# UNIVERSITY OF RAJSHAHI



## FACULTY OF ENGINEERING

## DEPARTMENT OF INDUSTRIAL AND PRODUCTION ENGINEERING

Syllabus for B.Sc. in Industrial & Production Engineering Session 2014-2015

December 2014

### University of Rajshahi Faculty of Engineering Department of Industrial & Production Engineering Syllabus for B.Sc. in Industrial & Production Engineering Session: 2014-2015

The courses designed for B.Sc. in Industrial & Production Engineering consist of 4075 marks of 163 credits distributed over eight semesters in four academic years. Each academic year is divided into two semesters (odd & even) each of duration not less than 11 weeks (66 working days). There shall be final examinations at the end of each semester. The medium of answer in all examinations will be either Bangla or English, but not the mixer of both. The theoretical examination of courses less than or equal to 2 credits shall be of 2 hours duration and courses greater than 2 credits shall be of 3 hours duration. An academic schedule for an academic year shall be announced for general notification before the start of the academic year, on the prior approval of the academic committee.

**1.** Attendance (Ref. The Rajshahi University Academic Ordinance, 2013 for B.Sc.. in Engineering Curriculum of the Affiliated Colleges/Institutes, article no: 13): In order to be eligible to appear, as a regular candidate, at the semester final examinations, a student shall be required to have attended at least 70% of the total number of periods of lectures/tutorials/laboratory classes offered during the semester in every course. A student whose attendance falls short of 70% but not below 60% in any course may be allowed to appear at the final Examinations as **non-collegiate** student and **he/she shall not be eligible for the award of any scholarship or stipend** for the following academic year/semester. A student, appearing the examination under the benefit of this provision shall have to pay in addition to the fees, the requisite fee prescribed by the syndicate for the purpose. Students having less than 60% attendance in lectures/tutorials/laboratory classes of any courses will not be allowed to appear in the final examinations of the semester. The basis of awarding marks for class participation and attendance is shown in Table-1.

Attendance	Marks%	Remarks
90% and above	100	
85% to less than 90%	90	
80% to less than 85%	80	Regular
75% to less than 80%	70	
70% to less than 75%	60	
65% to less than 70%	50	Non collegiste
60% to less than 65%	40	Non-conegiate
less than 60%	00	

#### **Table-1: Distribution of Marks in Attendance**

(Ref. The Rajshahi University Academic Ordinance, 2013 for B.Sc. in Engineering Curriculum of the Affiliated Colleges/Institutes, article no: 13), unit=100 marks.

#### 2. The Grading System

The letter grade system shall be used to assess the performance of the students as shown in Table-2 (Ref. The Rajshahi University Academic Ordinance, 2013 for B.Sc. in Engineering Curriculum of the Affiliated Colleges/Institutes, Article no. 14.1):

	cer Grade Dyb	UCIII	
Numerical grade	Letter	Grade point	Credit
	Grade (LG)	( <b>GP</b> )	( <b>C</b> <sub>i</sub> )
		( <b>G</b> <sub>i</sub> )	
80% or above	A+	4.00	4.00
75% to less than 80%	А	3.75	4.00
70% to less than 75%	A-	3.50	4.00
65% to less than 70%	B+	3.25	4.00
60% to less than 65%	В	3.00	4.00
55% to less than 60%	B-	2.75	4.00
50% to less than 55%	C+	2.50	4.00
45% to less than 50%	С	2.25	4.00
40% to less than 45%	D	2.00	4.00
less than 40%	F	0.00	4.00
Incomplete	Ι	0.00	4.00

A letter grade 'I' ((incomplete) shall be awarded for courses in the odd semester which continue through to the even semester.

A Grade Point Average (GPA) shall be calculated for each semester as follows:

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

Where, n is the number of courses offered during the semester, Ci is the number of credits allotted to the i-th course and Gi is the grade point earned for that course.

**Illustration:** Suppose a student obtained following grade in Part-1 odd semester:

Code No	Subject	Credit	Letter Grade	GP
PHY 1111	Physics-1	4	C	2.25
CHEM 1113	Chemistry-1	4	A+	4.0
MATH1115	Mathematics-1	4	B-	2.75
TE 1111	Introduction to Textile Engineering	6	B+	3.25
CE 1112	Engineering Drawing	2	A+	4.0

Therefore, GPA in the Part - 1 odd semester =  $\frac{4(2.25) + 4(4) + 4(2.75) + 6(3.25) + 2(4)}{4 + 4 + 6 + 2} = 2.40$ 

And let's assume that his/her GPA in Part-1 even semester is 3.13

A Yearly Grade Point Average (YGPA) shall be calculated for each academic year as follows:

$$YGPA = \frac{\sum_{j=1}^{2} C_{j}G_{j}}{\sum_{j=1}^{n} C_{j}}$$
(ii)

Therefore,YGPA of Part-1 Examination =  $\frac{20(2.40) + 20(3.13)}{20 + 20} = 2.77$ 

The Cumulative Grade Point Average (CGPA) gives the cumulative performance of students from the first year upto the end of the fourth year to which it refers, and will be calculated as follows:

$$CGPA = \frac{\sum_{k=1}^{m} C_k G_k}{\sum_{k=1}^{m} C_k}$$
(iii)

where, m is the total number of years being considered, Ck is the total number of credits registered during the k-th year and  $G_k$  is the YGPA earned in that particular year. Similarly assume that, the YGPA of the student for the other 3 Parts are as follows:

Year	Credit	YGPA
Part-II	40	3.47
Part-III	40	2.96
Part-IV	40	3.33

Then his/her CGPA of four academic years is

Therefore, CGPA = 
$$\frac{40(2.77) + 40(3.47) + 40(2.96) + 40(3.33)}{40 + 40 + 40} = 3.13$$

(Both YGPA & CGPA will be rounded upto the second place of decimal for reporting. For instance, YGPA= 2.212 shall be rounded up as YGPA=2.22) 3. Earned Credit

The courses in which a student has obtained minimum 'D' in 'Theoretical courses' and 'C' in 'Laboratory courses & Board Viva-Voice' or higher grade will be counted as credits earned by the student. Any course in which a student has obtained 'F' grade will not be counted towards his/her earned credit. 'F' grade will not be counted for GPA calculation but will stay permanently on the Grade sheet and Transcripts.

#### 4. Marks and Credits distribution for B.Sc. in Industrial & Production Engineering

The distribution of marks and credits in various Definitions of Disciplines in the ordinance for B.Sc.. Engineering Degree in the Department of Industrial & Production Engineering are given in Table-3 [Ref. The Rajshahi University Academic Ordinance, 2013 for B.Sc. in Engineering Curriculum of the Affiliated Colleges/Institutes, Article no 6.1]

Table-3: Marks and Credits distribution in discipline for B.Sc. in Industrial & Production Engineering

Course Type		Marks	Marks (%)	Credits
<sup>a</sup> Humanities		175	4.294	7
<sup>b</sup> Basic Sciences (with Lab)		650	15.95	26
Engineering		3250	79.75	130
Distribution	a. Theoretical	3150	77.30	126
	b. Board Viva-Voce	75	1.84	3
	c. Laboratory	850	20.86	34
Total		4075	100	163

<sup>a</sup>Each department must include courses on English. <sup>b</sup>Each department must include courses on Physics, Chemistry and Mathematics.

#### 5. Courses offered to the undergraduate students of Industrial & Production Engineering Department for B.Sc. Engineering degree (Session 2014-2015)

		Theory		Sessional		Total					
Code No.	Name of Subject	Credit	Contact	Credit	Contact	Credit	Contact				
		Hours	Hours	Hours	Hours	Hours	Hours				
PHY1181	Physics-I	3	3	0	0	3	3				
PHY1182	Physics-I Sessional	0	0	1	2	1	2				
CHEM1183	Chemistry	3	3	0	0	3	3				
CHEM1184	Chemistry Sessional	0	0	1	2	1	2				
MATH1185	Differential Calculus and Differential Equations	4	4	0	0	4	4				
HUM1187	English	2	2	0	0	2	2				
IPE1181	Introduction Industrial and Production Engineering	3	3	0	0	3	3				
IPE1182	Work Shop Practice-I	0	0	1	2	1	2				
IPE1184	Engineering Graphics-I	0	0	1	2	1	2				
	Total			4	8	19	23				
No. of Theory	Course : 05 Total Contac	No. of Theory Course : 05 Total Contact Hours : 23									

#### Part-1 Odd Semester

No . of Sessional Course

:04

Total Credits Hours : 19

### Part-1 Even Semester

		Theory		Sessional		Total	
Code No.	Name of Subject	Credit	Contact	Credit	Contact	Credit	Contact
		Hours	Hours	Hours	Hours	Hours	Hours
PHY1281	Physics-II	3	3	0	0	3	3
PHY1282	Physics-II Sessional	0	0	1	2	1	2
CHEM1283	Industrial Chemistry	3	3	0	0	3	3
МАТН1285	Vectors, Matrix and Co-ordinate	3	3	0	0	3	3
WIA1111203	Geometry	5	5	0	0	5	5
CSE1281	Basic Computer and Programming	3	3	0	0	3	3
CSF1282	Basic Computer and Programming	0	0	2	4	2	4
CSL1202	Sessional	0	0	2	4	2	-
IPE1281	Production Process	3	3	0	0	3	3
IPE1284	Work Shop Practice-II	0	0	1	2	1	2
	Total	15	15	4	8	19	23
No. of Theory Course : 05 Total Contact Hours : 23							

No. of Sessional Course :03

Total Credits Hours : 19

		Tl	Theory		Sessional		Total	
Code No.	Name of Subject	Credit	Contact	Credit	Contact	Credit	Contact	
		Hours	Hours	Hours	Hours	Hours	Hours	
HUM2181	Economics	2	2	0	0	2	2	
MATH2185	Vector Calculus, Laplace Transform and Fourier series	4	4	0	0	4	4	
EEE2181	Electrical Engineering-I	3	3	0	0	3	3	
EEE2182	Electrical Engineering-I Sessional	0	0	1	2	1	2	
ME2181	Engineering Mechanics	3	3	0	0	3	3	
IPE2181	Engineering Materials and Metallurgy	4	4	0	0	4	4	
IPE2182	Engineering Materials and Metallurgy Sessional	0	0	1	2	1	2	
IPE2184	Work Shop Practice-III	0	0	1	2	1	2	
IPE2186	Engineering Graphics-II	0	0	1	2	1	2	
	Total			4	8	20	24	
No. of Theory	Course : 05 Total Contact	Hours	: 24					

### Part-2 Odd Semester

No. of Sessional Course : 05 Total Contact Hours : 24 No. of Sessional Course : 04 Total Credits Hours : 20

#### Part-2 Even Semester

		Theory		Sessional		Total	
Name of Subject	Credit	Contact	Credit	Contact	Credit	Contact	
	Hours	Hours	Hours	Hours	Hours	Hours	
Electrical Engineering-II	3	3	0	0	3	3	
Electrical Engineering-II Sessional	0	0	1	2	1	2	
Heat Transfer and Thermodynamics	4	4	0	0	4	4	
Heat Transfer and Thermodynamics	0	0	1	2	1	2	
Sessional	0	0	1	2	1	2	
Mechanics of Solids	4	4	0	0	4	4	
Mechanics of Solids Sessional	0	0	1	2	1	2	
Probability and Statistics	4	4	0	0	4	4	
Engineering Economy	2	2	0	0	2	2	
Total	17	17	3	6	20	23	
Board Viva-Voce			1		1		
	Name of Subject Electrical Engineering-II Electrical Engineering-II Sessional Heat Transfer and Thermodynamics Heat Transfer and Thermodynamics Sessional Mechanics of Solids Mechanics of Solids Sessional Probability and Statistics Engineering Economy Total Board Viva-Voce	Name of SubjectTh Credit HoursElectrical Engineering-II3Electrical Engineering-II Sessional0Heat Transfer and Thermodynamics4Heat Transfer and Thermodynamics0Sessional0Mechanics of Solids4Mechanics of Solids Sessional0Probability and Statistics4Engineering Economy2Total17Board Viva-Voce17	TheoryName of SubjectTheoryCredit HoursContact HoursElectrical Engineering-II33Electrical Engineering-II Sessional00Heat Transfer and Thermodynamics44Heat Transfer and Thermodynamics00Sessional00Mechanics of Solids44Mechanics of Solids Sessional00Probability and Statistics44Engineering Economy22Total1717Board Viva-Voce	TheorySessName of SubjectCredit HoursCredit HoursCredit HoursElectrical Engineering-II330Electrical Engineering-II Sessional001Heat Transfer and Thermodynamics440Heat Transfer and Thermodynamics001Mechanics of Solids440Mechanics of Solids Sessional001Probability and Statistics440Engineering Economy220Total17173Board Viva-Voce11	TheorySessionalName of SubjectCredit HoursContact HoursCredit HoursContact HoursElectrical Engineering-II3300Electrical Engineering-II Sessional0012Heat Transfer and Thermodynamics4400Heat Transfer and Thermodynamics0012Mechanics of Solids4400Mechanics of Solids Sessional0012Probability and Statistics4400Engineering Economy2200Total171736Board Viva-Voce111	Name of SubjectTheorySessionalToCredit HoursContact HoursCredit HoursContact HoursCredit HoursCredit HoursElectrical Engineering-II33003Electrical Engineering-II Sessional00121Heat Transfer and Thermodynamics44004Heat Transfer and Thermodynamics00121Mechanics of Solids44004Mechanics of Solids Sessional00121Probability and Statistics44004Engineering Economy22002Total17173620Board Viva-Voce1111	

No. of Theory Course: 05Total Contact Hours: 23No. of Sessional Course: 03Total Credits Hours: 21

		Theory		Sessional		Total	
Code No.	Name of Subject	Credit	Contact	Credit	Contact	Credit	Contact
		Hours	Hours	Hours	Hours	Hours	Hours
HUM3181	Principles of Accounting	3	3	0	0	3	3
ME3181	Machine Tools and Machining	3	3	0	0	3	3
ME2192	Machine Tools and Machining	0	0	1	2	1	2
ME5162	Sessional	0	0	1	Δ	1	2
IPE3181	Operations Management	4	4	0	0	4	4
IPE3183	Operations Research	4	4	0	0	4	4
IPE3185	Product Design-I	3	3	0	0	3	3
IPE3186	Product Design-I Sessional	0	0	1	2	1	2
IPE3188	IPE Case Study	0	0	1	2	1	2
	Total	17	17	3	6	20	23
No. of Theor	ry Course : 05 Total Conta	ct Hours	: 23				

#### Part-3 Odd Semester

No. of Sessional Course : 03 Total Credits Hours : 20

		Th	Theory		Sessional		Total		
Code No.	Name of Subject	Credit	Contact	Credit	Contact	Credit	Contact		
		Hours	Hours	Hours	Hours	Hours	Hours		
ME3281	Fluid Mechanics and Machinery	3	3	0	0	3	3		
ME3282	Fluid Mechanics and Machinery Sessional	0	0	1	2	1	2		
ME3283	Measurement and Instrumentation	4	4	0	0	4	4		
ME3284	Measurement and Instrumentation Sessional	0	0	1	2	1	2		
IPE3281	Facility Management and Materials Handling	3	3	0	0	3	3		
IPE3283	Quality Control and Management	3	3	0	0	3	3		
IPE3285	Product Design-II	3	3	0	0	3	3		
IPE3286	Product Design-II Sessional	0	0	1	2	1	2		
Total		16	16	3	6	19	22		
IPE3288	Industrial Practice			1	4 weeks	1	4 weeks		
IPE3200	Board Viva-Voce			1		1			
No. of Theor	No of Theory Course $: 05$ Total Contact Hours $: 24 + 4$ weeks								

Part-3 Even Semester

No. of Sessional Course : 04 Total Credits Hours : 21

		Theory		Sessional		Total	
Code No.	Name of Subject	Credit	Contact	Credit	Contact	Credit	Contact
		Hours	Hours	Hours	Hours	Hours	Hours
IPE4180	Project and Thesis	0	0	2	4	2	4
IPE4181	Production Management	3	3	0	0	3	3
IPE4183	CAD/CAM	3	3	0	0	3	3
IPE4184	CAD/CAM Sessional	0	0	1	2	1	2
IPE4185	CIM	3	3	0	0	3	3
IPE4186	CIM Sessional	0	0	1	2	1	2
IPE4187	Modeling and Simulation	3	3	0	0	3	3
IPE4188	Modeling and Simulation Sessional	0	0	1	2	1	2
IPE4189	Optional-I (a) Total Quality Management (TQM)						
	(b) Microprocessor Programming	3	3	0	0	3	3
	and Interfacing						
	(c) Micro- Manufacturing						
Total		15	15	5	10	20	25
IPE4100	Board Viva-Voce			1		1	
No. of Theory Course : 05 Total Contact Hours : 25							

#### Part-4 Odd Semester

No. of Theory Course: 05Total Contact Hours: 25No. of Sessional Course: 04Total Credits Hours: 21

#### **Part-4 Even Semester**

Code No.	Name of Subject	Theory		Sessional		Total		
		Credit	Contact	Credit	Contact	Credit	Contact	
		Hours	Hours	Hours	Hours	Hours	Hours	
IPE4280	Project and Thesis	0	0	3	6	3	6	
IPE4281	Project and Environment Management	3	3	0	0	3	3	
IPE4283	Reliability and Maintenance Management	3	3	0	0	3	3	
IPE4285	Control Theory and Automation	3	3	0	0	3	3	
IPE4286	Control Theory and Automation Sessional	0	0	2	4	2	4	
IPE4287	Cost and Management Accounting	3	3	0	0	3	3	
IPE4288	Seminar	0	0	2	4	2	4	
IPE4189	Optional-II (a) Energy Management (b) IT in Manufacturing (c) Organizational Behavior	3	3	0	0	3	3	
Total		15	15	7	14	22	29	
No. of Theory Courses :05 Total Contact Hours :20								

No. of Theory Course: 05Total Contact Hours: 29No. of Sessional Course: 03Total Credits Hours: 22

6. **Rules for Promotion** (Ref. The Rajshahi University Academic Ordinance, 2013 for B.Sc. in Engineering Curriculum of the Affiliated Colleges/Institutes, Article no. 15):

There shall be final examinations conducted by the Examinations Conducting Committee of the college/institute at the end of each semester. The results shall be finalized at the end of the even semester of the academic year. A student entering in an odd semester shall automatically move on to the next semester, unless she/he was debarred from appearing at the final examinations at the end of the semester.

Individual course grades and GPA shall be announced within a date ordinarily not later than three weeks after the end of the semester final examinations.

- 6.1 **Minimum passing grade:** The minimum passing grade in a theoretical course will be D and the minimum passing grade in a laboratory/project/field work/in-plant training/ workshop/ similar Courses (henceforth referred to as laboratory course) and Viva-voce will be C.
- 6.2 **Promotion to higher class:** A student who has a grade point average of 2.25 or higher and no F grade in the theoretical courses and not less than C grade in the laboratory courses and viva-voce of the two semesters shall be promoted to the next higher class.
- 6.3 There shall be no refereed in laboratory courses and viva-voce. A student failing to secure a minimum C grade in any of the laboratory courses and Viva-voce in any semester will not pass in that year.

#### 6.4 **Course Improvement:**

- 6.4.1 **Referred (with 'F'):** A student who has a grade point average of 1.7 or higher, with 'F' grade in the theoretical courses, not more than 10 credit points in an academic year shall be awarded Referred up to 10 credits in the courses where less than B grade (including F grade) were obtained and he/she may appear at a supplementary examination in those courses only. In such case the student has to give his/her choice of course/courses for supplementary examination in writing.
- 6.4.2 **Referred (with no 'F'):** A student having grade point average of less than 2.2 and no 'F' grade in theoretical courses may appear at a supplementary examination in not more than 10 credit points in an academic year, only for courses in which less than B grade was obtained. In such case the student has to give his/her choice of course/courses for supplementary examination in writing.
- 6.4.3 **Promotion of Referred student to higher Class:** In order to be promoted to the next higher class, a student must obtain a grade point average of 2.2 with no less than D grade in any of the courses in which he/she appeared in supplementary examination.
- 6.4.4 Grades obtained by a student in the courses in which s/he appeared at the supplementary examination will be recorded for assessment and the grade obtained by him/her in those courses at the regular final examination shall automatically be treated cancelled.
- 6.4.5 Clause 6.4.4 is not valid for a candidate, who cannot improve his/her course grade at the supplementary examination, in that case the previous grade shall remain valid.
- 6.4.6 **Improvement of YGPA**: A candidate obtaining an YGPA of less than 2.75 at the end of the academic year shall be allowed to sit for supplementary examination up to a maximum of 8 credit points of <u>(courses in where less than 'B' grade was obtained)</u> theoretical courses in the academic year. No improvement shall be allowed for laboratory examination and Board Viva-voce. If a candidate fails to improve YGPA with the block of new GP in total, the previous YGPA shall remain valid.
- 6.4.7 All **Referred examinations** shall ordinarily be held during the inter-session break. This break may also be utilized for industrial attachment training or survey Sessional, etc.
- 6.5 **Course Exemption:** students who fail to be promoted to the next higher class shall be exempted from taking the theoretical and laboratory courses where they obtained grades equal to or better than B. These grades would be counted in calculating GPA in the next year's examination results.
- 6.6 **Merit Position:** The YGPA obtained by a student in the semester final examinations will be considered for determining the merit position for the award of scholarships, stipends etc.

#### 7. Publication of Results:

- 7.1 A student must successfully complete the courses of all the semesters within a maximum of seven academic years as outlined by the Committee of Courses with all its pre-requisites in order to be eligible for the award of B.Sc. Engineering degree. The student must earn 160 credits (no 'F' grade) and CGPA 2.25 or higher.
- 7.2 **Merit position:** Merit position of a student for each academic year of each degree) awarding department shall be determined on the basis of his/her YGPA of that particular year. Merit position for the award of the degree of B.Sc. Engineering will be based on CGPA of all the academic years.

- 7.3 **Honours:** Candidates for Bachelor's degree in engineering will be awarded the degree with Honours if their CGPA is 3.75 or higher.
- 7.4 **Result Improvement:** A candidate obtaining a CGPA of less than 2.75 at the end of Part-IV even semester examinations, within 4 or 5 academic years shall be allowed to improve his/her result, of upto a maximum 4 units (courses less than B grade) of the Part-IV, maximum 2 units from any one semester of the year, theoretical courses in the immediate next regular examination after publication of his/her result. No improvement shall be allowed for laboratory examinations and Board Viva-voce. If a candidate fails to improve CGPA with the block of new GP in total, the previous result shall remain valid.
- 7.5 **Dean's List:** As a recognition of excellent performance, the names of students obtaining a cumulative GPA of 3.75 or above in two regular semesters in each academic year may be published in the Dean's List in the faculty. Students who have received an 'F' grade in any course during any of the two regular semesters will not be considered for Dean's List in that year.
- 7.6 **Industrial and Professional Training Requirements:** Depending on each department's own requirements, a student may have to complete a prescribed number of days of industrial/professional training in addition to minimum credits and other requirements, to the satisfaction of the concerned department.
- 7.7 **Recording of Results:** The overall results of a successful student covering all semesters' examinations of four years shall be declared on the basis of CGPA with the corresponding Letter Grade (LG). The transcripts in English will show the course designation, course title, credit, grade and grade point of individual courses. YGPA of each year, CGPA and corresponding LG for the overall result.

#### 8. Eligibility for Examination:

- 8.1 A candidate may not be admitted to any semester final examinations unless he/she has
  - 8.1.1 Submitted to the registrar/ Vice-Chancellor an application in the prescribed form for appearing at the examination.
    - 8.1.2 Paid the prescribed examination fees, and all outstanding college/institute dues.
    - 8.1.3 Fulfilled the conditions for attendance in class and
    - 8.1.4 Been barred by any disciplinary rule.
- 8.2 On special circumstances the Vice- Chancellor may permit a student to appear at the examination.

8.3 A student whose attendance falls short of 70% but not below 60% in any course as mentioned above may be allowed to appear at the final examinations as a non-collegiate student

#### Details of course outline of each subject for Bachelor of Science in Industrial & Production Engineering

#### Part-1 Odd Semester

#### PHY1181 Physics-I

#### **Theory: Credit Hours - 3**

#### Structure of Matter, Electricity and Magnetism and Semiconductor Physics Structure of Matter: States of Matter, solid, liquid and gas, Classification of solids; amorphous crystalline ceramics & 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 between metal insulator and semiconductor.

Electricity and magnetism: Electric charge, Couloum's law. The electric field; Calculation of the electric flux and Gauss's law, some application 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 law, Resistivity; an atomic view, Ampere's law. Faraday's law, Lenz's law Self inductance and Mutual inductance. Magnetic properties of matter. Magneto motive force, Magnetic field intensity Permeability, Susceptibility, classifications of magnetic materials, Magnetization curves.

Semiconductor Physics: Semiconductor characteristics, classification of semiconductor, P-type and n type Semiconductor Diodes, characteristic curve of p-n junction, Rectifiers, LED, Transistors FET, IC, photoelectric effect.

#### PHY1182 Physics-I Sessional

Sessional: Credit Hours - 1 Sessional based on the theory of course PHY1181

#### **Theory: Credit Hours - 3**

Atomic structure; Periodical 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. Thermo chemistry, chemical kinetics, chemical equilibria. Electronic conductance, Emf. Electrochemical cells. Corrosion & reactions.

**CHEM1183** Chemistry

#### **CHEM1184 Chemistry Sessional**

Sessional: Credit Hours - 1

Sessional based on the theory of course CHEM1183

#### MATH1185 Differential Calculus and differential Equations

#### **Theory: Credit Hours - 4**

Differential Calculus: Limit, Continuity differentiation and successive differentiation on various types of function, 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 or inflection, its applications. Indeterminate form; L'Hospital rule,

Differential Equations: Basic concept and ideas of differential equation, solution if first order differential equations by methods, solutions of general linear equations of second and higher order with constant coefficient, applications.

HUM1187 English

#### **Theory: Credit Hours – 2**

English phonetics: the places and manners of articulation of the English sounds. Vocabulary. English grammar Construction of sentences, some grammatical problems. Comprehension. Composition on current affairs. Amplification, precis writing, Phrases and idioms. Commercial correspondence and tenders. Technical report writing, Lessons in spoken English, Drafting notes. - Short stories written by some well- known classic writers.

#### **IPE1181 Introduction to Industrial and Production Engineering**

#### **Theory: Credit Hours - 3**

Evolution of industrialization; Involvement of Industrial and Production Engineering in the entire life cycle of a product; Design of product; Basic processes for product manufacturing; Machineries for manufacturing; Computer in manufacturing; Managing manufacturing system; Improvement of systemsoptimization, quality management, ergonomics, safety, organizational behavior etc.

Contact Hours/week 2 + 0

#### **Contact Hours/week 3 + 0**

#### **Contact Hours/week 4 + 0**

Contact Hours/week 0 +2

#### Contact Hours/week 0 +2

#### **IPE1282** Work Shop Practice-I

Sessional: Credit Hours - 1

IPE1184 Engineering Graphics-I

Sessional: Credit Hours - 1

#### B.Sc. in Industrial & Production Engineering Part-1 Even Semester

#### PHY1281 Physics-II

#### Theory: Credit Hours - 3

**Geometrical optics:** Combination of lenses: equivalent lens and equivalent focal length, cardinal points of lens, power of a lens. Defects of images: spherical aberration, astigmatism, coma, distortion, curvature, chromatic aberration. Optical instruments: compound microscope, polarizing microscope, resolving power of a microscope, camera and photographic techniques.

**Oscillations and Wave:** Principals of statistical physics, probabilities and classical statistics. Quantum statistic, Boss-Einstein statistics, Fermi-Direct statistics and their applications, Simple harmonic motion, damped simple harmonic oscillation, forced oscillation, resonance, vibrations of membranes and columns, combination and composition of simple harmonic motions, Lissajou figures, Transverse and longitudinal nature of waves, traveling and standing 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.

#### PHY1282 Physics-II Sessional

Contact Hours/week 0 +2

Contact Hours/week 3 + 0

Contact Hours/week 3 + 0

Sessional based on the theory of course PHY1281

#### **CHEM1283 Industrial Chemistry**

Theory: Credit Hours - 3

Sessional: Credit Hours - 1

#### Non-metallic engineering Materials:

Glass: Classification, Manufacture and application.

**Coating Material:** Paints, varnishes and Metallic coating: composition and application of paints, varnishes and paints, varnishes and metallic coatings, methods used in applying coating on metal surface. **Plastic:** Fundamental characteristics, classification, raw materials and manufacture of plastic, some typical examples of plastics and their uses.

Fibres: Type of fibres, synthesis and application of synthetic fibres.

Rubbers: Source of natural rubber, chemical treatment of latex, synthesis and properties.

#### MATH1285 Vectors, Matrix and Co-ordinate Geometry

#### **Theory: Credit Hours - 3**

**Vectors:** Definition of vectors Equility of vevtors addition, subtraction and multiplication of vectors. Scalar and vector of two vectors and their geometrical interpretation. Triple Products and multiple products and their applicatuion to geometry and mechanics. Linear dependence an 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. Matcic polynomials. Eigen values and eigen vectors.

Contact Hours/week 0 +2

Contact Hours/week 0 +2

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Co-ordinate Geometry: Transformation of co-ordinates & indentificatuon of conics. Three dimensional co-ordinate system. Projection. Direction cosines. Equations of planes and lines. Angle begween 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. Conditions of tangency.

#### **CSE1281 Basic Computer and Programming**

#### **Theory: Credit Hours - 3**

Introduction to digital Computer: Introduction to digital Computer and its essential components like CPU, Memories and I/O storage devices.

Introduction to Number system: Binary, Octal and Hexadecimal number system.

Language: Assembly level, Machine level and High level languages. Compiler, interpreter and Assembler. Source and Object programs.

System and Application Software: Different system software and their functions. Essential general purpose software for word processing, spreadsheet analysis and etc.

**Concept of Algorithm:** Development of flowcharts to solve related engineering problems.

Introduction to C/C++ language: preliminaries, Data types, Expressions, Decision making, Loops, Function, Arrays, Pointer, Structure, and File Processing. Application of computer programming for solving IPE based engineering problems.

#### **CSE1282 Basic Computer and Programming Sessional**

Sessional: Credit Hours - 2

Sessional based on the theory of course CSE 1281.

#### **IPE1281 Production Process**

**Theory: Credit Hours - 3** 

Casting: Patterns & allowance; Molding tools & Operation. Sand molds casting. Other casting processes. Shell mold, plaster mold, lost wax casting, centrifugal casting, permanent mold casting,

**Chip formation process:** Types of chips: breakers: Tool materials; friction between tool & chip; cutting fluid & its action; surface finish.

Metal removing process: Introduction to turning, drilling shaping planning, milling, broaching, gringind, precision and non-precision finishing processes.

Welding: Arc, TIG, MICG, resistance, Thermit & other special types. Welding rods & their uses; cases & remedies of common welding troubles; Brazing & Soldering processes.

#### **IPE1284** Work Shop Practice-II

Sessional: Credit Hours - 1

**Theory: Credit Hours - 2** 

#### **B.Sc. in Industrial & Production Engineering** Part-2 Odd Semester

#### HUM2181 Economics

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 economic system, input-output, analyzing. Allocation of resources.

#### **Contact Hours/week 3 + 0**

Contact Hours/week 0 +4

Contact Hours/week 0 +2

**Contact Hours/week 2 + 0** 

#### MATH2185 Vector Calculus, Laplace Transform and Fourier series

#### **Theory: Credit Hours - 4**

#### Vector Calculus, Laplace Transform and Fourier series:

Vectors Calculus: Differentiation and integration of vectors together with elementary applications. Line, surface and volume integrals. Gradient of a scalar function. Divergence and cut of a vector function. Physical significance of gradient, divergence and curt, 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; since and cosine series; Fourier transformation and Fourier integral, its application to boundary value problems. Harmonic function, Laplace equations, spherical harmonic, surface zone harmonic, gravitational potential due to spherical shell and sphere.

#### **EEE2181 Electrical Engineering-I**

#### **Theory: Credit Hours - 3**

Direct current circuits: Laws and theorems. DC network analysis.

Alternating Current Circuits: AC quantities and waveforms. Phasors, AC circuit analysis with series and parallel branches of RL, RC and RLC. Principal of single phase transformer. Balanced three phase system.

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

#### **EEE2182 Electrical Engineering-I Sessional**

#### Sessional: Credit Hours - 1

**Theory: Credit Hours - 3** 

Sessional based on the theory of course EEE 2181.

#### **ME2181 Engineering Mechanics**

#### Contact Hours/week 3 + 0

**Contact Hours/week 4 + 0** 

Statics: Force in trusses and farms; 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 & acceleration in mechanism.

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.

#### **IPE2181** Engineering Materials and Metallurgy

#### **Theory: Credit Hours - 4**

Ceramic: Raw materials, preparation, characterization and processing. **Polymers:** Structure and properties of polymers, thermoplastics and thermo sets and processing.

Composites: Theory, fabrication, structure and uses.

Concents of Crystal Geometry: Types of lattices solidification metal & allovs. Variables affecting carbon steels and their microstructures various types of steels, Martensitic transformation composite of tool steel.

Heat Treatment of steels: Annealing, Normaling, Quenching, Tempering and tryes of harderning processes, perticipitation processes.

#### **Contact Hours/week 4 + 0**

**Contact Hours/week 3 + 0** 

**Ferrous & non ferrous Metals:** Production and properties of pig, wrought and cast iron; carbon steels, their properties and microstruction, prudction, properties and usess of common non-ferrous metal ans their alloys, bearing and spring metals. Alloy of Noble metals. Metallurgical sapect of metal joining. **Power metallurgy:** princiles and process, metal powder and their characteristics, method of prducing metal powders, application, advantange, disadvantanges of powder metallurgy.

#### **IPE2182** Engineering Materials and Metallurgy Sessional

#### Sessional: Credit Hours - 1

Sessional based on the theory of course IPE 2181.

#### **IPE2184 Work Shop Practice-III**

Sessional: Credit Hours - 1

#### **IPE2186 Engineering Graphics-II**

Sessional: Credit Hours - 1

#### B.Sc. in Industrial & Production Engineering Part-2 Even Semester

#### **EEE2281 Electrical Engineering-II**

#### **Theory: Credit Hours - 3**

**Introduction to digital Electronics:** logic gates, flip-flop, counters, registers and memory systems. A/D and D/A converters.

**Electrical Machine:** Principal of Electromagnetic induction, Details of DC generator and DC motor. Principal of AC motors and generators, starting, speed control of induction motor. Special machine like welding machine, universal motor, stepper motor, reluctance motor, repulsion motor, servomotor etc.

#### **EEE2282 Electrical Engineering-II Sessional**

Sessional: Credit Hours - 1

Sessional based on the theory of course **EEE2281**.

#### **ME2281 Heat Transfer and Thermodynamics**

#### **Theory: Credit Hours - 4**

**Heat transfer:** Interoduction to Heat Trasfer; Models of heat transfer, steady and unsteady state heat conduction and radiation heat transfer, Convection heat transfer, Natural and forced convection, Heat excsngers.

**Thermodynamics:** Fundamental concepts, The 1<sup>st</sup> Law of Thermodynamics, Non-Flow Process, Flow Process, 2<sup>nd</sup> Law of Thermodynamics, Corollaries of 2<sup>nd</sup> Law, General Thermodynamic Relations.

#### ME2282 Heat Transfer and Thermodynamics Sessional

#### Sessional: Credit Hours - 1

Sessional based on the theory of course ME2281.

#### **ME2283** Mechanics of Solids

#### **Theory: Credit Hours - 4**

**Stress analysis:** Statically indetermaination axilly loded member, thermal and centrifugal stresses; stresses in thin and thick walled cylindrs and spheres.

Contact Hours/week 3 + 0

Contact Hours/week 4 + 0

Contact Hours/week 0 +2

**Contact Hours/week 4 + 0** 

Contact Hours/week 0 +2

Contact Hours/week 0 +2

Contact Hours/week 0 +2

Beams: Shear force and bending moment diagrams; various types of stresses in beams; Flexure formula; Deflection of beams: integration and area moment methods; interdiction to reinforced concrete beams and slabs. Torsion Formula: Angle of twist Modulus of rupture; Helical spring; Combined stresses: Principle stress, Mohr's Circle; Columns: Euler's formula intermediate column formulas, the Secant formula; Flexure formula of curved beams.

Introduction to experimental stress analysis techniques, Stain energy; Failure theories.

#### ME2284 Mechanics of Solids Sessional

#### Sessional: Credit Hours - 1

Sessional based on the theory of course ME2283.

#### **IPE2281** Probability and Statistics

#### **Theory: Credit Hours - 4**

Basic law 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 therem; Chi-Square distribution, t- distribution, F- distribution: Estimation and confidence interval: Statistical, hypothesis and testing; Goodness-of-fit tests; Correlation and regression analysis, of variance; Experimental designs; Randomized block design, Factorial design. Introduction to stochastic problems in engineering

#### **IPE2283 Engineering Economy**

#### **Theory: Credit Hours - 2**

Introduction to engineering 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.

#### **IPE2200 Board Viva-Voce**

**Credit Hours - 1** 

#### **B.Sc. in Industrial & Production Engineering** Part-3 Odd Semester

#### HUM3181 Principles of Accounting

#### **Theory: Credit Hours - 3**

Accounts, transaction the accounting procedures and financial statements. Cost in general: objectives and classification. Overhead costing. Cost sheet under ob costing, operation costing and process costing. Marginal costing: tolls and techniques, cost volume profit analysis. Relevant costing analysis the probability within the firm. Guideline for decision-making. Long run planning and control capital budgeting.

#### ME3181 Machine Tools and Machining

#### **Theory: Credit Hours - 3**

#### Theory of Machine: Intertie and kinetic energy of rotating and reciprocating parts, turning moment diagram static and dynamic balancing of rotating components. Undamped and Damped free vibration of one and two degrees of freedom, Forced vibrations; Whirling speed of shafts and rotors, power transmission by ropes, belts, chain Gears and gear trains; Study of Cams.

#### Contact Hours/week 0 +2

Contact Hours/week 4 + 0

#### Contact Hours/week 2 + 0

#### **Contact Hours/week 3 + 0**

**Theory of Machine Tools Mechanism:** Introduction. Mechanism of Machine Tools: Spindles, clutches, Breaks, gearing systems, etc. Torques and power consumption in Machine Tools, Forced vibration of Machine Tool mechanisms. Torsional virtions. Balancing of rotary part of machine tools, vibration absorption, isolation and vibration damers. Theories of low and high frequency chatter formation in machine tools, Methods of damping chatter of machine tool mechanism.

#### **ME3182** Machine Tools and Machining Sessional

#### **Sessional: Credit Hours - 1**

Contact Hours/week 0 +2

Sessional based on the theory of course IPE3181.

#### **IPE3181** Operation Management

#### **Theory: Credit Hours - 4**

**Theory: Credit Hours - 4** 

**Theory: Credit Hours - 3** 

**Production System:** Elements of production planning and control, types of production system. Forecasting methods and their application, aggregate planning, master production scheduling, Material Requirement planning. MRP-II and Just-in-Time production system. Capacity planning. Inventory management, ABC analysis. Production line balancing scheduling & sequencing techniques, CPM and PERT, Group Technology & Flexible Manufacturing system. Work study and method study, plant performance measurement.

**Ergonomics:** Man-Machine-Material interfaces in manufacturing: physical and cognitive aspects, Comparative advantage of man and machine, physical work and human muscular effort, Bio mechanics and bio engineering. Anthropometry, work place design and work place layout, human performance under environment temperature , illumination, vibration, noise, pollution, radiation static and dynamic conditions.

**Safety Management:** 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 regulation for engineering works, case studies.

#### **IPE3183** Operation Research

#### Contact Hours/week 4 + 0

Introduction, Liner Programming: Types of Solutions, Simplex method, Duel Simplex method, Post Optimal Analysis, Transportation and Assignment Models, Dynamic programming, Introduction to queuing models, inventory models, Game and Decision theory, Integer & Mixed Integer programming, Non Liner Programming.

#### **IPE3185** Production Design-I

**Introduction to Design:** Design principle need and criterions for design. Design procedures and **Tooling:** Types of tools: Machine tools; Cutting tools; Fixtures; Jigs; Examples of drill jigs, Open and closed jigs; Index Jigs; Fixture for turning, Milling, Grinding and other operations, General tool design principles and their applications.

**Dies:** Progressive & compound dies; Blank developments; Design of cutting, forming and drawing dies, Punch design.

#### **IPE3186 Production Design-I Sessional**

Sessional: Credit Hours - 1 Sessional based on the theory of course IPE 3185.

IPE3188 IPE Case Study

#### Sessional: Credit Hours - 1

Contact Hours/week 0 +2

Contact Hours/week 0 +2

#### Contact Hours/week 3 + 0

#### **B.Sc. in Industrial & Production Engineering Part-3 Even Semester**

#### **ME3281 Fluid Mechanics and Machinery**

**Theory: Credit Hours - 3** 

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 measurement real fluid flow; frictional losses in pipes and fittings.

Machinery: Velocity diagram and Euler pump/turbine equation, turbines, pump 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.

#### ME3282 Fluid Mechanics and Machinery Sessional

#### Sessional: Credit Hours - 1

Contact Hours/week 0 +2

Contact Hours/week 3 + 0

Sessional based on the theory of course ME3281.

#### **ME3283** Measurement and Instrumentation

#### Contact Hours/week 4 + 0

**Theory: Credit Hours - 4** 

Sensors: Displacement & 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.

Measurement System: Functional Elements of a measurement system, classification of measuring instrument, characteristics of instrument, sensitivity and resolution of instrument, measurement system errors, signal conditioning. Standard units of measurements; accuracy and precision; linear and angular measurements, flatness and straightness testing; measurement of radius of curvature; surface roughness measurement, screw and gear measurement; limit gauging. Taylor's principle on limit gauges.

#### **ME3284** Measurement and Instrumentation Sessional

#### Sessional: Credit Hours - 1

Sessional based on the theory of course IPE3283.

#### **IPE3281** Facility Management and Materials Handing

#### **Theory: Credit Hours - 3**

Issues and importance of handling of materials: Analysis of material handling problems, classification of material, unit load, bulk loads and contenerization. Study of material handling system and their efficiency. Effects of follow movements to handling system.

Product handling: Design system configuration conforming to various kinds of product features and layout characteristics.

Design concepts common handling and transfer equipment: General ideas about different types of material transfer equipments. Automatic packaging devices: Testing procedure of packages: vibration test, drop test, performance limits and testing machines. 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).

Contact Hours/week 0 +2

#### **IPE4181 Production Management**

#### **Theory: Credit Hours - 3**

Management and organization: Definitions of management, management functions, organization fundamentals, organization structures, span of control.

Business: Single proprietorship, Partnership, Joint stock company, Corporation, Private & Public sector, business collusion's and combinations, share, bond, loan; share market; mortgage; bankruptcy Liquidation.

Financial Planning: Classification of capital: Capital procurement; economic analysis of cost pattern; break-even analysis; depreciation; depreciation calculation estimation of life of an engineering asset. Replacement of plant machinery.

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### Introduction: Definition of Quality control; need of scientific Quality control; Quality standards and

specification. Statistical Quality Control: Concept of Probability and its distribution. Elementary SPC tools PDCA cycle, Pareto's Law, cause and effect (fishbone), control charts-attribute and variable control charts, X-R & C charts. Measurement of variation and process capability analysis, Regression analysis. Acceptance sampling plan, single, double, sequential, rectifying inspection plan.

Quality Management: Concept of quality circle, Total Quality Management (TQM) application of TQM philosophy. Deming's principal on quality and productivity. Quality coats and their interpretation. Quality standards and their compliance, ISO certification system.

#### **IPE3285 Product Design-II**

#### **Theory: Credit Hours - 3**

**Theory: Credit Hours - 3** 

Functional aspects of a product, environment and human factors in design, value engineering. Design morphology and standardization.

Design of machine parts for strength, deflection stiffness, fatigue, Impact etc, design for manufacturing operations such as, machining, casting, welding, press working etc.

Reverse engineering, alternative solutions and their evaluation, designing for assembly and disassembly, reliability, product life cycle, cost analysis.

Prototype design, designing of engineering systems involving shafts, bearings linkages, couplings, clutches brakes, gears and power transmission, Introduction to Rapid Prototyping.

#### **IPE3286 Product Design-II Sessional**

Sessional: Credit Hours - 1

Sessional: Credit Hours - 1

Sessional based on the theory of course IPE 3285.

#### **IPE3288 Industrial Practice**

**Contact Hours/week 0 +4weeks** 

Contact Hours/week 0 +2

#### **IPE3200 Board Viva-Voce**

Credit Hours - 1

#### **B.Sc. in Industrial & Production Engineering Part-4 Odd Semester**

#### **IPE4180 Project and Thesis**

Sessional: Credit Hours - 2

#### **IPE3283 Ouality Control and Management**

## Contact Hours/week 3 + 0

Contact Hours/week 0 +4

Contact Hours/week 3 + 0

**Budgeting:** Types of expenditure, controllable and non- controllable expenditure; flexible budgets; budget revision; zero based budgets; cost control through budgeting.

**Personal Management:** functions of personal management; staffing; recruitment and development; motivation; labor relation; collective bargaining, strike; lockout; grevance arbitration.

**Wage and salary Administration:** Job evaluation; techniques of evaluation; merit rating; salary and wages; wage incentive plans; fringe benefit.

**Purchase and Sales:** purchasing policies: purchasing procedures; purchasing problems; salvage department; Sales forecasting; distribution channels; concept of marketing; advertising and sales promotion.

**Research and Development:** Technological change; process of innovation; importance of R&D; research cost and risk; patent and royalty; industrial espionage; product life cycle; development of a product; creativity.

#### IPE4183 CAD/CAM

#### **Theory: Credit Hours - 3**

**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 development and application of different types of data structures. Concepts of engineering graphics and differential geometry in CAD, Design of carves and surfaces. Evaluation of integral properties of volumes. Graphical representation and intersection & interference of surfaces and volumes. Application of CAD in mechanism design of different industrial and mechanical components.

**CAM:** Fundamental concepts, trend of development of NC, principals 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 principal of FMS.

#### **IPE4184 CAD/CAM Sessional**

**Sessional: Credit Hours - 1** Sessional based on the theory of course **IPE4183.** 

#### IPE4185 CIM

#### **Theory: Credit Hours - 3**

**CIM:** Introduction, features, types of CIM, flexible manufacturing system, material handling system, AGV storage system.

#### **IPE4186 CIM Sessional**

#### Sessional: Credit Hours - 1

Sessional based on the theory of course IPE4185.

#### **IPE4187** Modeling and Simulation

## Theory: Credit Hours - 3

Simulation methods, Model buildings, Random number generator, Statistical analysis of results, validation and verification techniques, Hand simulation and digital simulation of continuous system. Simulation and analytical methods for analysis of engineering and business problems. Introduction to the different simulation packages to solve the engineering problems.

#### **IPE4188 Modeling and Simulation Sessional**

#### Sessional: Credit Hours - 1

Sessional based on the theory of course **IPE4187**.

Contact Hours/week 0 +2

Contact Hours/week 0 +2

**Contact Hours/week 3 + 0** 

Contact Hours/week 3 + 0

**Contact Hours/week 3 + 0** 

#### **IPE4189** Optional-I

#### **Theory: Credit Hours- 3**

### Contact Hours/week 3 + 0

#### IPE4189(a) Total Quality Management (TQM)

TQM definition; Origins and growth of TQM; Benefits TQM; philosophic of TQM; Quality circle approach; Deming's approach; Juran's approach; Philip Crosby's approach. Planed implementation of TQM; planning and commitment, participation, continuous improvement.

#### IPE4189(b) 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 Structure, 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.

#### IPE4189(c) Micro- Manufacturing

Micro elements: Design and fabrication, Basic of macro-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.

#### **IPE4100 Board Viva-Voce**

**Credit Hours - 1** 

#### B.Sc. in Industrial & Production Engineering Part-4 Even Semester

#### **IPE4280** Project and Thesis

Sessional: Credit Hours - 3

Continuation of research work selected for IPE-4180.

#### **IPE4281 Project and Environment Management**

#### **Theory: Credit Hours - 3**

**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.

**Environment Management:** Environment & its characteristics, Chemical concept of DO,BOD,COD, quality of industrial waste water, Chemistry involved in water treatment plants, water quality parameters standards, water treatment: plain sedimentation, coagulation & flocculation, filtration, softening, disinflation other treatments methods, disposal of industrial effluents, water pollution sits control.

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**Contact Hours/week 0 +6** 

#### **IPE4283 Reliability and Maintenance Management**

#### **Theory: Credit Hours - 3**

**Quality and Reliability:** failure and survival probability; rate, component and system reliability and its prediction; failure mode and fault tree analysis, reliability testing.

**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, Documentation and computer control in maintenance management, Implementation of planning, plant asset management, human factors in motivation skill in a maintenance environment.

#### **IPE4285** Control Theory and Automation

#### **Theory: Credit Hours - 3**

**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.

#### **IPE4286** Control Theory and Automation Sessional

**Contact Hours/week 0 +4** 

Sessional based on the theory of course IPE4285.

#### **IPE4287** Cost and Management Accounting

#### Theory: Credit Hours - 3

Sessional: Credit-2

**Basic concepts:** 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 course of action. Marginal costing vs. total absorption costing study.

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

#### **IPE4288 Seminar**

Sessional: Credit Hours- 2

**IPE4289 Optional-II** 

**Theory: Credit Hours - 3** 

#### IPE4289(a) Energy Management

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

#### **IPE4289(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

Contact Hours/week 3 + 0

Contact Hours/week 3 + 0

#### Contact Hours/week 3 + 0

Contact Hours/week 0 +4

products, production processes, Manufacturing facilities, Martial handling facilities, Material flow and storage facilities, E-manufacturing, Future implication if IT in Manufacturing.

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

#### IPE4289(c) Organizational Behavior

Behavior of individual in organizations: Values and attitudes, motivation, Group processes, group dynamics, communication, power & conflict, Organizational system, structure, job design, appraisal of performance, processes of organizational change and development.