# UNDERGRADUATE SECTION

## Chapter- III
## Academic Ordinance for the Undergraduate Studies

(Recommended by the 97th Academic Council held on 08/05/2019 and Approved in the 85th Syndicate Meeting held on 30/07/2019; Amendment at the 130th Academic Council held on 26/07/2022)

### 1. Definitions

1.1 'University' means the Rajshahi University of Engineering & Technology abbreviated as RUET.
1.2 'Syndicate' means Syndicate of RUET.
1.3 'Academic Council' means the Academic Council of the University.
1.4 'Deans Committee' means the Executive Committee of concerned Faculty of the University.
1.5 'Academic Committee' means the Academic Committee for Undergraduate Studies of Department of the University.
1.6 'Vice-Chancellor' means the Vice-Chancellor of the University.
1.7 'Dean' means the Dean of the Faculty of the University.
1.8 'Head of the Department' means the Head of a Department of the University.
1.9 'Central Equivalence Committee' means the Central Equivalence Committee of the University.
1.10 'Degree' means the degree of Bachelor of Science in Engineering or Bachelor of Urban & Regional Planning or Bachelor of Architecture offered by the University.
1.11 'Course System' means pass or fail on course basis.
1.12 'Backlog Courses' means the failed courses after appearing at odd/even semester(s) examination.
1.13 'Short Semester' means a semester for conducting classes and examinations of Backlog course(s) at the end of 4th /5th year Backlog examination result.

### 2. Faculties

The University has four Faculties:

(1) Faculty of Civil Engineering (CE)



(2) Faculty of Electrical & Computer Engineering (ECE)
(3) Faculty of Mechanical Engineering (ME)
(4) Faculty of Applied Science & Humanities (ASH)

### 2.1 Degree Awarding Departments

The University has the following Degree Awarding Departments under four Faculties:

i. Department of Civil Engineering (CE)
ii. Department of Electrical & Electronic Engineering (EEE)
iii. Department of Mechanical Engineering (ME)
iv. Department of Computer Science & Engineering (CSE)
v. Department of Electronic & Telecommunication Engineering (ETE)
vi. Department of Industrial & Production Engineering (IPE)
vii. Department of Glass & Ceramic Engineering (GCE)
viii. Department of Urban & Regional Planning (URP)
ix. Department of Mechatronics Engineering (MTE)
x. Department of Architecture (ARCH)
xi. Department of Electrical & Computer Engineering (ECE)
xii. Department of Chemical & Food Process Engineering (CFPE)
xiii. Department of Materials Science & Engineering (MSE)
xiv. Department of Building Engineering & Construction Management (BECM)
xv. Any other Department to be instituted by the Syndicate on the recommendation of the Academic Council.

### 2.2 Teaching Departments

The University has the following teaching departments as defined in the statutes:

i. Department of Civil Engineering
ii. Department of Electrical & Electronic Engineering
iii. Department of Mechanical Engineering
iv. Department of Computer Science & Engineering
v. Department of Electronic & Telecommunication Engineering
vi. Department of Industrial & Production Engineering
vii. Department of Glass & Ceramic Engineering
viii. Department of Urban & Regional Planning

ix. Department of Mechatronics Engineering
x. Department of Architecture
xi. Department of Electrical & Computer Engineering
xii. Department of Chemical & Food Process Engineering
xiii. Department of Materials Science & Engineering
xiv. Department of Building Engineering & Construction Management
xv. Department of Mathematics
xvi. Department of Physics
xvii. Department of Chemistry
xviii. Department of Humanities
xix. Any other Department to be instituted by the Syndicate on the recommendation of the Academic Council.

**3. Degrees Offered**

The University offers courses leading to the award of the following degrees:

i. Bachelor of Science in Civil Engineering abbreviated as B.Sc. Engg. (CE)
ii. Bachelor of Science in Electrical & Electronic Engineering abbreviated as B.Sc. Engg. (EEE)
iii. Bachelor of Science in Mechanical Engineering abbreviated as B.Sc. Engg. (ME)
iv. Bachelor of Science in Computer Science & Engineering abbreviated as B.Sc. Engg. (CSE)
v. Bachelor of Science in Electronic & Telecommunication Engineering abbreviated as B.Sc. Engg. (ETE)
vi. Bachelor of Science in Industrial & Production Engineering abbreviated as B.Sc. Engg. (IPE)
vii. Bachelor of Science in Glass & Ceramic Engineering abbreviated as B.Sc. Engg. (GCE)
viii. Bachelor in Urban & Regional Planning abbreviated as BURP.
ix. Bachelor of Science in Mechatronics Engineering abbreviated as B.Sc. Engg. (MTE)
x. Bachelor in Architecture abbreviated as B. ARCH.
xi. Bachelor in Electrical & Computer Engineering abbreviated as B.Sc. Engg. (ECE)



xii. Bachelor in Chemical & Food Process Engineering abbreviated as B.Sc. Engg. (CFPE)
xiii. Bachelor in Materials Science & Engineering abbreviated as B.Sc. Engg. (MSE)
xiv. Bachelor in Building Engineering & Construction Management abbreviated as B.Sc. Engg. (BECM)
xv. Any other degree that may be awarded by any department on the approval of the syndicate on the recommendation of the Academic council.

**4. Student Admission, Equivalence and Admission Transfer**

4.1 The four academic years of study for the Bachelor's degree have been designated as 1st year class, 2nd year class, 3rd year class and 4th year class in succeeding higher levels of study. For Architecture, five years of study for the Bachelor degree have been designated as 1st year class, 2nd year class, 3rd year class, 4th year class and 5th year class in succeeding higher levels of study. Students shall be admitted into the 1st year class.

4.2 The Academic Council will form an Admission Committee in each academic session for admission into 1st year Bachelor Degree class.

4.3 A candidate for admission into the 1st year class must have passed the H.S.C Examination from a Secondary and Higher Secondary Education Board in Bangladesh (after 12 years of schooling) with Physics, Chemistry, Mathematics and English as his/her subjects of Examination in Higher Secondary level or examination recognized as equivalent thereto, and must also fulfill all other requirements as prescribed by the Academic Council on the recommendation of the Admission Committee. In case of confusion regarding the equivalence, the case may be referred to Equivalence Committee.

4.4 All candidates for admission into the courses of Bachelor Degree must be the citizens of Bangladesh. Candidates for all seats except the reserved (Tribal) ones, if any, are selected on the basis of merit. However, all candidates must pass the required level as set by the admission committee. The Academic Council, on the recommendation of the Admission

Committee, frames the rules for admission into the reserved seats.

4.5 No student ordinarily is admitted in the 1st year class after the corresponding classes start or after the call goes out for admission into the next session, whichever is earlier.

4.6 Admission of a newly admitted student in the 1st year class is canceled if he/she fails to attend any class within the first two consecutive weeks after the start of class without prior permission. The date of commencement of classes for the newly admitted students will be announced in advance.

4.7 An Equivalence Committee consisting of at least five members will be formed by the Academic Council in order to consider the equivalence of different public examinations.

4.8 A candidate, seeking admission on transfer from other University, should apply to the Registrar of the University if there is any exchange program with that university. The Registrar will refer the case to the concerned Head of the Department and also to the Equivalence Committee. On receiving the opinions of the Head of the Department and of the Equivalence Committee, the matter will be forwarded to the Academic Council. The Academic Council's decision will be communicated to the Head of the Department and the candidate.

4.9 There is no transfer in the 1st year class. In special cases, students may be admitted into a higher class under clause 4.8.

4.10 Every student being admitted to the University shall be examined by a competent medical officer as prescribed in the admission rules.

## 5. Method of Course Offering and Instruction

The undergraduate curricula at RUET are based on course system. The salient features of course system is:

i. Number of theoretical courses and examination papers shall be five in each semester (except for architecture and URP).

ii. Continuous evaluation of student's performance.

iii. The flexibility to allow the student to progress at his/her own pace depending on his/her ability or convenience,



subject to the regulations on credit and minimum grade point average (GPA) requirements.

iv. Promotion of teacher-student contact.

## 6. Academic Calendar

6.1 The academic year is ordinarily divided into two semesters each having duration of not less than 13 weeks.

6.2 There are final examinations at the end of each semester conducted by the respective degree awarding departments of the University.

6.3 On the approval of the Academic Council an academic schedule for the year will be announced for general notification before the start of the academic year.

The schedule may be prepared according to the following guidelines:

| **Odd Semester** | **Duration** |
|---|---|
| Classes | 13 Weeks |
| Mid-semester recess | 1 week |
| Recess before examination and Semester Final Examination | 29 days |
| Inter-Semester Recess | 1 weeks |
| **Even Semester** | **Duration** |
| Classes | 13 Weeks |
| Mid-semester recess | 1 week |
| Recess before examination and Semester Final Examination | 29 days |
| Inter-Year Recess | 1 week |
| Vacation and others | Rest |
| **Total** | **52 Weeks** |
| **Short Semester** | **Duration** |
| Classes and Examinations | 10 Weeks |

## 7. Duration of Course and Course Structure

7.1 Bachelor Degree courses (except Architecture) extend over a period of four academic years (8 semesters), each of a normal duration of one calendar year, which is divided as necessary for the purpose of academic program and conduct of

examinations. For Bachelor degree in Architecture, the period will be five academic years (10 Semesters).

7.2 The curricula of the Bachelor degree in the different departments are as proposed by the respective Academic and Dean's Committee and approved by the Syndicate on the recommendation of the Academic Council.

7.3 The Academic Committee reviews the curricula as required and put forward suggestions to the Academic Council through Dean's Committee.

7.4 Teaching for the courses is reckoned in credits and the credits allotted to various courses are determined by the Academic Committee with the following guidelines:

| Nature of Course | Contact hour | No. of Credit |
|---|---|---|
| i) Theory | 1 hour/week | 1.00 |
| ii) Tutorial | 1 hour/week | 1.00 |
| iii) Independent sessional/design | 3/2 hours/week<br>2 hours/week<br>3 hours/week and similar | 0.75<br>1.00<br>1.50 |
| iv) Project & thesis | 3 hours/week and similar | 1.50 |
| v) Field work / Industrial Training | 2-4 weeks of field work | 1.00-1.50 |

7.5 The total number of credits that a student has to complete successfully for the award of Bachelor degree is minimum 160 except for Bachelor in Architecture. The maximum period of candidature is seven years, i.e., 3 years (6 semesters) more than the normal time required to complete the course. For Architecture the minimum credit will be 200.

7.6 The total number of credits per week in a semester shall be as approved curricula.

7.7 The total contact hours for students including lecture, tutorial and sessional is around 25 (35 for Architecture) periods per week, each period being of minimum 50 minutes duration.



7.8 In each degree-awarding department, one of the senior teachers nominated by the Head of the Department acts as Course Coordinator who acts as Member Secretary to the academic committee.

7.9 A course plan for each course, approved by the Course Coordinator, showing details of lectures may be announced at the start of each semester.

7.10 Credits in any theory subject do not exceed 4 and that in sessional subject do not exceed 3.0. For Architecture credits in sessional subject will not exceed 12.0.

## 8. Course Designation and Numbering System

Details of the course designation and number system are provided in Chapter IV.

## 9. Types of Courses

The courses included in undergraduate curricula are divided into several groups as follows:

**9.1 Core Courses:** In each discipline a number of courses are identified as core courses which form the nucleus of the respective Bachelor's degree program. A student has to complete all of the designated core courses for his discipline.

**9.2 Pre-requisite Course:** Some of the core courses are identified as pre-requisite courses. A pre-requisite course is one, which is required to be completed before taking some other course(s). Any such course, on which one or more subsequent courses build up may be offered in each of the two regular semesters (if possible).

**9.3 Optional Courses:** Apart from the core courses, students have to complete a number of courses which are optional in nature. In those cases, students will have some choices to choose the required number of courses from a specified group/number of courses.

## 10. Departmental Monitoring Committee and Student Adviser

**10.1 Department monitoring committee:** Each department constitutes a Departmental Monitoring Committee with two teachers from the respective Department as members,

nominated by the Academic Committee and Head of the Department as chairman. This committee monitors and evaluates the performance of the Course System within the Department. The committee may also propose from time to time to the Academic Committee if any changes and modifications needed for upgrading/changing the Undergraduate Curriculum and the Course System.

**10.2 Student Adviser:** Advisor(s) are appointed for a batch of student by the Department Monitoring Committee of the concerned Department(s) who advises each student on the courses to be taken by a student. Adviser discusses with the student on his academic program and then decides the nature of courses for which he/she can register. However, it is the student's responsibility to keep contact with his adviser who reviews and eventually approves the student's specific plan of study and checks on subsequent progress. The adviser generally be of the rank of an Assistant Professor or above from the concerned Department(s). However, in case of shortage of teachers, Lecturers may be appointed as adviser.

For a student of second and subsequent semesters, the nature of courses for which he can register will be decided on the basis of his/her academic performance during the previous semester(s). The adviser advises the students to register for the courses during the next semester within the framework of the guidelines in respect of minimum/maximum credit hours limits.

## 11. Registration Requirements

Any student who wants to study a course is required to register formally. Being admitted to the University, each student is assigned to a student adviser. The student can register for courses he/she intends to take during a given semester only on the basis of the advice and consent of his/her adviser.

**11.1 Registration Procedure:** Students must register for each class in which they will participate. Each student will fill up his/her Course Registration Form in consultation with and under the guidance of his/her adviser. The original copy of the Course Registration Form(s) will be submitted to the Registrar's Office, and then the requisite number of copies will be



distributed to the adviser and Head. The date, time and venue for registration will be announced in advance by the Department's Office. It is absolutely necessary that all students present themselves for registration at the specified time.

**11.2 Limits on the Credit Hours to be taken:** A student must be enrolled for the requisite number of credits as mentioned in article 7.6. A student must enroll for the prescribed sessional courses in the respective semester within the allowed credit limits.

**11.3 Pre-condition for Registration:** A student will be allowed to register in those courses subject to the satisfaction of pre-requisite courses. If a student fails in a pre-requisite course in any semester, the concerned Department Monitoring Committee may allow him/her to register for a course which builds on the pre-requisite course provided his attendance and grades in continuous assessment in the said pre-requisite course is found to be satisfactory.

Registration will be done at the beginning of each semester. Late registration is however, permitted during the second week on payment of a late registration fee. Students having outstanding dues to the University or a hall of residence shall not be permitted to register. All students have therefore, to clear their dues and get a clearance or no dues certificate, on the production of which, they will be given necessary Course Registration Forms and complete the course registration procedure. Registration Forms are normally available in the Register's office. An orientation program will be conducted for only the first-year students at the beginning of the first semester when they will be handed over the registration package on producing enrollment slip/proof of admission.

**11.4 Registration Deadline:** Student must register for the courses to be taken within 1 (One) week from the commencement of each semester and no late registration will be accepted after 2 (Two) weeks of classes. Late registration after this date will not be accepted unless the student submits a written appeal to the Registrar through the concerned Head and can document extraordinary circumstances such as medical problems (physically incapacitated and not able to be presented) or some

other academic commitments which precluded enrolling prior to the last date of registration.

**11.5 Penalty for Late Registration:** Students who fail to register during the designated dates for registration are charged a late registration fee Tk 500/= per week. This extra fee will not be waived whatever be the reason for late registration.

**11.6 Withdrawal from a Semester:** If a student is unable to complete the semester Final Examination due to illness, accident or any other valid reason etc., he/she may apply to the Head of the department. Each Department will decide for total withdrawal from the semester before the start of the semester final examination. He/she may choose not to withdraw any laboratory/sessional/design course if the grade obtained in such a course is 'D' or better. The application must be supported by a medical certificate from any authorized Medical Officer. The Academic Council will take the final decision about such applications. However, he/she will not be permitted to the next year class unless he/she completes the required credit for that year.

**12. Striking off the Names and Readmission**

12.1 The names of the students shall be struck off and removed from the rolls on the following grounds:

i) Non-payment of University fees and dues within the prescribed period.

ii) Forced to discontinue his/her studies under disciplinary rules.

iii) Withdrawal of names from the rolls of the University on grounds acceptable to the Vice-Chancellor of the University/ nominated authority after having cleared all dues.

iv) Could not earn required credits for graduation as outlined in the respective curriculum and/or fulfill CGPA requirement within the maximum allowed time of 7 academic years. For Architecture maximum allowed time is 8 academic years.

12.2 Every student whose name has been struck off the rolls by exercise of the clauses (ii) of Article 12.1 seeking re-admission after expiry of the period for which he/she was forced to



discontinue his/her studies, shall submit an application to the Head of the Department in the prescribed form before the commencement of the session to which he/she seeks re-admission. The Head of the Department shall forward the application to the Registrar of the University with his remarks. In case the readmission is allowed, the student will be required on payment of all dues to get him/her-self admitted no later than one week from the date of permission given by the Registrar. All readmission should preferably be completed before the session starts. The percentage of attendance of the re-admitted students shall be counted from the date of recommendation of the concerned Head of the department.

12.3 No student who has withdrawn his/her name under clause (iii) of Article 12.1 shall be given readmission.

12.4 In case, a student whose name has been struck off the rolls under clause (i) of Article 12.1 seeks readmission within the session in which his/her name was struck off, he/she shall be readmitted on payment of all the arrears fees and dues. But if he/she seeks readmission in any subsequent session, the procedure for his/her readmission will be the same as described under Article 12.2.

12.5 The application of a student for readmission will be considered if he/she applies within two academic sessions from the semester of discontinuance of his/her studies in the University. Other than debarment as punishment under the ordinance related to discipline, a student failing for any other reason whatsoever to become a candidate for a semester final examination in which he/she ought to have had in the usual process of his/her progressive academic activities, shall be considered to have discontinued his/her studies for the relevant semester together with striking the name off from current roll and two such discontinuance periods will be considered equivalent to that for one academic session. The maximum period of discontinuance under no circumstances is to exceed two academic sessions during a student's period of studies for the degree.

12.6 In case any application for readmission is rejected, the student may appeal to the Academic Council and, in this case, the decision of the Academic Council shall be final.

12.7 A student, whose name has been struck off the rolls by exercise of clause (iv) of Article 12.1, is not eligible to seek readmission.

12.8 After Short semester, if any student fails to complete his/her required courses he/she will take readmission in the final year.

## 13. Grading System

The letter grade system shall be used to assess the performance of the student and shall be as follows:

| Numerical grade | Letter grade | Grade point |
|---|---|---|
| 80% or above | A+ (A Plus) | 4.0 |
| 75% to less than 80% | A (A Regular) | 3.75 |
| 70% to less than 75% | A- (A Minus) | 3.5 |
| 65% to less than 70% | B+ (B Plus) | 3.25 |
| 60% to less than 65% | B (B Regular) | 3.0 |
| 55% to less than 60% | B- (B Minus) | 2.75 |
| 50% to less than 55% | C+ (C Plus) | 2.5 |
| 45% to less than 50% | C (C Regular) | 2.25 |
| 40% to less than 45% | D | 2.0 |
| Less than 40% | F | 0 |
| Incomplete | I | - |
| Need to register | - | - |

A grade 'I' shall be awarded for courses (like project & thesis, design etc.) in the odd semester, which continues through to the even semester.

**13.1 Calculation of GPA and CGPA:** Grade point average (GPA) is the weighted average of the grade points obtained in all the courses passed/completed by a student in a semester. 'F' grades do not count for GPA calculation. GPA of a semester will be calculated as follows:

$$GPA = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i}$$



where, n is the total number of courses passed by the student, $C_i$ is the number of credits allotted to a particular course i and $G_i$ is the grade point corresponding to the grade awarded for i-th course.

The overall or Cumulative Grade Point Average (CGPA) gives the cumulative performance of the student from first semester up to any other semester to which it refers and is computed by dividing the total grade points ($\Sigma C_i G_i$) accumulated up to the date by the total credit hours ($\Sigma C_i$). Both GPA and CGPA are rounded off to the second place of decimal for reporting.

## 14. Distribution of Marks

14.1 The distribution of marks for a given course is as follows:

**i) Theory courses:**

Continuous assessment (40%)
Summative assessment (60%)

| | |
|---|---|
| Class Participation and Attendance | 10 |
| Class Tests | 20 |
| Assignment/ Project/ Viva Voce/Presentation/ etc. | 10 |
| Semester Final Examination (3 hours duration) | 60 |
| Total | 100 |

*** Minimum requirement to pass in the theory course is 15 marks out of 60 in the semester final exam.

**ii)Independent laboratory/sessional/design/fieldwork courses:**

| | |
|---|---|
| Class participation and attendance | 10 |
| Quizzes/viva voce | 20 |
| Board Viva (Compulsory) | 25 |
| Lab performance/reports | 45 |
| Total | 100 |

**iii) Project and thesis (Architecture):**

| | |
|---|---|
| Class participation and attendance | 10 |
| Supervisor (Internal Examiner) | 20 |
| Viva voce/ Jury | 30 |
| Internal criticisms | 40 |
| Total | 100 |

**iii) Project and thesis:**

| | |
|---|---|
| Viva voce (conducted by a viva voce committee) | 30 |
| Supervisor (internal examiner) | 50 |
| External examiner (any other teacher of the department/Examination committee) | 20 |
| Total | 100 |

14.2 Basis for awarding marks for class participation and attendance will be as follows:

| Attendance | Marks |
|---|---|
| 90% and above | 10 |
| 85% to less than 90% | 9 |
| 80% to less than 85% | 8 |
| 75% to less than 80% | 7 |
| 70% to less than 75% | 6 |
| 65% to less than 70% | 5 |
| 60% to less than 65% | 4 |
| Less than 60% | 0 |

14.3 The students will not be allowed to sit in the semester final examination for failing to attend at least 50% in the classes. The students whose percentage of attendance will fall short of 75% in any of the theory, sessional courses for which he/she has registered in one academic year shall not be eligible for the award of any type of scholarship/stipend/grant for the following academic session.

**15. Class tests**

i) 3 best out of 4 class tests may be taken for awarding grade.

ii) Duration of class tests normally should be 20-30 minutes and materials covered should be what were taught in 2 to 3 previous weeks or most recent classes.

iii) The dates for the class tests shall be fixed by the Head or Course Coordinator and dates shall be announced accordingly.

iv) All class tests shall ordinarily be of equal value. The result of each individual class test shall be posted for information of the students preferably before the next class test is held.



**16. Earned Credits**

The courses in which a student has obtained 'D' or a higher Grade will be counted as credits earned by him/her. Any course in which a student has obtained 'F' grade will not be counted towards his/her earned credits.

A student, who obtains a 'F' grade in any Core Course in any semester, he/she will have to repeat the course. If a student obtains a 'F' in an Optional Course, he/she may choose to repeat the course or take a substitute course if available.

'F' grades will be considered as backlog courses. 'F' grades will not be counted for GPA calculation but will stay permanently on the Grade Sheet and Transcript.

A student obtaining D grade in a course will be allowed to repeat the course for the purpose of grade improvement if CGPA of the student falls below 2.20. In such case he/she will be awarded the new grade thus he/she obtains or retains his/her previous grade if he/she fails.

**17. Performance Evaluation**

i) The minimum CGPA requirement for obtaining a B.Sc. Engineering/ Bachelor degree is **2.20**. The performance of a student will be evaluated in terms of two indices, viz. Semester grade point average and cumulative grade point average.

ii) Students will be allowed to sit in Backlog examination for maximum 3 courses (in same year) in an academic year. However only 4$^{th}$ year students are allowed to choose 3 courses from his/her Backlog course(s).

iii) Students must complete minimum 33 credits (Odd, Even semesters and Backlog examination) in each academic year for promotion to the next academic year.

**18. Honors, VC's List and University gold medal**

**18.1 Honors:** Candidates for Bachelor's degree will be awarded the degree with honors if their CGPA is 3.75 or above and will be called as First Class with Honors.

**18.2 Class:** Candidates having CGPA 3.00 or above and less than 3.75 will be called as First Class and Candidates having CGPA **2.20** or above and less than 3.00 will be called as Second Class.

**18.3 VC's List:** In recognition of excellent performance, the names of students who maintain good standing with the University obtaining SGPA of 3.75 or above in two regular semesters in each academic year may be published in the VC's List in each department. Students who have received F grade in any course during any of the two regular semesters will not be considered for VC's List in that year.

**18.4 University Gold Medal:** If a student can show extraordinary brilliance and obtains all A or better grades in all the courses, he/she attended and fulfills the credit requirement for graduation will be honored by awarding University gold medal in a special function/convocation.

## 19. Student Classification

The regular students are classified according to the number of credit hours earned towards a degree shown in the following table:

| Year | Earned Credits |
|---|---|
| First Year | 0 to 33 |
| Second Year | 34 to 66 |
| Third Year | 67 to 99 |
| Fourth Year | 100 and above/<br>For Architecture 100 to 132 |
| Fifth Year (Architecture) | 133d above (Arch) |

## 20. Registration for the Second & Subsequent Semesters

A student is normally required to register courses according to the approved curricula in each semester. After odd semester final examination, Students will normally register courses in even semester.

## 21. Measures for Helping Academically weak Students

The following provisions are made in order to help academically weak students to enable them to complete their studies within the maximum period of seven years. Adviser will keep special



contact for all such students whose Cumulative grade point average (CGPA) is less than **2.20** at the end of a semester.

## 22. Backlog Examination

i) There will be Backlog Examination after the publication of result of Even semester examination.
ii) 'F' grade(s) obtained after semester examination will be considered as backlog course(s).
iii) Students are allowed to sit for maximum 3 backlog courses in odd and/or even semester(s).
iv) Class test marks of Backlog courses in odd/even semester(s) will be counted for Backlog examination.
v) Maximum B (B regular) grade will be counted in Backlog examination.

**Backlog Courses:** The course(s) which a student registered in a Semester but after Semester examination he/she obtained 'F' grade in that course(s).

## 23. Short Semester Examination:

The Short Semester Examination on only backlog courses may be conducted for the students who have participated in their 4(four)/5(Five) year degree course (up to $4^{th}$ /$5^{th}$ year backlog examination). A student can register maximum 5 (Five) incomplete courses including sessional, project and thesis to obtain Bachelor degree. The short semester examination will be arranged in a convenient time by the Head of the Department within 10 weeks of the publication of results of the final year backlog examination. The evaluation system will be the similar as regular semester. The students willing to appear at the short semester examination have to apply to the Head of the Department and with his permission must register within 15 (Fifteen) working days of publication of final year Backlog examination results. **Maximum grade B** will be counted in short semester examination.

**24. Minimum Earned Credit and GPA Requirements for Obtaining Degree:**

Minimum credit requirements for the award of Bachelor Degree will be recommended by the respective Academic Committee to the Academic Council. The minimum CGPA requirements for obtaining a Bachelor Degree are 2.20.

**25. Time Limits for Completion of Bachelor's Degree**

A student must complete his/her studies within a maximum period of seven years for 4-year bachelor degree and eight years for 5-year bachelor degree.

**26. Industrial/Professional Training Requirements**

Depending on each Department's own requirement a student may have to complete a prescribed number of days for industrial/professional training as mentioned in the course curricula.

**27. Application for Graduation and Award of Degree**

A student who has fulfilled all the academic requirements for bachelor's degree will have to apply to the Registrar/VC through his/her Adviser for graduation. Provisional degree will be awarded on completion of Credit and GPA requirements. Such provisional degrees will be confirmed by the academic council.

**28. Inclusion of repeaters from the present system to the new course system**

Repeater students will be included in the course system of curricula as and when such situation will arise. Equivalence of Courses and Grades (if required) will be done by Academic Council with recommendation by the respective Academic and Dean Committee.

**29. Absence during Semester**

A student should not be absent from quizzes, tests etc. during the semester. Such absence will naturally lead to reduction in points/marks, which count towards the final grade. Absence in semester final examination due to lack of attendance (less than



50%) only of any courses will be considered as unregistered, hence requires a new registration with a regular semester.

A student who has been absent for short period, up to a maximum of three weeks due to illness, should approach the course teacher(s) or the course coordinator(s) for a make-up quizzes or assignments immediately on returning to the classes. Such request should be supported by medical certificate from university medical officer. The medical certificate issued by a registered medical practitioner (with the registration number shown explicitly or the certificates) will also be acceptable only in those cases where the student has valid reason for his/her absence from the University.

## Chapter - IV
## Course Structure of the Undergraduate Studies

**[Effective from student entry session 2020-2021]**

### Course Designation and Numbering System

Each course is designated by a three to four letter word identifying the department which offers it following by a four-digit number with the following criteria:

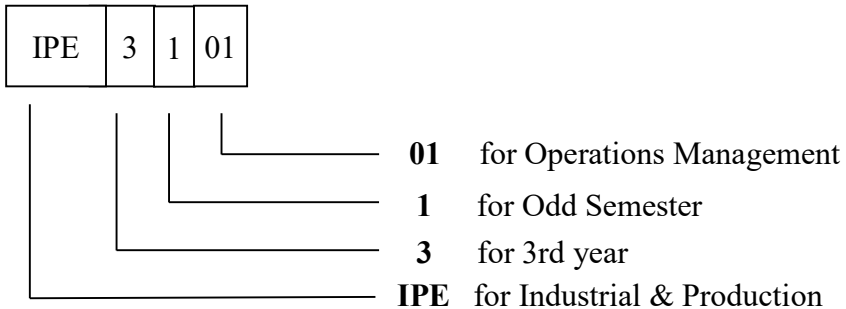
a) The first digit corresponds to the year in which the course is normally taken by the students.
b) The second digit corresponds to the semester in that year.
c) The 3rd and 4th digits are reserved for departmental use indicating major area.
d) The 4th digit is usually odd for theoretical and even for laboratory or sessional courses.
e) Credit (Cr.) is a unit by which course/Sessional work is measured. It acts as a weight for overall result.
f) Contact hours indicates most traditionally the number of hours and meaningful interaction between students and their teacher for a course. For theory course, the contact hours will be same as credit of the course and for sessional course contact hours will be doubled to credit of the course.

The course designation system is illustrated by one example as shown below:

Course No. **IPE 3101**

Course Title: **Operations Management**

Credit: **3.00** Contact Hour/ Week: **03**






## 1st Year Odd Semester

| SL. No. | Course No. | Course Title | Theory | | Sessional | | Total Cr. |
|---|---|---|---|---|---|---|---|
| | | | Contact Hour/ Week | Cr. | Contact Hour/ Week | Cr. | |
| 1 | Chem 1123 | Inorganic and Physical Chemistry | 03 | 03 | | | 3.00 |
| 2. | Phy 1123 | Physics-I | 03 | 03 | - | - | 3.00 |
| 3. | Math 1123 | Engineering Mathematics-I | 04 | 04 | - | - | 4.00 |
| 4. | Hum 1123 | Economics | 03 | 03 | | | 3.00 |
| 5. | EEE 1183 | Electrical Engineering-I | 03 | 03 | - | - | 3.00 |
| 6. | IPE 1100 | Engineering Graphics-I | - | - | 3.0 | 1.50 | 1.50 |
| 7. | Chem 1124 | Chemistry Lab | - | - | 1.5 | 0.75 | 0.75 |
| 8. | Phy 1124 | Physics-I Lab | - | - | 1.5 | 0.75 | 0.75 |
| 9. | EEE 1184 | Electrical Engineering-I Lab | - | - | 3.0 | 1.50 | 1.50 |
| **Total** | | | **16** | **16** | **9.0** | **4.50** | **20.50** |

| | |
|---|---|
| No. of Theory Course = 05 | Total Credit = 20.50 |
| No. of Sessional Course = 04 | Total Contact Hour = 25.00 |

## 1st Year Even Semester

| SL. No. | Course No. | Course Title | Theory | | Sessional | | Total Cr. |
|---|---|---|---|---|---|---|---|
| | | | Contact Hour/ Week | Cr. | Contact Hour/ Week | Cr. | |
| 1. | Chem 1223 | Industrial Chemistry | 03 | 03 | - | - | 3.00 |
| 2. | Phy 1223 | Physics-II | 03 | 03 | - | - | 3.00 |
| 3. | Math 1223 | Engineering Mathematics-II | 03 | 03 | - | - | 3.00 |
| 4. | ME 1251 | Thermodynamics and Heat Transfer | 04 | 04 | - | - | 4.00 |
| 5. | EEE 1283 | Electrical Engineering-II | 03 | 03 | - | - | 3.00 |
| 6. | IPE 1200 | Engineering Graphics-II and CAD Lab | - | - | 3.0 | 1.50 | 1.50 |
| 7. | IPES 1202 | Shop Practice-I | - | - | 1.5 | 0.75 | 0.75 |
| 8. | Phy 1224 | Physics-II Lab | - | - | 1.5 | 0.75 | 0.75 |
| 9. | EEE 1284 | Electrical Engineering-II Lab | - | - | 3.0 | 1.50 | 1.50 |
| **Total** | | | **16** | **16** | **9.0** | **4.50** | **20.50** |

| | |
|---|---|
| No. of Theory Course = 05 | Total Credit = 20.50 |
| No. of Sessional Course = 04 | Total Contact Hour = 25.00 |

## 2nd Year Odd Semester

| SL. No. | Course No. | Course Title | Theory | | Sessional | | Total Cr. |
|---|---|---|---|---|---|---|---|
| | | | Contact Hour/ Week | Cr. | Contact Hour/ Week | Cr. | |
| 1. | IPE 2101 | Engineering Economy | 02 | 02 | - | - | 2.00 |
| 2. | IPE 2113 | Engineering Materials and Metallurgy | 04 | 04 | - | - | 4.00 |
| 3. | Math 2123 | Engineering Mathematics-III | 04 | 04 | - | - | 4.00 |
| 4. | Hum 2123 | Technical English and Sociology | 03 | 03 | - | - | 3.00 |
| 5. | ME 2161 | Engineering Mechanics and Theory of Machines | 04 | 04 | - | - | 4.00 |
| 6. | IPES 2102 | Shop Practice-II | - | - | 1.5 | 0.75 | 0.75 |
| 7. | IPE 2114 | Engineering Materials and Metallurgy Lab | - | - | 1.5 | 0.75 | 0.75 |
| 8. | ME 2152 | Thermodynamics and Heat Transfer Lab | - | - | 3.0 | 1.50 | 1.50 |
| **Total** | | | **17** | **17** | **6** | **3** | **20.00** |

| | |
|---|---|
| No. of Theory Course = 05 | Total Credit = 20.00 |
| No. of Sessional Course = 03 | Total Contact Hour = 23.00 |

## 2nd Year Even Semester

| SL. No. | Course No. | Course Title | Theory | | Sessional | | Total Cr. |
|---|---|---|---|---|---|---|---|
| | | | Contact Hour/ Week | Cr. | Contact Hour/ Week | Cr. | |
| 1. | IPE 2201 | Organizational Behavior | 02 | 02 | - | - | 2.00 |
| 2. | IPE 2203 | Probability and Statistics | 04 | 04 | - | - | 4.00 |
| 3. | IPE 2211 | Production Process-I | 03 | 03 | - | - | 3.00 |
| 4. | ME 2251 | Mechanics of Solids | 04 | 04 | - | - | 4.00 |
| 5. | CSE 2283 | Introduction to Computer Programming | 03 | 03 | - | - | 3.00 |
| 6. | IPE 2212 | Production Process-I Lab | - | - | 1.5 | 0.75 | 0.75 |
| 7. | Hum 2224 | English Language Practice | - | - | 1.5 | 0.75 | 0.75 |
| 8. | ME 2252 | Solid Mechanics Lab | - | - | 1.5 | 0.75 | 0.75 |
| 9. | CSE 2284 | Introduction to Computer Programming Lab | - | - | 2.0 | 1.00 | 1.00 |
| **Total** | | | **16** | **16** | **6.50** | **3.25** | **19.25** |

| | |
|---|---|
| No. of Theory Course = 05 | Total Credit = 19.25 |
| No. of Sessional Course = 04 | Total Contact Hour = 22.50 |



## 3rd Year Odd Semester

| SL. No. | Course No. | Course Title | Theory | | Sessional | | Total Cr. |
|---|---|---|---|---|---|---|---|
| | | | Contact Hour/ Week | Cr. | Contact Hour/ Week | Cr. | |
| 1. | IPE 3101 | Operations Management | 03 | 03 | - | - | 3.00 |
| 2. | IPE 3103 | Operations Research | 04 | 04 | - | - | 4.00 |
| 3. | IPE 3105 | Product Design-I | 03 | 03 | - | - | 3.00 |
| 4. | IPE 3111 | Production Process-II | 03 | 03 | - | - | 3.00 |
| 5. | IPE 3121 | Management Information system and Programming | 03 | 03 | - | - | 3.00 |
| 6. | IPE 3106 | Product Design-I Lab | - | - | 3.0 | 1.50 | 1.50 |
| 7. | IPE 3112 | Production Process-II Lab | - | - | 1.5 | 0.75 | 0.75 |
| 8. | IPE 3122 | Management Information system and Programming Lab | - | - | 1.5 | 0.75 | 0.75 |
| **Total** | | | **16** | **16** | **6.00** | **3.00** | **19.00** |

| | |
|---|---|
| No. of Theory Course = 05 | Total Credit = 19.00 |
| No. of Sessional Course = 03 | Total Contact Hour = 22.00 |

## 3rd Year Even Semester

| SL. No. | Course No. | Course Title | Theory | | Sessional | | Total Cr. |
|---|---|---|---|---|---|---|---|
| | | | Contact Hour/ Week | Cr. | Contact Hour/ Week | Cr. | |
| 1. | IPE 3201 | Quality Control and Management | 03 | 03 | - | - | 3.00 |
| 2. | IPE 3205 | Product Design–II | 03 | 03 | - | - | 3.00 |
| 3. | IPE 3211 | Machine Tools | 04 | 04 | - | - | 4.00 |
| 4. | Math 3223 | Engineering Mathematics-IV | 04 | 04 | | | 4.00 |
| 5. | ME 3251 | Fluid Mechanics and Machinery | 03 | 03 | - | - | 3.00 |
| 6. | IPE 3200 | IPE Case Study | - | - | 2.0 | 1.0 | 1.00 |
| 7. | IPE 3206 | Product Design-II Lab | - | - | 3.0 | 1.50 | 1.50 |
| 8. | IPE 3212 | Machine Tools Lab | - | - | 1.5 | 0.75 | 0.75 |
| 9. | Math 3224 | Numerical Analysis Lab | - | - | 1.5 | 0.75 | 0.75 |
| 10. | ME 3252 | Fluid Mechanics and Machinery Lab | - | - | 1.5 | 0.75 | 0.75 |
| **Total** | | | **17** | **17** | **9.50** | **4.75** | **21.75** |

| | |
|---|---|
| No. of Theory Course = 05 | Total Credit = 21.75 |
| No. of Sessional Course = 05 | Total Contact Hour = 26.50 |

## 4th Year Odd Semester

| SL. No. | Course No. | Course Title | Theory | | Sessional | | Total Cr. |
|---|---|---|---|---|---|---|---|
| | | | Contact Hour/ Week | Cr. | Contact Hour/ Week | Cr. | |
| 1. | IPE 4100 | Project and Thesis | | | 3.0 | 1.50 | 1.50 |
| 2. | IPE 4101 | Industrial and Business Management | 03 | 03 | - | - | 3.00 |
| 3. | IPE 4103 | Ergonomics and Safety Management | 03 | 03 | - | - | 3.00 |
| 4. | IPE 4121 | Measurement and Instrumentation | 03 | 03 | - | - | 3.00 |
| 5. | IPE 4123 | CAD/CAM | 03 | 03 | - | - | 3.00 |
| 6. | IPE 4131(*) | Optional-I | 03 | 03 | - | - | 3.00 |
| 7. | IPE 4104 | Ergonomics and Safety Lab | - | - | 1.5 | 0.75 | 0.75 |
| 8. | IPE 4122 | Measurement and Instrumentation Lab | - | - | 1.5 | 0.75 | 0.75 |
| 9. | IPE 4124 | CAD/CAM Lab | - | - | 1.5 | 0.75 | 0.75 |
| 10. | IPE 4128 | Industrial Simulation Lab | - | - | 3.0 | 1.50 | 1.50 |
| **Total** | | | **15** | **15** | **10.50** | **5.25** | **20.25** |

| | |
|---|---|
| No. of Theory Course = 05 | Total Credit = 20.25 |
| No. of Sessional Course = 05 | Total Contact Hour = 25.50 |

## 4th Year Even Semester

| SL. No. | Course No. | Course Title | Theory | | Sessional | | Total Cr. |
|---|---|---|---|---|---|---|---|
| | | | Contact Hour/ Week | Cr. | Contact Hour/ Week | Cr. | |
| 1. | IPE 4200 | Project and Thesis | - | - | 6.0 | 3.00 | 3.00 |
| 2. | IPE 4201 | Project and Environmental Management | 03 | 03 | - | - | 3.00 |
| 3. | IPE 4203 | Materials Handling and Maintenance Management | 03 | 03 | - | - | 3.00 |
| 4. | IPE 4205 | Cost and Management Accounting | 03 | 03 | - | - | 3.00 |
| 5. | IPE 4221 | Control Theory and Automation | 03 | 03 | - | - | 3.00 |
| 6. | IPE 4231(*) | Optional-II | 03 | 03 | | | 3.00 |
| 7. | IPE 4204 | Materials Handling Lab | - | - | 1.5 | 0.75 | 0.75 |
| 8. | IPE 4222 | Control Theory and Automation Lab | - | - | 1.5 | 0.75 | 0.75 |
| 9. | IPE 4240 | Industrial Practice | | | 4 Weeks | 1.00 | 1.00 |
| 10. | IPE 4242 | Engineering Communication Seminar | | | 2.0 | 1.00 | 1.00 |
| **Total** | | | **15** | **15** | **11.0** | **6.50** | **21.50** |

| | |
|---|---|
| No. of Theory Course = 05 | Total Credit = 21.50 |
| No. of Sessional Course = 05 | Total Contact Hour = 26.00 |



## Optional Courses Offered in the Undergraduate Studies

| Optional-I | | Optional-II | |
|---|---|---|---|
| Course No. | Course Title | Course No. | Course Title |
| IPE 4131 (a) | Supply Chain Management | IPE 4231 (a) | CNC Machine Tools |
| (b) | Total Quality Management (TQM) | (b) | IT in Manufacturing |
| (c) | Microprocessor Programming and Interfacing | (c) | AI and Neuro-Fuzzy Theory |
| ;(d) | Intelligent Manufacturing | (d) | Energy Management |
| (e) | Technology Management | (e) | Computer Integrated Manufacturing (CIM) |
| (f) | Micro-Manufacturing | | |
| (g) | Entrepreneurship Development and Micro Industries | | |
| (h) | Machine Vision and Image Processing | | |

## Summary of the Courses of Undergraduate Studies at a Glance

| SL. No. | Year/ Semester | Theory | | Sessional | | Total Credit |
|---|---|---|---|---|---|---|
| | | No. of Course | Credits | No. of Course | Credits | |
| 1. | First/Odd | 05 | 16 | 04 | 4.50 | 20.50 |
| 2. | First/Even | 05 | 16 | 04 | 4.50 | 20.50 |
| 3. | Second/Odd | 05 | 17 | 03 | 3.00 | 20.00 |
| 4. | Second/Even | 05 | 16 | 04 | 3.25 | 19.25 |
| 5. | Third/Odd | 05 | 16 | 03 | 3.00 | 19.00 |
| 6. | Third/Even | 05 | 17 | 05 | 4.75 | 21.75 |
| 7. | Fourth/Odd | 05 | 15 | 05 | 5.25 | 20.25 |
| 8. | Fourth/ Even | 05 | 15 | 05 | 6.50 | 21.50 |
| **Total** | | **40** | **128** | **33** | **34.75** | **162.75** |

## Chapter- V
## Detail Syllabus of the Undergraduate Studies

### Details Syllabus of 1st Year Odd Semester

**Chem 1123: Inorganic and Physical Chemistry**
**3.00 credit hours**
Atomic structure, periodic table. Properties and uses of noble gases. Different types of chemical bonds and their properties. Different types of solutions and their compositions. Properties of dilute solutions. Thermochemistry, chemical kinetics, chemical equilibrium. Electrolytic conductance, Emf, Electrochemical cells.

**Phy 1123: Physics-I**
**3.00 credit hours**
**Structure of Matter:** States of Matter, Solid, liquid and gas; Classification of solids; amorphous and crystalline ceramics and polymers. Atomic arrangements in solids, different types of bonds in solids; metallic, Vander Walls, Covalent and ionic bond; Packing in solid; Inter atomic distances and forces of equilibrium, x-ray diffraction, Bragg's law, Plasticity and electricity. Distinction among metal, insulator and semiconductor.

**Electricity and Magnetism:** Electric charge, Coulomb's law, The electric field: calculation of electric flux and Gauss's law, some applications of Gauss's law, electric potential V, relation between E and V, electric potential energy, Capacitors; capacitance, dielectrics and atomic view, dielectrics and Gauss's law; current and resistance; current and current density, Ohm's law, resistivity an atomic view, Ampere's law. Faraday's law, Lenz's law, self-inductance and mutual inductance. Magnetic properties of matter; magnetomotive force, magnetic field intensity, permeability, susceptibility, classifications of magnetic materials, magnetization curves.

**Atomic Physics:** Bohr atom model, Photo-electric effect, Compton Effect, De Broglie waves.



**Nuclear Physics:** Nuclear force and nuclear binding Energy, isotopes, Radioactive Decay, Half Life, Mean Life, Alpha, Beta and Gamma decay.

**Math 1123: Engineering Mathematics-I**
**4.00 credit hours**
**Differential calculus**: Limit, Continuity, differentiation and successive differentiation on various types of functions, Leibnitz's theorem, Expansion of functions; Rolle's theorem, Mean value theorem, Taylor's theorem, Partial differentiation, Determination of maximum and minimum values of functions point of inflection and its applications. Indeterminate form; L. Hospital rule, Curvature, curve tracing.

**Integral calculus:** Review of elementary technique (Integration by the method of substitution, Integration by parts, Successive reduction, and standard integrals), Improper integrals; Beta Gamma and error function, deferential inside integral, Applications: Area length of curves, volume.

**Deferential Equations:** Basic concept and ideas of differential equation, Solution of first order differential equations by various methods, Solution of general linear equations of second and higher order with constant coefficients, Solutions in series by Frobenious method, Bessel function, Legendre polynomials and their properties.

**Hum 1123: Economics**
**3.00 credit hours**
The basic ideas of microeconomics and macroeconomics in developing economy. Theory of firms, theory of production, consumption, costs, pricing and distribution of income, markets and their equilibrium. Comparative economy system, input-output, analyzing. Allocation of resources.

Employment, Inflation, economic indicators of development, market economy. Theory of demand and supply.

**EEE 1183: Electrical Engineering-I**
**3.00 Credit hours**
**Direct current circuits:** Laws and theorems. DC network analysis.

**Alternating current circuits:** AC quantities and waveform. Phasors, AC circuit analysis with series and parallel branches of RL, RC and RLC. Balanced three-phase system.

**Electronics:** Principle of semiconductors, P-N junction. Diode and rectifiers, Transistor and its biasing technique. Concept of FET, MOSFET, CMOS etc. Introduction to Silicon Controlled Rectifiers (SCR) and its applications. Introduction to operational amplifier and its applications.

**IPE 1100: Engineering Graphics-I**
**Sessional: Contact Hour: 3.0 Hours/Week; No. of Credit: 1.50**
Introduction, Instruments and their uses.

**2D Drawing:** First and third angle projections; Orthographic drawings;

**3D Drawing:** Isometric views, Missing lines, and views; Sectional views and conventional practices; Auxiliary views

**Chem 1124: Chemistry Lab**
**Sessional: Contact Hour: 1.5 Hours/Week; No. of Credit: 0.75**
Practical experiments based on Chem1123.

**Phy 1124: Physics-I Lab**
**Sessional: Contact Hour: 1.5 Hours/Week; No. of Credit: 0.75**
Practical experiments based on Phy1123.

**EEE 1184: Electrical Engineering-I Lab**
**Sessional: Contact Hour: 3.0 Hours/week; No. of Credit: 1.50**
Sessional based on EEE 1183.



## Details Syllabus of 1st Year Even Semester

**Chem 1223: Industrial Chemistry**
**3.00 credit hours**
**Materials Corrosion:** Cost and importance of corrosion, electrochemical and thermodynamic principles of corrosion, different types of corrosion, methods of corrosion prevention, corrosion in industries.

**Non-metallic engineering materials:** Raw materials, production, properties, and application of glass; plastics, rubbers, fibers, lubricants, coating materials, petrochemicals.

**Phy 1223: Physics-II**
**3.00 credit hours**
**Geometrical Optics**: Combination of lenses and Equivalent focal length, cardinal points of a lens.

**Defects of images:** Spherical aberration, Astigmatism, Coma, Distortion and Curvature, chromatic aberration.

**Optical Instruments:** compound microscope, polarizing microscope, resolving power of a microscope, camera and photographic techniques.

**Wave Mechanics:** Principle of statistical physics, probabilities and classical statistics. Quantum statistics: Bose-Einstein statistics, Fermi-Dirac statistics and their applications, Schrodinger equation, Time independent Schrodinger equation, Schrodinger equation in one electron atom.

**Oscillations and Waves:** Simple Harmonic Motion, Damped Simple Harmonic Oscillations. Forced Oscillations. Resonance. Vibrations of membranes and columns. Combination and composition of Simple Harmonic Motions. Lissajous figures. Transverse and Longitudinal nature of waves: Traveling and Standing waves. Intensity of a wave, Energy calculation of Progressive and Stationary waves. Phase Velocity. Group velocity. Sound waves: Velocity of longitudinal wave in a gaseous medium, Doppler effect. Architectural Acoustics: Sabine's formula, Requisites of a good auditorium.

**Math 1223: Engineering Mathematics-II**
**3.00 credit hours**
**Vectors:** Definition of vectors, Equality of vectors Addition, subtraction and multiplication of vectors. Scalar and vector product of two vectors and their geometrical interpretation. Triple products and multiple products and their application to geometry and mechanics. Linear dependence and independence of vectors.

**Matrix:** Definition of matrix. Different types of matrices. Algebra of matrices. Adjoint and inverse of a matrix. Rank and elementary transformations of matrices. Normal and canonical forms. Solution of linear equations. Quadratic forms. Matric polynomials. Eigen values and eigen vectors.

**Co-ordinate geometry:** Transformation of co-ordinates and identification of conics. Three-dimensional co-ordinate system. Projection. Direction cosines. Equations of planes and lines. Angle between lines and planes. Distance from appoint to a plane. Coplanar lines. Shortest distance between two given straight lines. Standard equations of sphere, ellipsoid, hyperboloid of one sheet, hyperboloid of two sheets. Tangent planes. Normal lines. Condition of tangency.

**ME 1251: Thermodynamics and Heat Transfer**
**4.00 credit hours**
**Thermodynamics:** Basic concepts and definitions: Sources of energy: Conventional and renewable. Fundamental concepts and laws, non-flow and flow processes; Thermodynamic cycles; Introduction and performance study of steam generating units and its accessories and mountings, Internal combustion engines, Steam turbines, Gas turbines, Refrigeration and air conditioning systems.

**Heat transfer:** Introduction to Heat Transfer; Modes of heat transfer, Steady and unsteady state heat conduction and radiation heat transfer, Convection heat transfer, Natural and forced convection, Heat exchangers.



**EEE 1283: Electrical Engineering-II**
**3.00 credit hours**
**Introduction to digital Electronics**: logic gates, flip-flops, counters, registers and memory systems. A/D and D/A converters.

**Electrical Machine:** Principle of Electromagnetic induction, principle of single-phase transformer. Details of DC generator and DC motor. Principle of AC motors and generators, starting, speed control of induction motor. Special machinelike welding machine, universal motor, stepper motor, reluctance motor, repulsion motor, servomotor etc.

**IPE 1200: Engineering Graphics-II and CAD Lab**
**Sessional: Contact Hour: 3.0 Hours/week; No. of credit: 1.5**
Study of part drawing, detail and assembly drawing. Dimensioning with tolerances, notes etc. Representations of threads, fasteners, gear, spring, their specification and drawing.

**CAD software (2D and 3D):** Use of interactive menu driven software for preparation of line drawings, graphic co-ordinate system. Commands for draw, erase, move, rotate, mirror, hatch, trim, planes, parallelism and perpendicularity, surfaces; intersections and development etc. Blocks and layers. Dimensional drawing files, saving, editing and plotting.

**IPES 1202: Shop Practice-I**
**Sessional: Contact Hour: 1.5 Hours/Week; No. of Credit: 0.75**
**Machine Shop Practice**
**Tools**: common bench and hand tools, marking and layout tools, measuring tools, cutting tools, machine tools. Bench work on jobs.

**Practices on machine tools**: drilling machine, lathe machine, shaper machine, milling machine, grinding machine.

**Phy 1224: Physics-II Lab**
**Sessional: Contact Hour: 1.5 Hours/Week; No. of Credit: 0.75**
Practical experiments based on Phy 1223

**EEE 1284: Electrical Engineering-II Lab**
**Sessional: Contact Hour: 3.0 Hours/week; No. of credit: 1.5**
Sessional based on EEE 1283.

## Details Syllabus of 2nd Year Odd Semester

**IPE 2101: Engineering Economy**
**2.00 credit hours**
Introduction to engineering and economic decision making common to engineering, cash flow analysis and basic concepts of discounting, cost of capital, required ROR equivalence etc. Investment appraisal criteria for economic decisions, present worth, internal rate of return, benefit-cost ratio, etc. Decisions involving taxes, depreciation, inflation and Replacement.

**IPE 2113: Engineering Materials and Metallurgy**
**4.00 credit hours**
**Ceramic**: Raw materials, preparation, characterization and processing.

**Polymers**: Structure and properties of polymers, thermoplastics and thermosets and processing.

**Composites:** Theory, fabrication, structure and uses.

**Concepts of Crystal Geometry**: Types of lattices, solidification metal and alloys, variables affecting solidification, Nucleation, Grain growth crystal structures and their defects. Deformation and dislocation theories.

**Equilibrium Diagrams for Binary Alloy**: Interpretation of equilibrium diagram; structure and properties of metal and alloys related to equilibrium, Iron-iron carbide equilibrium diagram, plain carbon steels and their microstructures, various types of steels, Martensitic transformation, composite of tool steel.

**Heat Treatments of steels**: Annealing, Normalizing, Quenching, Tempering and types of hardening processes, precipitation processes.

**Ferrous and Non-ferrous Metals**: Production and properties of Pig, wrought and cast iron; Carbon steels, their properties and microstructures. Production, properties and uses of common non-ferrous metals and their alloys, bearing metals and spring metals. Alloy of Noble metals. Metallurgical aspect of metal joining.



**Powder metallurgy**: Principles and process, metal powder and their characteristics, method of producing metal powders, application, advantages, disadvantages of powder metallurgy.

**Math 2123: Engineering Mathematics-III**
**4.00 credit hours**
**Vector calculus:** Differentiation and integration of vectors together with elementary applications. Line, surface and volume integrals. Gradient of a scalar function. Divergence and curl of a vector function. Physical significance of gradient, divergence and curl, Gauss's theorem, Stoke's theorem. Green's theorem and their applications.

**Laplace transform:** Definition of Laplace transform. Elementary transformation sand properties. Convolution. Solution of differential equation by Laplace transformation. Evaluation of improper integrals by Laplace transforms.

**Fourier series:** Periodic functions; Fourier series (both real and complex forms); odd and even functions; sine and cosine series; Fourier transformations and Fourier integral, its application to boundary value problems. Harmonic functions, Laplace equations, spherical harmonic, surface zonal harmonic, gravitational potential due to spherical shell and sphere.

**Hum 2123: Technical English and Sociology**
**3.00 credit hours**
**Technical English**: Ways of correct English Pronunciation, Construction of sentences and paragraphs, Definition of scientific terms – Correction – Commercial correspondence: Writing for mass media, preparing tenders and schedules – Phrases and Idioms - Prepositions – Comprehension – Amplification – Description and Precise writing, Writing technical report on different topics.

**Sociology:** Scope: Some basic concepts. Social evolution and techniques of production. Cultural and civilization. Social structure of Bangladesh. Population and world resources. Oriental and occidental societies. Industrial revolution. Family-urbanization and industrialization. Urban Ecology. Co-operative and Socialist movements. Rural Sociology

**ME 2161: Engineering Mechanics and Theory of Machines**
**4.00 credit hours**

**Statics:** Force in trusses and frames; friction, centroids and moment of inertia; Kinetics of particles and rigid bodies.

**Kinematics**: The components of mechanism, joints, pairs and couplings, grashof's law, analytical methods for kinematics analysis, graphical determination of velocity and acceleration in mechanisms.

**Dynamics:** Newton's laws, applied and constraint forces, free body diagrams, velocity and acceleration analysis by vector mathematics linkage force analysis by Virtual work methods, Force analysis in Linkages by Graphical methods.

**Theory of machines:** Undammed and damped free vibration of one and two degrees of freedom, forced vibrations; Whirling of shafts and rotors, Power transmission by ropes, belts, chains; Gears and gear trains; Study of cams. Forced vibrations of machine tool mechanism: Torsional vibration, balancing of rotary parts of machine tools, vibration absorption.

**IPES 2102: Shop Practice-II**
**Sessional: Contact Hour: 1.5 Hours/Week; No. of Credit: 0.75**
**Wood, Welding & Sheet Metal Workshop Practice**

Acquaintance with hand & machine tools used in woodworking. Introduction to different joints and making a simple wood pattern that will be used in foundry shop. Acquaintance with tools & appliances used in welding & sheet metal shop, welding defects. Simple exercise on sheet metal work.

**IPE 2114: Engineering Materials and Metallurgy Lab**
**Sessional: Contact Hour: 1.5 Hours/Week; No. of Credit: 0.75**

Sessional based on IPE 2113.

**ME 2152: Thermodynamics and Heat Transfer Lab**
**Sessional: Contact Hour: 3.0 Hours/Week; No. of Credit: 1.5**

Sessional based on ME 1251.



## Details Syllabus of 2nd Year Even Semester

**IPE 2201: Organizational Behavior**
**2.00 Credit hours**

Behavior of individuals in organizations: Values and attitudes, motivation, Group and group processes, group dynamics, communication, power and conflict, Organizational system, structure, job design, appraisal of performance, Processes of organizational change and development, Leadership. Emergence of management thought and the patterns of management analysis: Modern operational management theory, emergence of the behavioral sciences, recent contributors to management thought. Management and Society: the external environment, social responsibility and ethics. Organization and management: system approach to organization, organization theory and organizing practices, basics of organizing.

**IPE 2203: Probability and Statistics**
**4.00 credit hours**

Basic laws of Probability, conditional probability, Baye's Theorem, Random variables; Measures of central tendency and dispersion. Mathematical expectation; Probability distributions, transformation of variables; Moments and moment generating functions; Sampling; Central limit theorem; Chi-Square distribution, t- distribution, F-distribution: Estimation and confidence interval; Statistical hypothesis and testing; Goodness-of-fit tests; Correlation and regression analysis, analysis of variance; Introduction to stochastic problems in engineering, Randomized block design.

**IPE 2211: Production Process-I**
**3.00 credit hours**

Classification of manufacturing processes, casting processes for ferrous and non-ferrous metals; sand, die, centrifugal, slush, plaster mold, loam mold, precision investment casting etc., and casting defects, design of molds, riser, gate, sprue and core, cost analysis.

**Joining methods:** Soldering, brazing, welding, conventional welding processes: gas welding and cutting, arc welding, TIG, MIG, thermit, resistance, friction, electroslag etc. Special welding processes: Laser, electron beam, submerged arc etc. Precision and non-precision surface finishing operation.

**ME 2251: Mechanics of Solids**
**4.00 credit hours**
**Stress analysis**: Statically indetermination axially loaded member, thermal and centrifugal stresses; stresses in thin and thick-walled cylinders and spheres, relationships of principal strains with principal stress.

**Beams:** Shear force and bending moment diagrams; various types of stresses in beams; Flexure formula; Deflection of beams: integration and area moment methods; Introduction to reinforced concrete beams and slabs.
**Torsion formula**: Angle of twist; Modulus of rupture; Helical springs; Combined stresses: Principal stress, Mohr's Circle; Columns: Euler's formula, Intermediate column formulas, the Secant formula. Introduction to experimental stress analysis techniques, Stain energy; Failure theories.

**CSE 2283: Introduction to Computer Programming**
**3.00 credit hours**
**Introduction:** Introduction to computer programming, Compiler, Source and Object programs, Algorithm and flowchart.

**Basic Programming in C:** Data Types, Operator and Operand, Procedures of operators, Basic flow control, Loops arrays, function, pointer and structure.

**Advance Programming in JAVA:** Objects oriented concepts of classes and objects, access control, private vs. public methods, Static methods and variables, JAVA API, Inheritance and polymorphism, packages, interfaces, applications vs. applets.

**IPE 2212: Production Process-I Lab**
**Sessional: Contact Hour: 1.5 Hours/Week; No. of Credit: 0.75**
Sessional based on IPE 2211.

**Hum 2224: English Language Practice**
**Sessional: Contact Hour: 1.5 Hours/Week; No. of Credit: 0.75**
Dialogue: Improving speaking skill. Composition: Spoken composition on general topics. Vocabulary: Improving stock of words. Listening comprehension: Improving listening skill through



audio-visual methods. Correspondence: Business communication including writing for mass media.

**ME 2252: Solid Mechanics Lab**
**Sessional: Contact Hour: 1.5 Hours/Week; No. of Credit: 0.75**
Sessional based on ME 2251.

**CSE 2284: Computer Programming Lab**
**Sessional: Contact Hour: 2 Hours/Week; No. of Credit: 1.0**
Sessional based on CSE 2273.

## Details Syllabus of 3rd Year Odd Semester

**IPE 3101: Operations Management**
**3.00 credit hours**
Production systems, product/service life cycle, forecasting models, bill of materials, material and inventory management: Inventory models, ABC analysis, coding and standardization. Aggregate planning, MPS, MRP-I, capacity planning, operating scheduling, Facility Location algorithm, Facility Layout Techniques, Work study, MRP II, JIT etc.

**IPE 3103: Operations Research**
**4.00 credit hours**
Introduction, Linear Programming: Types of Solutions, Simplex method, Dual Simplex method, Post Optimal Analysis, Transportation and Assignment Models, Dynamic programming, Introduction to queuing models, inventory models, Game and Decision theory, Integer and Mixed Integer programming, Non-Linear Programming, Network optimization model.

**IPE 3105: Product Design-I**
**3.00 Credit Hours**
Fundamental aspects of a product, environment and human factors in design, value engineering, design morphology, standardization, QFD, Product life cycle.

Designing of machine parts for strength, deflection, stiffness, fatigue, impact etc., design of tension members, belt drives.

**IPE 3111: Production Process-II**
**3.00 credit hours**
**Metal removal processes:** Process of metal cutting, Chip formation and tool design, tool geometry, chip breakers.
**Theory of metal cutting:** mechanics of metal cutting, machinability, cutting forces, metal cutting dynamometers, economics of metal cutting, tool life. Cutting fluid
**Different machining processes-** turning, drilling, shaping, planning, milling, grinding, reaming, broaching etc. Manufacture of threads and gears, Ultra finishing operations: Lapping, honing, micro stoning etc.
**Modern machining processes:** electro-chemical, electro-discharge, plasma etc., LASER beam, electron beam, ultrasonic and abrasive jet machining.
**Plastic product manufacturing processes:** Compounding, extrusion, injection molding, compression molding, blow molding, vacuum forming and hand layup.
Selection of manufacturing processes on the basis of product characteristics and manufacturing economy.

**IPE 3121: Management Information System and Programming**
**3.00 Credit hours**
**Basics:** Data and Information; Management and Information requirements; Role, Task and Tools used by analyst; Information gathering and planning; Feasibility analysis, Data flow diagram; Decision table; Cost benefit analysis.

**Database Management:** Different data models and its architecture; Different of relational database; Different normal forms; Role of database Administrator.

**Programming:** Microsoft Access Database Design and Maintenance; Relational algebra and SQL; Web-based Database Management and Programming, Computer crime and digital forensics.

**Advanced Topics:** Internet and Telecommunication, Internet marketing, Electronic Commerce, Business models, Business process management and reengineering, Data warehouse and



Business Intelligence, Ethics in Information, Collaboration Tools, and Mobile Computing Shootout.

**IPE 3106: Product Design-I Lab**
**Sessional: Contact Hour: 3.0 Hours/Week; No. of Credit: 1.50**
Sessional work compatible to IPE 3105

**IPE 3112: Production Process-II Lab**
**Sessional: Contact Hour: 1.5 Hours/Week; No. of Credit: 0.75**
Sessional based on IPE 3111.

**IPE 3122: Management Information system and Programming Lab**
**Sessional: Contact Hour: 1.5 Hours/Week; No. of Credit: 0.75**
Sessional based on IPE 3121

## Details Syllabus of 3rd Year Even Semester

**IPE 3201: Quality Control and Management**
**3.00 credit hours**
**Introduction:** Definition of Quality control; need of scientific Quality control.

**Statistical quality control**: Elementary SPC tools-PDCA cycle, control charts-attribute, variable and special types, $\overline{X}$-R chart, P-chart and C charts, MA chart, Measurement of variation and process capability analysis, Acceptance sampling plan, single, double, sequential, rectifying inspection plan, Design of experiment, 6σ quality control.

**Reliability:** Failure and survival probability; hazard rate, component and system reliability and its prediction; reliability testing.

**Quality management**: Seven basic tools of TQM, Concept of quality circle, Total Quality Management (TQM), application of TQM philosophy, Deming's principle on quality and productivity, Quality costs and their interpretation, Taguchi loss function, Quality standards and their compliance, ISO certification systems, Quality awards.

**Lean manufacturing system:** Define lean, Seven's wastage, Value stream mapping, 5s, SMED etc.

**IPE 3205: Product Design-II**
**3.00 credit hours**
Reverse engineering, alternative solutions and their evaluation, designing, designing for assembly and disassembly, cost analysis, Proto type design, designing of engineering systems involving compression members, twisting members, bolt, nuts and joints, bearings, linkages, Spindle, clutches, brakes, gears system and power transmission, design of welded components, Introduction to Rapid Prototyping.

**IPE 3211: Machine Tools**
**4.00 credit hours**
**Fundamental of Machine tools:** Characteristics of machine tools, recent developments in the design of machine tools. Drive system of machine tools, design of mechanical drive, speed gearboxes, feed gearboxes, infinitely variable drives, PIV and other mechanical step-less drives, hydraulic drives, electrical drives. Bearings, spindles, slide-ways of machine tools, machine tool structure.

**Locating and Clamping:** Locating principles and locators, clamps. Fixtures; Jigs; Examples of drill jigs; Open and closed jigs; Index Jigs; Fixture for turning, Milling, Grinding and other operations.

**Detail study of Machine tools:** Lathe, Shaper and Slitter, Planer, milling machine, Drilling and Boring machines, grinding machine.

**Math 3223: Engineering Mathematics-IV**
**4.00 Credit hours**
**Complex variable:** Analytical functions, singularity; Line integration, Cauchy's theorem; Cauchy's integral formula; Power series: Taylor and Laurent series, Zeros and Poles. Residue theorem and contour integration; Conformal mapping; Simple applications to fluid dynamics.

**Numerical analysis:** Solution of Algebraic and transcendental equations; Bisection method, Regula- falsi method, Initial approximation and convergence criteria of Iteration method; Newton-Raphson method. Solution of simultaneous linear algebraic equations; Gauss Elimination method, Gauss-Jordan method, Jacobi



method, Gauss Seidel method, Finite differences, Interpolation with equal and unequal intervals, Central difference interpolation formulae, Numerical solution of differentiation and integration.

**ME 3251: Fluid Mechanics and Machinery**
**3.00 credit hours**
**Fluid properties**: Fluid statics; basic hydrostatic equation, manometry, pressure variation in static incompressible and compressible fluids.

**One dimensional flow of fluid**: Equation of continuity; Bernoulli's equation; Fluid flow measurements; real fluid flow; Frictional losses in pipes and fittings.
**Machinery:** Velocity diagram and Euler Pump/turbine equation, turbines, pumps and compressors: principles of operation, characteristics and performance study.

**Fluidics:** Hydraulic and pneumatic components and systems: servo control valves, Fluid transmission lines, Actuators: Fluids power supplies and fluid motors, compressibility and leakage, system modeling, stability and compensation.

**IPE 3200: IPE Case Study**
**Sessional: Contact Hour: 2 Hours/Week; No. of Credit: 1.00**
In this sessional course, student will identify, survey and solve a real-world problem based on their achieved knowledge under a supervisor.

**IPE 3206: Product Design-II Lab**
**Sessional: Contact Hour: 3 Hours/Week; No. of Credit: 1.5**
Integrated design based on the knowledge of reverse engineering, reliability, cost analysis, strength, etc.

**IPE 3212: Machine Tools Lab**
**Sessional: Contact Hour: 1.5 Hours/Week; No. of Credit: 0.75**
Sessional based on IPE 3211.

**Math 3224: Numerical Analysis Lab**
**Sessional: Contact Hour: 1.5 Hours/Week; No. of Credit: 0.75**
Numerical solution of problems in Engineering with computer programming based on Math 3223.

**ME 3252: Fluid Mechanic and Machinery Lab**
**Sessional: Contact Hour: 1.5 Hours/Week; No. of Credit: 0.75**
Sessional based on ME 3251.

## Details Syllabus of 4th Year Odd Semester

**IPE 4100: Project and Thesis**
**Contact Hour: 3 Hours/week, No. of Credit: 1.50**
Research work on suitable problem related to IPE. The study will continue as IPE 4200 in 4th Year Even Semester. Evaluation will be done with IPE 4200.

**IPE 4101: Industrial & Business Management**
**3.00 credit hours**
Business and management process, managerial function of business and then relative importance, managerial skills and development. Job gradation, process of performance appraisal and reward systems. Scientific management and Taylor's principles.

**Management in operations and business:** systems approach to operations management and business, managing the marketing of goods and service, total marketing activity, marketing mix, some selected topics of marketing such as industrial and consumer selling, advertising, new product strategy and decisions.
Management in the international selling, management revisited and challenges for management in the twenty first century.

**Industrial law in Bangladesh:** various ordinance payments of wages, legislation relating employment in industries, factories, shops and agriculture, Trade union act.

**Marketing Management:** Understanding Marketing management, developing marketing strategies, conducting marketing research, analyzing consumer and Business market, identifying market segments and targets, dealing with competition.



**IPE 4103: Ergonomics and Safety Management**
**3.00 Credit hours**
**Ergonomics:** Man-Machine-Material interfaces in manufacturing: physical and cognitive aspects, comparative advantages of man and machine, physical work and human muscular effort, Bio- mechanics and bio-engineering. Product and workplace design using Ergonomic concepts. Anthropometry, work place design and work place layout, human performance under environment temperature, illumination, vibration, noise, pollution radiation static and dynamic conditions.

**Safety:** Evolution of modern safety concepts, industrial hazard, safety and risk management, productivity, worker health and safety, proactive management techniques for safety management, Safety standards and regulations for engineering works, Fire safety, Hazardous materials, case studies.

**IPE 4121: Measurement and Instrumentation**
**3.00 credit hours**
Introduction to fundamentals of engineering measurements; study and use of instrumentation and control systems.
Linear measuring system, instruments limits, fits and gauges: ISO system of limits and fits.
Precision dimensional measurement of length and angles, roundness profiles and flatness, surface roughness and texture, wear, Taylor's principles on limit gauges; Abbey's principle, measuring threads, gears; ultrasonic measurement, measurement by light-wave interference; Electrical and electronic measurement, digital recording by LASER and LASER beam dimension measuring system. Nondestructive testing methods (NDT methods). Inspection and kinds of inspection Testing and calibration testing; of gauges and dynamic measurement. The characteristics and use of analogue and digital instrumentation applicable to industrial engineering problems Basic concepts of modern instrumentation. Displacement and motion sensor: potentiometers, resistance strain gages, piezoelectric transducers, Nozzle-Flapper transducer, Electro-optical devices, Tachometer-Encoder, velocity sensor: Force sensor: Load cell, shaft power measurement pressure; and sound sensors: Manometers, fluid flow sensors, temperature sensors; RTDS, Thermocouples.

**IPE 4123: CAD/CAM**
**3.00 credit hours**
**CAD:** Fundamental concepts, application, hardware and software, types of CAD systems. Methodology of interactive graphical engineering design. Concepts of optimization and simulation in CAD. Algorithm developments and application of different types of data structures. Concepts of engineering graphics and differential geometry in CAD, Design of curves and surfaces. Evolution of integral properties of volumes. Graphical representation and intersection and interference of surfaces and volumes. Application of CAD in mechanism design of different industrial and mechanical components. Representation of curve, surface and solid.

**CAM:** Fundamental concepts, trend of development of NC, principles of NC, types of NC systems and machines, NC manual part programming, CNC part programming using APT language, interfacing CAM software with CNC machine, implementing the CAD/CAM system principle of FMS.

**IPE 4104: Ergonomics and Safety Lab**
**Sessional: Contact Hour: 1.50 Hours/Week; No. of Credit: 0.75**
Sessional based on IPE 4103.

**IPE 4122: Measurement and Instrumentation Lab**
**Sessional: Contact Hour: 1.50 Hours/Week; No. of Credit: .0.75**
Sessional based on IPE 4121.

**IPE 4124: CAD/CAM Lab**
**Sessional: Contact Hour: 1.50 Hours/Week; No. of Credit: 0.75**
Sessional based on IPE 4123.

**IPE 4128: Industrial Simulation Lab**
**Sessional: Contact Hour: 3.0 Hours/Week; No. of Credit: 1.5**
Model building, Introduction to the different simulation packages to solve the engineering problems.



## Details Syllabus of the Optional Courses Offered in 4th Year Odd Semester

**Optional-I (IPE 4131*)**
**3 Credit hours**

**(a) Supply Chain Management**
Concept of supply chain, Importance of supply chain flows, supply chain performance, the role of distribution and it's influencing factors, Factors influencing network design decisions, Models for facility location and capacity allocations, Demand forecasting; Seasonal forecasting, Sinusoidal forecasting, Box-Jenkins methods, Forecasting error analysis, Lot sizing techniques, Inventory: Deterministic models and probabilistic models, Sourcing decisions in supply chain. Transportation in supply chain: Role of transportation, Logistics, Factors affecting transportation decisions, Modes of transportations and their performances, Design options, Tradeoffs in transportation design, Routing and scheduling in transportation, co-ordination in supply chain, IT in supply chain.

**(b) Total Quality Management (TQM)**
TQM definition; Origins and growth of TQM; Benefits of TQM; Philosophies of TQM; Quality circle approach; Deming's approach; Juran's approach; Philip Crosby's approach. Planned implementation of TQM; Planning and commitment, participation, continuous improvement.

**(c) Microprocessor Programming and Interfacing**
**Microprocessor Programming:** Introduction to different types of microprocessors and its applications, Intel 8086 Microprocessor: Architecture, Instruction Format, Instruction Sets, Opcode, Processor status and Flag registers, addressing modes, Branching and Looping, Interrupt Structures, I/O interfacing, DMA. Assembly Language: Program writing, debugging and execution, Programming in Microcomputers, Subroutine and reentrant programs. Microprocessor Based System Design: Hardware design, Building, Debugging, Testing and Linking program modules, Programming EPROM.

**Interfacing:** Traps and Interrupts Address space partitioning, AD and DA converters and some related chips. Interfacing ICs of I/O devices. I/O ports, Programmable peripheral interface, DMA controller, Interrupt controller, Communication interface, Interval timer etc. Microprocessor in Scientific Instruments and other Applications, Display, Protective relays, Measurements of Electrical quantities, Temperature monitoring system, Water level indicator, Motor speed controller, Traffic light controller, etc.

**(d) Intelligent Manufacturing**

AI Technologies and expert system: components and features, knowledge system, knowledge engineer, domain expert, knowledge engineering languages. Artificial neural network and fuzzy logic

Expert manufacturing systems: CIM, manufacturing communication system and intelligent manufacturing, flexible manufacturing system, case study of EMS.

**(e) Technology Management**

Introduction to technology: Growth of technology; Types and components of technology; Technology and environment, Technology forecasting; Technology assessment, Transfer of technology; Technological development and planning.

**(f) Micro-Manufacturing**

Micro elements: Design and fabrication, Basic of micro-fabrication technology; thin film growth and deposition, photolithography, X-ray lithography, wet and dry chemical etching, electrochemical machining, ultrasonic machining, plasma machining and laser machining.

**(g) Entrepreneurship Development and Micro Industries**

**Entrepreneurship:** Definition and importance and its role: Characteristics and skills of entrepreneurs, Entrepreneurial process; Self-assessment; Managers. Leader, innovators and entrepreneurs.

**Small business:** Nature and importance, methods for generating ideas, creativity process, product planning and development process, Merger, acquisition and joint venture, Business plan; Marketing plan, Market research, financial plan, Organizational and



human resource plan, Production plan, Financing the business, Managing early operations and growth.

**(h) Machine Vision and Image Processing**

**Machine vision:** Human vs. machine vision, components of machine vision systems, Applications of machine vision systems.

**Image processing**: Image acquisition, sampling and quantization, Image preprocessing, noise filtering, image segmentation, mathematical morphology, image analysis, feature extraction, stereovision, color image processing, object recognition and classification.

## Details Syllabus of 4th Year Even Semester

**IPE 4200: Project and Thesis**

**Contact Hour: 6.0 Hours/week, No. of Credit: 3:00**

Continuation of research work selected for IPE 4100.

**IPE 4201: Project and Environmental Management**

**3.00 credit hours**

**Project:** Identification, planning, appraisal, project implementation, project organization, budgeting, scheduling, using bar diagram, CPM, PERT, resource allocation, information system and project control, project termination, project organization, matrix organization, project manager, contract negotiation and conflict resolution, Case study: Planning and evaluation of an investment project. Project failure and risk control.

**Environmental impact assessment of projects:** Source of degradation of earth's eco-system technological development, greenhouse gases, ozone layer depletion, toxic gases and industrial wastes. Montreal protocol, remedies NOxout Chain-sun refrigerant technologies and use of catalysts, Environmental economics and accounting system.

**IPE 4203: Materials Handling and Maintenance Management**
**3.00 credit hours**

**Issues and importance of handling of materials**: Analysis of material handling problems, classification of materials, unit load, bulk loads. Study of material handling systems and their efficiency. Selection and classification of material conveying equipment.

**Designing concepts common handling and transfer equipment**: Different types of conveyors such as belt, screw, chain, bucket elevators, pneumatic hydraulic; cranes and forklifts. Algorithms to design and analyze discrete parts material storage and flow system such as Automated Storage/Retrieval System (ASRS), order picking, automated guided vehicle system (AGVS), warehousing.

**Maintenance management:** Concept of maintenance and value of maintenance management; maintenance organization and department structure (resource and administration), Types of maintenance, fixed time replacement, condition-based maintenance, preventive and corrective maintenance, Replacement strategies.

**IPE 4205: Cost and Management Accounting**
**3.00 credit hours**

**Basic Concepts:** Accounts, transaction, the accounting procedures and financial statements Scope and application of cost and Management accountancy. Costing methods and techniques. Income measurement in manufacturing companies.

**Material costing and labor costing:** Overhead and their allocation. Marginal costing and decision making among alternative courses of action. Marginal costing vs. total absorption costing, Case study.

**Financial statement analysis:** Understanding the financial statement. Tests for probability liquidity, solvency and overall measure. Budgets and their control.

**IPE 4221: Control Theory and Automation**
**3.00 credit hours**

**Control theory**: Introduction, Classification of control systems, block diagram, system modeling, transfer function, Stability analysis by Routh-Hurwitz criteria, preliminary design by root locus



method, frequency response analysis, use of bode plots, polar plots, gain adjustment, compensation, introduction to digital control.

**Automation:** Automation system components, structure of programmable logic controllers (PLCs), programming languages for PLC, Application of PLC, Industrial communications, Continuous control, PID control, overview of SCADA and DCS systems.

**IPE 4204: Materials Handling Lab**
**Sessional: Contact Hour: 1.5 Hours/Week; No. of Credit: 0.75**
Sessional based on IPE 4203.

**IPE 4222: Control Theory and Automation Lab**
**Sessional: Contact Hour: 1.5 Hours/Week; No. of Credit: 0.75**
Sessional based on IPE 4221.

**IPE 4240: Industrial Practice**
**Contact Period: 4 weeks; No of credit: 1.0**
Practical hands-on case study related to IPE to be done in suitable organization. To be arranged in suitable time in 4th year.

**IPE 4242: Engineering Communication Seminar**
**Sessional: Contact Hour: 02 Hours/Week; No. of Credit: 1.0**
Introduction to presentation skill. Students need to present their research work for evaluation purpose.

## Details Syllabus of the Optional Courses Offered in 4th Year Even Semester

**Optional-I (IPE 4231*)**
**3.00 Credit hours**
**(a) CNC Machine Tools**

CNC concepts; hardware, input-output systems and interfacing in CNC machine tools.

Principles of CNC machine tool elements; actuators, feedback devices, interpolators, machine control unit, micro-electro-mechanical devices. Control systems of CNC machine tools; point to point system, contouring system, adaptive control., Case study of a CNC machine tool.

**(b) IT in Manufacturing**

Database Concepts, Network and data communications, Networking Architecture, Mobile and Wireless communications, Internet, MIS, E-commerce, Scope of IT in Manufacturing, Information regarding the products, Production processes, Manufacturing facilities, Material handling facilities, Material flow and storage facilities, E-manufacturing, Future implication of IT in Manufacturing.

**(c) AI and Neuro-Fuzzy Theory**

**AI:** Introduction, Nets and Basic search methods Depth-first, breadth first, Hill climbing beam search, best search, branch and bound search, game tree.

**Neuro-fuzzy:** Neuron model, transfer functions, network architectures, perceptron, Hebb rule Backpropagation, Fuzzy sets, membership functions, Fuzzy Numbers, Fuzzy logic, Fuzzy controller applications.

**(d) Energy Management**

Energy systems: commercial- noncommercial, rural – urban, renewable – nonrenewable energy; Energy planning, Energy generation and distribution systems management; generation mix, dispatch system Energy policy; national energy policy and tariff policy.

**(e) Computer Integrated Manufacturing (CIM)**

Introduction to automation; Manufacturing model and matrices; Industrial control system: computer process control; Automated production lines: fundamentals, applications and analysis of automated production lines; Group technology and Computer aided process planning: Cellular manufacturing, Flexible manufacturing, CAPP; Automated quality inspection and its technologies; Factory of the future.

**Industrial Robotics:** Introduction to robotics; Geometric configurations: structural elements, linkages, arms and grippers; Robot motion analysis and controls: manipulator kinematics, robot dynamics; Actuators, end effectors, and sensors for robots; Robot programing: and languages; Application of industrial robots: material transfer, processing operations, assembly and inspection etc.; Teleoperators, Mobile robots and Special purpose robots.