

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship

14. Understanding the meaning of Trust; Difference between intention and competence

15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship

16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals

17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

**Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence**

18. Understanding the harmony in the Nature

19. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self regulation in nature

20. Understanding Existence as Co-existence of mutually interacting units in all- pervasive space

21. Holistic perception of harmony at all levels of existence.

**Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics**

22. Natural acceptance of human values

23. Definitiveness of Ethical Human Conduct

24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

26. Case studies of typical holistic technologies, management models and production systems

27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

28. Sum up.

**READINGS:**

Text Book

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books New Delhi, 2010

**Reference Books**


1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal

10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English) Gandhi - Romain Rolland (English)

| CO | PO1 | PO 2 | PO3 | PO 4 | PO5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | | | | | | 2 | 2 | | 2 | | 2 |
| CO2 | | | | | | | 2 | 2 | | 2 | | 2 |
| CO3 | | | | | | | 2 | 2 | | 2 | | 2 |
| CO4 | | | | | | | 2 | 2 | | 2 | | 2 |
| CO5 | | | | | | | 2 | 2 | | 2 | | 2 |