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Academic
Rules & Regulations

ABOUT THE INSTITUTE

INTRODUCTION

Ghani Khan Choudhury Institute of Engineering & Technology (GKCIET), Malda, West Bengal was established in 2010 by Ministry of Human Resource Development, Govt. of India in the memory of Sri A.B.A. Ghani Khan Choudhury who had contributed immensely to societal development of the region. The Institute is located at Malda, West Bengal with the bordering districts of Bihar, Jharkhand and North Eastern states. Ghani Khan Choudhury Institute of Engineering & Technology (GKCIET), Malda was established with the objective to create a multi-layered inter disciplinary and inter-sectorial efficient professional technical manpower to act as an international podium for the development and transfer of technical competence in academics. It is committed to provide best possible technical education from grass route level to higher level and to cater to the specific needs of women, school dropouts and other disadvantaged sections of society by organizing a large no of short/long term skills orientation programmes for economic upliftment and inclusive growth of society. It was formulated that the institute, besides catering to the needs of formal education would undertake the non-formal education to prepare the skilled and qualified manpower for self-employment. Further, the institute would take up a strategic research and development activities, which along with entrepreneurship will help in extending the efforts of the institute in imparting education to the unemployed and working population by updating and upgrading their technical skills. GKCIET is devoted to provide leadership, organizational expertise, technical assistance and the other resources required to meet the demand.

For more information, please visit to the website www.gkciet.ac.in and or contact at the following telephone/fax number:

Phone: 03512-268780
Fax : 03512-268455

VISION

GKCIET envision to be a lead Technical-Vocational University for inclusive growth and development of technical manpower through formal and non-formal mode mitigating the skilled manpower requirement of the nation.

MISSION

- Technical education and training in formal and non-formal sectors.
- Development of competency based curriculum and ICT based course ware for professional courses.
- Research & Development in the sphere of Science, Technology & Pedagogy.
- Emphasizing to build institute Industry-entrepreneurship and Institute-community interface.
- Building collaboration with National and International Centres of Excellence and partnership with stake holders.

OBJECTIVES

Education and Training:

- To offer flexible, modular, multi-point entry and exit programs in engineering and technology.
- To promote self-employment in all programmes by introducing an element of entrepreneurship, providing guidance and counseling services to help students to take up self-employment ventures.
- To develop enabling frame work to implement national policy on skilled development.
- To offer Non-formal skilled development programmes in the areas of Engineering & Technology, Agriculture, Sericulture & Textile, Health care and Service sector to strengthen the scope of employment and self-employment.
- To provide technical education facilities for women, school dropouts and other backward sections of society through specially designed courses.
- To offer continuing education programme for working personnel from industries at different levels to meet the requirements of the industry/trade.
- To offer bridge courses for lateral entry in relevant programme and for moving from one level of course to another level.

Research & Development:

- To conduct action research in TVET sector and Science & Technology.
- To prepare the students in capable of initiating & managing development activities in the region, hence the programmes will lay emphasis on developing relevant & appropriate technical & vocational skills.
- To promote institute-Institute and Institute-Industries interactions by sharing resources for sustainable development of the region in particular and India as a whole.

EXTENSION SERVICES

To offer services to:

- Industries in the neighborhood and in the region
- Working personnel
- Passed out students
- I.T.I.s and Polytechnics
- Research and other institutes of higher learning

STATUS

The Institute is an autonomous body and fully funded by the Ministry of Human Resource and Development (MHRD), Government of India.

GOALS

Short Term Goal

Dissemination of technical knowledge and skill, inculcate entrepreneurship trait among rural youths using both formal as well as non-formal mode so that they could contribute in the sustainable development of the region in particular and nation as general.

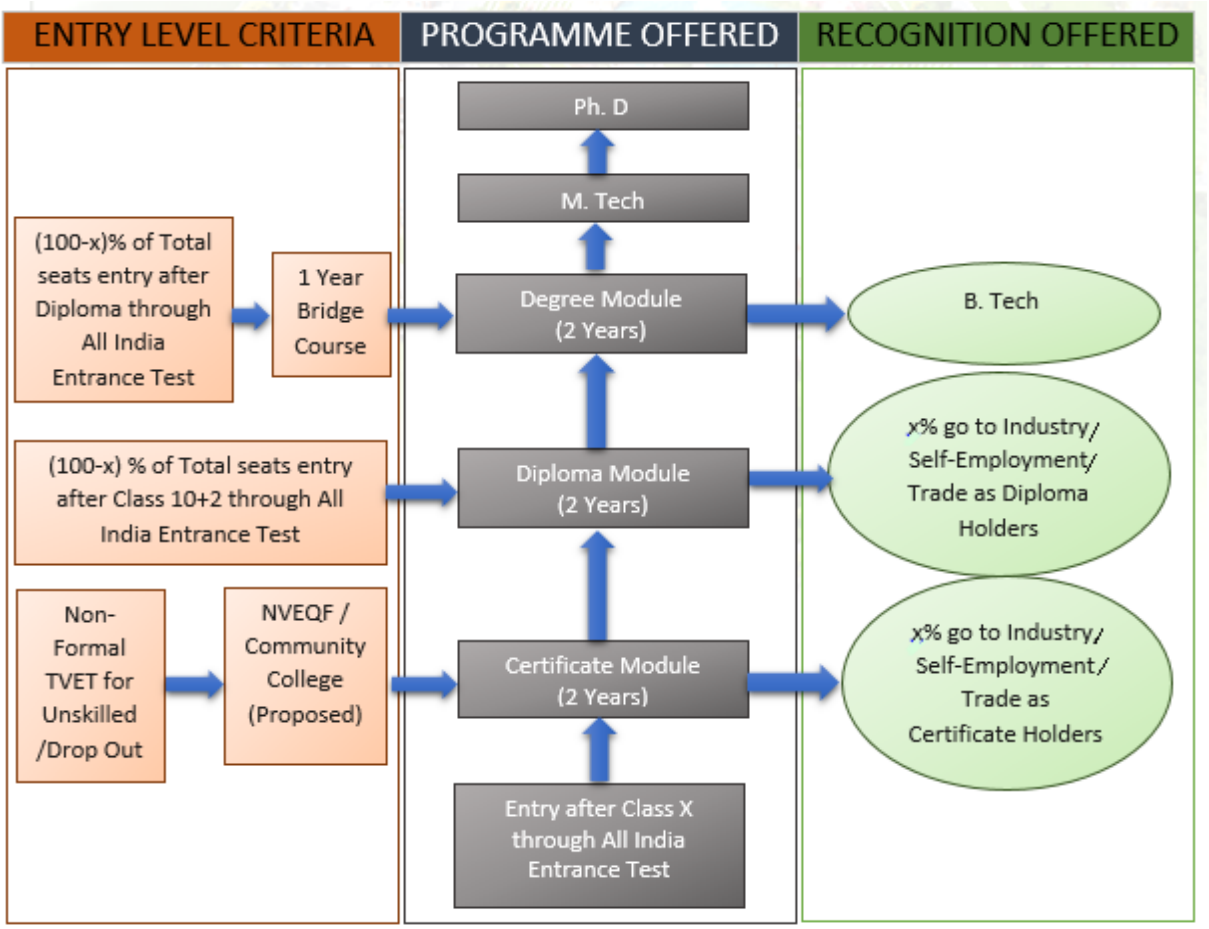
Long Term Goal

Institute is to become fountain-head in providing technological excellence in academics through formal/non-formal Technical Education, Entrepreneurship & Research to meet the changing global needs of the society by transforming itself into Technical Vocational University.

LOCATION

The institute is temporarily located at Power Grid Corporation's Training Institute, Malda and the permanent location is developing in a sprawling area of 101 acres of land, at a distance of 7 km from Malda central railway station and 0.7 km from 34 No. National Highway. It is surrounded by lush green land and mango trees with beautiful landscapes.

ACADEMIC STRUCTURE



1.1 ACADEMIC DISCIPLINES (In 2014-2015 Academic Session)

1. Food Technology
2. Electrical Engineering
3. Mechanical Engineering
4. Civil Engineering
5. Computer Science & Engineering
6. Sericulture & Textile Technology
7. Chemical Technology

1.2 COURSES OF STUDY & AWARD OF DEGREES, DIPLOMAS AND CERTIFICATES

1.2.1 CERTIFICATE PROGRAMMES:

Sl. No.	Certificate Programmes	Intake Capacity	Qualification	Duration
1	Food Processing and Preservation.	30	10th Std. Pass	2 Years
2	Servicing and Maintenance of Electrical Appliances	30	10th Std. Pass	2 Years
3	Repairing and Maintenance of Auto and Farm Machineries	30	10th Std. Pass	2 Years
4	Construction Technology	30	10th Std. Pass	2 Years
5	Computer Applications	30	10th Std. Pass	2 Years
6	Sericulture & Textile Technology	30	10th Std. Pass	2 Years
7	Chemical Technology	30	10th Std. Pass	2 Years

1.2.2 DIPLOMA PROGRAMMES:

Sl. No.	Diploma Programmes	Intake		Qualification		Duration
		For Vertical Entry	For Direct Entry	For Direct Entry	Vertical Entry of GKCIET Student	
1	Food Processing Technology	15	15	10 +2 Pass (with PCM)	Certificate Course pass	2 Years
2	Electrical Engineering	15	15	10 +2 Pass (with PCM)	Certificate Course pass	2 Years
3	Mechanical Engineering	15	15	10 +2 Pass (with PCM)	Certificate Course pass	2 Years

1.2.3 DEGREE PROGRAMMES (B.Tech.)

Sl. No.	Degree Programmes	Intake		Qualification	Duration	
		For vertical entry	For Direct Entry		For GKCIET Diploma Student	For the Diploma holders of Other Institutions
1	Food Processing Technology	15	15	Diploma Pass	2 Years	3 Years
2	Electrical Engineering	15	15	Diploma Pass	2 Years	3 Years
3	Mechanical Engineering	15	15	Diploma Pass	2 Years	3 Years

1.3 RESIDENCE

The Institute is envisaged to be fully residential. In the present campus (temporary) only few students can be accommodated. However, every student will be accommodated in the Institute hostel when such infrastructures will be ready in the permanent Campus at Narayanpur. Then every student is required to reside in the hostel unless otherwise permitted to reside outside. Each and every student has to abide by the rules and regulation of the respective hostel as well as the general rules of the Institute.

1.4 ADMISSION AND ENROLMENT OF STUDENTS TO THE INSTITUTE

1.4.1 Details of admission notification with intake capacity, reservation of seats etc. in any of the programme viz. Certificate, Diploma, Degree Programmes, is published in the newspapers as well as Institute's website (www.gkciet.ac.in) in the month of March/April every year in the form of "Information Brochure". However, summery of admission procedure is given in respective sub-head of different programmes.

1.4.2 Seats are reserved for candidate belonging to OBC, SC, ST and Persons with Disabilities (PWD) candidates as per the guidelines issued by MHRD, Govt. of India and as Institute adopt it. Institute also follows the territorial based reservation policy as per guidelines issued by MHRD, Govt. of India.

1.4.3 The candidates have to fulfill the medical standards required for admission as set out by the Institute.

1.4.4 Notwithstanding anything aforesaid, the admission of a candidate shall be subject to

i. Submission of a migration/school leaving certificate from the concerned Board or University (within three (3) months from the date of admission)

ii. Good conduct certificate from the Head of the Institute last studied.
iii. Medical fitness certificate.

1.4.5 If, at any time after admission, it is found that a candidate has not fulfilled all the requirements stipulated in the offer of admission, the head of the Institute may revoke the admission of the candidate.

1.4.6 The Institute reserves the right to cancel the admission of any student and ask him/her to discontinue his/her studies at any stage of his/her career on the grounds of unsatisfactory academic performance or on disciplinary grounds. The criteria for academic performance will be governed by the Academic Rules and Regulations, while the criteria for disciplinary grounds will be governed by the Rules and Regulations stipulated for Conduct of Students as adopted by the Institute.

1.5 FEE STRUCTURE

i) The payment of fees in a semester is compulsory to continue the studentship.

ii) The fee structure shall be as approved by the Academic Council and/or Board of Governors of the Institute and shall be notified from time to time.

iii) Registration for the first semester of all programmes is a part of the admission procedure; fee for subsequence semesters shall deposited by the student as per notification.

iv) The fee shall be deposited by the students on the day(s) of Registration as per notification issued by the Institute.

v) If a student does not register for admission on the specified/notified date and time, he/she shall be charged a fine as described in the clause no. 2.2.5.

vi) In case the last day falls on holiday the next working day will be treated as last day.

vii) After completion of a course of study or withdrawal from the Institute, security deposits or caution money shall be refunded to a student subject to submission of application in prescribed format by the student, after deduction of all dues, fines and other claims against him.

viii) If a student does not claim the refund of Security deposit/Caution money within one year (reckoning with date of result/withdrawal) of passing or withdrawing from the Institute, the money will be treated as donated to the Institute.

1.6 CO-ORDINATOR OF EXAMINATIONS (CoE)

The Co-coordinator of Examinations shall be a faculty member of the Institute. The Coordinator of Examination may engage other staffs also. He/she shall exercise his/her powers and duties under the immediate directions of the Head of the Institute.

1.7 APPOINTMENT OF QUESTION PAPER SETTERS, EXAMINERS, CONDUCT OF EXAMINATION, APPROVAL & PUBLICATION OF RESULTS

1.7.1 The **Course Coordinators** (Ref. clause no. 1.8.1) act as the Question Paper-setters and Examiners. Other faculty members involved in handling the course are also associated with the evaluation process.

1.7.2 The question paper for the End Semester Examination will be set by the Course Co-coordinator. The End Semester Examination question papers shall be moderated by the **Question-paper Moderation Board (QMB)** of the concerned Department.

The required number of Question papers after moderation shall be submitted by the Course Coordinators to Coordinators of Examinations (CoE) in strictly confidential sealed envelopes within a specified date.

1.7.3 Question-Paper Moderation Board (QMB) shall comprise of:

i.	Head of the Department	-	Chairperson
ii.	One Internal Subject expert	-	Member
iii.	One External Subject expert	-	Member
iv.	Course Co-ordinator	-	Member

1.7.3.1 **Functions of the Question-Paper Moderation Board**

The Board shall ensure that the question paper has been set strictly in accordance with the syllabus, and the Academic Regulations of the Institute. The Board may,

(i) Delete question(s) set from outside the syllabus and make necessary corrections and substitutions, if required.

(ii) Remove ambiguity in the language of a question, if any.

(iii) Moderate some or all questions giving ample opportunity to candidates with average and exceptional capabilities.

(iv) Ensure proper distribution of marks to each question or part(s) thereof, modify the questions and correct errors, in this regard.

(v) The decision of the QMB will be final and binding on the question setter.

1.7.4 Ordinarily Course Co-ordinator, who is the Paper-setter, shall act as an Examiner. In case, the Course Co-ordinator is not available due to unavoidable reasons, a Course Instructor or a faculty member having expertise in the subject may be appointed as an Examiner by the HoD. The Examiner/Evaluator of the Answer-Scripts shall ensure the correct entries of Marks obtained by students in Mid-Semester examination, tests/quizzes/assignments etc. and End Semester Examination in the format for the break-up of marks provided for the purpose. He/she shall round off a fraction equal to half or more to the next higher figure in the total marks. A fraction less than one-half will be neglected.

The Marks-list/Grade-sheet duly signed by the Course Co-ordinator and Head of the concerned Department shall be sent to the Co-ordinator of Examinations within the stipulated date in strict confidence.

1.7.5 All examinations of the Institute shall be conducted in accordance with the Academic Regulations framed for the purpose and modified from time to time by the Institute Authority.

1.7.6 Subject to the Rules and Regulations framed and approved by Academic Council and BoG, the Co-ordinator of Examinations shall be responsible for all arrangements for the smooth conduct of examinations and all matters connected therewith.

1.7.7 The Centre Superintendent of an examination centre shall have the disciplinary control over candidates appearing in the examination at the centre. He/she shall have the power to expel and refuse to allow a candidate from taking the examination for reasons to be recorded in the presence of Invigilator(s). Any such action taken shall be immediately reported to the Co-ordinator of Examinations. The Co-ordinator of Examinations shall place all such cases to the Examination Board of the Institute.

All cases of malpractice and indiscipline in the examination shall be reported to the Examination Board of the Institute (EBI).

1.7.7.1 **Composition of EBI**:

(i) Dean (Academic) - Chairman
(ii) All Heads of the Departments or their nominees - Members
(iii) Co-ordinator of Examinations - Member Secretary

Centre Superintendent/Invigilators or any other official may be invited to the meeting of the Board, on the approval of Chairman, EBI.

1.7.7.2 **Functions of EBI**:

(i) To award punishment for malpractices during the examination.

(ii) To recommend the cases of gross indiscipline and misbehavior during the examination to the Institute's Disciplinary Committee.

(iii) To suggest measures for improvement in discipline/conducting examination.

(iv) To consider request(s) for showing of End Semester Examination or Supplementary Examination answer script of aggrieved students.

(v) To show the evaluated answer scripts to the students in the presence of the Course Co-ordinator and make necessary changes, if any, in marks, grades and examination result.

1.7.7.3 **Powers of EBI:**

The EBI shall be empowered to:

(i) award F grade for malpractices and IA grade on valid ground(s).

(ii) recommend issue of warning to a student for improvement in his/her behavior.

(iii) arrange scrutiny for marking of unchecked questions or part(s) thereof and totaling of marks in an answer script.

1.7.8 On approval of the Head of the Institute, the Co-ordinator of Examinations shall notify the name(s) of Centre Superintendents for different days and time of the examination who shall be responsible for overall discipline and smooth conduct of examination.

1.7.9 The Co-ordinator of Examinations may engage other staff required to conduct the examinations. He/she shall arrange the handing over of Examination Answer-scripts in sealed envelopes to Examiners/Evaluators immediately after the examination.

1.7.10 If a candidate falls sick or is suffering from a contagious disease and wishes to appear at the Examination on notified date and time, special arrangement may be made by the Co-ordinator of Examinations at the request of the candidate subject to the production of evidence in support of such illness, duly certified by Medical officer in-charge (MO) of the Institute/other recognized Hospitals and countersigned by the MO, GKCIET, provided that for such special arrangement, the candidate shall pay additional fee per paper fixed by the Institute from time to time.

1.7.11 The End Semester Practical Examination shall be conducted by the Course Co-ordinators.

1.7.12 The Project work evaluation, viva-voce examination for Project Work/field report in subjects where applicable, shall be conducted as per provisions in the Academic Regulation of the Institute.

1.7.13 The Centre Superintendent, Question Paper Setters, Invigilators, Examiners/Evaluators, Tabulators and Assistants shall be paid honorarium as decided by the Institute from time to time, for the End Semester/supplementary/"I" grade/Practical examinations and project evaluation as may be applicable.

A person shall not accept any of the above examination related works of a question paper in which his/her relative is appearing. An invigilator will not perform invigilation duty in the room/hall/laboratory etc. where his/her relative is writing the examination.

1.7.14 Not with standing anything contrary to the provisions contained herein above, the Head of the Institute shall have the power to order such actions, as he/she may consider necessary in order to ensure fair and smooth conduct of the Institute examinations.

1.7.15 The grades/marks from the grade-sheet/marks-list shall be tabulated by Tabulators appointed for the purpose. They shall be primarily responsible for correct entries in the tabulation sheets of grades /marks and calculation of grade point average

(GPA/CGPA) in accordance with the Academic regulations of the Institute. They shall be assisted by Assistants in tabulation work and preparation of Result.

1.7.16 The Result prepared by the Tabulators and Co-ordinator of Examinations shall be presented to the **Result Moderation Board (RMB)** of the Institute. The RMB shall comprise of:

i)	Head of the Institute	- Chairman
ii)	Dean (Academic)	- Member
iii)	All Heads	- Member
iv)	Dy. Registrar (Academic)	- Member
v)	Co-ordinator of Examinations	- Member Secretary
vi)	Respective Course Co-ordinator	- Member

1.7.17 Power & Functions of the Result Moderation Board (RMB):

(i) The Result Moderation Board may moderate the result of a student submitted by the Co-ordinator of Examinations.

(ii) The RMB may award a grace marks to a student for passing the Semester or upgrading the Semester grades.

1.7.18 On the approval of the Head of the Institute, the moderated result shall be published by the Co-ordinator of Examinations on a specified date in the Academic Calendar.

1.7.19 Notwithstanding anything above, the Head of the Institute may quash the result of a candidate, if

i. he/she has used unfair means in the examination.
ii. a mistake is found in the result of the candidate.
iii. he/she has willfully suppressed any important information pertaining to his/her admission in the Institute.

1.7.20 In view of the provision at 1.7.7.2 (iv) and (v), no evaluated answer script of the End Semester Examinations shall be given out on RTI request.

1.7.21 All evaluated answer script of the End Semester Examinations will be destroyed/disposed off after six months from the date of publication of the result.

1.8 COURSE CO-ORDINATOR

1.8.1 Each course has a **Course Co-ordinator** who has full responsibility for conducting the course, coordinating the work of the other teachers involved in teaching that course, holding the test, quizzes etc., practical examination and evaluating the answer-scripts. In case of any difficulty, the students should approach the Course Co-ordinator for advice and clarification.

1.8.2 A teacher of a course other than the Course Co-ordinator is called a Course Instructor. He/she will assist the Course Co-ordinator in teaching, holding test, quizzes, practical examination etc. and evaluating the answer-scripts.

1.9 ACADEMIC CALENDAR

1.9.1 Each academic session is divided into two semesters having at least 90 working days each. There is also an Industrial Training Term commence normally after Even Semester in every academic year. The academic session shall commence from a date in the first week of August and end in the last week of June. The tentative duration of semesters is given bellow

Odd Semester : August to December
Even Semester : January to June

Apart from the above two regular Semesters, a Summer Term will be conducted for the students having shortfall in their attendance. The Summer Term will commence in the month of July in every academic year.

1.9.2 The Academic Council/Board of Governors of the Institute will approve the comprehensive Academic Calendar consisting of schedules of activities for a session inclusive of dates for Registration, Mid Semester, End Semesters, Summer Terms, Supplementary Examination, Inter-semester breaks etc. well in advance of start of the Academic Session.

1.10 STUDENTS FEEDBACK

Students' feedback will be taken by the Heads of all Departments, course wise and teacher wise, from each semester for helping improvement in the teaching learning process.

ACADEMIC RULES, REGULATIONS & STUDY SCHEME FOR UG PROGRAMMES

ACADEMIC RULES, REGULATIONS AND STUDY SCHEME FOR UG COURSES

INTRODUCTION

The Govt. of India in order No F25-1/2009-TS-IV dated 18-2-2010 established Ghani Khan Choudhury Institute of Engineering & Technology (GKCIET), Malda (WB) to promote higher technical education and offer Academic programmes i.e; Certificate, Diploma, Degree courses leading to B.Tech.

The provision contained in this Regulation will govern the conditions for imparting courses of instruction, conducting examinations and evaluation of students' performance leading to the Certificate, Diploma and Degree programmes in different discipline.

These Regulations are effective for the batches of Students who will be admitted in the Academic Session 2014-2015, onwards. The provisions of this regulation shall also be applicable to any new discipline that are introduced from time to time and added to the list in the respective section.

The Board of Governors (BoG) may, on the recommendation of Academic Council, change any or all parts of this Regulation at any time considered appropriate.

2.0 GENERAL RULES & REGULATIONS COMMON FOR ALL THE PROGRAMMES

2.1.0 ADMISSION

The modular structure of UG curriculum at GKCIET, Malda consists of three independent modules in Engineering & Technology stream as given below:

(i) Certificate Module
(ii) Diploma Module
(iii) Degree Module (B.Tech.)

2.1.1 Duration of a Module

Under normal circumstances, a student is expected to complete the requirements of a module in two (2) academic years for Certificate and Diploma Module. It is two (2) years for the vertical entrants, and three (3) years for the lateral entrants including one (1) year bridge course, in Degree Module of Technology. However, academically weak and deficient students, who are unable to pass in the required number of courses in normal duration, may be allowed a maximum of additional two (2) years including the withdrawal period.

2.1.2 Reservation of seats*

2.1.2.1 Reservation for SC, ST, OBC & PWD: *Reservation will be as per latest guidelines issued by the Government of India from time to time.

2.1.2.2 **Territorial Quota:**

Territorial Reservation Seats meant for Certificate Courses and Diploma Courses are bifurcated for the candidates of the State of West Bengal and for the candidates belonging to other States, respectively in the following proportion:

Certificate Programmes

Quota for West Bengal - 75%
Quota for Other States and U.T - 25%

Diploma Programmes

Quota for West Bengal - 50%
Quota for Other States and U.T - 50%

For Degree Programmes, there is no such territorial quota.

If the seat under quota for West Bengal/Other States and U.T remained vacant during counseling, the same shall be filled-up from the quota for Other States and U.T/West Bengal. If the seats remained vacant after counseling, the same shall be filled-up through spot counseling on first come and first service basis from the candidates who full fill minimum eligibility criteria, however Govt. of India reservation rules shall be followed in all such cases.

2.1.2.3 **Rules for Operating Reservation:**

i) To avail the reservations under Territorial quota candidate have to produce a domicile certificate from competent authority at the time of admission.

ii) Seats remaining vacant in OBC category will be offered to general category, as per instructions of Govt. of India as may be applicable from time to time. For applying to avail reservation under OBC category, the candidates will be required to submit adequate proof/certificate, issued by the competent authority as may be prescribed from time to time in evidence of his/her not belonging to creamy layer. The criteria of creamy layer will be applied as may be prescribed by the Govt. of India from time to time. **The above proof/certificate should pertain to the year just preceding the year of GKCIET Entrance Test (GKCIET-ET) Examination.**

iii) For claiming seats reserved for Person with Disability candidates, the minimum degree of disability should be 40%. Seats falling to the share of Person with Disability candidates in various branches are inter changeable depending upon the availability/suitability of candidates. However, in any branch (as well as in the total seats meant for direct entry) number of seats will not exceed the prescribed quota of 3%. To claim reservation under Person with Disability candidate's category, the candidate is required to submit a certificate from the Chief Medical Officer of the district concerned clearly mentioning about the extent/degree of disability. The admission to this category will be governed by the rules of Govt. of India as may be applicable from time to time. The decision of admission committee, regarding the suitability of a candidate for a particular branch for claiming reservation under this category, shall be final and binding on the candidates.

iv) The seats remaining vacant in any branch due to non-availability/suitability of eligible candidates belonging to Person with Disability category will be shifted to general category in that branch.

v) There shall not be any reservation for GKCIET students promoted from Certificate module to Diploma module and from Diploma module to Degree module through vertical mobility.

2.2.0 CONDUCT AND DISCIPLINE

2.2.1 Students shall conduct themselves within and outside the precincts/campus of the Institute in a manner befitting the students of a renowned institution.

2.2.2 Every student has to abide by the general rules and regulations of conduct issued by the Institute for its students.

2.2.3 The student shall show due respect to the teachers of the Institute, The wardens of the Halls of Residence and other official and non-official staffs. They shall also pay due attention and courtesy to visitors.

2.2.4 Students are required to develop a friendly relation with fellow students. In particular, they are expected to show kindness and consideration to the new students admitted to the Institute every year.

2.2.5 As per order of the **Hon'ble Supreme Court of India**, ragging in any form is banned. Acts of ragging will be considered as gross indiscipline and will severely dealt with.

2.2.6 The students shall not indulge in such activities amounting to acts of indiscipline and misbehavior such as:

I. Taking procession and holding demonstration in the campus.

II. Gearing, intimidating and threatening the staff.

III. Interfering with the functions of various committees.

IV. Defacing the building by writing slogans pasting bills and damaging the property of the institute.

V. Disturbing the classes in session, assaulting teachers/students/other employees of Institute.

VI. Keeping in possession of any lethal weapon will liable for severe disciplinary action.

VII. Keeping in Possession and/or consuming alcohol liquor.

VIII. Any other acts of indiscipline decided by competent authority. If the students involved in any in-disciplinary activity, the disciplinary committee shall decide the amount of punishment.

IX. Students involved in drugs and narcotics in any form shall be expelled from the institute. Students placed on conduct probation shall not represent the institute and shall lose any office that he/she may hold any organization functioning in the institute.

2.3.0 ELIGIBILITY OF REGISTRATION

2.3.1 A student will be automatically registered to the first semester at the time of admission. Every student in any programme is required to register themselves for every semester (2nd semester and onward) in person with the Academic Office on the date of registration as per Academic Calendar. A student will be eligible for

enrolment only if he/she has deposited semester fees and pending dues and is not debarred from enrolment by a disciplinary action of the Institute and cleared the minimum academic requirement.

2.3.2 In order to continue students in upcoming higher semesters, the student must have attended the immediate previous semesters respectively. A student is eligible for registration for higher semester provided he/she clears the previous semester by regular/supplementary examination.

2.3.3 Only those students will be permitted to register who have:

a. Cleared all Institute and Hall dues of the previous semesters.
b. Paid all required prescribed fees for the current semester, and
c. Not been debarred from registering for a specified period on disciplinary or any other ground.

2.3.4 A student who has been debarred from appearing at an examination either a) as per recommendation of the subject teacher for unsatisfactory attendance or b) by the Institute as a measure of disciplinary action or c) for adopting malpractice at an examination and consequently awarded X grade may register for the subject(s) after the term of debarment expires, provided that provisions of the regulation do not prevent him/her.

2.3.5 A student who does not register on the day announced for the purpose may be permitted, in consideration of any compelling reason, late registration within next 10 working days on payment of an additional late fee of ₹200.00 per day as prescribed by the Institute. However Head of the Institute may permit a student up to 21 days after expiry of scheduled date. In this case fine mentioned above will be applicable.

2.3.6 Cancellation of Registration

The registration and studentship of a student will be cancelled if the student is involved in any unlawful activities, in-disciplinary activity or involvement in any police case or fails to deposit the semester Fees.

2.3.7 Registration for summer term

I. Students who have failed due to lack of attendance (obtained grade 'FA' in four or less subjects) in any compulsory subject in any semester must have to register for summer term course.

II. In case of failure in Laboratory/Practical subject the student will have to register for it in the summer term course.

2.3.8 Procedure of Registration

(a) A set of course registration sheets for each student is issued by the Academic Cell.

(b) The course registration sheets signed by the student along with the "No Dues" Certificates and after payment of fees, must be submitted to the Academic Section on the day of registration by the student himself/herself.

2.3.9 In-absentia registration

2.3.9.1 In exceptional case, when a student is not able to present himself/herself for registration due to serious illness leading to hospitalization or due to other extra-ordinary circumstances, the registration may be done in absentia by parents/guardians along with proof with the explicit approval of the Head of the Institute.

2.3.9.2 A student who has been debarred from appearing at an examination either a) by the Institute as a measure of disciplinary action or b) for adopting malpractice at an examination and consequently awarded X grade may register for the subject(s) after the term of debarment expires, provided that provisions of the regulation do not prevent him/her.

2.4.0 WITHDRAWAL OF STUDENTSHIP

A student may withdraw from the institute at any time on his / her request. Such student has to deposit Rs.10 in accounts branch as withdrawal charges to obtain the Studentship Withdrawal Form (SWF). The institute leaving certificate will be issued and caution money will be refunded to the student on submission of duly completed no dues form. If a student once withdrawn from the institute wants to get admission again he/ she may do so by appearing as a fresh candidate.

2.5.0 CHANGE OF BRANCH

Change of trade/ branch shall not be allowed after the close of admission process in any programme.

2.6.0 ATTENDANCE

2.6.1 Ideally, every student is expected to attend all the classes (Lectures, Tutorials, Laboratories, Workshops, etc.) and earn 100% attendance. Students are also required to attend all the classes of Extra Academic Activities. He/she shall secure not less than 75% attendance on each subject. However, in order to allow provision of unavoidable reasons such as medical exigencies/family calamity or activities like representing Institute in district/State/National level Sports & Cultural meet, Science Exhibition, NCC/NSS Camp or such other activities as decided by the Institute with prior approval by the Head of the Institute, the student is expected to earn a minimum of 65% attendance in each subject.

2.6.2 A student will be debarred from appearing in the end semester examination in a subject(s) in which his/her attendance falls short as per clause no. 2. 6.1 above and will be awarded FA grade in that subject(s).

2.6.3 Absence from classes without prior permission will be considered as an act of indiscipline and will be dealt as per rules and regulations.

2.7.0 LEAVE OF ABSENCE

2.7.1 If the period of leave is for a short duration (less than 2 weeks), prior application for the leave shall have to be submitted to the Head of the Department concerned stating fully the reason for the leave along with supporting documents and such leave may be granted by the Head of the Department Concerned.

2.7.2 Absence for a period not exceeding two weeks in a semester due to sickness or any other unavoidable reasons for which prior application could not be made may be condoned by the Head of the Department provided he/she is satisfied with the explanation.

2.7.3 If the period of absence is likely to exceed two weeks, a prior application for grant of leave will have to be submitted through the Head of the Department to the Head of the Institute with supporting documents in each case, the decision to grant leave shall be taken by the Head of the Institute on the recommendation of the Head of the Department. The Head of the Institute may, on receipt of an application also decide whether the student be asked to withdraw from the course for that particular semester because of long absence.

2.7.4 If the period of absence is more than 35% of total scheduled classes, the student will be debarred from appearing in the end semester examination and will be under the provision of year lapse.

2.8.0 TEMPORARY WITHDRAWAL FROM THE INSTITUTE

2.8.1 A student who has been admitted to undergraduate programmes may be permitted to discontinue temporarily from the programme on the grounds of prolonged illness or grave calamity in the family for a period of one semester or more provided,

I. he/she applies to the Institute within 6 weeks of the commencement of the semester or from the date he/she last attended whichever is later, stating fully the reasons for such withdrawal together with supporting documents and endorsement of his/her guardian;

II. The Institute is satisfied that, counting the period of withdrawal, the student is likely to complete his/her requirements of the programme within the maximum time limits for the course.

III. There are no outstanding dues or demands in the Institute/ Hostel /Department/ Library.

2.8.2 A student who has been granted temporary withdrawal from the Institute under the provisions of Clause 2.8.1 will be required to pay fees/charges (except tuition fees) till such time as his/her name is on the Roll List. However, fees once paid will not be refunded.

2.8.3 Normally, a student will be permitted only one such temporary withdrawal during his/her tenure as a student of the undergraduate programme.

2.9.0 COUNSELLING SYSTEM

Each class after admission to the institute shall be assigned to a faculty counselor. The counselor shall help each student in planning the academic programme of his / her studies and expected to keep constantly in touch with their counselor so that he / she may evaluate their progress and guide them accordingly. Counselor will meet students once in a week for which a slot in timetable is provided.

2.10.0 INDUSTRIAL TRAINING AND FIELD WORK

2.10.1 The curricula for all the Programmes would include compulsory Industrial Training for about 4 weeks to be carried out in the summer vacation at the end of the 2nd semester of Certificate, Diploma and Degree semester II.

2.10.2 Those who will be not able to undergo Industrial Training may be permitted to do so during the semester break after 3rd semester (4th week of Dec to 3rd Week of Jan) in special cases.

2.10.3 Any arrangement of training in industry or academia has to be routed through Training and Placement cell via the Departmental Training Coordinator.

2.10.4 The allotment of training programmes of all the students by Training and Placement Cell will be frozen by a suitable and fixed deadline each year. No further change will be allowed.

2.10.5 A student is required to score minimum passmark/pass grade to pass the industrial training, failing which he/she has to repeat the industrial training and appear again in the viva voce examination.

2.11.0 EXAMINATION AND EVALUATION PROCESS

2.11.1 The Evaluation process is based on absolute marking system for Certificate and Diploma Programmes while absolute grading system for Degree Programme.

2.11.2 Performance in each course of study shall be evaluated based on (i) **Continuous Internal Assessment** including mid semester examinations throughout the semester and (ii) **End Semester Examination** at the end of the semester.

2.11.3 Distribution of marks

The distribution of marks for Sessional/Continuous Evaluation and End Semester Examination shall be as under

Theory:

Continuous Internal Assessment	:	25-50 %
End Semester Examination	:	50-75 %

Practical:

Continuous Internal Assessment	:	50 %
End Semester Examination	:	50 %

Further distribution of **Continuous Internal Assessment** Evaluation marks in Theory/Practical Subject is as follows

Theory:

Attendance	:	10 %
Assignment/Quiz	:	30 %
Mid Semester	:	60 %

Practical:

Viva- Voce	:	50 %
Punctuality/Report etc.	:	50 %

2.11.4 Mid semester examination/end semester examinations

The Mid Semester Examination and End Semester Examination will be conducted centrally by the Examination Section of the Institute every semester. Every theory subject must have one Mid Semester and an End Semester Examination. The durations of the examinations will be 2 hours and 3 hours respectively. No course can have an examination of shorter durations. The class-tests or quizzes will be organized by the instructor concerned and the duration will be decided accordingly.

2.12.0 QUALIFYING CRITERIA AND GRADES

2.12.1 A candidate who secures not less than 40% of total marks prescribed for the subjects (**Continuous Internal Assessment** + End Semester Examination) with a minimum of 40% of the marks prescribed for the End Semester Examination in theory and 40% of total marks allotted for the subject (**Continuous Internal Assessment** + End Semester Examination) with a minimum of 40% of the marks allotted for the End Semester Examination in practical subject (including Project work), shall be declared to have passed in the Examination. Minimum passing marks & **grades** in different examination is tabulated below:

Examination	Pass mark		Over-all passing Criteria		
	Continuous assessment	End Semester	% of Marks		Grade
			Certificate	Diploma	Degree
Theory	Nil	40 %	40%	40%	5
Practical	Nil	40 %	40%	40%	5

2.12.2 A student will have supplementary in an examination paper if he/she fails to secure the marks/grades prescribed in the above clause in the particular subject.

2.13.0 PROMOTION AND SUPPLEMENTARY EXAMINATION

2.13.1 A student obtained **F/IA** grade in any course may appear for Supplementary examination held during Summer Term examination as per Academic Calendar and notified by Examination Cell. For that purpose, he/she has to apply for the same as per academic calendar when notified by the examination cell.

2.13.2 A student willing to appear in supplementary examination will have to submit Supplementary Examination Form (SEF) to Academic Section with prescribed fee of ₹300.00 per subject. He/she has to attach the Xerox copy (attested) of Mark sheet concerned to that semester with Supplementary Examination Form on the dates notified by the Academic Section.

2.13.3 The syllabus of supplementary examination and Summer Term Course will be same for which he/she had originally registered for the course and had obtained F/IA grade.

2.13.4 Even if a student gets 'F' grade in in four or less subjects in two consecutive semesters of a particular year of study even after appearing in the supplementary examination (F grade) promoted to the next higher year of study, provided that he/she fulfills the other necessary conditions. In this case he/she has to appear for supplementary examination in next year.

2.13.5 Those who have obtained FA grade in four or less subjects in two cumulative semesters of a particular year of study due to lack of attendance are bound to

register for the summer term course as per schedule given in the Academic Calendar and notified by Examination Cell. And has to fulfill the attendance and other academic requirement.

2.14.0 FAILURE TO GET PROMOTION

2.14.1 A student will be retained in the same year of study if he/she gets five or more supplementary in two semesters of an academic year even after appearing in the. Supplementary examination held during summer term.

2.14.2 A student will be retained in the same year of study if he/she gets FA grade in five or more subject in a semester. He/she will also not be promoted to the next higher semester.

2.14.3 A student will also be retained in the same year of study if he/she gets FA grade in five or more subject in two consecutive semesters of a particular year of study.

2.14.4 A student will be retained in the same year of study if he/she carry FA grade even in one subject after summer term examination.

2.14.5 A student retained in a particular year of study (eg. 1st year) as per Cl 2.14.1, will be a casual student in that particular year of study (i.e. 1st year) during the next academic year and will need to clear the relevant examination papers of particular semesters only. Such a student may also attend the classes with junior batch.

2.14.6 A student retained in a particular year of study as per Cl 2.14.2, will have to register in relevant semester/s of particular year of study with his/her junior batch and has to fulfill the attendance criteria in the subjects in which he/she has obtained FA grade and has to clear all the subjects of relevant semester of particular year of study.

2.14.7 A student retained in a particular year of study as per Cl 2.14.3, will have to register in relevant semesters of particular year of study with his/her junior batch and has to fulfill the attendance criteria and has to clear the subjects in which he/she has obtained FA grade of relevant semester/s of particular year of study

2.15.0 IMPROVEMENT OF MARKS/GRADE

A candidate who has already appeared for any subject in a semester and passed the examination is not entitled to reappear in the same subject for improvement of marks/Grade.

2.16.0 REVALUATION OF ANSWER SCRIPT

2.16.1 A candidate can apply for revaluation of his/her end semester examination answer paper in a theory course, within 2 weeks from the declaration of results, on payment of a prescribed fee along with prescribed application to the Coordinator of Examinations through the Head of Departments. The Coordinator of Examinations will arrange for the revaluation and the results will be intimated to the candidate concerned through the Head of the Department. Revaluation is not permitted for project work. The prescribed fee for the re-evaluation is Rs. 250.00 per subjects.

2.16.2 Mid Semester Examination Answer Scripts will be shown to the students by the Course instructors as per academic calendar.

2.16.3 Re-evaluation for project work is not permitted.

2.16.4 Answer Script will be stored in Examination cell for Six month from the last date of
Examination of Particular Semester. After that these may be destroyed.

2.17.0 ASSESSMENT OF PROJECT WORK

2.17.1 The evaluation of the project work will be based on sessional work assigned by the supervisor, seminar, project report and project evaluation committees' assessment. Supervisor will assign individual project work to a student or a group of students.The Institute examination for project work will be evaluated by an evaluation committee followed by a viva-voce examination conducted separately for each student by a committee consisting of the guide of the project group and an internal examiner.

2.17.2 Performance in the various activities involved in the project would be assessed individually at the end of each semester in which it is being carried out as per the curriculum. The student is required to submit a written report at the end of the semester.

2.17.3 The Head of the Department would appoint a project evaluation board for the purpose of assessment. The different components of evaluation and the weights assigned to these components are depicted below

Subcomponent	**Weight**
Supervisor's assessment	40%
Project Report/Thesis (to be assessed by the board)	20%
Evaluation Board's assessment	40%

2.17.4 If a student due to non-completion of the project work cannot submit the final project report at the end of final semester for **Diploma and Degree** programme and does not appear before the evaluation board for the viva-voce on the date fixed by the Head of the may be granted extension of time not exceeding two months on the following conditions:

(i) he/she would be deemed to have completed the requirements for the degree if applicable in the succeeding session.

2.18.0 MAKE-UP FOR MID SEMESTER EXAMINATION

Students missing Mid Semester Examination in any of the courses during regular semester on valid grounds may apply for make-up in those courses to the Course Co-ordinator. The Course Co-ordinator may consider all such applications and conduct the examination/assign assignment of all such students for make-up.

2.19.0 AWARD AND CONVERSION OF 'IA' & 'I' GRADE:

(a) If a student fails to appear at the centrally conducted End Semester Examination in a particular subject (theory or practice or both). For this, the student will be awarded **'IA' grade**. For theory component, he/she has to appear for supplementary examination. For practice components, the course coordinator will conduct the practical examination before supplementary examination at his/her discretion.

(b) If a student's Project work/Seminar/Industrial Training is found unsatisfactory by the department and the student is asked to repeat or improve upon it. In such cases, 'I" grade shall be awarded by the Course/Project/Departmental training coordinator. For the same, the Course/Project/Departmental Training coordinator will conduct the Evaluation process of Project work/Seminar/Industrial Training before supplementary examination at his/her discretion.

(c) A candidate will be required to fill-up an application form for conversion of 'IA' and 'I' grade as per notification with the prescribed examination fee of Rs.300/- (Rupees three hundred) per subject for theory as well as practice courses or practice component of a paper.

2.20.0 SUMMER TERM COURSE/SUPPLEMENTARY EXAMINATION

2.20.1 Those who have obtained FA grade in four or less subjects due to lack of attendance have to register for the summer term course as per schedule given in the Academic Calendar and notified by Examination Cell.

2.20.2 The assessment procedure in a summer term course will also be similar to the procedure for a regular course or there will be assignment, quiz whichever is applicable and course coordinator will be responsible for the conduct of summer term course.

2.20.3 A student can however register himself for a maximum number of four subjects in summer course. Head of the department in consultation with course coordinator will finalize the timetable and other requirement of teaching learning process.

2.20.4 Regular classes may be held in case of Summer Term course if the no. of students is five or more. Otherwise the course may be offered as self-study course.

2.20.5 The student has to secure attendance requirement in every registered course failing which he/she will not be allowed to appear for the examination.

2.20.6 The students who have obtained F grade have to apply for **supplementary examination** held during summer term Course with required fees.

2.20.7 The student who has obtained F grade need not fulfill attendance requirement. However, if he/she wants to attend classes he/she may do the same.

2.21.0 GRADING SYSTEM

2.21.1 As a measure of students' performance a 7-scale absolute grading system using the following letter grades and corresponding grade points per credit, shall be followed:

Performance	Percentage Marks obtained in subjects	Grade point per credit	Letter Grade
Out Standing	90-100	**10**	**O**
Excellent	80-89	**9**	**E**
Very good	70-79	**8**	**A**
Good	60-69	**7**	**B**
Fair	50-59	**6**	**C**
Pass	40-49	**5**	**P**
Fail	<40	**0**	**F**
Fail due to lack of attendance	-	**0**	**FA**

Incomplete in project, Seminar etc.	-	**0**	**I**
Incomplete due to Absence in End Term Exam	-	**0**	**IA**
Debarred	-	**0**	**X**

2.21.2 **A Semester Grade Point Average** (SGPA) will be computed for each semester. The SGPA will be calculated as follows:

$$SGPA = \sum_{i-1}^{n} c_i g_i \Big/ \sum_{i-1}^{n} c_i$$

Where 'n' is the number of subjects registered for the semester, 'c_i' is the number of Credits allotted to a particular subject, and 'g_i' is the grade-points carried by the letter corresponding to the grade awarded to the student for the subject. SGPA will be rounded off to the second place of decimal and recorded as such. The SGPA would indicate the performance of the student in the semester to which it refers.

2.21.3 Starting from the second semester at the end of each semester S, a **Cumulative Grade Point Average** (CGPA) will be computed for every student as follows:

$$CGPA = \sum_{i-1}^{m} c_i g_i \Big/ \sum_{i-1}^{m} c_i$$

Where 'm' is the total number of subjects the student has registered from the first semester onwards up to and including the semester S, ''c_i' is the number of Credits allotted to a particular subject 's_i' and 'g_i' is the grade-point carried by the letter corresponding to the grade awarded to the student for the subject 'S_i'. CGPA will be rounded off to the second place of decimal and recorded as such.

The SGPA and CGPA are calculated in consideration of only the credits cleared, i.e. Grade F credits are not included for the calculation. The CGPA would indicate the cumulative performance of the student from the first semester up to the end of the semester to which it refers. The CGPA, SGPA and the grades obtained in all the subjects in a semester will be communicated to every student at the end of every semester.

When a student gets the grade 'IA' /'I' for any subject(s) during a semester, the SGPA of that semester and the CGPA at the end of that semester will be tentatively calculated ignoring this (these) subjects.

After the 'IA' /'I' grade(s) has (have) been converted to appropriate grades, the SGPA and CGPA for that semester will finally be recalculated after taking into account this (these) grade(s).

2.21.4 Yearly Grade Point Average

Yearly Grade Point Average will be mentioned in the every even semester grade card. It is calculated by

$$\mathbf{YGPA = (SGPA_1 + SGPA_2)/2}$$

Where,

$SGPA_1$= SGPA of odd semester of particular year of study

$SGPA_2$= SGPA of even semester of particular year of study

When a student gets the grade 'F' in any subject during a semester, the SGPA and the CGPA from that semester onwards will be tentatively calculated, taking only 'zero point' for each such 'F' grade. After the 'F' grade(s) has/have been substituted by better grades during a subsequent semester, the SGPA and the CGPA of all the semesters, starting from the earliest semester in which the 'F' grade has been updated, will be recomputed and recorded to take this change of grade into account.

2.21.5 Conversion of Grade to percentage

Conversion of Grade to percentage is done by following:

Percent marks= (CGPA-0.75) x 10

2.22.0 UNFAIR-MEANS CASES

It is expected that a student shall maintain decorum while "appearing in a tests/ examination. However, following is the procedure for dealing with the unfair means cases / impersonation.

a) A student who refuses to obey the invigilator or changes seat with other student or deliberately writes other student's Roll No in his/ her answer booklet or creates disturbance of any kind during examination / impersonation, possession of copying material, will be treated as unfair means cases.

b) The center superintendent shall report to Academic section the day of occurrence of any case of unfair means with details of evidence(s) and report of invigilator.

c) The committee constituted by competent authority shall responsible for dealing with all the cases of use of unfair means in any test. The committee will thoroughly investigate the case and will give a chance to student to explain his/ her position before taking the decision. The committee may call superintendent and /or invigilator of examination or any other person for determining the facts of the case.

d) A student found guilty of unfair means as explained above , can be awarded zero marks in that papers can be debarred to appear in that subject examination for one year / monetary fine depending upon the recommendation of committee. This recommendation will be placed before Head of the Institute for approval.

e) A person caught impersonating in the examination shall be handed over to the police.

2.23.0 DIEFFERENT CRITERIA FOR CERTIFICATE PROGRAMME

2.23.1 General introduction and trade:

2 Years courses in Engineering/Technology leading to the award of certificate is currently offered in following disciplines-

a. Food Processing & Preservation
b. Servicing and Maintenance of Electrical Appliances
c. Repairing and Maintenance of Farm and Auto Machineries
d. Construction Technology
e. Computer Applications
f. Sericulture and Textile Technology
g. Chemical Technology

2.23.2 Admission procedure

2.23.2.1 **General:**

Admission to Ghani Khan Choudhury Institute of Engineering & Technology (GKCIET), Malda (WB) for all the courses will be made in accordance with the instruction received from Ministry of Human Resource Development and as per Institute norms from time to time.

2.23.2.2 **Admission test**

The admission to certificate program is made through an All India Level Entrance test known as GKCIET-ET conducted by GKCIET on a date notified from time to time which shall normally be conducted in May/ June every year.

2.23.2.2 **Eligibility**

The minimum qualification for admission to certificate program is 10th pass along with English, Mathematics and Science from a State Secondary Education Board/CBSE/ICSE or equivalent.

2.23.3 Duration

The duration for Certificate Course is two years. The maximum duration for the course is 4 years.

2.23.4 Award of division

The division of pass student shall be determined as follows:

Marks Percentage	Division
≥40% but < 50 %	Third Division
≥ 50% but < 60%	Second Division
≥ 60%	First Division

2.23.5 Qualifying criteria for award of certificate

a. A student has cleared all the subjects offered by the Institute in concerned course and has successfully completed industrial training within permissible maximum course duration.
b. They should maintain all decorum of Institute and not debarred from the Institute under any circumstances.
c. They have to clear all dues to the Institute, Hall of residence, Library dues and the Department.

2.24.0 DIEFFERENT CRITERIA FOR DIPLOMA COURSE

2.24.1 General introduction and trade:

2 Years courses in Engineering/Technology leading to the award of Diploma is currently offered in following discipline-

a) Food Processing Technology
b) Electrical Engineering
c) Mechanical Engineering

2.24.2 Admission test for diploma course

There are two categories of Admission test in Diploma Program

a. Admission through vertical Entry scheme only for GKCIET students of lower module

For vertical promotion from certificate to diploma course against the reserved seats, the certificate course students shall appear in a Special Entrance Test designed for them in order to enter into the diploma stream. Merit of such candidate shall be based upon 50 % weightage of the score in the entrance test and 50 % weightage of their marks obtained in the qualifying certificate program.

b. Admission through Direct Entry scheme

The Institute reserves 50 % of total intake in diploma course for students other than GKCIET students. For admission to these seats the Institute conducts National Level GKCIET Entrance Test. Non GKCIET and GKCIET students who have passed certificate course in previous session are eligible to get admission against these seats. GKCIET students competing for direct entry seats shall have to appear in GKCIET Entrance Test and shall be treated as per with the outside candidates for admission to this category without any weightage to their score in the qualifying certificate course.

2.24.3 Eligibility

The minimum qualification for admission to the Diploma program is 10+2 pass with physics, chemistry and mathematics from a recognized State board/ University or a certificate holder from GKCIET in any trade.

2.24.4 Duration

The duration for Diploma program is two years. Maximum duration for the diploma course is 4 (four) years from the date of admission into 1st semester.

2.24.5 **Award of division**

The division of pass student shall be determined as follows:

Marks Percentage	Division
≥40% but < 50 %	Third Division
≥ 50% but < 60%	Second Division
≥ 60%	First Division

2.24.6 **Qualifying criteria for award of diploma**

a. A student has cleared all the subjects offered by the Institute in concerned course and has successfully completed industrial training within permissible maximum course duration.
b. They should maintain all decorum of Institute and not debarred from the Institute under any circumstances.
c. They have to clear all dues to the Institute, Hall of residence, Library dues and the Department

2.25.0 DIEFFERENT CRITERIA FOR B.TECH PROGRAMME

2.25.1. General

2 Years (For Vertical entry)/ 3 years (for Direct entry) courses in Engineering/Technology leading to the award of B. Tech is currently offered in following discipline-

a) Food Processing Technology
b) Electrical Engineering
c) Mechanical Engineering

2.25.2 Admission to degree program

There are two categories of seats in Degree program

a. Vertical Entry seats only for GKCIET Students

50 % of total sanctioned strength will be filled up through vertical mobility scheme of the Institute by promotion of the lower module (Diploma) based on combined merit of entrance test and their score in the diploma program. The merit of such candidates shall be based on 50% weightage of their score in the special entrance test designed for them and 50% weightage of their score in the qualifying Diploma course.

b. Direct Entry seats

The Institute reserves 50 % of total intake in degree course for students other than GKCIET students. For admission to these seats the Institute conducts National Level GKCIET Entrance Test. Non GKCIET and GKCIET students who have passed Diploma course in relevant discipline in previous session are eligible to get admission against these seats. GKCIET students competing for direct entry seats shall have to appear in GKCIET Entrance Test and shall be treated as per with the outside candidates for admission to this category without any weightage to their score in the qualifying certificate course.

2.25.3 Eligibility

All the candidates who have passed the Diploma Course offered by Ghani Khan Choudhury Institute of Engineering & Technology or from any other

Institute/Polytechnic affiliated to any State Board of Technical Education and approved by All India Council for Technical Education (AICTE) are eligible to apply for the B.Tech program.

2.25.4 Duration

The Duration of B.Tech program is 3 years for the students admitted through Direct Entry Scheme and 2 years for the students admitted by promotion of the diploma passed student of GKCIET through vertical mobility scheme. However the maximum duration for Completion of the program is 5 years for direct entry students and 4 years for vertical entry students.

2.25.5 Qualifying criteria for award of degree

a. A student has cleared all the subjects offered by the Institute in concerned course and has successfully completed industrial training within permissible maximum course duration.
b. They should maintain all decorum of Institute and not debarred from the Institute under any circumstances.
c. They have to clear all dues to the Institute, Hall of residence, Library dues and the Department

Annexure- I

RULES RELATING TO RESIDENCE REQUIREMENTS

Following are the detailed rules governing residence requirements of students:

1. The mess of residences shall function as a single integrated unit and shall not, under any circumstances be subdivided into any kind of groups or subgroups.
2. No student shall come into or give up the assigned accommodation in any Hall of residence without the prior permission of the Warden.
3. No married accommodation shall be provided to any student of the any courses.
4. A student shall reside in a room allotted to him/her and may shift to any other room only under the direction/permission of the warden of the respective hostel.
5. Students shall be required to make their rooms available whenever required for inspection, repairs, maintenance or disinfecting.
6. Students shall be responsible for the proper care of the furniture, fan and other fittings in the rooms allotted to them and shall generally assist the wardens in ensuring proper use, care and security of those provided in the hall of common use of all students.
7. Loss or damage of furniture, fans, or other fitting in room will dealt with severe punishment as will be suggested by warden and Hostel Management Committee.
8. Students will be responsible for safe keeping of their own property. In the event of loss of any personal property of a student due to theft, fire or any other cause the institute shall accept no responsibility and shall not be liable for payment of any compensation.
9. Engaging personal attendants, keeping pets and use of appliances like electrical heater, refrigerator etc. by a student in the hall of residence are prohibited.
10. All students must abide by the rules and regulations of the Hall of Residence as may be framed from time to time.

Annexure-II

RULES REGARDING CONDUCT AND DISCIPLINE

Following rules shall be in force to govern the conduct and discipline of all students:

1. Students shall show due respect to the teachers of the Institute, the Wardens of the Halls of Residence, the Sports Officers of the Athletics and the Officers of the National Cadet Corps; proper courtesy and consideration should be extended to the employees of the Institute and of the Halls of Residence. They shall also pay due attention and courtesy to visitors.
2. Students are required to develop a friendly relationship with fellow students. In particular, they are expected to show kindness and consideration to the new students admitted to the Institute every year. Law bans ragging in any form. Any act of ragging will be considered as gross indiscipline and will be severely dealt with.
3. The following acts of omission and/or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures:

    - His/her absence to the warden of the hall before availing any leave. Furnishing false statement of any kind in the form of application for admission or for award of scholarship etc.
    - Displaying lack of courtesy and decorum; resorting to indecent behaviour anywhere within or outside the campus.
    - Willfully damaging or stealthily removing any property/belongings of the Institute, Hall or fellow students.
    - Possession, consumption or distribution of alcoholic drinks or any kind of hallucinogenic drugs.
    - Adoption of unfair means in the examinations.
    - Organizing or participating in any group activity in company with others in or
    - Outside the campus without prior permission of the Dean of Students' Affairs.
    - Mutilation or unauthorized possession of library books.
    - Restoring to noisy and unseemly behaviour, disturbing studies of fellow students.
    - Not intimating Commensurate with the gravity of the offence, the punishment may be reprimand, fine, and expulsion from the hall, debarment from an examination, rustication for a specified period or even outright expulsion from the Institute.

Structure & Syllabus

FOOD PROCESSING TECHNOLOGY

B. TECH PROGRAMME FOOD PROCESSING TECHNOLOGY (FPT)

BRIDGE COURSE SEMESTER I (AUGUST TO DECEMBER)

Sl. No.	Course Code	Course Tile	L	T	P	Credit	GKCIET Diploma	Others Diploma
1.	AM B101	Comprehensive Mathematics-I	3	0	0	3	No	Yes
2.	AP B101	Engineering Physics	3	0	0	3	No	Yes
3.	AC B101	Engineering Chemistry	3	0	0	3	No	Yes
4.	ME B101	Mechanical Design of Process Equipment	2	0	0	2	No	Yes
5.	FT B101	Food Process Tech.-I	3	0	0	3	No	Yes
6.	AP B151	Engineering Physics Lab.	0	0	3	2	No	Yes
7.	AC B151	Engineering Chemistry Lab.	0	0	3	2	No	Yes
8.	FT B151	Food Process Tech.-I Lab.	0	0	4	2	No	Yes
9.	HU B101	Business Communication & Presentation Skill	3	0	0	3	No	Yes
10.	HU B151	Business Communication & Presentation Skill lab.	0	0	3	2	No	Yes
		Total	**17**	**0**	**13**	**25**		

BRIDGE COURSE SEMESTER II (JANUARY TO MAY)

Sl. No.	Course Code	Course Tile	L	T	P	Credit	GKCIET Diploma	Others Diploma
1.	AM B201	Comprehensive Mathematics-II	3	0	0	3	No	Yes
2.	FT B201	Food Chemistry- I	4	0	0	4	No	Yes
3.	FT B202	Food Preservation-I	3	0	0	3	No	Yes
4.	FT B203	Food process Tech -II	4	0	0	4	No	Yes
5.	CS B201	Programing in C/C++	3	0	0	3	No	Yes
6.	FT B251	Food Chemistry - I Lab.	0	0	3	2	No	Yes
7.	FT B252	Food Preservation-I Lab.	0	0	3	2	No	Yes
8.	FT B 253	Food process Tech –II Lab	0	0	3	2	No	Yes
9.	CS B251	Programing in C/C++ Lab	0	0	3	2	No	Yes
10.	HU B201	Sociology & Elements of Indian History for Engineers	3	0	0	3	No	Yes
		Total	**20**	**0**	**12**	**28**		

DEGREE SEMESTER-I (AUGUST TO DECEMBER)

Sl. No.	Course Code	Course Tile	L	T	P	Credit	GKCIET Diploma	Others Diploma
1.	AM 5101	Engineering Mathematics-I	3	0	0	3	Yes	Yes
2.	AP 5101	Engineering Physics	3	0	0	3	Yes	Yes
3.	HU 5101	Environmental Science	2	0	0	2	Yes	Yes
4.	ME 5101	Basic Engineering Mechanics	4	0	0	4	Yes	Yes
5.	FT 5101	Food Chemistry -II	4	0	0	4	Yes	Yes
6.	FT 5102	Food Microbiology-I	4	0	0	4	Yes	Yes
7.	FT 5151	Food Chemistry-II Lab.	0	0	3	2	Yes	Yes
8.	FT 5152	Food Microbiology-I Lab.	0	0	3	2	Yes	Yes
9.	CS 5101	Database Technology	2	0	0	2	Yes	Yes
10.	CS 5151	Database Technology Lab.	0	0	3	2	Yes	Yes
11.	AP 5151	Engineering Physics Lab.	0	0	3	2	Yes	Yes
12.	MC 5101	Technical Communication & Soft Skills	2	0	0	0	Yes	Yes
		Total	**24**	**0**	**12**	**30**		

DEGREE SEMESTER- II (JANUARY TO MAY)

Sl. No.	Course Code	Course Tile	L	T	P	Credit	GKCIET Diploma	Others Diploma
1.	AM 5201	Engineering Mathematics- II	3	0	0	3	Yes	Yes
2.	AC 5201	Engineering Chemistry	2	0	0	2	Yes	Yes
3.	FT 5201	Bakery, Confectionary and Extruded Food	3	0	0	3	Yes	Yes
4.	FT 5202	Food Analysis & Quality Control	3	0	0	3	Yes	Yes
5.	FT 5203	Food Microbiology-II	3	0	0	3	Yes	Yes
6.	FT 5204	Unit Operation-I	3	0	0	3	Yes	Yes
7.	FT 5205	Beverage Technology	3	0	0	3	Yes	Yes
8.	AC 5251	Engineering Chemistry Lab.	0	0	3	2	Yes	Yes
9.	FT 5201	Bakery, Confectionary and Extruded Food Lab.	0	0	3	2	Yes	Yes
10.	FT 5202	Food Analysis & Quality Control Lab.	0	0	3	2	Yes	Yes
11.	FT 5203	Microbiology-II Lab.	0	0	3	2	Yes	Yes
12.	FT 5204	Unit Operation-I Lab.	0	0	3	2	Yes	Yes
13.	HU 5201	Economics for Engineers	3	0	0	3	Yes	Yes
		Total	**23**	**0**	**15**	**33**		

DEGREE COURSE SEMESTER- III A (JUNE TO AUGUST)

Sl. No.	Course Code	Course Title	L	T	P	Credit	GKCIET Diploma	Other Diploma
1.	IT 6170	Industrial Training	0	0	0	3	Yes	Yes

DEGREE COURSE SEMESTER- III B (AUGUST TO DECEMBER)

Sl. No.	Course Code	Course Tile	L	T	P	Credit	GKCIET Diploma	Others Diploma
1.	AM 6101	Engineering Mathematics-III	3	0	0	3	Yes	Yes
2.	FT 6101	Unit Operation-II	3	0	0	3	Yes	Yes
3.	HU 6101	Industrial Management	3	0	0	3	Yes	Yes
4.	FT 6102	Packaging Technology	2	0	0	2	Yes	Yes
5.	FT 6103	Food Process Tech.-III	3	0	0	3	Yes	Yes
6.	OE 601*	Open Electives- I	3	0	0	3	Yes	Yes
7.	FT 61A*	Professional Electives- I	3	0	0	3	Yes	Yes
8.	FT 6190	Assignments and Term Paper	0	0	0	2	Yes	Yes
9.	FT 6101	Unit Operation-II Lab.	0	0	3	2	Yes	Yes
10.	MC 6104	Value Education and Spirituality	2	0	0	0	Yes	Yes
		Total	**22**	**0**	**3**	**27**		

DEGREE SEMESTER- IV (JANUARY TO MAY)

Sl. No.	Course Code	Course Tile	L	T	P	Credit	GKCIET Diploma	Others Diploma
1.	FT 6201	Food process Engineering	2	0	0	2	Yes	Yes
2.	FT 6202	Food Preservation-II	2	0	0	2	Yes	Yes
3.	FT 6203	Food Process Tech.-IV	2	0	0	2	Yes	Yes
4.	OE 602*	Open Electives -II	3	0	0	3	Yes	Yes
5.	FT 62A*	Professional Electives- II	3	0	0	3	Yes	Yes
6.	FT 62B*	Professional Electives- III	3	0	0	3	Yes	Yes
7.	FT 6260	Comprehensive Viva-voce	0	0	0	2	Yes	Yes
8.	FT 6290	Project work & seminar	0	0	0	4	Yes	Yes
		Total	**15**	**0**	**0**	**21**		

OPEN ELECTIVE - I

Sl. No.	Course Code	Course Title
1.	OE 601A	Rural Technology & Community Development
2.	OE 601B	Modelling & Simulation in Food Processing
3.	OE 601C	Separation Process in Food Industries

OPEN ELECTIVE-II

Sl. No.	Course Code	Course Title
1.	OE 602A	Food Safety
2.	OE 602B	Waste Treatment Engineering
3.	OE 602C	Fermented Food Products

PROFESSIONAL ELECTIVE-I

Sl. No.	Course Code	Course Title
1.	FT 61A1	Spices & Flavour Technology
2.	FT 61A2	Handling and Storage of Food and Food Products
3.	FT 61A3	Modern Techniques in Food Processing

PROFESSIONAL ELECTIVE-II

Sl. No.	Course Code	Course Title
1.	FT 62A1	Protein Technology
2.	FT 62A2	Bio Chemical Engineering
3.	FT 62A3	Health Foods

PROFESSIONAL ELECTIVE-III

Sl. No.	Course Code	Course Title
1.	FT 62B1	Food Plant Layout & Design
2.	FT 62B2	Food Additives
3.	FT 62B3	Food Industry By Product Management

B. TECH PROGRAMME FOOD PROCESSING TECHNOLOGY (FPT)
BRIDGE COURSE SEMESTER-I

AM-B101-COMPREHENSIVE MATHEMATICS-I

L T P **Credits:03**
3 0 0

UNIT-I

Review of distance formula and section formula, equation of straight line in various standard forms, intersection of two straight lines, angle between two lines, condition of parallelism and perpendicularity, perpendicular distance formula. General equation of a circle, diameter form, centre and radius of a circle, circle through three non-collinear points, tangent and normal to a circle at a given point on it, condition of tangency. Verification of known formulae. (10 Hrs.)

UNIT-II

Introduction to conic section, standard equation of parabola, ellipse and hyperbola (without proof), writing equations when directrix, focus and eccentricity are given; finding focus, directrix, latus-rectum, axes, eccentricity and vertex when equation is given. Arithmetic progression, geometric progression, arithmetic-geometric series, special series: $\sum n$, $\sum n^2$, $\sum n^3$.Functions, domain and range. Concept of limit, continuity of a function (with simple examples). Physical & geometric meaning of $\frac{dy}{dx}$, differentiation of $x^n, \sin x, \cos x, \tan x$, e^x, a^x and $\log x$ from the first principle. Differentiation of sum, difference, product, quotient. (10 Hrs.)

UNIT-III

Differentiation of function of a function. Chain rule of differentiation of inverse trigonometric functions, logarithmic and parametric differentiation, differentiation of implicit function. Equations of tangent and normal (for explicit function only).successive differentiation, Leibnitz's theorem. Fundamental theorems: Rolle's Theorem & Lagrange's mean value theorem. Expansion of function using Taylor and McLauren's series. Indeterminate forms, L'Hospital rule. Equation of tangent and normal (for explicit function only). Concept of integration, integration of rational and irrational functions. (10 Hrs.)

UNIT-IV

Organization of data. Measures of Central Tendency- Mean, median, mode. Measures of Disperson - Standard deviation. Karl Pearson's coefficient of correlation. Probability and its laws. Conditional probability. Baye's theorem (without proof). Random Variable, Discrete and Continuous probability Distributions, Binomial and Poisson distributions. Probability mass function, Probability density function; Distribution Function, Expectation, Variance, Probability correlation and Regression, Method of Least Squares: Linear Curve Fitting. (10 Hrs.)

RECOMMENDED BOOKS

Text books on Mathematics for XI, NCERT, New Delhi
Text books on Mathematics for XII, NCERT, New Delhi
Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern Ltd
Probability and Statistics for Science and Engineering, G Shanker Rao
Schaum's Outline Series, Probability & Statistics, Tata McGraw Hill
Engineering Mathematics, Koneru Sarveswara Rao
Ordinary and Partial Differential equations –M.D Rai singhania

AP B101 ENGINEERING PHYSICS

L T P **Credit:5**
3 0 3

UNIT-I

Moment of Inertia: Moment of Inertia of rigid body, radius of gyration, theorem of parallel and perpendicular axes, moment of inertia of a straight rod, circular ring, circular disc, cylinder(solid and hollow) ,sphere, relation between torque and moment of inertia, kinetic energy and angular momentum, motion of cylinder and sphere rolling without slipping on an inclined plane. Numerical problems. (08 Hrs.)

UNIT-II

Kinetic Theory of Gases:Introduction, fundamental assumption of kinetic theory of gases,pressure exerted by gas, K.E of molecules, kinetic interpretation of temperature, derivation of gas laws from kinetic theory of gases. Numerical Problems. (05 Hrs.)

UNIT-III

Wave Optics: Wave front and Huygen's principle, interference of light(Narrow source & broad source), Young's double slit experiment, Qualitative idea of Spatial and Temporal Coherence, Conservation of energy and intensity distribution, Newton's ring. (04 Hrs.)

Diffraction of light, Fresnel and Fraunhofer class, Fraunhofer diffraction due to a single slit. Elementary idea on double slit & grating (rigorous calculation is not required),Rayleigh criterion for resolution & resolving power of grating. (04 Hrs.)
General concepts of polarisation, Plane of vibration and plane of polarisation, qualitative discussion on plane, Circularly and elliptically polarised light, polarisation through reflection and Brewster's law. Numerical Problems. (03 Hrs.)
Fiber Optics: Core and cladding, step index and graded index fibers, acceptance angle, numerical aperture, losses, applications. (04 Hrs.)

UNIT-IV

Atomic Physics : Discharge through gases at varying pressure, Cathode rays and their properties, specific charge on electron by J.J. Thomson, determination of charge of an electron, Millikan's oil drop method. (05 Hrs.)
Nuclear Physics: Introduction, Isotopes, isotones and isobars, atomic mass unit, mass defect and packing fraction, Binding Energy, Nuclear stability, Radioactive laws, Nature of radiation emitted from the radioactive substance, half life and average life, decay, Nuclear Fission and Fusion. energy sources of stars and the sun. Numerical Problems. (07 Hrs.)

Recommended Books:
Text Books:
Arthur Beiser - Concepts of Modern Physics (McGraw Hill)
College Physics – C.R. Dasgupta
Reference Books:
University Physics – Sears and Zemansky

AC B101 ENGINEERING CHEMISTRY

L T P **Credit: 5**
3 0 3

UNIT-I

Organic chemistry: Functional Group: (Cyanides, isocyanides,, nitro compounds and amines) Nomenclature of Cyanides, isocyanides, nitro compounds and amines and their methods of preparation, physical, chemical properties and uses. (7 Hrs.)

UNIT-II

Transition Metals and Coordination Chemistry: Transition Metals: Electronic configuration, general characteristic properties, oxidation states of transition metals. First row transition metals and general properties of their compounds oxides, halides and sulphides. (6 Hrs.)

Coordination Compounds: Nomenclature, isomerism in coordination compounds, bonding in coordination compounds, stability of coordination compounds, application of coordination compounds, compounds containing metal-carbon bond; application of organo-metalics. (6 Hrs.)

UNIT-III

Chemical Thermodynamics: First law of Thermodynamics: Internal energy, enthalpy, and application of first law of thermodynamics, Second and third law of thermodynamics: Entropy, Free energy, spontaneity of a chemical reaction, Free-energy change and chemical equilibrium. (7 Hrs.)

Surface Chemistry: Surfaces: Adsorption, Colloids (preparation and general properties), emulsions, micelles; Catalysis: Homogeneous and heterogeneous, structure of catalyst. (2 Hrs.)

UNIT-IV

Bio-molecules: Carbohydrates: Monosaccharide, disaccharides, polysaccharides; Amino acids and peptides: Structure and classification; Proteins and Enzymes: Structure of proteins, role of enzymes Nucleic acids: DNA and RNA; Lipids: Structure, membranes and their functions. (6 Hrs.)

Chemistry in Action: Dyes: Classification of dyes with examples; Chemicals in medicines: Antipyretics, Antibiotics, analgesics, antiseptics, disinfectants, anti-malarial, tranquilizers, germicides and anaesthetics, (only definition and examples); Rocket propellants: Types of propellants- solid, liquid and hybrid. (6 Hrs.)

Recommended Books:

Text Book:

1. A text book of Engineering Chemistry: Sashi Chawla
2. Engineering Chemistry: Amrita lal De, Abhranil De
3. Advance Chemistry: Philip Matthew
4. Engineering Chemistry: WILEY-INDIA
5. General and Inorganic Chemistry: R. P. Sarkar.

Reference Book:

1. Inorganic Chemistry: Huheey, Keiter, Keiter, Medhi
2. Physical Chemistry: Atkins
3. Physical Chemistry: Leidler
4. Chemical Kinetics: Laidler
5. Organic Chemistry: S. K. Ghosh
6. Organic Chemistry: McMurry and Simanek

MEB101 MECHANICAL DESIGN OF PROCESS EQUIPMENT

L T P **Credit: 2**
2 0 0

UNIT-I

Material of construction: Introduction to material selection; Material properties; Environmental effects on material selection; Mechanical properties & strength of materials. Design basis: Design code; Design pressure; Design temperature; Design stress & factor of safety; Design & actual thickness; Corrosion allowance. (12 Hrs.)

UNIT-II

Design of thin walled process vessels: Cylindrical & spherical vessels under internal and external pressure; Design of attachments and closures; Compensation for openings; Design of flange connections & threaded fasteners. (10 Hrs.)

UNIT-III

Design of thick walled high pressure vessels; Design of piping; Methods of fabrication of ferrous & non-ferrous metals; Concrete, wood and other non-metallic construction.(10 Hrs.)

UNIT-IV

Design of belt and chain drives; Toothed gearing; shafting & bearing; specification of handling equipment. (08 Hrs.)

Text Books / References:

1. Introduction to Chemical Equipment Design — Mechanical Aspects;
B. C. Bhattacharya; CBS Publishers, Delhi
2. Process Equipment Design; H. C. Hesse and J. H. Rushton; Van Nostrand, East West Press
3. Selection of Material and Fabrication for Chemical Process Equipment;
B. C. Bhattacharya; Chem. Engg. Education Dev. Centre; I.I.T Madras
4. Process Equipment Design; L. E. Brownell and E. H. Young; John Wiley and Sons, Inc. N.Y.Structure & Detailed Syllabus of B.Tech in Food Technology
5. Computer Aided Design of Chemical Process Equipment; B. C. Bhattacharya; and C. M. Narayanan; New Central Book Agency, Kolkata
6. Mechanical Design and Fabrication of Process Equipment; B. C. Bhattacharya; Khanna Publishers, Delhi

FT B101 FOOD PROCESS TECHNOLOGY – I
(CEREALS, FRUITS AND VEGETABLE TECH.)

L T P **Credit – 5**
3 0 4

UNIT-I

Storage of cereals, Infestation control; Drying of grains, Processing of rice and rice products. Milling of wheat and production of wheat products, including flour and semolina. (10 Hrs.)

UNIT-II

Milling of corn, barley, oat, coarse grains including sorghum, ragi and millets; Processing of tea, coffee and cocoa. (10 Hrs.)

UNIT-III

Storage and handling of fresh fruits and vegetables, Preservation of fruits and vegetable by heat treatment. Production and preservation of fruits and vegetable juices, preservation of fruit juice by hurdle technology. Preparation of Jam, Jelly and marmalade, pickles, vinegar and tomato product. (10 Hrs.)

UNIT-IV

Non-alcoholic beverages; Food Laws, food rules and standards, Statistical Quality Control; Various types of packaging. (10 Hrs.)

Text Books / References :

1. Food Science by Potter
2. Technology of Food Preservation by Desrosier
3. Principles of Food Science, Vol-I by Fennma Karrel
4. Preservation of Fruits & Vegetables by Girdhari Lal, Sidhapa and Tandon
5. Post Harvest Technology of cereal pulse and oil seeds by Chakraborty, AC
6. Food Science by Mudambi.

HU B101 BUSINESS COMMUNICATION AND PRESENTATION SKILLS

L T P **Credits: 5**
3 0 3

UNIT-I

Business communication covering, Role of communication in information age; Concept and meaning of communication; skills necessary for technical communication; Communications in a technical organization; Barriers to the process of communication. (6 Hrs.)
Style and organization in technical communication covering, Listening, speaking, reading and writing as skills; Objectivity, clarity, precision as defining features of technical communication; Various types of business writing: Letters, reports, notes, memos; Language and format of various types of business letters; Language and style of reports; Report writing strategies. (8 Hrs.)

UNIT-II

Communication and personality development covering, Psychological aspects of Communication, cognition as a part of communication; Emotional Intelligence; Politeness and Etiquette in communication; Cultural factors that influence communication. (6 Hrs.)

UNIT-III

Oral Presentation and professional speaking covering, Basics of English pronunciation; Elements of effective presentation; Body Language and use of voice during presentation; Connecting with the audience during presentation; Projecting a positive image while speaking; Planning and preparing a model presentation; Organizing the presentation to suit the audience and context; Basics of public speaking; Preparing for a speech. (10 Hrs.)

UNIT-IV

Career Oriental Communication covering, Resume and bio data: Design & style; applying for a job: Language and format of job application. Job Interviews: purpose and process; How to prepare for interviews; Language and style to be used in interview; Types of interview questions and how to answer them; Group Discussion: structure and dynamics; Techniques of effective participation in group discussion; Preparing for group discussion. (10 Hrs.)

Recommended Books:

1. Fred Luthans, Organizational Behaviour, McGraw Hill
2. M. Ashraf Rizvi, Effective Technical Communication, McGraw Hill
3. Wallace and masters, Personal Development for Life and Work, Thomson Learning
4. Malcolm Goodale, Professional Presentations
5. Farhathullah, T. M. Communication skills for Technical Students
6. Michael Muckian, John Woods, The Business letters Handbook
7. MLA Handbook for Writers of Research Paper

BRIDGE COURSE SEMESTER-II
AM B201 COMPREHENSIVE MATHEMATICS-II

L T P **Credit-03**
3 0 0

UNIT-I

Functions of two or more variables:- Partial derivatives, homogenous functions. Euler's theorem , total derivative of an implicit function, tangent and normal to a surface, change of variables, Jacobians, Taylor's theorem for a function of two variables, maxima and minima of a function to two variables , Lagrange's method of undetermined multipliers. Line integral, double integral, change of order of integration, triple integral , change of variables. Applications to area and volume, beta and gamma functions, surface area of revolution, moment of inertia, centre of gravity. (10 Hrs.)

UNIT-II

Differential Equations:- Higher order linear differential equation with constant coefficients, complementary function and particular integral, Method of variation of parameter, Solution of Cauchy -Euler's homogeneous equations. Solution of simple simultaneous differential equations, Cauchy's and Legendre's equation formation of partial differential equations. Non-linear differential partial differential equation of first order, Charpit's method, Homogeneous linear partial differential equations with constant coefficients. Non-linear equation of second order, separation of variables, Formation and solution of wave equation ,one dimensional heat flow equation and solution, two dimensional heat flow equation and solution. (10 Hrs.)

UNIT-III

Elementary transformations on a matrix:- Row reduced Echelon forms, Rank of a matrix, consistency of system of linear equations, Gauss elimination process for solving a system of linear equations in three unknowns, Eigen values and Eigen vectors, properties of Eigen values, Reduction to diagonal form, Cayley- Hamilton Theorem, Inverse of a non-singular matrix, Idempotent matrices, complex matrices. (10 Hrs.)

UNIT-IV

Scalar and vector fields:- Definition and Terminologies; product- Dot, Cross, Box; vector triple product, differentiation of a variable vector, Scalar and Vector point functions; Vector Operator- Del, Gradient, curl and Divergence- their physical interpretation and applications, Directional derivative, line surface and volume integral, tangent planes and normal and related problems. Theorems of Green (in plane), Gauss and Stoke's theorem, their verification and applications. (10 Hrs.)

RECOMMENDED BOOKS:

Text Book

1. R.K.Jain, S.R.K. Iyengar , Advanced Engg. Mathematics, Narosa
2. V. Krishnamurthy, An Introduction to Linear Algebra (for section I)
3. Thomas & Finney, Calculus, Pearson Education (for sections II, III, IV)
4.Linear Algebra in action –harry Dym
5.Differential equations with applications and programmes –S.Balachandra Rao,H.R.Anuradha

Reference Books

1. Denial A Murray, Elementary Course in Differential Equations, Longman
2. Erwin Kreyszig, Advanced Engg. Mathematics, Wiley Eastern Limited, New Delhi
3. M.R.Spiegal, Advanced Calculus – Theory and Problems, Schaum Publications, New York

FT B201 FOOD CHEMISTRY - I

L T P **Credits: 6**
4 0 3

UNIT-I

Introduction: Food Chemistry, Role of Food Chemists in Food Processing industry.(4 Hrs.)

Water: Structure, properties of liquid water, water as reactant. (5 Hrs.)

UNIT-II

Carbohydrates: Definition and classification; structure, physical and chemical properties of mono-saccharides and disaccharides. (4 Hrs.)

Proteins: Definition, classification, structure, functions. of amino acids, proteins and their importance in food, Changes during processing. (6 Hrs.)

UNIT-III

Lipids: Definition, structure, classification, functions, physical and chemical properties, rancidity and reversion, Nutritional Significance. (6 Hrs.)

Pigments: Their occurrence, importance, types, changing during processing. (5 Hrs.)

UNIT-IV

Enzymes: Definition, classification, function of enzyme, effect of temperature, pH, Concentration, substrate concentration on enzyme activity, specificity of enzyme, enzyme Inhibition, kinetics of enzyme (6 Hrs.)

Chemical additives: Properties and functions. (4 Hrs.)

Recommended Books:

Authors	Title	Publishers
A V. V. S Ramarao.	A text book of biochemistry	AVI
L. Mayor.	Food Chemistry	CBS

B202 FOOD PRESERVATION – I

L T P **Credit -5**
3 0 3

UNIT-I

Objectives and techniques of food preservation; Canning: classification of cans, can specification, structure of cans, lacquering, canning of food items, Thermal process time calculations for canned foods, spoilage in canned foods. (12 Hrs.)

UNIT-II

Water activity of food and its significance in food preservation; dehydration and drying of food items; IMF; Low temperature preservation: cold storage and freezing including cryogenic freezing. (10Hrs.)

UNIT-III

Preservation by fermentation: curing and pickling; Hurdle technology. (8 Hrs.)

UNIT-IV

Ionization radiation; Use of preservative in foods: chemical preservative, bio preservative Including antibiotics. (10 Hrs.)

Text Books / References:

1. Technology of Food Preservation by Desrosier
2. Food Science by Potter
3. Fruits and vegetable processing by Cruss
4. Preservation of Fruits & Vegetables by IRRI

FT B203 FOOD PROCESS TECHNOLOGY – II (MEAT, FISH &POULTRY)

L T P **Credit – 6**
4 0 3

UNIT-I

Classification of fresh water fish and marine fish; Commercial handling, storage and transport of raw fish; Average composition of fish; Freshness criteria and quality assessment of fish; Spoilage of Fish; Methods of Preservation of fish: Canning, Freezing, Drying, Salting, Smoking and Curing. (10 Hrs.)

UNIT-II

Fish products - production of fish meal, fish protein concentrate, fish liver oil and fish sauce and other important byproducts; Quality control of processed fish; Fish processing industries in India. (10 Hrs.)

UNIT-III

Slaughtering technique of animal; Meat cuts and portions of meat, muscle; Color of meat; Post mortem changes of meat; Meat processing - curing and smoking; Fermented meat products (meat sausages & sauces); Frozen meat & meat storage; By-products from meat industries and their utilization; Meat industries in India. (10 Hrs.)

UNIT-IV

Classification of poultry meat; Composition and nutritional value of poultry meat & eggs; Processing of poultry meat and eggs; Spoilage and control; Byproduct utilization and future prospects; Poultry farms in India. (10 Hrs.)

Text books/ References:

1. Processed Meats; Pearson AM & Gillett TA; 1996, CBS Publishers.
2. Meat; Cole DJA & Lawrie RA; 1975, AVI Pub.
3. Egg and poultry meat processing; Stadelman WJ, Olson VM, Shemwell GA & Pasch S; 1988, Elliswood Ltd.
4. Developments in Meat Science – I & II, Lawrie R; Applied Science Pub. Ltd.

CS B201 PROGRAMMING IN C/ C++

L T P **Credit - 5**
3 0 3

UNIT – I

Introduction: What is object oriented programming? Why do we need object oriented. Programming characteristics of object-oriented languages. C and C++.
C++ Programming basics: Output using coat. Directives. Input with cin. Type bool. The setwmanipulator. Type conversions. (08 Hrs.)

UNIT – II

Functions: Returning values from functions. Reference arguments. Overloaded function. Inline function. Default arguments. Returning by reference.
Object and Classes: Encapsulation, Abstraction, Polymorphism, Classes, Messages Association, Interfaces, Implementation of class in C++, C++ object as data types constructor. Object as function arguments. The default copy constructor, returning object from function. Structures and classes. Classes objects and memory static class data. Const and classes. (10 Hrs.)

UNIT – III

Arrays and string arrays fundamentals. Arrays as class Member Data: Arrays of object, string, the standard C++ String class
Operator overloading: Overloading unary operations. Overloading binary operators, data conversion, pitfalls of operators overloading and conversion keywords. Explicit and Mutable.
Inheritance: Concept of inheritance. Derived class and based class. Derived class constructors, member function, class hierarchies, public and private inheritance, aggregation: Classes within classes, inheritance and program development. (10 Hrs.)

UNIT – IV

Pointer: Addresses and pointers. The address of operator and pointer and arrays, Memory management: New and Delete, pointers to objects, debugging pointers.
Virtual Function: Virtual Function, friend function, Static function, Assignment and copy initialization, this pointer, dynamic type information. (06 Hrs.)

UNIT – V

Streams and Files : Streams classes, Stream Errors, Disk File I/O with streams, file pointers, error handling in file I/O with member function, overloading the extraction and insertion operators, memory as a stream object, command line arguments, and printer output.
Templates and Exceptions:
Function templates, Class templates Exceptions, The Standard Template Library. (06 Hrs.)

TITLE	AUTHOR	PUBLISHER
C++ : The Complete Reference	Herbert Schildt	Tata McGraw Hill Education
Object Oriented Programming in C++	R Rajaram	New Age International
Object Oriented Programming in C++	Sourav Sahay	Oxford University Press

HU B201 SOCIOLOGY & ELEMENTS OF INDIAN HISTORY FOR ENGINEERS

L T P **Credits: 3**
3 0 0

The objective of this course is to familiarize the prospective engineers with elements of Indian history and sociological concepts and theories by which they could understand contemporary issues and problems in Indian society. The course would enable them to analyze critically the social processes of globalization, modernization and social change. All of this is a part of the quest to help the students imbibe such skills that will enhance them to be better citizens and human beings at their work place or in the family or in other social institutions. (6 Hrs.)

UNIT- I A

Introduction to Elements of Indian History: What is history?; History Sources- Archaeology, Numismatics, Epigraphy & Archival research; Methods used in History; History & historiography; (3 Hrs.)

UNIT- I B

Introduction to sociological concepts-structure, system, organization, social institutions, Culture social stratification (caste, class, gender, power).State & civil society; (6 Hrs.)

UNIT- II A

Indian history & per iodization; evolution of urbanization process: first, second &third phase of urbanization; Evolution of polity; early states to empires; Understanding social structures feudalism debate; (4Hrs.)

UNIT- II B

Understanding social structure and social processes: Perspectives of Marx, Weber & Durkheim; (5 Hrs.)

UNIT- III A

From Feudalism to colonialism-the coming of British; Modernity & struggle for independence;

(3 Hrs.)

UNIT- III B

Political economy of Indian society. Industrial, Urban, Agrarian and Tribal society; Caste, Class, Ethnicity and Gender; Ecology and Environment; (8 Hrs.)

UNIT- IV A

Issues & concerns in post-colonial India (up to 1991); Issues & concerns in postcolonial India 2nd phase (LPG decade post 1991) (3 Hrs.)

UNIT- IV B

Social change in contemporary India: Modernization and globalization, Secularism and communalism, Nature of development, Processes of social exclusion and inclusion, Changing nature of work and organization (8 Hrs.)

Text/Reference Books:

(a) History

1. Desai, A.R. (2005), Social Background of Indian Nationalism, Popular Prakashan
2. Guha, Ramachandra (2007), India After Gandhi, Pan Macmillan
3. Thapar, Romila (2002), Early India, Penguin
4. Sharma R.S.(1965), Indian Feudalism, Macmillan
5. Deshpande, Satish (2002), Contemporary India: A Sociological View, Viking
6. Gadgil, Madhav & Ramachandra Guha(1993), This Fissured Land: An Ecological History of India, OU Press

(b) Sociology:

7. Giddens, A (2009), Sociology, Polity, 6th edn.
8. Haralambos M, RM Heald, M Holborn (2000), Sociology, Collins
9. Xaxa, V (2008), State, Society and Tribes Pearson
10. Chandoke, Neera & Praveen Priyadarshi (2009), Contemporary India: Economy, Society and Politics,Pearson
11. Oommen,T.K.(ed.) (1997), Citizenship and National Identity: From Colonialism to Globalization, Sage.
12. Mohanty, M (ed.) (2004), Class, Caste & Gender- Volume 5, Sage
13. Dhanagare, D.N. , Themes and Perspectives in Indian Sociology, Rawat
14. Ramaswamy, E.A. and Ramaswamy,U.(1981), Industry and Labour, OU Press
15. Bhowmik, S (ed.) (2010), Street Vendors in the Global Urban Economy, Routledge
16. Rao, M.S.A. (ed.) (1974), Urban Sociology, Orient Longmans

DEGREE COURSE (B.TECH)
SEMESTER I
AM5101- ENGINEERING MATHEMATICS- I

LTP **Credits: 03**
3 0 0

UNIT-I

Vector space:-. Vector space over the field of real numbers, subspace of a vector space and a criterion for a sub-space, linear combination, Linear independence and linear dependence of vectors, basis and dimension of vector space; Liner transformations:- kernel and images of a linear transformation; kernel and Images of a linear transformation formation subspaces, Nullity and Rank of a linear transformation, Inner Product space; Norm of a vector; Orthogonal and ortho-normal set of vectors. (10 Hrs.)

UNIT-II

Sequences:- Convergence and divergence of an infinite series and typical examples of convergent and divergent series. Series of positive terms. Test of convergence:- Comparison test, Integral test, Ratio test, Raabe's test, logarithmic test, Cauchy's root test, alternating series, Leibnitz's rule. Absolute and conditional convergence, power series. (10 Hrs.)

UNIT-III

Three dimensional geometry:- Distance formula, section formula, direction ratios and direction cosines, equation of a plane (general form, normal form and intercept form),equations of a straight line, condition for a line to lie in a plane , coplanar lines, shortest distance between two lines, intersection of three planes, point of intersecting planes representing a straight line. Equation of a sphere, cone and cylinder. Equation of tangent planes to sphere, cone, cylinder. Rectangular Cartesian, Spherical polar & Cylindrical polar co-ordinate system. (10 Hrs.)

UNIT-IV

Series solution of a differential equations and it's applications:- Introduction, validity of series solution of an equation, general method to solve equation type:$P_0y^{"} + P_1y' + P_2y = 0$, Bessel's equation, Legendre's equation, Legendre function, recurrence formula for Legendre function, Orthogonality. Verification of Legendre function$(P_n(x))$ and Bessel function $(J_n(x))$ as the solutions of Legendre and Bessel equations respectively, graphical representation of these solutions. (10 Hrs.)

RECOMMENDED BOOKS:

Text Book

1. R.K.Jain, S.R.K. Iyengar , Advanced Engg. Mathematics, Narosa
2. V. Krishnamurthy, An Introduction to Linear Algebra (for section I)
3. Thomas & Finney, Calculus, Pearson Education (for sections II, III, IV)

Reference Books

1. Denial A Murray, Elementary Course in Differential Equations, Longman
2. Erwin Kreyszig, Advanced Engg. Mathematics, Wiley Eastern Limited, New Delhi
3. M.R.Spiegal, Advanced Calculus – Theory and Problems, Schaum Publications, New York

AP 5101 ENGINEERING PHYSICS

L T P **Credits:5**
3 0 3

UNIT-I

Mathematical Preliminaries: Vector triple Product, gradient, divergence and curl of vectors, vector identities, line, surface and volume integral of vectors, divergence theorem and Stokes theorem (No deduction necessary). Expression of grad, div, curl and Laplacian in spherical and cylindrical coordinates. (06 Hrs.)

UNIT-II

Special Theory of Relativity: Objective and Result of Michelson Morley experiment, postulate of special theory of relativity, Galilean transformation, Lorentz transformation, relativity of simultaneity, length contraction and time dilation, relativistic addition of velocities, mass energy equivalence, relativistic energy – momentum relationship, mass less particles. (06 Hrs.)

Quantum Mechanics: Blackbody radiation, Planck's radiation law. Derivation of Wien's law, Rayleigh jeans law and Stefan's law from Planck's radiation law. Compton effect, wavelength shift and recoil of electrons; de Broglie hypothesis, wave group, group velocity and particle velocity; uncertainty relation (qualitative) and its applications, operators, Schrodinger time dependent and time independent equation, expectation values of physical quantities(position, momentum and energy) application to free particle and particle in a box(1D and 3D potential well), Discussion on degenerate levels. (08 Hrs.)

UNIT-III

Statistical Mechanics: Introduction, Principle of equal a prior probability, equilibrium state of a dynamic system, thermodynamic probability, distribution of particles in compartments, Phase space, Microstates and Macro states, MB, FD, BE statistics (no deduction necessary), fermions, bosons (definitions in terms of spin, examples), physical significance and application, classical limits of quantum statistics. (07 Hrs.)

UNIT-IV

Solid State Physics & Semiconductor Devices : Lattice and basis, unit cell, different crystal system,bravias lattices, atomic packing factor for cubic systems, Miller indices, X-ray diffraction and Bragg's Law. Classification of bonding, Band theory of solids (qualitative). Conductors, Insulators, Semiconductors, Intrinsic & Extrinsic, Semiconductors, p-n junction diode, depletion region, potential barrier, forward and reverse biasing, diode as rectifier. (08 Hrs.)

Laser: Spontaneous and Stimulated emission, Einstein's A and B coefficients, population inversion, Optical resonator and condition for Lasing action, types of lasers (He-Ne, Ruby, CO_2 and semiconductor laser), applications of Lasers. (05 Hrs.)

Recommended Books:

Text Books:

Arthur Beiser - Concepts of Modern Physics (McGraw Hill)
College Physics – C.R. Dasgupta

Reference Books:

University Physics – Sears and Zemansky

HU 5101 ENVIRONMENTAL SCIENCE

L T P **Credits: 2**
2 0 0

UNIT- I

Introduction: Basic ideas of environment, basic concepts related to environmental perspective, man, society and environment, their inter relationship. (4 Hrs.)
Mathematics of population growth and associated problems, definition of resource, types of resource, Renewable, non-renewable, potentially renewable, effect of excessive use vis-à-vis population growth, Definition of pollutant and contaminant. Environmental impact assessment. (5 Hrs.)
Environmental degradation: Toxic element, particulates etc. and its effect on man. Overall methods for pollution prevention, environmental problems and sustainable development, components of environment. (5 Hrs.)

UNIT- II

Ecology: Renewable and Non-renewable Resources; Biosphere; Ecosystem and its Components, Nutrient cycles (C, N, P); Energy Flow; Food Chain; Food Pyramid; Bio magnification; Terrestrial and Aquatic ecosystem; Biodiversity. (5 Hrs.)

Water Pollution: Water and Wastewater Quality Parameter (Temperature, Turbidity, Taste and Odour, Colour, Solids, pH, Metals - Fe, Mn, As, Hardness, Alkalinity, Chloride, Fluoride, Nitrate, Organic Matters- BOD & COD, Pathogens- Indicator Organisms), Brief Overview on Water Treatment; Water quality standard. (6 Hrs.)

UNIT- III

Air Pollution: Environmental Lapse Rate, Simple global temperature model, Particulate Control Devices - Types and Working Principle; Stack and plume; Air quality standard. (5 Hrs.)

Solid Waste Management: Sources; Types and Characteristics; Disposal Methods of Municipal Solid Waste - Sanitary Landfill, Composting, Incineration; Biomedical Waste. (3 Hrs.)

UNIT- IV

Noise Pollution: Classification - Continuous, Intermittent, Impulsive; Sound Levels – Pressure Level, Intensity Level, Power Level; Noise Measurement Criteria - Leq, Adding and Averaging of Noise levels; Noise quality standard. (5 Hrs.)
Environmental Issues: EIA –definition and applicability; Pollution Control Acts. (2 Hrs.)

Recommended Books:
Text Book:
Environment & Ecology by Gour krishna Das mohapatra
Introduction to Environmental Science and Engineering by Amal Kumar Dutta
Introduction to Environmental Science by Gilbert M. Masters
Reference Book:
Fundamentals of Ecology by M. C. Dash
Environmental Engineering by Peavy, Rowe and Tchobanoglous

ME 5101 BASIC ENGINEERING MECHANICS

L T P **Credits: 4**
4 0 0

UNIT-I

Introduction to Engineering Mechanics covering, Basic concepts, System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; (8Hrs.)

UNIT-II

Friction covering, Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack; (6 Hrs.)

UNIT-III

Centroid and Centre of Gravity covering, Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook; (12 Hrs.)

UNIT-IV

Introduction to Dynamics covering, Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D‟ Alembert‟s principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation; (8 Hrs.)

UNIT-V

Mechanical Vibrations covering, Basic terminology, free and forced vibrations, resonance and its effects; Degree of freedom; Derivation for frequency and amplitude of free vibrations without damping and single degree of freedom system, simple problems, types of pendulum, use of simple, compound and torsion pendulums; (6 Hrs.)

Recommended Books:
Text/Reference Books:

1. Shanes and Rao (2006), Engineering Mechanics, Pearson Education,
2. Hibler and Gupta (2010), Engineering Mechanics (Statics, Dynamics) by Pearson Education
3. Reddy Vijaykumar K. and K. Suresh Kumar (2010), Singer‟s Engineering Mechanics
4. Bansal R.K. (2010), A Text Book of Engineering Mechanics, Laxmi Publications
5. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.
6. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications

FT 5101 FOOD CHEMISTRY - II

L T P **Credits: 6**
4 0 3

UNIT-I

Introduction to biochemical sciences. Enzyme and coenzymes : Introduction, definition, nomenclature, classification, numbering, structure and functions of coenzyme energy-rich - compounds, active centre of enzymes, mechanisms of enzyme action, effect of temperature, pH, enzyme concentration and substrate concentration on the rate of enzyme reaction. Specificity of enzymes, enzyme inhibition, kinetics of enzyme action, activation of enzymes; regulatory enzymes, iso enzymes; enzymes involved in digestion. (10 Hrs.)

UNIT- II

Determination of food energy. Physiological fuel value of foods, calculation of energy value of foods. Methods of measuring on estimating caloric value of a diet. Physiological functions, role in metabolism and daily requirements of vitamin A, D, E, K, C, Thiamin, riboflavin, niacin, pyridoxine, cyanocobalamine, folic acid, choline, p-amino benzoic acid, pantothenic acid. (10 Hrs.)

UNIT- III

Metabolism of carbohydrates: Embden – Meyerh off pathway, Cori and cory cycle, muscle contraction and relaxation, Neuberg second and third form of fermentation, Kreb's cycle. Metabolism of lipids: Digestion and absorption of lipids, fatty liver, lipotropic agents, oxidation pathway, oxidation of odd- carbon- chain fatty acids, Ketone bodies, energy balance, Lipid biosyntehsis. Metabolism of proteins: Importance proteins, digestion and absorption of proteins, amino acid pool, nitrogen balance, essential amino acids, evaluation of quality of proteins, general metabolism of proteins and amino acids. (10 Hrs.)

UNIT- IV

Minerals as structural and functional constituents in human metabolism. Specific role of iron, calcium, phosphorous, sodium, potassium, magnesium, chlorine, zinc, copper and iodine. Dietary interrelationship. Functional foods. Neutraceuticals. Assessment of nutritional status of populations. Problems of under nutrition and effect of calorie over nutrition. Diet and dental health. Nutrition during pregnancy, lactation and aging. Nutrition of children. Selection of an adequate diet. New developments in foods and nutrition.
(10 Hrs.)

Recommended Books:

Title	**Author**	**Publishers**
A textbook of biochemistry	Ramarao	CBS
Biochemistry	Deb	
Principles of biochemistry	Lehninger	AVI

FT5102 FOOD MICROBIOLOGY-I

L T P **Credits: 6**
4 0 3

UNIT- I

Introduction: Importance and historical developments in food microbiology, prokaryotic and eukaryotic cell, morphology, structure, microbiology and reproduction of Bacteria, Yeast and Mold. (10 Hrs.)

UNIT- II

Microbial growth and death kinetics: Definition, Growth curves (different phases), synchronous growth, doubling/generation time, intrinsic and extrinsic factors, relationship between number of generations and total number of microbes. (08Hrs.)

UNIT- III

Microbiology and microbial spoilage of Food Products: Microbiology of raw milk and fermented milk products viz yoghurt, cheese; cereals products, fruits and vegetable, meat and meat product, egg and fish. (10Hrs.)

UNIT- IV

Food spoilage: Bacterial and fungal food spoilage, food poisoning, food borne infection, food borne intoxication, Toxins produced by staphylococcus, clostridium, as per gillus; bacterial pathogens-salmonella, bacillus, listeria, E. coli, shigella, campylobacter. (12Hrs.)

Recommended Books:

Author	**Title**
W.C. Frazier	Food Microbiology
H.J. Pleczar	Microbiology
J. Heritage	Introductory Microbiology
K.S. Bilgrami	Essentials of Microbiology
Casida	Industrial Microbiology

CS 5101 DATABASE TECHNOLOGY

L T P **Credit : 4**
2 0 3

UNIT – I

Introduction to databases: Basic concepts, DBMS, why DBMS, Relational Model: relations, Entity, attribute, relationships, Key: Super key, Candidate Key and Primary Key, foreign key; E-R model, Data Constraints, basic Normalization concepts, Basic transaction concepts. (13 Hrs.)

UNIT – II

Introduction to SQL: Basic table concepts, creating table, inserting data into table, updating table data, modifying table structure, viewing table data etc. (05 Hrs.)

UNIT – III

Grouping data, LIKE clause, Arithmetical and logical operations on table data, views. (08 Hrs.)

UNIT – IV

SQL security clauses: GRANT and REVOKE clause, Introduction to PL/SQL (14 Hrs.)

BOOK TITLE	AUTHOR	PUBLISHER
SQL, PL/SQL: The Programming Language of Oracle	Ivan Bayros	BPB Publications
Oracle Database 11g PL/SQL Programming	Michael McLaughlin	Tata McGraw-Hill Education
SQL in easy steps	Mike McGrath	Tata McGraw-Hill Education

MC 5101 TECHNICAL COMMUNICATION AND SOFT SKILLS

L T P **Credits: 0**
2 0 0

UNIT -I

SPEECH MECHANISM: Organs of speech, Consonants & Vowels (basics) Cardinal Vowel Scale, Production of Speech Sounds, Description & Classification of Speech Sounds. Introduction to Linguistics, Sociolinguistics; Language Usage. (10 Hrs.)

UNIT-II

BUSINESS COMMUNICATION: Business Letters, Drafting Notices, Memos, Agenda and Minutes of Meetings, Applications for Jobs, Facing Interviews (10 Hrs.)

UNIT-III

BASICS OF GRAMMAR: Narration, Voice, Words Often Confused, (05 Hrs.)

UNIT-IV

Prepositions. Rhetoric/ Figures of Speech, Writing Skills, Oral Skills.
Introduction to poetry: Poem-I: Reading/ Explanation & Poem-II: Reading/ Explanation (15 Hrs.)

Recommended books :

Title	**Author**	**Publisher**
An Introduction to Pronunciation of English	Gimson	ELBS
ModernLinguistics: an Introduction	Verna and Krishanswamy	Oxford University
Modern Prose: Stories, Essays and Sketches	Michael Thorpe	Oxford University
Writing Skills	Oliviera and Motta	Penguin
Oxford Guide to Effective Writing &Speaking	John Seely	Oxford University Press
English Pronouncing Dictionary	Daniel Jones	ELBS
New International Business English	Leo Jones	Cambridge
Collins Cobuild English Grammar	John Sinclair	ed. Collins
Rhetoric/ Figures of Speech	Bose and Sterling	

B. Tech programme

SEMESTER II

AM 5201 ENGINEERING MATHEMATICS- II

L T P **Credit -03**
3 0 0

UNIT-I

Laplace transformations of elementary functions, properties of Laplace transform, Transform of derivative and integrals, evaluations of integrals by Laplace transforms , inverse Laplace transforms, convolution theorem, solution of ordinary differential equations, unit step function and unit impulse function, engineering applications . Z-transform and inverse Z-transform. (10 Hrs.)

UNIT- II

Fourier series: Euler's formula, problems on general Fourier series, conditions for Fourier expansion, Fourier expansions of discontinuous functions , change of interval , even and odd functions, half range series, application to standard wave forms, Parseval's identity, Fourier transform and its properties, inverse Fourier transform, Fourier transform of derivative, application of Fourier transform in solving partial differential equations- Laplace's equation, heat conduction equation and wave equation. (10 Hrs.)

UNIT- III

Limit of a complex function, differentiation, analyticity, Cauchy-Riemann equations, harmonic functions , conformal mapping , some special transformations – translation, inversion and rotation, bilinear transformation, Line integral , Cauchy's theorem (proof using Green's theorem),Cauchy's integral formula , Morera's theorem , Cauchy's inequality, Poisson's integral formulae .Power series .Taylor's and Laurent's series .Singularities .Zeros. Residues, Cauchy's residue theorem. Integration around unit circle, integration over semi-circular contours (with or without real poles), integration over rectangular contours. (10 Hrs.)

UNIT-IV

Graph Theory: Graph, Sub-graphs, operations on graphs, Isomorphism, walk, path, circuit, shortest path, tree, properties of tree, Binary Tree, Pendant Vertices, Distance and centers in a tree, Rooted and binary trees, Spanning trees, counting of tree, Linear programming problem & Game Theory. (10 Hrs.)

RECOMMENDED BOOKS

Text Book

R.K.Jain&S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa Publishing House

G.B. Thomas & R.L. Finney, Calculus: Analytical Geometry, Addison Wesley

Reference Books

Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern

David Widder, Advanced Calculus, PHI

Glyn James, Advanced Modern Engg. Mathematics, Pearson

AC 5201 ENGINEERING CHEMISTRY

L T P **Credits: 4**
2 0 3

UNIT- I

Solid state chemistry: Introduction to stoichiometric defects (Schottky & Frenkel) and non-stoichiometric defects (Metal excess and metal deficiency); role of silicon and germanium in the field of semiconductor, transistors, elements of band theory, conductors, semi-conductors and insulators. (5 Hrs.)

Bio - Chemistry :(Enzymes): Physiochemical nature of enzymes, importance, classification and nomenclature, mechanism of enzyme action, factors affecting enzyme activity. Coenzyme and their role in biological systems. (5 Hrs.)

UNIT- II

Applied Chemistry :(Corrosion): Direct, chemical corrosion and mechanism, electrochemical corrosion and mechanism, Galvanic corrosion, concentration cell corrosion, atmospheric corrosion, passivity, pitting corrosion, factors influencing corrosion, prevention of corrosion. (5Hrs.)

Lubricants: Classification of lubricants, lubricating oils, semisolid lubricants, solid and synthetic lubricants. Properties of lubricating oils (viscosity, flash and fire points cloud and pour point, mechanical stability and saponification number). (5 Hrs.)

UNIT- III

Biochemical Techniques: Ion exchange chromatography, gas chromatography, liquid chromatography, thin layer chromatography. (5 Hrs.)

Polymerization: Concepts, classifications and industrial applications; polymerization processes, degree of polymerization (addition and condensation polymerization); preparation, structure and use of some common polymers: plastic (PE, PP, PVC Bakelite), rubber (natural rubber, SBR, NBR), fibre (nylon 6,6, polyester);conducting and semiconducting polymers. (6 Hrs.)

UNIT- IV

Industrial Chemistry: Solid, liquid and gaseous fuels; constituents of coal, carbonization of coal, coal analysis, proximate and ultimate analysis; classification of coal. Petroleum, gasoline, octane number, aviation fuel, diesel, cetane number; natural gas, water gas. (5 Hrs.)

Analytical Chemistry :(Spectroscopic Techniques in Chemistry) Introduction, principle and concept of UV, IR and NMR. (4 Hrs.)

Recommended Books:

Text Book: 1. A text book of Engineering Chemistry: Sashi Chawla 2. Engineering Chemistry: Amrita lal De,Abhranil De3. Advance Chemistry: Philip Matthew4. Engineering Chemistry: WILEY-INDIA5. General and Inorganic Chemistry: R. P. Sarkar

Reference Book: 1. Inorganic Chemistry: Huheey, Keiter, Keiter, Medhi2. Physical Chemistry: Atkins 3. Physical Chemistry: Leidler4.Chemical Kinetics: Laidler5. Organic Chemistry: S. K. Ghosh6. Organic Chemistry: McMurry and Simanek

FT 5201 BAKERY, CONFECTIONARY AND EXTRUDED FOODS

L T P **Credits: 5**
3 0 3

UNIT- I

Introduction to baking; Bakery ingredients and their functions; Machines & equipment for batch and continuous processing of bakery products. (8 Hrs.)

UNIT- II

Testing of flour; Manufacture of bread, cake and biscuits; Analysis of bakery products; Cake icing techniques, wafer manufacture, cookies and crackers. (8Hrs.)

UNIT- III

Manufacture of bread rolls, sweet yeast dough products, cake specialties, pies and pastries, doughnuts, chocolates and candies; Maintenance, safety and hygiene of bakery plants. (10Hrs.)

UNIT- IV

Objectives and importance of extrusion in food product development; Components and functions of an extruder; Classification of extruder; Advantages and disadvantages of different types of extrusion; Change of functional properties of food components during extrusion; Pre and post extrusion treatments; Use of extruder as bioreactor; Manufacturing process of extruded products; Application of extrusion technologies in food industries. (14 Hrs.)

Text books/ References:

1. Extrusion of Food, Vol 2; Harper JM; 1981, CRC Press.
2. Bakery Technology & Engineering; Matz SA; 1960; AVI Pub.
3. Up to-date Bread Making; Fance WJ & Wrogg BH; 1968, Maclasen & Sons Ltd.
4. Modern Cereal Chemistry; Kent-Jones DW & Amos AJ; 1967, Food Trade PressLtd.

FT 5202 FOOD ANALYSIS AND QUALITY CONTROL

L T P **Credits: 5**
3 0 3

UNIT- I

Introduction: Quality Control and its importance, functions of quality control departments and quality control laboratories. (2 Hrs.)

Colour: Importance and need of colour determination, methods of colour determination with Spectrophotometer, Colorimeter, Hunter Colour lab, CIE system, Lovibond Tintometer, Munsellcolour and colour difference meter, Disc colorometry and their applications. (5 Hrs.)

Flavour: Importance of flavour, food flavours, factors affecting food product flavours, measurement of food flavours, theory of taste and smell (4 Hrs.)

UNIT- II

Food Rheology and viscosity: Shear stress, shear rate, torque, Newtonian and Non-Newtonian flow and their further classification, measurement of rheology and its importance, Factors affecting consistency and viscosity, measurement of viscosity and consistency with Brookfield synchrolectric viscometer, Stormer viscometer, Ostwald viscometer, Bostwick consistometer, Adams consistometer. (5 Hrs.)

Kinesthetics and Texture: Food texture, Physical characteristics of food, working of texture measuring instruments such as Texture Analyser, Instron Universal Testing machine, Fruit pressure tester, puncture tester, succulometer, tenderometer, texturometer, maturometer, fibrometer, Texture Profile Analysis (TPA). (6 Hrs.)

UNIT- III

Non Destructive Methods: Near Infrared Spectroscopy (NIR), Nuclear Magnetic Resonance (NMR) and its application, Ultrasonicequipments, conductivity and resistivity meters. (5 Hrs.)

Chromatography: Principle and working of Gas chromatography (GC), High pressure liquid chromatography (HPLC), types of detectors used in GC and HPLC, Thin layer chromatography (TLC), Column Chromatography, chromatographic methods applied as quality control. (4 Hrs.)

UNIT- IV

Sensory evaluation: Objectives, panel selection, Different test methods and their groups such as difference tests, rating tests, sensitivity tests, Sensory scores, statistical analysis of the data, application of statistical tests such as t-Test, Chi-Square test, F-test, Linear Regression and Correlation Coefficient.
(4 Hrs.)

Food Safety and Regulations: Food Safety and Standards Act (2006), Codex Alimentarius, ISO series, Good Manufacturing Practices (GMP), Good Hygienic Practices (GHP), Good Agricultural Practices (GAP), Genetically Modified Foods (GMF). (5 Hrs.)

Recommended Books:

Authors	Title	Publishers
Ronald S Pearson‘s	Composition and Analysis of foods	Addison & Wesley
Ranganna	Handbook of Analysis of Fruit and Vegetable	Tata McGraw-Hill

FT 5203 FOOD MICROBIOLOGY – II

L T P **Credit - 5**

3 0 3

UNIT- I

Important microorganisms and the factors affecting their growth and survival in foods; changes caused by spoilage; Spoilage of processed foods and their control. (10 Hrs.)

UNIT- II

Methods for the microbiological examination of water and foods; Control of microbiological quality; Bacterial and non-bacterial agents of food borne illnesses; (10 Hrs.)

UNIT- III

Microbial cultures for food fermentation and their maintenance; Production of vinegar, fermented foods, alcoholic beverages, SCP and mushrooms. (10Hrs.)

UNIT- IV

Principles of genetic engineering and its application. (10 Hrs.)

Text books/ References:

1. Food Microbiology; Frazier WC; 4th ed, Tata-McGrowhill Pub.
2. Modern Food Microbiology; Jay JM; 4th ed, CBS Publishers.
3. Microbiology; Pelczar, Chan & Krieg; Tata-McGrawHill Pub.
4. Food Microbiology; Adams MR & Moss MD; New Age International (P) Ltd Pub.
5. Food Biotechnology, Vol 1 & 2; King RD & Cheetham PSJ; 1988, Elsevier App. Sci.
6. Food Biotechnology; Angold R, Buch G & Taggart J; 1989, Cambridge University Press.
7. Fermentation Biotechnology: Principles, Processes & Products; Ward OP; Open University press.
8. Fundamental Principles of Bacteriology; Salle AJ; 7th ed, 1985, Tata-McGraw-Hill.

FT 5204 UNIT OPERATION-I

L T P **Credits: 5**
3 0 3

UNIT- I

Units and dimensions, Mathematical techniques in process calculations, Physico Chemical properties of Gases, Liquids, Solids. (10 Hrs.)

UNIT- II

Energy balance calculations : a) Principle of energy conversion and conservation b) Thermo physics c) Thermo chemistry d) Energy balance Calculations : without and with chemical reactions. (10 Hrs.)

UNIT- III

Material balance calculations: Without and with chemical reactions. (10 Hrs.)

UNIT- IV

Thermodynamic properties: Pressure, volume, temperature, internal energy and enthalpy. Thermodynamic process, state and path function. Reversible and irreversible processes. Equations of state. First and second law of thermodynamics applications to batch and flow systems. Carnot cycle. Claudius inequality theorem and entropy. (10 Hrs.)

Recommended Books:

Authors	Title	Publishers
P.Fellows	Food processing technology	Wood head
R.L.Earle	Unit operation in food processing	
Mc Cobe Smith & Harriot	Unit operation of chemical engineering	TMH

FT 5205 BEVERAGE TECHNOLOGY

L T P **Credits: 3**
3 0 0

UNIT- I

Introduction: Beverage and its importance in modern life, Current status of beverage industry in India.
(2Hrs.)

Bottled Water: Water treatment before its utilization in beverages, Mineral water, bottled water, Quality standards of water. (4 Hrs.)

UNIT- II

Soft drinks: Technology of carbonated soft drinks, Role of various ingredients of soft drinks, Carbonation of soft drinks. (6 Hrs.)

Tea: Nature of tea plant, relationship between plucking and quality of the tea. Processing of black tea, green and semi fermented tea, grading of tea, Chemical and Biochemical changes during processing of tea**.** (6 Hrs.)

UNIT- III

Coffee: The nature of coffee tree, structure of coffee bean, processing of green coffee (Dry and Wet Processes), conversion of green coffee into beverage, Manufacturing of instant and decaffeinated coffee, Chemical changes during coffee processing**.** (6 Hrs.)

Cocoa and Drinking chocolate: The nature of cocoa plant, processing of raw bean and the key role of fermentation, The roasting procedure, Processing of roast bean, Chemical changes occurring during various stages of processing**.** (6 Hrs.)

UNIT- IV

Alcoholic beverages: The role of yeast in beer and other alcoholic beverages, ale type beer, lager type beer, technology of brewing process, Wine and related beverages, Distilled spirits**.**

(6 Hrs.)

Fruit Juices: Technology of production of various juices, chemistry of major fruit juices.
(4 Hrs.)

Recommended Books:

Authors	**Title**	**Publisher**
Varnam and Sutherland	Beverages- Technology, Chemistry and Microbiology	ASPEN
J.Negi.	Food & beverage services	S.CHAND
J.Negi	Food & beverage services operation	S.CHAND

HU 5201 ECONOMICS FOR ENGINEERS

L T P **Credits: 3**
3 0 0

UNIT-I

Basic Principles and Methodology of Economics. Demand/Supply – elasticity –Government Policies and Application. Theory of the Firm and Market Structure. Basic Macroeconomic Concepts (including GDP/GNP/NI/Disposable Income) and Identities for both closed and open economies. Aggregate demand and Supply (IS/LM). Price Indices (WPI/CPI), Interest rates, Direct and Indirect Taxes. (12 Hrs.)

UNIT-II

Public Sector Economics –Welfare, Externalities, Labour Market. Components of Monetary and Financial System, Central Bank –Monetary Aggregates; Commercial Banks &their functions; Capital and Debt Markets. Monetary and Fiscal Policy Tools & their impact on the economy – Inflation and Phillips Curve. (12Hrs.)

UNIT-III

Elements of Business/Managerial Economics and forms of organizations. Cost &Cost Control –Techniques, Types of Costs, Budgets, Break even Analysis, Capital Budgeting, Investment Analysis – NPV, ROI, IRR, Payback Period. (08Hrs.)

UNIT-IV

Issues of Inclusion – Sectors, States/Regions, Groups of people (M/F), Urbanization. Employment–Informal, Organized, Unorganized, Public, Private. Challenges and Policy Debates in Monetary, Fiscal, Social, External sectors. (08Hrs.)

Recommended Books:

Authors	**Title**	**Publishers**
Mankiw Gregory N.	Principles of Economics (2002)	Thompson Asia
V. Mote, S. Paul, G. Gupta.	Managerial Economics (2004)	Tata McGraw Hill
Misra, S.K. and Puri.	Indian Economy (2009)	Himalaya
Pareek Saroj	Textbook of Business Economics (2003)	Sunrise Publishers

B. Tech Programme
SEMESTER III

AM 6101 ENGINEERING MATHEMATICS-III

L T P **Credits: 03**
3 0 0

UNIT-I

Errors in arithmetic operations and functions, Round-off error, truncation error, Absolute error, Relative error, Percentage error, Principles of equal effect, Significant digits, Intermediate value property, Bisection method, Method of false position, Secant Method, Newton-Raphson method, Iterative method, Convergence of these methods. (10 Hrs.)

UNIT-II

Gauss Elimination method (with and without partial pivoting), Gauss-Seidel, Jacobi's methods, Triangularization method, Eigen value problem, Rayleigh's power method, Finite differences-forward, backward and central differences, Shift and averaging operators. (10 Hrs.)

UNIT-III

Newton's forward, backward and divided difference interpolation formulae, Lagrange's formula, Gauss forward and backward difference interpolation formulae, Spline interpolation – quadratic and cubic, Numerical differentiation using Newton's forward and backward difference formulae.

(10 Hrs.)

UNIT-IV

Numerical integration – Trapezoidal rule, Simpson's one third and three-eighth rules, Romberg's integration, Error in integration, Taylor series method, Picard's method, Euler method, Modified Euler's method, Runge-Kutta methods (Upto fourth order) for solution of ODE of first order. (10 Hrs.)

RECOMMENDED BOOKS:

Text Book

S.S. Sastry, Introductory Method of Numerical Analysis, PHI
Gerald Wheatley, Applied Numerical Analysis, Pearsons Education

Reference Books

M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Sc. and Engg. Computation, P.B Patial & U P Verma, Numerical Computational Mathematics, Narosa
J.H. Mathew, Numerical Methods for Maths., Science and Engg., PHI

FT 6101 UNIT OPERATION -II

L T P **Credits: 5**
3 0 3

UNIT-I

Introduction: Basic concepts of heat and mass transfer, importance of heat and mass transfer in food processing. (02 Hrs.)

Conduction Heat Transfer: Steady state heat transfer through slabs, composite walls, cylinders, spheres; insulation and its purposes, critical thickness of insulation for cylinders and spheres, unsteady state heat transfer in simple geometry. (06 Hrs.)

Convection Heat Transfer: Natural and forced convection, dimensional analysis for free and forced convection, dimensionless numbers used in convective heat transfer, important correlations for free and forced convection**.** (04 Hrs.)

UNIT-II

Radiation Heat Transfer: Characteristics of black, grey and real bodies in relation to thermal radiation, Stefan Boltzman law; Kirchhoff's law; Wein displacement law, intensity of radiation, radiation between two bodies. (04 Hrs.)

Heat Exchangers: Classification, overall heat transfer coefficient, fouling factors, log-mean temperature difference for parallel and counter flow heat exchangers, effectiveness of parallel and counter flow heat exchanger by NTU method, Design of shell and tube heat exchanger. (06Hrs.)

UNIT-III

Mass Transfer: Introduction to mass transfer, different modes of mass transfer, Mass flux and molar flux for a binary system, Fick's law of diffusion of mass transfer, Derivation of general diffusion mass transfer equation, Molecular diffusion in gases, liquids and solids having steady state equi-molar counter diffusion and through non diffusing body; Steady state equimolar counter diffusion, convective mass transfer coefficient, natural and forced convective mass transfer. (08Hrs.)

UNIT-IV

Momentum Transfer: Analogy between momentum, heat and mass transfer, Physical properties of fluid, classification of fluid flow, characteristic of non-Newtonian fluids-generalized viscosity coefficient and Reynolds number; Continuity equation, Bernoulli equation, Flow of compressible fluids; flow through porous media; Flow measurement devices like venturimeter, rotameter, pilot tube. (10 Hrs.)

Recommended Books:

Author	Title	Publisher
Arora&D'kundwarA	Course in Heat and Mass Transfer	DhanpatRai&Sons
R.C. Sachdeva	Fundamentals of Engg. Heat & Mass Transfer	New Age
G.K. Roy	Fundamental of Heat and Mass Transfer	Khanna Pub
D.S. Kumar	Heat and Mass Transfer	Kataria& Sons
Bird et al	Transport Phenomena	John Wiley
Geankoplis	Transport Process & Unit operations	PHI

HU 6101 INDUSTRIAL MANAGEMENT

L T P
Credits: 3
3 0 0

UNIT-I

Basic concepts of management, objectives, classification and hierarchy, different schools of management thought, principal functions of management, Management as an organizing and directing force, Structure of the management decision making process, (10 Hrs.)

UNIT-II

Organization structure, authority and responsibility, Organisation dynamics, Managerial leadership, communication systems, Managing human factors in business and industry, Industrial relation, Union activities, trade union acts, collective argaining, disciplinary procedure. (10 Hrs.)

UNIT-III

Organizational objectives and long range forecasting, planning, organizing, programming and controlling process, managerial control strategies; quantity and quality control, cost benefit analysis, present work and breakeven analysis, budgetary control, use of management science for the efficient administration of economic Units, production, financial and marketing management. (10 Hrs.)

UNIT-IV

Adoption of statistical and computer methods and techniques to managerial research and managerial decision making and general management. (10 Hrs.)

Books:

1. Industrial Management - S C Jain, W S Bawa, Dhanpat Rai & Co. (P) Ltd.
2. Industrial Management, Vol.1 L.C. Jhamb, EPH,
3. Industrial Engineering & Production Management - Martand Telsang, S. Chand
4. Industrial & Business Management - Martand T. Telsang, S. Chand
5. Introduction to Materials Management - J Tony Arnold & Stephen N. Chapman, Pearson Education Asia
6. Production & Operations Management – Adam, Pearson Education /PHI
7. Industrial Relations, Trade Unions & Labour Legislation - Sinha, Pearson Education Asia
8. Business Organisation & Management - Tulsian, Pearson Education Asia.

FT 6102 PACKAGING TECHNOLOGY

L T P **Credits:2**
2 0 0

UNIT- I

Introduction: Definitions, Objectives and functions of packaging and packaging materials. (04 Hrs.)

Properties of Packaging Materials: Packaging requirements and selection of packaging materials, properties of materials such as tensile strength, bursting strength, tearing resistance, puncture resistance, impact strength, tear strength, their methods of testing and evaluation. (10 Hrs.)

UNIT- II

Packaging Materials: (a) Paper: pulping, fibrillation and beating, types of papers and their testing methods, cellulosic, paper board. (b) Glass: composition, properties, types of closures, methods of bottle making. (c) Metals: Tinplate containers, tinning process, components of tinplate, tin free steel (TFS), types of cans, Aluminum containers, lacquers (d) Plastics: types of plastic films, laminated plastic materials, extrusion, edible films, biodegradable plastics. (12 Hrs.)

UNIT- III

Barrier Properties of Packaging Materials: Theory of permeability, factors affecting permeability, permeability coefficient, gas transmission rate (GTR) and its measurement, water vapour transmission rate (WVTR) and its measurement, prediction of shelf life of foods, selection and design of packaging material for different foods. (10 Hrs.)

UNIT- IV

Food Packaging Systems: Different forms of packaging such as rigid, semi-rigid, flexible forms and different packaging system for (a) dehydrated foods (b) frozen foods (c) dairy products (d) fresh fruits and vegetables (e) meat, poultry and sea foods. (06 Hrs.)

Recommended Books

Title	Author	Publisher
A Handbook of Food Packaging	Frank A. Paine	Blackie Academic
Food Packaging	Stanley Sacharow and Roger C. Griffin	AVI Publications
Food Packaging Materials	N.T.Crosby	Applied Science
Plastic Films for Packaging; Technology, Applications and Process Economics	Calvin J. Bening	Technomic
Plastics in Packaging	A.S.Athalye	TataMc-Graw Hill
Food Packaging: Principles and Practice	Gordon L. Robertson	Marcell Dekker

FT 6103 FOOD PROCESS TECHNOLOGY – III (FATS & OILS)

L T P **Credits: 3**
3 0 0

UNIT-I

Importance of fats and oils in foods; Sources of fats and oils; Extraction of fats and oils – rendering, pressing, solvent extraction; Processing of oils – degumming, refining, bleaching, deodorization, fractionation; Reversion and rancidity of fats and oils. (10 Hrs.)

UNIT-II

Natural vegetable oil and animal fat: source, composition, properties and industrial applications; Plastic fat in bakery and confectionary; Preparation of shortenings and margarine.

(10 Hrs.)

UNIT-III

Manufacture of different types of fat/oil derived products: winterization, hydrogenation, esterification, inter-esterification & emulsification. (10 Hrs.)

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UNIT-IV

Production technology of oilseed protein isolates; Standard and quality control of fats and fatty foods; By-products of fat/oil processing industries. (10 Hrs.)

Text books/ References:

1. Bailey's Industrial Oil and Fat Products, Vol 1 & 2; Swern D; 4th ed, 1982, John Wiley & Sons.
2. The Chemistry & Technology of Edible Oils and Fats; Devine J & Williams PN; 1961, Pergamon Press.
3. Food Oils and their Uses; Weiss TJ; 1983, AVI.
4. Edible Oils & Fats: Developments since 1978 (Food Technology Review # 57); Torrey S; 1983, NDC.

MC 6104 VALUE EDUCATION & SPIRITUALITY

L T P **Credits: 0**
2 0 0

UNIT- I

The importance and the needs of spirituality and value education; Personal Development & Values in life; Humanity vs. enmity, cruelty, violence, injustice, exploitation, corruption as well as gross violation of human rights; Exploring Spirituality. (10 Hrs.)

UNIT- II

Understanding Value Education, The Basic Human Aspirations-Continuous Happiness and prosperity , Self-Exploration as the Process for Value Education, Imbalance in human personality & society. (08 Hrs.)

UNIT- III

Understanding the harmony at various levels, Understanding the Human Being as co-existence of self and body, Harmony in Self, family, society, nature and existence; providing the Basis for Universal Human values and Ethical Human Conduct. (08 Hrs.)

UNIT- IV

Vision for Holistic Technologies, Production Systems and Management Models; Holistic education relative to the present crisis; Change through knowledge; Meditation & Values in Society; Values for excellence in life; A spiritual life style. (10 Hrs.)

Text books / References:

1. Discovering Myself: A graded series of ten books on value education
   Author(s) : Andre Bruylants S.J & Bruylants

Title	Introduction to Values Education
Author	E. Palispis
Publisher	Rex Bookstore, Inc.
ISBN	9712317927, 9789712317927

2. Law, Ethics and Communication
   Author: B S Jolly
   Publisher: Tata Mc-graw Hill Publishing Co.ltd. (2012)
3. Vivekananda: His Call to the Nation**Author:** Swami Vivekananda
   Publisher: Advaita Ashrama
4. Inspiring Thoughts, Publisher-Raj Pal & Sons.
5. Gospel of Shri Rama Krishna,Author: Rama Krishna,Pubilsher: Create Space
6. Study Materials of value education from Education wing of Brahma Kumaris Raj Yoga Education Research Foundation

OPEN ELECTIVES-I

OE 601A RURAL TECHNOLOGY AND COMMUNITY DEVELOPMENT

L T P **Credits: 3**
3 0 0

UNIT-I

Data Analysis and Measures of Central Tendency- Meaning, nature, scope and limitations of statistics, collection of statistical data, classification, tabulation and diagrammatic representation of data, Measures of central tendency: Statistical averages Mean, Median, Mode. (10 Hrs.)

UNIT- II

Data, Information and Knowledge; concept of information, need of information (professional, educational, research), qualities of information, value of information, difference between data and information, properties of the needed information. Information and Management; planning, organizing, co - ordinating and controlling, (10 Hrs.)

UNIT-III

Concepts of marketing; difference between marketing selling and retailing; marketing mix, market-segmentation, marketing planning. Strategy and Approaches; modern concept of marketing. Community development; concept, definition, meaning, need, history, principles, objectives and scope. Community Building: Coming of Age, Regenerating Community, Community Model. (10 Hrs.)

UNIT- IV

Consensus Organizing Model, What's Behind Building Healthy Communities? Participatory Democracy, The Role of various NGOs in Community Development. The Role of Business and Government in Community Development Initiatives How to Form a Non-profit Corporation Fund Raising and Grant Writing. (10 Hrs.)

Text/Reference Books:

1. Clark, Kenneth B. and Jeannette Hopkins, eds. 1969. A Relevant War Against Poverty: A Study of Community Action Programs and Observable Social Change. New York: Harper and Row.
2. Creevey, Lucy E., ed. 1986. Women Farmers in Africa: Rural Development in Mali and the Sahel. Syracuse, NY: Syracuse University Press.
3. Edwards, Allen David and Dorothy G. Jones. 1976. Community and Community Development. The Hague, Netherlands: Mouton.
4. Green, Tova and Peter Woodrow. 1994. Insight and Action: How to Discover and Support a Life of Integrity and Commitment to Change. Philadelphia, PA: New Society Publishers.
5. Heskin, Allen David. 1991. The Struggle for Community. Boulder, CO: West view Press.9. Kramer, Ralph M. and Harry Specht. 1975. Readings in Community Organization Practice. 2d ed. Englewood Cliffs, NJ: Prentice-Hall.
6. Sustainable Rural Technology, by M.S. Virdi, Daya Publishing House, ISBN: 8170355656

OE 601B MODELLING AND SIMULATION IN FOOD PROCESSING

L T P **Credits: 3**
3 0 0

UNIT-I

Introduction-Systems, System types, System Modelling, Types of system modelling, Classification and comparison of simulation models, attributes of modelling, Comparison of physical and computer experiments, Application areas and Examples. (10 Hrs.)

UNIT- II

Mathematical and Statistical Models- Probability concepts, Queuing Models, Methods for generating random variables and Validation of random numbers. (10 Hrs.)

UNIT-III

Language-System modelling, programming languages, comparison of languages, Identifying and selection of programming language, feasibility study of programming language for the given application. (6 Hrs.)
Experiments-Simulation of different systems, Analysis, validation and verification of input and output simulated data, study of alternate techniques. (4 Hrs.)

UNIT- IV

Case study-Developing simulation model for information centers, inventory systems and analysis of maintenance systems. (10 Hrs.)

Recommended Books:

Text Books:

1. Geoffrey Gordon, "System Simulation", Second edition, Prentice Hall, India, 2002.

2. Jerry Banks and John S.Carson, Barry L.Nelson, David M.Nicol, "Discrete Event System Simulation", Third edition, Prentice Hall, India, 2002.

Reference Books:

1. Robert E. Shannon, "System Simulation The art and science", Prentice Hall, New Jersey, 1995.
2. D.S. Hira, "System Simulation", S.Chand and company Ltd, New Delhi, 2001.

OE 601C SEPARATION PROCESS IN FOOD INDUSTRIES

L T P **Credits-3**
3 0 0

UNIT-I

Theory of diffusion processes – molecular and eddy diffusion in fluids, measurement of diffusivity. Theory of interphase mass – transfer, mass transfer coefficients and mass transfer theories. (10 Hrs.)

UNIT-II

Analogy between heat mass and momentum transfer. Theory of absorption of a single component from gas mixtures wetted wall column. Design principles of absorption towers. Theory of desorption operation. (9 Hrs.)

UNIT-III

Fundamental principles of liquid-liquid extraction, selectivity and choice of solvent. Material balances in stage operations and principles of graphical methods in determination of number of equilibrium stages. (10 Hrs.)

UNIT-IV

Fundamental principles of leaching operation and material balance calculations. Theory of crystallisation, material and energy balance calculations, introduction to crystallizer design, introduction to the principles of adsorption. (11 Hrs.)

Recommended Books:

Separation process Principles (chemical & bio-chemical operations), 3rd edition, Seader, Henley, Roper, Amazon

Separation process engineering (second edition), Phillip C. Wankat, Prentice Hall

PROFESSIONAL ELECTIVE-I

FT 61A1 SPICES & FLAVOUR TECHNOLOGY

L T P **Credits: 3**
3 0 0

UNIT-I

Introduction: Status and scope of spice and flavour processing industries in India; Spices, Herbs and seasonings: sources, production, selection criteria; flavours: commercially available materials, classification on the basis of origin, physical characteristic. (07 Hrs.)

UNIT-II

Processing technology of Spices: Chemical composition of spices; processing methods: equipment used in the processing of spices; spice encapsulation; recent developments in production, retention and recovery of spices; effect of processing on spice quality: contamination of spices with micro-organisms and insects. (09 Hrs.)

Spice Essential Oils: Definition, methods of extraction, isolation, separation equipment. (06 Hrs.)

UNIT-III

Flavour Technology: Essence (flavour) recovery techniques from fruits, spices and herbs along with the equipment used: liquid and Solid flavour production; Flavouring remixing: flavour intensifiers: synthetic flavours; effect of processing on flavour quality. (07 Hrs.)

UNIT-IV

Spice Oleoresins: Definition, method of extraction, isolation, separation equipment**.** (03Hrs.)

Spices and flavour quality evaluation: Criteria for assessment of flavour quality; identification of natural food flavours; methods of flavour evaluation (chemical, instrumental, sensory); PFA standards for flavouring materials and flavours. (08Hrs.)

Recommended Books:

Title	Author	Publishers
Source book of flavour	Reineccius, G	CBS
Food Flavours	Morton, I. D., Macleod ,A.J	AVI

FT 61A2 HANDLING AND STORAGE OF FOOD AND FOOD PRODUCTS

L T P **Credits: 3**
3 0 0

UNIT-I

Introduction: Importance of handling and storage of food and food products; Post harvest losses of fruits, vegetables and grains in India; Prevention of losses, storage and its benefits; qualitative and quantitative changes during storage; Public distribution system of grains in India and role of Govt. agencies. (10 Hrs.)

UNIT-II

Handling of fruits, vegetables, cereals, pulses & oilseeds: Types and operational principles of handling equipment: conveyors (belt, screw and pneumatic), elevators, pumps, fans, Scoops, semi-trucks; weighing, packaging and sealing machines for granular and powdered materials, handling losses and their control. (10 Hrs.)

UNIT-III

Fruits and vegetable storage: Low temperature storage of fruits and vegetables, storage requirements and types of storages structures, spoilage during storage of fruits and vegetables and their prevention. (10 Hrs.)

UNIT-IV

Storage of cereals and other grains: Factors affecting quality of grain during storage; types of storage structures for small, medium and large quantities; Causes of spoilage during storage and their prevention. (10 Hrs.)

Recommended Books:

Authors	Title	Publishers
Hall, C.W.	Handling and storage of food grains in tropical and subtropical areas.	Oxford and IBH
Sinha R.N. and	Grain storage- Part of a System	AVI
W.E. Muir Volkind and Rostov	Modern Potato and Vegetable storage	Amerind

FT 61A3 MODERN TECHNIQUES IN FOOD PROCESSING

L T P **Credits: 3**
3 0 0

UNIT – I

Membrane technology: Introduction to pressure activated membrane processes: microfiltration, UF, NF and RO and their industrial application.
(05 Hrs.)

Supercritical fluid extraction: Concept, property of near critical fluids NCF, extraction methods.
(04 Hrs.)

UNIT – II

Microwave and radio frequency processing: Definition, Advantages, mechanism of heat generation, application in food processing: microwave blanching, sterilization and finish drying.
(05 Hrs.)

Hurdle technology: Types of preservation techniques and their principles, concept of hurdle technology and its application. (04 Hrs.)

UNIT – III

High Pressure processing: Concept, equipment's for HPP treatment, mechanism of microbial inactivation and its application in food processing. (04 Hrs.)
Ultrasonic processing: Properties of ultrasonic, application of ultrasonic as processing techniques. (04 Hrs.)

UNIT – IV

Newer techniques in food processing: Application of technologies of high intensity light, pulse electric field, ohmic heating, IR heating, inductive heating and pulsed X-rays in food processing and preservation. (10 Hrs.)
Nanotechnology: Principles and applications in foods. (04 Hrs.)

Recommended Books:

Author	Title	Publisher
G. W. Gould	New Methods of Food Preservation	CRC
R.P.Singh	Introduction to Food Engineering	
Barbosa-Canovas	Novel Food Processing Technologies	CRC

B. Tech Programme
Semester IV

FT-6201 FOOD PROCESS ENGINEERING

L T P **Credits: 2**
2 0 0

UNIT- I

Material and energy balance: Numerical problems on material and energy balance related to food processing. (03 Hrs.)

Thermal Processing: Microbial inactivation; Derivation and application of equation for determination of thermal process time for cans, evaluation of thermal process time for batch sterilization by graphical method; calculation of process time for continuous sterilization of liquid foods; factors affecting rate of heat penetration. (06 Hrs.)

UNIT- II

Steam Properties: Properties of wet, saturated and superheated steam use of steam tables and Mollier diagram. (04 Hrs.)

Evaporation: Boiling point elevation, Duhring rule, basic principles of evaporators; capacity and economy of evaporator; multiple effect evaporator: operation and various feeding systems, calculation of heat transfer area in single and multiple effect evaporators. (08 Hrs.)

UNIT- III

Psychometric: Properties of air-water vapour mixture, psychometric chart, Humidification and dehumidification operations, Application of psychometry to drying; related numerical problems. (04 Hrs.)

Drying and dehydration: Principles of drying and dehydration, water activity, sorption and desorption isotherms, rates of drying: constant and falling rate periods during convective drying, drying rate constant; capillary flow and diffusion in falling rate period. (06 Hrs.)

UNIT- IV

Freezing and Crystallization: Basic concepts, theories of crystallization; Depression in freezing point, Planks equation and other modified equations for prediction of freezing time, different types of freezers and crystallizers. (05 Hrs.)

Fluidization: Mechanism of fluidization, characteristics of gas –solid fluidized systems, minimum porosity, bed weight, and pressure drop in fluidized bed. (04 Hrs.)

Recommended Books:

Author	Title	Publisher
R.T. Toledo	Fundamentals of food process Engg	CBS
Brennan and Cowell	Food Engineering Operations	Applied Science
Heldman and Singh	Food Process Engineering	Academic Press
Smith, P G	Intro to Food Process Engg	Springer
Geankoplis	Transport Process &Unit operations	PHI

FT 6202 FOOD PRESERVATION-II

L T P **Credits-2**
2 0 0

UNIT-I

General introduction to food technology. Construction of sanitary cans and testing of cans, can lacquers and can scaling compounds. (10 Hrs.)

UNIT-II

Preservation by application of heat. Various canning techniques. Dehydration, water activity of food, intermediate moisture food. (10 Hrs.)

UNIT-III

Preservation of food by removal of heat, cold storage and freezing including cryogenic freezing of food. Curing pickling. (10 Hrs.)

UNIT-IV

Preservation by ionization radiation use of chemical and preservatives in food preservation. Preservation by fermentation. (10 Hrs.)

Recommended Books:

Author	Title	Publisher
Potter	Food science	CBS
Fennema,Kerrel	Principal of food preservation	
Norman W.Desrosier,James N.Desrosier	The technology of food preservation	CBS

FT 6203 FOOD PROCESS TECHNOLOGY - IV (DAIRY TECHNOLOGY)

L T P **Credits: 2**
2 0 0

UNIT- I

Introduction: Status of dairy industries in India, Introduction of basic unit operations involved in the processing of milk and milk products. (04 Hrs.)
Composition of milk: Composition and physico-thermal properties of milk, their interaction with processing. (04 Hrs.)

UNIT- II

Homogenization of milk: Principle of homogenization, single and two stage homogenizers, care and maintenance of homogenizers, application of homogenization in dairy industry. (05 Hrs.)

Thermal processing of milk: Pasteurization of milk- batch, flash and continuous pasteurizers, care and maintenance, UHT processing of milk. (05 Hrs.)

UNIT- III

Concentration of milk: Concentration of milk and machineries, heat and mass balance in single and multiple effect evaporator, types of evaporators and their performances characteristics and selection criteria. (06 Hrs.)
Drying and dehydration of milk: Drying theories, estimation of drying rates and drying time, drying equipment (spray drier, drum drier). (06 Hrs.)

UNIT- IV

Food freezing: Kinetics of food freezing, freezing methods and equipment, recent advances in food freezing, Technology of ice-cream manufacturing. (05 Hrs.)
Cleaning and sanitation: Selection and use of dairy cleaners and sanitizers, washing equipment, working and maintenance of can washers, steam sterilization of canes, clean in place system, factors affecting, washing operation.
(05 Hrs.)

Recommended Books: Author	**Title**
Sukumar De	Outlines of Dairy Technology
Walstra	Dairy Technology
Spreer	Milk and Dairy Product technology
Eckles, Comb and Macy	Milk and Milk Products
Kessler	Food Engineering and Dairy Technology
Farral	Engineering of Dairy and food Products

OPEN ELECTIVE-II

OE 602A FOOD SAFETY

L T P **Credits-3**
3 0 0

UNIT-I

Introduction to the structure of systems of plant operation, maintenance and safety. System interactions and degree of freedom with man, material and equipment. (10 Hrs.)

UNIT-II

Factory rules and procedures with Indian and International specifications in operation, maintenance and safety. Effects of economic design criteria in optimum plant operation. (10 Hrs.)

UNIT-III

Trouble shooting operation and maintenance in presence of uncertainty. Simulation for interpretation in difficult plant operation. Introduction to microprocessor based operations. (8 Hrs.)

UNIT-IV

Inspection, testing and analysis of tolerance limit and types of failure. Contains based maintenance and its economical viability. Hazards and operative (HAZOP) analysis. Accidents and emergency preventive procedures. Insurance claim and loss analysis. Case studies on Food and Biochemical plants. (12Hrs.)

Recommended Books:

The handbook of safety engineering (principle & applications) Frank R. Spellman, Nancy E.Whiting; Published by Government Institutes

Safety professional's reference and study guide, W.David Yates

OE 602B WASTE TREATMENT ENGINEERING

L T P **Credits-3**
3 0 0

UNIT-I

Environment and energy of nature. Water for food and biochemical industries. (10 Hrs.)

UNIT-II

Stream pollution and measurement. a) Physical treatment. b) Chemical treatment. c) Drying and incineration. (10 Hrs.)

UNIT-III

Industrial waste treatment: a) Vacuum treatment b) Sludge lagooning. c) Drying and incineration. Treatment and disposal of sludge solids a) Vacuum treatment b) Sludge lagooning c) Drying and incineration (10 Hrs.)

UNIT-IV

Microbial flocculation and sedimentation, Design of bio filters and bio clarifiers. Ion exchange in biological fluids. Biogas. (10 Hrs.)

Recommended Books:

Wastewater Engineering, Dr.B.C.Punmia, Ashok Kr. Jain, Arun Kr. Jain, Laxmi Publications (1998)

Fundamentals of wastewater treatment and engineering, Rumana Riffat, CRC Press

OE 602C FERMENTED FOOD PRODUCTS

L T P **Credits-3**
3 0 0

UNIT-I

Importance of fermented foods; Organisms used for production of fermented food products; Environmental parameters for fermentation process; Classification of fermentation processes for fermented foods; safety criteria of fermented foods. (10 Hrs.)

UNIT-II

Cereal and legume based fermented products like Bread, Soya Sauce, Koji, Tempeh, Miso, Natto, Tofu, Angkkak; Indian products like Idly, Dosa, Bada, Bori. Alcoholic beverages and vinegar. (10 Hrs.)

UNIT-III

Vegetables, fish and meat based fermented products; Different types of pickles like olive cucumber, salt stock and dill pickles, Fish sauce, sausages and Surimi. (10 Hrs.)

UNIT-IV

Dairy based fermented products like cheese, Butter, Yoghurt, Kefir, Koumiss, Srikhand, Cultured butter milk; Whey based fermented products. (10 Hrs.)

Text Books/ References:

1. Fermented Foods of the world. (A Dictionary & Guide) –by Geoffrey Champbell, Platt, Butterworths, London.
2. Industrial Microbiology by Brinton M miller & Warren Litsky. MGH.
3. Pickle & Sauce Making, Binsted, Devey & & Dakin (2nd edn), Food Trade Press Ltd, London.

PROFESSIONAL ELECTIVE-II

FT 62A1 PROTEIN TECHNOLOGY.

L T P **Credits-3**
3 0 0

UNIT-I

Determination of protein structure; Nutritional and commercial importance of proteins; Physical, chemical and functional properties of proteins; Folding of proteins; Commercial sources of proteins; Creation of new proteins by bio-composite synthesis technique. (10 Hrs.)

UNIT-II

Process of making protein isolates and concentrates; Factors affecting quality of isolates and concentrates; Treatment to isolate and concentrate; Packaging of protein isolates and concentrates; Food and non food uses of isolates and concentrates. (10 Hrs.)

UNIT-III

Methods of manufacturing protein hydrolysates; Factors affecting quality of hydrolysates; Food uses of hydrolysates; Fibre spinning process of proteins; Textured protein gels and expanded products; Simulated milk products; Restructured protein; Non-conventional sources of protein. (10 Hrs.)

UNIT-IV

Centrifugation; Cell disruption; Protein precipitation and its recovery; Aqueous two-phase separation; Ion exchange chromatography; Gel filtration; Affinity chromatography; Electrophoresis; Cross filtration; Ultra filtration. (10 Hrs.)

Text Books/ References:

1. Altschul, A.M and Wilcke, H.L Ed 1978. New protein Foods. Vol III. Academic Press, New York.
2. Bodwell, C.E.Ed. 1977. Evaluation of proteins for Humans. AVI, Westport. 3. Milner,M., Scrimshaw, N.S and Wang, D.I.C.Ed. 1978. Protein Resources and Technology. AVI, Westport.
4. Salunkhe, O.K and Kadam, S.S Eds. 1999. Handbook of world legumes; Nutritional Chemistry, Processing Technology and Utilization. Volume I to III. CRC Press, Florida.
5. Salunkhe, D.K. Chavan, J.K., Adsule, R.N Kadam, S.S 1992. World Oilseeds: Chemistry, Technology and Utilization, Van Nostrand Reinhold, New York.
6. Bio separation engineering: Principles, Practise and Economics, M.Ladish; Wiley Inter science.

FT62A2 BIOCHEMICAL ENGINEERING

L T P **Credits: 3**
3 0 0

UNIT- I

Introduction: Introduction to biochemical engineering, its scope and area covered, Microbiological and biochemical aspects related to biological processes. (02 Hrs.)

Media Sterilization: Medium formulation, Thermal sterilization, Sterilization by filtration, Design criteria and design equations for sterilization process, Temperature-time profile and design calculations, Methods of air sterilization, Interception, diffusion and combined mechanism. (8 Hrs.)

UNIT- II

Microbial Growth and Death Kinetics: Microbial growth kinetics under batch and continuous process, Thermal death kinetics of microorganism, measuring and monitoring growth processes, influence of temperature on specific growth and death rates, relationship between growth and substrate utilization. (10 Hrs.)

UNIT- III

Enzyme kinetics: Concepts of biochemical reaction kinetics, thermodynamic considerations, concepts of free energy and activation energy, simple enzyme reaction kinetics, complex enzyme kinetics, Michaelis-Menten equation, Briggs–Halden approach, evaluation of parameters, enzyme inhibition (competitive and non-competitive), enzyme immobilization techniques and kinetics of immobilized enzymes. (10 Hrs.)

UNIT- IV

Biorector and Fermenter: Bioreactor design and analysis in view of microbial reaction process, operation of batch and continuous fermentation, aseptic inoculation of pilot and industrial fermenter, oxygen supply and demand in microbial processes, mass transfer resistances, critical value of oxygen concentration and oxygen uptake rate, aeration in fermenter, types and design of sparger. (10 Hrs.)

Recommended Books: Title of book	**Name of author**	**Name of publisher**
Biochemical Engineering	Aiba, S,, Humphrey,A.E. and Millis, N.	Academic press
Biochemical Engineering Fundamentals	Bailey, J.E and and Ollis, D.F.	McGraw Hill, NY
Biochemical Engineering	James M. Lee	Prentice Hall, NJ
Principles of Fermentation Technology	Stanbury, P. F Whitaker, W and and Hall, S.J	Reed Elsevier PvteLtd,New Delhi

FT 62A3 HEALTH FOODS

L T P **Credits:3**
3 0 0

UNIT- I

Definition, status and scope of health and functional foods in India, Definition of nutraceuticals and their importance. (05 Hrs.)
Types of health and functional foods and their properties. (05 Hrs.)

UNIT- II

Various food constituents responsible for functional effects: - Anti-carcinogenic, hypocholesterolemic and hypoglycemic foods, - Dietatic foods, anti-ageing foods, - Fortified foods, diabetic foods, - Biofedic, prebiotics and probiotic foods. (10 Hrs.)

UNIT- III

Processing of health and functional foods, criteria for selection of raw materials, and their processing. (06 Hrs.)
Storage, packaging and labeling of health and functional food. (04 Hrs.)

UNIT- IV

Marketing aspects of health and functional foods. (05 Hrs.)
Safety / Legal aspects of health and functional foods. (05Hrs.)

Recommended Books: Title

	Author	**Publishers**
Functional Foods	R. Chadwick,S. Henson,B. Moseley,G.	CRC Press
Methods of Analysis for Functional Foods and Nutraceuticals	W. Jeffrey Hurst	
Functional Foods	Mazza	Technomic Press
Handbook of Nutraceuticals and Functional Foods	Robert E.C. Wildman	CRC Press

PROFESSIONAL ELECTIVE – III

FT 62B1 FOOD PLANT LAYOUT & DESIGN

L T P **Credits: 3**
3 0 0

UNIT- I

Basic concepts of plant layout and design with special reference to food process industries. Application of HACCP concept, ISO, FPO & MPO requirements in food plant layout and design. (10 Hrs.)

UNIT- II

Design consideration for location of food plants. Basic understanding of equipment layout and ventilation in food process plants. Preparation of flow sheets for material movement and utility consumption in food plants (10 Hrs.)

UNIT- III

Plant layout and design of bakery and biscuit industries. Plant layout and design of fruits and vegetables processing industries including beverages. (10 Hrs.)

UNIT- IV

Plant layout and design of milk and milk products. Miscellaneous aspects of plant layout and design like provision for waste disposal, safety arrangements etc. (10 Hrs.)

Text Books/ References:

1. Manufacturing Facilities Design and Material Handling by Fred E. Meyers, and Matthew P. Stephens, 3rd Edition, Pearson Prentice Hall, 2000.
2. James M Moore, "Plant Layout and Design", Mcmillan & Co., (1959)
3. Bolz, Harold A George E., " Material Handling Handbook.
4. J M Apple, " Plant layout and Material Handling", John Willey & Sons, (1977)
5. Various Indian Standards.

FT 62B2 FOOD ADDITIVES

L T P **Credits: 3**
3 0 0

UNIT- I

Need for food additives; Antioxidants; Chelating agents; Colouring agents; Curing agents and emulsifiers. (10 Hrs.)

UNIT-II

Flavour and flavour enhancers; Flour improvers; Humectants and anticaking agents; Leavening agents. (10 Hrs.)

UNIT- III

Low calorie sweeteners; pH control agents; Preservatives; Stabilizers and other additives; Nutrient supplements & thickeners. (10Hrs.)

UNIT-IV

Coating or enrobing; Coating materials; Enrobes; Dusting or breading; Pan coating. (Hard, soft, chocolate coating)
(10Hrs.)

Text Books/References.

1. Food Science (5th Edn.) by Potter & Hotchkiss, CBS Publishers & Distributors.
2. Food process Technology by Fellows (Woodhead Publishing Ltd).

FT 62B3 FOOD INDUSTRY BY PRODUCT MANAGEMENT

L T P **Credits: 3**
3 0 0

UNIT- I

Isolation of major components of essential oils and their utilization in perfumery chemicals. Synthesis and perfumery applications of large ring ketones and lactones. (10 Hrs.)

UNIT- II

Artificial masks and their applications, blending of perfumes. Various raw materials in the cosmetic industry, personal care products. (10 Hrs.)

UNIT- III

Technology of Production of cosmetic like various creams, shavings, lotions, Hair Oils, Tooth paste and tooth powder, lipstick, face powders, herbal cosmetics. (10 Hrs.)

UNIT- IV

Plants and equipment associated with the cosmetic industry. (10Hrs.)

Recommended Books:

Modern technology of cosmatics, NIIR Board, ISBN

Indian plant perfumes, S.N. Mahindru, ISBN

Hand book of cosmetic science and technology (third edition), Andr'e O.Barel, Marc Paye, Howard I. Maibach, Informa Healthcare

ELECTRICAL ENGINEERING

B. TECH PROGRAMME ELECTRICAL ENGINEERING (EE)

BRIDGE COURSE SEMESTER I (AUGUST TO DECEMBER)

Sl. No.	Course Code	Course Title	L	T	P	Credit	GKCIET Diploma	Other Diploma
1.	AM B101	Comprehensive Mathematics-I	3	0	0	3	No	Yes
2.	AP B101	Engineering Physics	3	0	0	3	No	Yes
3.	AC B101	Engineering Chemistry	3	0	0	3	No	Yes
4.	EE B101	Electrical Engineering Materials (Audit)	2	0	0	2	No	Yes
5.	HU B101	Business Communication & Presentation Skill	3	0	0	3	No	Yes
6.	EE B102	Electric Power Utilization	3	0	0	3	No	Yes
7.	AP B151	Engineering Physics Lab.	0	0	3	2	No	Yes
8.	AC B151	Engineering Chemistry Lab.	0	0	3	2	No	Yes
9.	HU B151	Business Communication & Presentation Skill Lab.	0	0	3	2	No	Yes
10	EE B151	Electric Power Utilization Lab.	0	0	3	2	No	Yes
		Total	17	0	12	**25**		

BRIDGE COURSE SEMESTER II (JANUARY TO MAY)

Sl. No.	Course Code	Course Title	L	T	P	Credit	GKCIET Diploma	Other Diploma
01.	EE B202	Introduction to Digital Electronics	3	1	0	4	No	Yes
02.	AM B201	Comprehensive Mathematics-II	3	0	0	3	No	Yes
03.	EE B201	Electrical Circuits	3	0	0	3	No	Yes
04.	HU B201	Sociology & Elements of Indian History For Engineers	3	0	0	3	No	Yes
05.	CS B201	Programming in C/C++	3	0	0	3	No	Yes
06.	EE B203	Power Electronics-I	3	1	0	4	No	Yes
07.	EE B252	Introduction to Digital Electronics Lab.	0	0	3	2	No	Yes
08.	EE B251	Electrical Circuits Lab.	0	0	3	2	No	Yes
09.	CS B251	Programming in C/C++ Lab.	0	0	3	2	No	Yes
10.	EE B253	Power Electronics-I Lab.	0	0	3	2	No	Yes
		Total	**18**	**2**	**12**	**28**		

DEGREE SEMESTER- I (AUGUST TO DECEMBER)

Sl. No.	Course Code	Course Title	L	T	P	Credit	GKCIET Diploma	Other Diploma
01.	AM 5101	Engineering Mathematics-I	3	0	0	3	Yes	Yes
02.	AP 5101	Engineering Physics	3	0	0	3	Yes	Yes
03.	HU 5101	Environmental Sciences	2	0	0	2	Yes	Yes
04.	ME 5101	Basic Engineering Mechanics	2	0	0	2	Yes	Yes
05.	EE 5102	Analog & Digital Electronics	3	0	0	3	Yes	Yes
06.	CS 5101	Database Technology	2	0	0	2	Yes	Yes
07.	EE 5103	Network Theory	3	0	0	3	Yes	Yes
08.	EE 5104	Electrical Machines-I	3	0	0	3	Yes	Yes
09.	MC 5101	Technical Communication & Soft Skills	2	0	0	0	Yes	Yes
10.	AP 5151	Engineering Physics Lab	0	0	3	2	Yes	Yes
11.	EE 5152	Analog & Digital Electronics Lab	0	0	2	1	Yes	Yes
12.	CS 5151	Database Technology Lab	0	0	3	2	Yes	Yes
13.	EE 5153	Network Theory Lab	0	0	2	1	Yes	Yes
14.	EE 5154	Electrical Machine-I Lab	0	0	2	1	Yes	Yes
		Total	**23**	**0**	**12**	**28**		

DEGREE SEMESTER- II (JANUARY TO MAY)

Sl. No.	Course Code	Course Title	L	T	P	Credit	GKCIET Diploma	Other Diploma
01.	AM 5201	Engineering Mathematics- II	3	0	0	3	Yes	Yes
02.	AC 5201	Engineering Chemistry	2	0	0	2	Yes	Yes
03.	HU 5201	Economics for Engineers	3	0	0	3	Yes	Yes
04.	EE 5201	Electromagnetic Field Theory	3	0	0	3	Yes	Yes
05.	EE 5202	Microprocessor & Microcontrollers	3	0	0	3	Yes	Yes
06.	EE 5203	Measurements & Instruments	3	0	0	3	Yes	Yes
07.	EE 5204	Electrical Machines- II	3	0	0	3	Yes	Yes
08.	EE 5205	Power Systems- I	3	0	0	3	Yes	Yes
09.	AC 5251	Engineering Chemistry Lab	0	0	3	2	Yes	Yes
10.	EE 5252	Microprocessor & Microcontrollers Lab	0	0	2	1	Yes	Yes
11.	EE 5253	Measurements & Instruments Lab	0	0	2	1	Yes	Yes
12.	EE 5254	Electrical Machine- II Lab	0	0	2	1	Yes	Yes
13.	EE 5255	Power Systems- I Lab	0	0	2	1	Yes	Yes
		Total	**23**	**0**	**11**	**29**		

DEGREE COURSE SEMESTER- III A (JUNE TO AUGUST)

Sl. No.	Course Code	Course Title	L	T	P	Credit	GKCIET Diploma	Other Diploma
I.	IT 6170	Industrial Training	0	0	0	3	No	Yes

DEGREE COURSE SEMESTER- III B (AUGUST TO DECEMBER)

Sl. No.	Course Code	Course Title	L	T	P	Credit	GKCIET Diploma	Other Diploma
01.	AM 6101	Engineering Mathematics - III	3	0	0	3	Yes	Yes
02.	EE 6101	Power Systems- II	3	0	0	3	Yes	Yes
03.	HU 6101	Industrial Management	3	0	0	3	Yes	Yes
04.	EE 6102	Control Systems- I	3	0	0	3	Yes	Yes
05.	EE 6103	Power Electronics	3	0	0	3	Yes	Yes
06.	OE 601*	Open Electives- I	3	0	0	3	Yes	Yes
07.	EE 61A*	Professional Electives- I	2	0	0	2	Yes	Yes
08.	EE 6190	Assignments & Term Paper	0	0	0	2	Yes	Yes
09.	MC 6104	Value Education & Spirituality	2	0	0	0	Yes	Yes
10.	EE 6151	Power Systems- II L:ab	0	0	2	1	Yes	Yes
11.	EE 6152	Control Systems- I Lab	0	0	2	1	Yes	Yes
12.	EE 6153	Power Electronics Lab	0	0	2	1	Yes	Yes
13.	EE 61A*5	Professional Electives- I Lab	0	0	2	1	Yes	Yes
		Total	22	0	8	26		

DEGREE SEMESTER- IV (JANUARY TO MAY)

Sl. No.	Course Code	Course Title	L	T	P	Credit	GKCIET Diploma	Other Diploma
01.	EE 6201	Control Systems –II	3	0	0	3	Yes	Yes
02.	EE 6202	High Voltage Engineering	3	0	0	3	Yes	Yes
03.	EE 6203	Design of Electrical Machines	3	0	0	3	Yes	Yes
04.	OE 602*	Open Electives –II	3	0	0	3	Yes	Yes
05.	EE 62A*	Professional Electives- II	2	0	0	2	Yes	Yes
06.	EE 62B*	Professional Electives- III	2	0	0	2	Yes	Yes
07.	EE 6260	Comprehensive Viva-voce	0	0	0	2	Yes	Yes
08.	EE 6290	Project Work & Seminar	0	0	0	4	Yes	Yes
09.	EE 6251	Control Systems –II Lab	0	0	2	1	Yes	Yes
10.	EE 6252	High Voltage Engineering Lab	0	0	2	1	Yes	Yes
11.	EE 6253	Design of Electrical Machines Lab	0	0	2	1	Yes	Yes
		Total	**16**	**0**	**6**	**25**		

OPEN ELECTIVE - I

Sl. No.	Course Code	Course Title
1.	OE 601A	Digital Signal Processing
2.	OE 601B	Rural Technology & Community Development
3.	OE 601C	Signal and Systems
4.	OE 601D	Engineering System Modelling & Simulation

OPEN ELECTIVE-II

Sl. No.	Course Code	Course Title
1.	OE 602A	Artificial Intelligence & Robotics
2.	OE 602B	Digital Communication
3.	OE 602C	Project Management
4.	OE 602D	Engineering Safety

PROFESSIONAL ELECTIVE-I

Sl. No.	Course Code	Course Title
1.	EE 61A1	Electric Drives
2.	EE 61A2	Advanced Instrumentation
3.	EE 61A3	Mechatronics
4.	EE 61A4	Computer Network

PROFESSIONAL ELECTIVE-II

Sl. No.	Course Code	Course Title
1.	EE 62A1	Non-Conventional Energy Sources & Applications
2.	EE 62A2	Power Plant Engineering
3.	EE 62A3	Materials in Electrical Systems
4.	EE 62A4	Advanced Power Systems

PROFESSIONAL ELECTIVE-III

Sl. No.	Course Code	Course Title
1.	EE 62B1	Advanced Power Electronics
2.	EE 62B2	Utilization of Electrical Energy & Electric Traction
3.	EE 62B3	Electronic Devices & Systems
4.	EE 62B4	Switchgear & Relaying

BRIDGE COURSE SEMESTER-I

AM-B101 COMPREHENSIVE MATHEMATICS-I

L T P **Credits: 03**
3 0 0

UNIT-I

Review of distance formula and section formula, equation of straight line in various standard forms, intersection of two straight lines, angle between two lines, condition of parallelism and perpendicularity, perpendicular distance formula. General equation of a circle, diameter form, Centre and radius of a circle, circle through three non-collinear points, tangent and normal to a circle at a given point on it, condition of tangency. Verification of known formulae. (10 Hrs..)

UNIT-II

Introduction to conic section, standard equation of parabola, ellipse and hyperbola (without proof), writing equations when directrix, focus and eccentricity are given; finding focus, directrix, latus-rectum, axes, eccentricity and vertex when equation is given. Arithmetic progression, geometric progression, arithmetic-geometric series, special series: $\sum n$, $\sum n^2$, $\sum n^3$.Functions, domain and range. Concept of limit, continuity of a function (with simple examples). Physical & geometric meaning of $\frac{dy}{dx}$, differentiation of x^n, $\sin x$, $\cos x$, $\tan x$, e^x, a^x and $\log x$ from the first principle. Differentiation of sum, difference, product, quotient.

(10 Hrs..)

UNIT-III

Differentiation of function of a function. Chain rule of differentiation of inverse trigonometric functions, logarithmic and parametric differentiation, differentiation of implicit function. Equations of tangent and normal (for explicit function only).successive differentiation, Leibnitz's theorem. Fundamental theorems: Rolle's Theorem & Lagrange's mean value theorem. Expansion of function using Taylor and McLauren's series. Indeterminate forms, L'Hospital rule. Equation of tangent and normal (for explicit function only). Concept of integration, integration of rational and irrational functions.

(10 Hrs..)

UNIT-IV

Organization of data. Measures of Central Tendency- Mean, median, mode. Measures of Disperson - Standard deviation. Karl Pearson's coefficient of correlation. Probability and its laws. Conditional probability. Baye's theorem (without proof). Random Variable, Discrete and Continuous probability Distributions, Binomial and Poisson distributions. Probability mass function, Probability density function; Distribution Function, Expectation, Variance, Probability correlation and Regression, Method of Least Squares: Linear Curve Fitting.

(10 Hrs.)

RECOMMENDED BOOKS

Text books on Mathematics for XI, NCERT, New Delhi
Text books on Mathematics for XII, NCERT, New Delhi
Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern Ltd
Probability and Statistics for Science and Engineering, G Shanker Rao
Schaum's Outline Series, Probability & Statistics, Tata McGraw Hill
Engineering Mathematics, Koneru Sarveswara Rao
Ordinary and Partial Differential equations –M.D Rai singhania

AP B101 ENGINEERING PHYSICS

L T P **Credit: 03**
3 0 3

UNIT-I

Moment of Inertia: Moment of Inertia of rigid body, radius of gyration, theorem of parallel and perpendicular axes, moment of inertia of a straight rod, circular ring, circular disc, cylinder(solid and hollow) ,sphere, relation between torque and moment of inertia, kinetic energy and angular momentum, motion of cylinder and sphere rolling without slipping on an inclined plane. Numerical problems. (08 Hrs.)

UNIT-II

Kinetic Theory of Gases:Introduction, fundamental assumption of kinetic theory of gases,pressure exerted by gas, K.E of molecules, kinetic interpretation of temperature, derivation of gas laws from kinetic theory of gases. Numerical Problems. (05 Hrs.)

UNIT-III

Wave Optics: Wave front and Huygen's principle, interference of light(Narrow source & broad source), Young's double slit experiment, Qualitative idea of Spatial and Temporal Coherence, Conservation of energy and intensity distribution, Newton's ring. (04 Hrs.)

Diffraction of light, Fresnel and Fraunhofer class, Fraunhofer diffraction due to a single slit. Elementary idea on double slit & grating (rigorous calculation is not required),Rayleigh criterion for resolution & resolving power of grating.
(04 Hrs.)

General concepts of polarisation, Plane of vibration and plane of polarisation, qualitative discussion on plane, Circularly and elliptically polarised light, polarisation through reflection and Brewster's law. Numerical Problems. (03 Hrs.)

Fiber Optics: Core and cladding, step index and graded index fibers, acceptance angle, numerical aperture, losses, applications. (04 Hrs.)

UNIT-IV

Atomic Physics: Discharge through gases at varying pressure, Cathode rays and their properties, specific charge on electron by J.J.Thomson, determination of charge of an electron, Millikan's oil drop method.
(05 Hrs.)

Nuclear Physics:Introduction,Isotopes,isotones and isobars, atomic mass unit,mass defect and packing fraction,Nuclear stability, Radioactive laws,Nature of radiation emitted from the radioactive substance, half life and average life, decay,Nuclear Fission and Fusion.energy sources of stars and the sun.Numerical Problems. (06 Hrs.)

Recommended Books:
Text Books:
Arthur Beiser - Concepts of Modern Physics (McGraw Hill)
College Physics – C.R. Dasgupta
Reference Books:
University Physics – Sears and Zemansky

AC B101 ENGINEERING CHEMISTRY

L T P **Credit: 03**
3 0 3

UNIT- I

Organic chemistry: Functional Group: (Cyanides, isocyanides, nitro compounds and amines) Nomenclature of Cyanides, isocyanides, nitro compounds and amines and their methods of preparation, physical, chemical properties and uses. (07 Hrs.)

UNIT- II

Transition Metals and Coordination Chemistry: Transition Metals: Electronic configuration, general characteristic properties, oxidation states of transition metals. First row transition metals and general properties of their compounds oxides, halides and sulphides. (05 Hrs.)

Coordination Compounds: Nomenclature, isomerism in coordination compounds, bonding in coordination compounds, stability of coordination compounds, application of coordination compounds, compounds containing metal-carbon bond; application of organo - metalics. (05 Hrs.)

UNIT- III

Chemical Thermodynamics: First law of Thermodynamics: Internal energy, enthalpy, and application of first law of thermodynamics, Second and third law of thermodynamics: Entropy, Free energy, spontaneity of a chemical reaction, Free-energy change and chemical equilibrium. (07 Hrs.)

Surface Chemistry: Surfaces: Adsorption, Colloids (preparation and general properties), emulsions, micelles; Catalysis: Homogeneous and heterogeneous, structure of catalyst. (04 Hrs.)

UNIT- IV

Bio-molecules: Carbohydrates: Monosaccharide, disaccharides, polysaccharides; Amino acids and peptides: Structure and classification; Proteins and Enzymes: Structure of proteins, role of enzymes Nucleic acids: DNA and RNA; Lipids: Structure, membranes and their functions. (06 Hrs.)

Chemistry in Action: Dyes: Classification of dyes with examples; Chemicals in medicines: Antipyretics, Antibiotics, analgesics, antiseptics, disinfectants, anti-malarial, tranquilizers, germicides and anaesthetics, (only definition and examples); Rocket propellants: Types of propellants- solid, liquid and hybrid. (06 Hrs.)

Text Book:

1. A text book of Engineering Chemistry: Sashi Chawla
2. Engineering Chemistry: Amrita lal De, Abhranil De
3. Advance Chemistry: Philip Matthew
4. Engineering Chemistry: WILEY-INDIA
5. General and Inorganic Chemistry: R. P. Sarkar.

Reference Book:

1. Inorganic Chemistry: Huheey, Keiter, Keiter, Medhi
2. Physical Chemistry: Atkins
3. Physical Chemistry: Leidler
4. Chemical Kinetics: Laidler
5. Organic Chemistry: S. K. Ghosh

EE B101 ELECTRICAL ENGINEERING MATERIAL (AUDIT)

L T P **Credits: 02**
2 0 0

UNIT- I

Conducting materials: Automatic structure, composition and application of conducting materials effect of temperature on resistively, Properties and uses of Nickles, Nichrome, Maganese, carbon, Graphite etc. Metals and alloys for fuses, properties and specification of wire, cable etc. (09 Hrs.)

UNIT-II

Insulation materials: Electrical, Thermal and Mechanical properties of various insulating materials, transformer oil, quartz etc. Polarization and Dielectric constant, D**i**electric properties in alternating fields (08 Hrs.)

UNIT-III

Magnetic Materials: Classification of magnetic materials, diamagnetism, paramagnetic, ferro and anti-ferromagnetism, wiss field and magnetic domains, magnetic energy, Hard and soft magnetic material, types and uses. B-H curve and hysteresis loss. (09 Hrs.)

UNIT-IV

Electrical components: Different types of resistors, capacitor, choke coil and resistors, Electromagnetic and electrostatic shielding. (06 Hrs.)

UNIT-V

Special materials, classification, properties and uses of ceramic materials, semiconducting materials, contact materials, chemicals used for cleaning the contacts. Introduction to super conductors, types and their application. (08 Hrs.)

Recommended Books:

Material science for electrical and electronics engineers---Jones----Oxford
Electronic components and processes—Preeti Maheshwari---New age
Engineering Material----Abadhanlalu----S.Chand

HU B201 BUSINESS COMMUNICATION AND PRESENTATION SKILLS

L T P **Credits:**
03
3 0 3

UNIT-I

Business communication covering, Role of communication in information age; Concept and meaning of communication; skills necessary for technical communication; Communications in a technical organization; Barriers to the process of communication. (6 Hrs.)

Style and organization in technical communication covering, Listening, speaking, reading and writing as skills; Objectivity, clarity, precision as defining features of technical communication; Various types of business writing: Letters, reports, notes, memos; Language and format of various types of business letters; Language and style of reports; Report writing strategies. (8 Hrs.)

UNIT-II

Communication and personality development covering, Psychological aspects of Communication, cognition as a part of communication; Emotional Intelligence; Politeness and Etiquette in communication; Cultural factors that influence communication. (6 Hrs.)

UNIT-III

Oral Presentation and professional speaking covering, Basics of English pronunciation; Elements of effective presentation; Body Language and use of voice during presentation; Connecting with the audience during presentation; Projecting a positive image while speaking; Planning and preparing a model presentation; Organizing the presentation to suit the audience and context; Basics of public speaking; Preparing for a speech (10 Hrs.)

UNIT-IV

Career Oriental Communication covering, Resume and bio data: Design & style; applying for a job: Language and format of job application. Job Interviews: purpose and process; How to prepare for interviews; Language and style to be used in interview; Types of interview questions and how to answer them; Group Discussion: structure and dynamics; Techniques of effective participation in group discussion; Preparing for group discussion. (10 Hrs.)

Recommended Books:

1. Fred Luthans, Organizational Behaviour, McGraw Hill
2. M. Ashraf Rizvi, Effective Technical Communication, McGraw Hill
3. Wallace and masters, Personal Development for Life and Work, Thomson Learning
4. Malcolm Goodale, Professional Presentations
5. Farhathullah, T. M. Communication skills for Technical Students
6. Michael Muckian, John Woods, The Business letters Handbook
7. MLA Handbook for Writers of Research Paper

EE B202 ELECTRIC POWER UTILIZATION

L T P **Credits: 03**
3 0 3

UNIT-I

Electric heating: advantages, classification, Resistance heating, Design of heating element, Types of electrode. (6 Hrs.)

UNIT-II

Induction heating, Dielectric heating, Dielectric loss calculation, Electric Welding: types of resistance welding, Arc welding. (8 Hrs.)

UNIT-III

Illumination: Nature of light, Eye sensitivity, definition, laws Illumination, Evaluation of different light sources, Polar curve, Roussean diagram, Luminous efficiency, types of lamps, lighting schemes & its design. (10 Hrs.)

UNIT-IV

Electrochemical Process: Laws of electrolyte, Electric deposition, Application of electrolysis, factors affecting electro chemical process. (6 Hrs.)

UNIT-V

Refrigeration cycle, Refrigeration systems, Domestic Refrigerator Water cooler Desert cooler Air conditioning, Industrial air conditioning, Heating of buildings, Calculation of Rating of Electrical Equipments, related numerical problems. (10 Hrs.)

Books:

Art and Science of Utilisation of Electrical Energy. H. Pratap, Dhanpat Rai & Sons
Generation, Distribution & Utilisation of Electrical Energy, C.L, Wadhawa, New Age Intemational
Electric Power Utilisation, Taylor, Print Longman

BRIDGE COURSE SEMESTER-II

EE B102 INTRODUCTION TO DIGITAL ELECTRONICS

L T P **Credits: 03**
3 1 3

UNIT-I

Number System: Binary, Octal and Hexadecimal representation and their conversion, BCD, ASCII, EBDIC, Gray codes and their conversion, Signed binary numbers representation with 1'sand 2's complement methods, Binary arithmetic.

Boolean algebra: Various logic gates and their truth tables and circuits, Representation in SOP and POS forms, Minimization of logic expressions by algebraic method, K-map method. (10 Hrs.)

UNIT-II

Combinational circuits: Adder and sub tractor circuit of Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer. (10 Hrs.)

UNIT-III

Memory Systems: RAM, ROM, PROM, EPROM, EEPROM

Sequential Circuits: Basic memory elements, S-R, J-K, D, and T Flip-flop, various types of Registers & Counters. (10 Hrs.)

UNIT-IV

Different types of A/D and D/A conversion techniques. Logic families: TTL, ECL, MOS & CMOS Their operation and Specification. (10 Hrs.)

Text books:

1. Digital Principles & Application, 5th Edition, Leach & Malvino, Mc Graw Hill Company.
2. Modern Digital Electronics, 2nd Edition, R.P. Jain. Tata Mc Graw Hill Company Limited
3. Fundamental of Digital Circuits, A. Anand Kumar, PHI.

Reference Books:

1. Digital Logic Design, Morrries Mano, PHI.
2. Digital Integrated Electronics, H. Taub & D. Shilling, Mc Graw HILl Company.
3. Digital Electronics, James W. Bignell & Robert Donovan, Thomson Delmen Learning.
4. Fundamental of Logic Design, Charles H. Roth, Thomson Delman Learning.

AM B201 COMPREHENSIVE MATHEMATICS-II

L T P **Credit-03**
3 0 0

UNIT-I

Functions of two or more variables:- Partial derivatives, homogenous functions. Euler's theorem , total derivative of an implicit function, tangent and normal to a surface, change of variables, Jacobeans, Taylor's theorem for a function of two variables, maxima and minima of a function to two variables , Lagrange's method of undetermined multipliers. Line integral, double integral, change of order of integration, triple integral, change of variables. Applications to area and volume, beta and gamma functions, surface area of revolution, moment of inertia, centre of gravity. (10 Hrs.)

UNIT-II

Differential Equations:- Higher order linear differential equation with constant coefficients, complementary function and particular integral, Method of variation of parameter, Solution of Cauchy -Euler's homogeneous equations. Solution of simple simultaneous differential equations, Cauchy's and Legendre's equation formation of partial differential equations. Non-linear differential partial differential equation of first order, Charpit's method, Homogeneous linear partial differential equations with constant coefficients. Non-linear equation of second order, separation of variables, Formation and solution of wave equation ,one dimensional heat flow equation and solution, two dimensional heat flow equation and solution. (10 Hrs.)

UNIT-III

Elementary transformations on a matrix:- Row reduced Echelon forms, Rank of a matrix, consistency of system of linear equations, Gauss elimination process for solving a system of linear equations in three unknowns, Eigen values and Eigen vectors, properties of Eigen values, Reduction to diagonal form, Cayley- Hamilton Theorem, Inverse of a non-singular matrix, Idempotent matrices, complex matrices. (10 Hrs.)

UNIT-IV

Scalar and vector fields:- Definition and Terminologies; product- Dot, Cross, Box; vector triple product, differentiation of a variable vector, Scalar and Vector point functions; Vector Operator- Del, Gradient, curl and Divergence- their physical interpretation and applications, Directional derivative, line surface and volume integral, tangent planes and normal and related problems. Theorems of Green (in plane), Gauss and Stoke's theorem, their verification and applications. (10 Hrs.)

RECOMMENDED BOOKS:

Text Book

1. R.K.Jain, S.R.K. Iyengar , Advanced Engg. Mathematics, Narosa
2. V. Krishnamurthy, An Introduction to Linear Algebra (for section I)
3. Thomas & Finney, Calculus, Pearson Education (for sections II, III, IV)
4.Linear Algebra in action –harry Dym
5.Differential equations with applications and programmes –S.Balachandra Rao,H.R.Anuradha

Reference Books

1. Denial A Murray, Elementary Course in Differential Equations, Longman
2. Erwin Kreyszig, Advanced Engg. Mathematics, Wiley Eastern Limited, New Delhi
3. M.R.Spiegal, Advanced Calculus – Theory and Problems, Schaum Publications, New York

EE B201 ELECTRIC CIRCUITS

L T P **Credits: 03**
3 0 3

UNIT- I

Fundamental taws-KCL & KVL both for dc & ac circuits. Network Analysis: Nodal Analysis, Mesh Analysis, Network Equations for R-L-C circuits & mutually coupled circuits, Star-Delta Transformations. (8 Hrs.)

UNIT- II

Network Theorems: Superposition, Thevenin's, Nortonrs, Reciprocity, Maximum Power Transfer, Tellegen's, Substitution, Compensation and Millman's Theorems. (8 Hrs.)

UNIT- III

Electrical Transients: DC and AC Transients in R-L circuit, Sinusoidal Steady-State Analysis (Single-Phase AC Circuits): Phasor Algebra, Response of General Networks, Resonance in series & parallel circuits. (8 Hrs.)

UNIT- IV

Polyphase circuits: Three-phase voltage, current and power, Star and Delta connected circuits, Balanced and unbalanced 3-phase circuits (8 Hrs.)

UNIT- V

Two-PortNetworks. (8 Hrs.)

Books:

l. Theory and Problems of Electric Networks by B.R. Gupta, S. Chand Publications
2. Networks and Systems by D. Roy Chaudhury New Age International
3. Problems in Electrical Engineering by Parker Smith, CBS Publication
4. Electric Circuits, Schaum Series
5. Circuit and network---Sukhija—Oxford
6. Network analysis and synthesis---Kuo—Wiley India

HU B101 SOCIOLOGY & ELEMENTS OF INDIAN HISTORY FOR ENGINEERS

L T P **Credits: 03**
3 0 0

The objective of this course is to familiarize the prospective engineers with elements of Indian history and sociological concepts and theories by which they could understand contemporary issues and problems in Indian society. The course would enable them to analyze critically the social processes of globalization, modernization and social change. All of this is a part of the quest to help the students imbibe such skills that will enhance them to be better citizens and human beings at their work place or in the family or in other social institutions.

UNIT- I A

Introduction to Elements of Indian History: What is history?; History Sources- Archaeology, Numismatics, Epigraphy & Archival research; Methods used in History; History & historiography; (3 Hrs.)

UNIT- I B

Introduction to sociological concepts-structure, system, organization, social institutions, Culture social stratification (caste, class, gender, power).State & civil society; (6 Hrs.)

UNIT- II A

Indian history & per iodization; evolution of urbanization process: first, second &third phase of urbanization; Evolution of polity; early states to empires; Understanding social structures feudalism debate; (4 Hrs.)

UNIT- II B

Understanding social structure and social processes: Perspectives of Marx, Weber & Durkheim. (5 Hrs.)

UNIT- III A

From Feudalism to colonialism-the coming of British; Modernity & struggle for independence; (3 Hrs.)

UNIT- III B

Political economy of Indian society. Industrial, Urban, Agrarian and Tribal society; Caste, Class, Ethnicity and Gender; Ecology and Environment; (8 Hrs.)

UNIT- IV A

Issues & concerns in post-colonial India (up to 1991); Issues & concerns in postcolonial India 2nd phase (LPG decade post 1991) (3 Hrs.)

UNIT- IV B

Social change in contemporary India: Modernization and globalization, Secularism and communalism, Nature of development, Processes of social exclusion and inclusion, Changing nature of work and organization (8 Hrs.)

Text/Reference Books:

(a) History

1. Desai, A.R. (2005), Social Background of Indian Nationalism, Popular Prakashan
2. Guha, Ramachandra (2007), India After Gandhi, Pan Macmillan

3. Thapar, Romila (2002), Early India, Penguin
4. Sharma R.S.(1965), Indian Feudalism, Macmillan
5. Deshpande, Satish (2002), Contemporary India: A Sociological View, Viking
6. Gadgil, Madhav & Ramachandra Guha (1993), This Fissured Land: An Ecological History of India, OU Press

(b) Sociology:

7. Giddens, A (2009), Sociology, Polity, 6th edn.
8. Haralambos M, RM Heald, M Holborn (2000), Sociology, Collins
9. Xaxa, V (2008), State, Society and Tribes Pearson
10. Chandoke, Neera & Praveen Priyadarshi (2009), Contemporary India: Economy, Society and Politics, Pearson
11. Oommen, T.K.(ed.) (1997), Citizenship and National Identity: From Colonialism to Globalization, Sage.
12. Mohanty, M (ed.) (2004), Class, Caste & Gender- Volume 5, Sage
13. Dhanagare, D.N. Themes and Perspectives in Indian Sociology, Rawat
14. Ramaswamy, E.A. and Ramaswamy, U. (1981), Industry and Labour, OU Press
15. Bhowmik, S (ed.) (2010), Street Vendors in the Global Urban Economy, Routledge
16. Rao, M.S.A. (ed.) (1974), Urban Sociology, Orient Longmans

CS B201 PROGRAMMING IN C++

L T P **Credit - 03**
3 0 3

UNIT – I

Introduction: What is object oriented programming? Why do we need object oriented. Programming characteristics of object-oriented languages. C and C++.

C++ Programming basics: Output using cout. Directives. Input with cin. Type bool. The setwmanipulator. Type conversions. (08 Hrs.)

UNIT – II

Functions: Returning values from functions. Reference arguments. Overloaded function. Inline function. Default arguments. Returning by reference.

Object and Classes: Encapsulation, Abstraction, Polymorphism, Classes, Messages Association, Interfaces, Implementation of class in C++, C++ object as data types constructor. Object as function arguments. The default copy constructor, returning object from function. Structures and classes. Classes objects and memory static class data. Const and classes. (10 Hrs.)

UNIT – III

Arrays and string arrays fundamentals. Arrays as class Member Data: Arrays of object, string, The standard C++ String class

Operator overloading: Overloading unary operations. Overloading binary operators, data conversion, pitfalls of operators overloading and conversion keywords. Explicit and Mutable.

Inheritance: Concept of inheritance. Derived class and based class. Derived class constructors, member function, class hierarchies, public and private inheritance, aggregation: Classes within classes, inheritance and program development. (10 Hrs.)

UNIT – IV

Pointer: Addresses and pointers. The address of operator and pointer and arrays, Memory management: New and Delete, pointers to objects, debugging pointers.

Virtual Function: Virtual Function, friend function, Static function, Assignment and copy initialization, this pointer, dynamic type information. (06 Hrs.)

UNIT – V

Streams and Files: Streams classes, Stream Errors, Disk File I/O with streams, file pointers, error handling in file I/O with member function, overloading the extraction and insertion operators, memory as a stream object, command line arguments, and printer output.

Templates and Exceptions:

Function templates, Class templates Exceptions, The Standard Template Library. (06 Hrs.)

TITLE	AUTHOR	PUBLISHER
C++ : The Complete Reference	Herbert Schildt	Tata McGraw Hill Education
Object Oriented Programming in C++	R Rajaram	New Age International
Object Oriented Programming in C++	Sourav Sahay	Oxford University Press

EE B203 POWER ELECTRONICS-I

L T P **Credits: 03**
3 0 3

UNIT-I

Power diodes, Basic Structure and V-I characteristics, Break down Voltage, ON State Losses, Switching state Characterise, Principle of operation, Diode Snubbers, Schottkey Diode, UJT. (08 Hrs.)

UNIT-II

Rectifier: Uncontrolled rectifier, Basic Concepts, Single phase bridge rectifier, three phase full bridge rectifier, Controlled rectifiers, half wave, full wave, single phase and three phase.

(08 Hrs.)

UNIT-III

Thyristor, brief description of members of thyristor family with Symbol. V-I characteristics and application. Two Transistor model of SCR, SCR turn on methods, Switching Characteristics. Gate Characteristics. Rating. SCR Protection. Series and Parallel operation. Thyristor firing Circuits. R and RC triggering circuit, UJT triggering. Thyristor Communication-line, load and forced communication. (10 Hrs.)

UNIT-IV

Power MOSFETS:- Structure, V-I Characteristics, Switching characteristics operating limitations and safe operating area, Gate and snubber circuit, GTO- Basic Structures and characteristics, IGBT – Structure and Characteristics. Drive and Snubber circuit FCT, MCT, RCT (10 Hrs.)

UNIT-V

Application of Power Electronics: Ac Voltage Regulator, Different types of Choppers. Speed control of D.C. Motor (04 Hrs.)

Recommended Books:

Power electronics—P.S.Bhimbra—Khanna Pub
Power electronics-Moorthi—Oxford
Power electronics—Haribabu—Scitech
Power electronics—P.C.Sen---S.Chand
Power electronics essentials and application---Umanand---Wiley India

B. Tech Programme
SEMESTER I

AM5101 ENGINEERING MATHEMATICS- I

L T P **Credits: 03**
3 0 0

UNIT-I

Vector space:-. Vector space over the field of real numbers, subspace of a vector space and a criterion for a sub-space, linear combination, Linear independence and linear dependence of vectors, basis and dimension of vector space; Liner transformations: kernel and images of a linear transformation; kernel and Images of a linear transformation formation subspaces, Nullity and Rank of a linear transformation, Inner Product space; Norm of a vector; Orthogonal and ortho-normal set of vectors. (10 Hrs.)

UNIT-II

Sequences:- Convergence and divergence of an infinite series and typical examples of convergent and divergent series. Series of positive terms. Test of convergence:- Comparison test, Integral test, Ratio test, Raabe's test, logarithmic test, Cauchy's root test, alternating series, Leibnitz's rule. Absolute and conditional convergence, power series. (10 Hrs.)

UNIT-III

Three dimensional geometry:- Distance formula, section formula, direction ratios and direction cosines, equation of a plane (general form, normal form and intercept form),equations of a straight line, condition for a line to lie in a plane , coplanar lines, shortest distance between two lines, intersection of three planes, point of intersecting planes representing a straight line. Equation of a sphere, cone and cylinder. Equation of tangent planes to sphere, cone, cylinder. Rectangular Cartesian, Spherical polar & cylindrical polar co-ordinate system. (10 Hrs.)

UNIT-IV

Series solution of a differential equations and it's applications:- Introduction, validity of series solution of an equation, general method to solve equation type:$P_0y^{"} + P_1y' + P_2y = 0$, Bessel's equation, Legendre's equation, Legendre function, recurrence formula for Legendre function, Orthogonality. Verification of Legendre function$(P_n(x))$ and Bessel function $(J_n(x))$ as the solutions of Legendre and Bessel equations respectively, graphical representation of these solutions. (10 Hrs.)

RECOMMENDED BOOKS:

Text Book

1. R.K.Jain, S.R.K. Iyengar, Advanced Engg. Mathematics, Narosa
2. V. Krishnamurthy, An Introduction to Linear Algebra (for section I)
3. Thomas & Finney, Calculus, Pearson Education (for sections II, III, IV)

Reference Books

1. Denial A Murray, Elementary Course in Differential Equations, Longman
2. Erwin Kreyszig, Advanced Engg. Mathematics, Wiley Eastern Limited, New Delhi
3. M.R.Spiegal, Advanced Calculus – Theory and Problems, Schaum Publications, New York

AP 5101 ENGINEERING PHYSICS

L T P **Credits: 03**
3 0 3

UNIT-I

Mathematical Preliminaries: Vector triple Product, gradient, divergence and curl of vectors, vector identities, line, surface and volume integral of vectors, divergence theorem and Stokes theorem (No deduction necessary). Expression of grad iv, curl and Laplacian in spherical and cylindrical coordinates. (06 Hrs.)

UNIT-II

Special Theory of Relativity: Objective and Result of Michelson Morley experiment, postulate of special theory of relativity, Galilean transformation, Lorentz transformation, relativity of simultaneity, length contraction and time dilation, relativistic addition of velocities, mass energy equivalence, relativistic energy – momentum relationship, mass less particles. (06 Hrs.)

Quantum Mechanics: Blackbody radiation, Planck's radiation law, derivation of Wine's law ,Rayleigh jeans law and Stefan's law from planck's radiation law. Compton effect, wavelength shift and recoil of electrons; de Broglie hypothesis, wave group, group velocity and particle velocity; uncertainty relation (qualitative) and its applications, operators, Schrodinger time dependent and time independent equation, expectation values of physical quantities(position, momentum and energy) application to free particle and particle in a box(1D and 3D potential well), Discussion on degenerate levels. (08 Hrs.)

UNIT-III

Statistical Mechanics: Introduction, Principle of equal a prior probability, equilibrium state of a dynamic system, thermodynamic probability, distribution of particles in compartments, Phase space, Microstates and Macrostates, MB, FD, BE statistics (no deduction necessary), fermions, bosons (definitions in terms of spin, examples), physical significance and application, classical limits of quantum statistics. (07 Hrs.)

UNIT-IV

Solid State Physics : Lattice and basis,unit cell,different crystal system,bravias lattices, atomic packing factor for cubic systems, Miller indices, X-ray diffraction and Bragg's Law. Classification of bonding, Band theory of solids (qualitative).
(05 Hrs.)

Band Theory of Solids: Conductors, Insulators, Semiconductors, Intrinsic & Extrinsic, Semi conductors, p-n junction diode, depletion region, potential barrier, forward and reverse biasing, diode as rectifier. (03 Hrs.)

Laser: Spontaneous and Stimulated emission, Einstein's A and B coefficients, population inversion, Optical resonator and condition for Lasing action, types of lasers (He-Ne, Ruby, CO_2 and semiconductor laser), applications of Lasers. (05 Hrs.)

Recommended Books:

Text Books:

Arthur Beiser - Concepts of Modern Physics (McGraw Hill)
College Physics – C.R. Dasgupta

Reference Books:

University Physics – Sears and Zemansky

HU 5101 ENVIRONMENTAL SCIENCE

L T P **Credits: 02**
2 0 0

UNIT-I

Introduction: Basic ideas of environment, basic concepts related to environmental perspective, man, society and environment, their inter relationship. (4 Hrs.)
Mathematics of population growth and associated problems, definition of resource, types of resource, renewable, non-renewable, potentially renewable, effect of excessive use vis-à-vis population growth, definition of pollutant and contaminant. Environmental impact assessment. (5 Hrs.)
Environmental degradation: Toxic element, particulates etc. and its effect on man. Overall methods for pollution prevention, environmental problems and sustainable development, components of environment. (5 Hrs.)

UNIT-II

Ecology: Renewable and Non-renewable Resources; Biosphere; Ecosystem and its Components, Nutrient cycles (C, N, P); Energy Flow; Food Chain; Food Pyramid; Bio magnification; Terrestrial and Aquatic-co-system; Bio-diversity. (5 Hrs.)

Water Pollution: Water and Wastewater Quality Parameter (Temperature, Turbidity, Taste and Odour, Colour, Solids, pH, Metals - Fe, Mn, As, Hardness, Alkalinity, Chloride, Fluoride, Nitrate, Organic Matters- BOD & COD, Pathogens- Indicator Organisms), Brief Overview on Water Treatment; Water quality standard. (6 Hrs.)

UNIT-III

Air Pollution: Environmental Lapse Rate, Simple global temperature model, Particulate Control Devices - Types and Working Principle; Stack and plume; Air quality standard. (5 Hrs.)
Solid Waste Management: Sources; Types and Characteristics; Disposal Methods of Municipal Solid Waste - Sanitary Landfill, Composting, Incineration; Biomedical Waste (3 Hrs.)

UNIT-IV

Noise Pollution: Classification - Continuous, Intermittent, Impulsive; Sound Levels – Pressure Level, Intensity Level, Power Level; Noise Measurement Criteria - Leq, Adding and Averaging of Noise levels; Noise quality standard. (5 Hrs.)
Environmental Issues: EIA –definition and applicability; Pollution Control Acts. (2 Hrs.)

Recommended Books:
Text Book:
Environment & Ecology by Gourkrishna Dasmohapatra
Introduction to Environmental Science and Engineering by Amal Kumar Dutta
Introduction to Environmental Science by Gilbert M. Masters
Reference Book:
Fundamentals of Ecology by M. C. Dash
Environmental Engineering by Peavy, Rowe and Tchobanoglous

ME 5101 BASIC ENGINEERING MECHANICS

L T P **Credits: 02**
2 0 0

UNIT-I

Introduction to Engineering Mechanics covering, Basic concepts, System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; (8Hrs.)

UNIT-II

Friction covering, Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack; (6 Hrs.)

UNIT-III

Centroid and Centre of Gravity covering, Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia-Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook. (10 Hrs.)

UNIT-IV

Introduction to Dynamics covering, Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D"Alembert"s principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation; (8Hrs.)

UNIT-V

Mechanical Vibrations covering, Basic terminology, free and forced vibrations, resonance and its effects; Degree of freedom; Derivation for frequency and amplitude of free vibrations without damping and single degree of freedom system, simple problems, types of pendulum, use of simple, compound and torsion pendulums; (8Hrs.)

Recommended Books:

Text/Reference Books:

1. Shanes and Rao (2006), Engineering Mechanics, Pearson Education,
2. Hibler and Gupta (2010), Engineering Mechanics (Statics, Dynamics) by Pearson Education
3. Reddy Vijaykumar K. and K. Suresh Kumar (2010), Singer"s Engineering Mechanics
4. Bansal R.K.(2010), A Text Book of Engineering Mechanics, Laxmi Publications
5. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.
6. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications

EE 5102 ANALOG & DIGITAL ELECTRONICS

L T P **Credits: 03**
3 0 2

UNIT-I

Transistor amplifiers and oscillators covering, Classification, Small Signal Amplifers,- Basic features, Common emitter Amplifier, Coupling and bypass Capacitors, Distortion , AC equivalent circuit, Feedback Amplifier – Principle, Advantages of Negative feedback, current Series and feedback Amplifiers, Oscillators- Classification, R-C Phase shift, wien bridge, High Frequency LC and Non-Sinusoidal Type Oscillators. (12 Hrs.)

UNIT-II

IC 555 Timer- Block diagram, Astable and Mono stable Multi vibrator Configurations; Data Converters- Basic Principle of Analogue to Digital (ADC) and Digital to Analog (DAC) Conversion. Flash type, Counter- ramp type and successive Approximation type ADCs, Resistor Ladder type DAC, Specification of ADC and DAC. (10 Hrs.)

UNIT-III

Ripple and Synchronous Counters. Ring Counters. Resisters and shift registers, Parallel load and serial load. Memory Systems. RAM, ROM, EPROM, EEROM, Digital integrated circuits, Different Logic families. TTC, ECL, MOS and CMOS, their operation and Specifications. (10 Hrs.)

UNIT-IV

Signed binary number representation with 1'S and 2'S Complement method. Binary arithmetic, addition, Subtraction, multiplication. Sign-magnitude Binary representation (08 Hrs.)

Reference Books:

Title	Author	Publisher
Digital Principle and Application	Leach, Malvino, Saha	TMH
Digital Logic Design	Mano	PHI
Digital Integrated Electronics	H. Taub & D. Shilling	Mc Grow Hill
Electronics Devices & Circuits	Mottershed	Wiley Eastern
Electronic Principles	Malvino	TMH
Electronic: Analog & Digital	Nagrath	PHI
Integrated Electronics	Millman & Halkias	Tata Mc Graw Hill

CS 5101 DATABASE TECHNOLOGY

L T P **Credit : 02**
2 0 3

UNIT – I

Introduction to databases: Basic concepts, DBMS, why DBMS, Relational Model: relations, Entity, attribute, relationships, Key: Super key, Candidate Key and Primary Key, foreign key; E-R model, Data Constraints, basic Normalization concepts , Basic transaction concepts (03 Hrs.)

UNIT – II

Introduction to SQL: Basic table concepts, creating table, inserting data into table, updating table data, modifying table structure, viewing table data etc. (05 Hrs.)

UNIT – III

Grouping data, LIKE clause, Arithmetical and logical operations on table data, views (08 Hrs.)

UNIT – IV

SQL security clauses: GRANT and REVOKE clause, Introduction to PL/SQL (14 Hrs.)

BOOK TITLE	AUTHOR	PUBLISHER
SQL, PL/SQL: The Programming Language of Oracle	Ivan Bayros	BPB Publications
Oracle Database 11g PL/SQL Programming	Michael Mclaughlin	Tata McGraw-Hill Education
SQL in easy steps	Mike McGrath	Tata McGraw-Hill Education

EE 5103 NETWORK THEORY

L T P **Credits: 03**
3 0 2

UNIT-I

Application of Network Theorems in AC circuits:- Introduction, mesh Analysis Source Conversions. Nodal Analysis, Independent and dependent Sources. Thevenin's and Norton's theorem. Superposition Theorem for AC Networks. Milman's theorem for AC Networks. Reciprocity theorem for AC Network Maximum Power transfer theorem in AC circuits, Tellegen's Theorem. (08 Hrs.)

UNIT-II

Properties of Network function:- Introduction Driving Point impedance and Admittance. Voltage and Current Transfer ratio. Restriction on Location of Poles and Zeros in Driving point functions. Natural response of a Network. Magnitude and phase angle of the Co-efficient in the Network function. (08 Hrs.)

UNIT-III

Laplace Transformation and it's application:- Introduction properties of Laplace Transformation. Basic types of social Signals. Laplace transformation of Social waveforms. Gate function. (08 Hrs.)

UNIT-IV

Passive Filters:- Introduction, Properties of filter. Classification of Filters. Concept of working of Low Pass and High Pass filters using reactive elements. Analysis and design of Low Pass, High Pass, Band Pass, Band Stop Filter. Derived filter. (08 Hrs.)

UNIT- V

Active Filters:- Theory of Active Filters. Realisation of active LPF. Cascading of similar filter. Butterworth filter Realisation of Active Butter Worth filter. Chebyshev filter. Realisation of Butterworth polynomial using approximation. Realisation of chebysher's polynomial using approximation. Concepts of Network Synthesis, Procedure of Sysnthesis (08 Hrs.)

Referance Books:-

Title	**Author**	**Publishers**
Networks & System	D. Roy Choudhury	New Age International
Circuit Theory	A. Chakrabarti	Dhanpat5 Rai & CO.s
Circuit and networks	Shkhija	Oxford
Network analysis and synthesis	Kuo	Wiley India

EE 5104 ELECTRICAL MACHINES-I

L T P **Credits: 03**
3 0 2

UNIT- I

Direct current Machines:- Review of Construction, Types of armature Winding. Physical Concept of winding pitches. Review of operating characteristic of shunt, Series and Compound motor and Generator respectively. (08 Hrs.)

UNIT-II

Starting and Speed Control of DC motors, 2 point and 3 point starter. Speed Control by Controlling armature resistance, field excitation and armature voltage. Ward- Leonard method of speed Control. Application of Brush less DC motor. (06 Hrs.)

UNIT-III

Single phase Transformer:- Principle of Transformer operation, Derivation of equivalent Circuit of a transformer. Phasor diagram. Voltage regulation of transformer. Per unit resistance Leakage reactance and impendence voltage drop. Voltage regulation by per unit Quantities Condition for Zero Voltage regulation. Condition for maximum voltage regulation. Losses in transformers. Separation of Hysteresis and Eddy-current Losses. Back to back test. Transformer efficiency. Condition for maximum efficiency. Current and KVA at maximum efficiency per unit Transformer Values. Full Load Copper loss in per unit. all day efficiency. Application of Transformer. (12 Hrs.)

UNIT-IV

Tree phase Transformer:- Determination of Polarity and Connections, (Star / Star, Star/ Delta, Delta / Star, Star / Zigzag, open Delta). Phasor groups. Effects of unbalanced loading, Production of harmonic in transformer and their suppression. 3-phase to 2-phase transformation. Scott Connection, 3-Phase to Six Phase Connections; Double Star and double delta. 3-winding transformers. Parameter estimation. Application. Parallel operation of transformers. Auto Transformers. Introduction to tap Changers and their functions. (14 Hrs.)

Reference Book:-

Author	**Title**	**Publishers**
P.S. Bhimra	Electrical Machinery	Khanna Publishers
I.I. Nagrath and P.P. Kothari	Electrical Machines	TMH
Irving L Koskow	Electrical Machinery and Transformers	PHI
Bhag S. Guru and H.R. Hiziroglu	Electrical Machinery and Transformers	Oxford

MC 5101 TECHNICAL COMMUNICATION AND SOFT SKILLS

L T P **Credits: 0**
2 0 0

UNIT -I

SPEECH MECHANISM: Organs of speech, Consonants & Vowels (basics) Cardinal Vowel Scale, Production of Speech Sounds, Description & Classification of Speech Sounds. Introduction to Linguistics, Sociolinguistics; Language Usage. (10 Hrs.)

UNIT-II

BUSINESS COMMUNICATION: Business Letters, Drafting Notices, Memos, Agenda and Minutes of Meetings, Applications for Jobs, Facing Interviews (10 Hrs.)

UNIT-III

BASICS OF GRAMMAR: Narration, Voice, Words Often Confused, (05 Hrs.)

UNIT-IV

Prepositions. Rhetoric/ Figures of Speech, Writing Skills, Oral Skills.
Introduction to poetry: Poem-I: Reading/ Explanation & Poem-II: Reading/ Explanation
(15 Hrs.)

RECOMMENDED BOOKS

Title	**Author**	**Publisher**
An Introduction to Pronunciation of English	Gimson	ELBS
ModernLinguistics: an Introduction	Verna and Krishanswamy	Oxford University
Modern Prose: Stories, Essays and Sketches	Michael Thorpe	Oxford University
Writing Skills	Oliviera and Motta	Penguin
Oxford Guide to Effective Writing &Speaking	John Seely	Oxford University Press
English Pronouncing Dictionary	Daniel Jones	ELBS
New International Business English	Leo Jones	Cambridge
Collins Cobuild English Grammar	John Sinclair	ed. Collins
Rhetoric/ Figures of Speech	Bose and Sterling	

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B. Tech Programme
Semester II

AM 5201 ENGINEERING MATHEMATICS- II

L T P **Credit -03**
3 0 0

UNIT-I

Laplace transformations of elementary functions, properties of Laplace transform, Transform of derivative and integrals, evaluations of integrals by Laplace transforms , inverse Laplace transforms, convolution theorem, solution of ordinary differential equations, unit step function and unit impulse function, engineering applications . Z-transform and inverse Z-transform.

(10 Hrs.)

UNIT- II

Fourier series: Euler's formula, problems on general Fourier series, conditions for Fourier expansion, Fourier expansions of discontinuous functions , change of interval , even and odd functions, half range series, application to standard wave forms, Parseval's identity, Fourier transform and its properties, inverse Fourier transform, Fourier transform of derivative, application of Fourier transform in solving partial differential equations-Laplace's equation, heat conduction equation and wave equation.

(10 Hrs.)

UNIT- III

Limit of a complex function, differentiation, analyticity, Cauchy-Riemann equations, harmonic functions , conformal mapping , some special transformations – translation, inversion and rotation, bilinear transformation, Line integral, Cauchy's theorem (proof using Green's theorem),Cauchy's integral formula , Morera's theorem, Cauchy's inequality, Poisson's integral formulae .Power series .Taylor's and Laurent's series .Singularities .Zeros. Residues, Cauchy's residue theorem. Integration around unit circle, integration over semi-circular contours (with or without real poles) , integration over rectangular contours.

(10 Hrs.)

UNIT-IV

Graph Theory: Graph, Sub-graphs, operations on graphs, Isomorphism, walk, path, circuit, shortest path, tree, properties of tree, Binary Tree, Pendant Vertices, Distance and centers in a tree, Rooted and binary trees, Spanning trees, counting of tree, Linear programming problem & Game Theory. (10 Hrs.)

RECOMMENDED BOOKS

Text Book

R.K.Jain&S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa Publishing House
G.B. Thomas & R.L. Finney, Calculus: Analytical Geometry, Addison Wesley

Reference Books

Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern
David Widder, Advanced Calculus, PHI
Glyn James, Advanced Modern Engg. Mathematics, Pearson

AC 5201 ENGINEERING CHEMISTRY

L T P **Credits: 02**
2 0 3

UNIT- I

Solid state chemistry: Introduction to stoichiometric defects (Schottky & Frenkel) and non-stoichiometric defects (Metal excess and metal deficiency); role of silicon and germanium in the field of semiconductor, transistors, elements of band theory, conductors, semi-conductors and insulators. (5 Hrs.)

Bio - Chemistry :(Enzymes): Physiochemical nature of enzymes, importance, classification and nomenclature, mechanism of enzyme action, factors affecting enzyme activity. Coenzyme and their role in biological systems. (5 Hrs.)

UNIT- II

Applied Chemistry :(Corrosion): Direct, chemical corrosion and mechanism, electrochemical corrosion and mechanism, Galvanic corrosion, concentration cell corrosion, atmospheric corrosion, passivity, pitting corrosion, factors influencing corrosion, prevention of corrosion. (5 Hrs.)

Lubricants: Classification of lubricants, lubricating oils, semisolid lubricants, solid and synthetic lubricants. Properties of lubricating oils (viscosity, flash and fire points cloud and pour point, mechanical stability and saponification number). (5 Hrs.)

UNIT- III

Biochemical Techniques: Ion exchange chromatography, gas chromatography, liquid chromatography, thinlayer chromatography. (5Hrs.)

Polymerization: Concepts, classifications and industrial applications; polymerization processes, degree of polymerization (addition and condensation polymerization); preparation, structure and use of some common polymers: plastic (PE, PP, PVC Bakelite), rubber (natural rubber, SBR, NBR), fibre (nylon 6,6, polyester);conducting and semiconducting polymers. (6 Hrs.)

UNIT -IV

Industrial Chemistry: Solid, liquid and gaseous fuels; constituents of coal, carbonization of coal, coal analysis, proximate and ultimate analysis; classification of coal. Petroleum, gasoline, octane number, aviation fuel, diesel, cetane number; natural gas, water gas. (5 Hrs.)

Analytical Chemistry: (Spectroscopic Techniques in Chemistry) Introduction, principle and concept of UV, IR and NMR. (4 Hrs.)

Recommended Books:

Text Book: 1. A text book of Engineering Chemistry: Sashi Chawla 2. Engineering Chemistry: Amrita lal De,Abhranil De3. Advance Chemistry: Philip Matthew4. Engineering Chemistry: WILEY-INDIA5. General and Inorganic Chemistry: R. P. Sarkar

Reference Book: 1. Inorganic Chemistry: Huheey, Keiter, Keiter, Medhi2. Physical Chemistry: Atkins 3. Physical Chemistry: Leidler4.Chemical Kinetics: Laidler5. Organic Chemistry: S. K. Ghosh6. Organic Chemistry: McMurry and Simanek

HU 5201 ECONOMICS FOR ENGINEERS

L T P **Credits: 03**
3 0 0

UNIT-I

Basic Principles and Methodology of Economics. Demand/Supply – elasticity –Government Policies and Application. Theory of the Firm and Market Structure. Basic Macroeconomic Concepts (including GDP/GNP/NI/Disposable Income) and Identities for both closed and open economies. Aggregate demand and Supply (IS/LM). Price Indices (WPI/CPI), Interest rates, Direct and Indirect Taxes. (12Hrs.)

UNIT-II

Public Sector Economics –Welfare, Externalities, Labour Market. Components of Monetary and Financial System, Central Bank –Monetary Aggregates; Commercial Banks &their functions; Capital and Debt Markets. Monetary and Fiscal Policy Tools & their impact on the economy – Inflation and Phillips Curve. (12Hrs.)

UNIT-III

Elements of Business/Managerial Economics and forms of organizations. Cost &Cost Control –Techniques, Types of Costs, Budgets, Break even Analysis, Capital Budgeting, Investment Analysis – NPV, ROI, IRR, Payback Period. (08Hrs.)

UNIT-IV

Issues of Inclusion – Sectors, States/Regions, Groups of people (M/F), Urbanization. Employment–Informal, Organized, Unorganized, Public, Private. Challenges and Policy Debates in Monetary, Fiscal, Social, External sectors. (08Hrs.)

Recommended Books:

Authors	**Title**	**Publishers**
Mankiw Gregory N.	Principles of Economics (2002)	Thompson Asia
V. Mote, S. Paul, G. Gupta.	Managerial Economics (2004)	Tata McGraw Hill
Misra, S.K. and Puri.	Indian Economy (2009)	Himalaya
Pareek Saroj	Textbook of Business Economics (2003)	Sunrise Publishers

EE 5201 ELECTROMAGNETIC FIELD THEORY

L T P **Credit- 03**
3 0 0

UNIT-I

Co-ordinate System and transformation, Certesion Co-ordinates, Circular cylindrical Co-ordinates, Spherical Co-ordinates and their transformation. Differential lengh, area and Volume in different Co-ordinates System. (03 Hrs.)

UNIT-II

Introduction to vector Calculus, Del operator, Gradient of a Scalar. Divergence of a Vector and Divergence theorem. Curl of a Vector and Strokes theorem. Laplacian of a Scalar. Classification of Vector fields. Helmholtz's theorem. (03 Hrs.)

UNIT-III

Coulomb's Law, Field intercity, Gauss' Law- Maxwell's equation. Electric potential and potential gradient, Relation between E and V, Maxwell's equation, Electric dipole, Dipole moment, Energy density in electro static fields.

Boundary Condition:- Dielectric-dielectric, Conductor-dielectric, Conductor-Free Space, Poisson's and Laplace equation. General Procedure for solving Poisson's and Laplace's equation. (08 Hrs.)

UNIT- IV

Biot-sarvart Law. Ampere's Circuital Law – Maxwell's equation, Magnatic flux density-Maxwell's equation for static and vector potential. Forces due to Magnetic fields, Magnetic torque and moments. Magnetisation in material. Magnetic energy, Force on magnetic materials. (10 Hrs.)

UNIT-V

Electromagnetic Field:- Farody's Law, Static emf and motional emf. Displacement current, Maxwell's equations. Time varying potentials. (04 Hrs.)

Electromagnetic Wave Propagation:- Wave propagation in lossy dielectrics, Plane waves in lossless dielectric, Plane wave in free space, plane wave in good Conductor, Skin effect Skin depth, power and the poynthing vector, reflection of a plane wave at normal incidence, reflection of a plane wave at oblique incidence, polarisation Transformission line equation. (10 Hrs.)

Text Book:-

Author	Title	Publishers
Hyat	Engineering Electromagnetics	TMH
Mathew N.O. Sadsiku	Elements of ELectromagnetics	Oxford Publishers
Sunil Bhoosan	Fundamental of Electromagnetics	Oxford Publishers

EE 5202 MICROPROCESSOR & MICROCONTROLLERS

L T P **Credits: 03**
3 0 2

UNIT-I

Microprocessors Architecture- 8085 Microprocessors Architecture, Timing and control unit, machine cycles, interrupt diagram. Architecture of 8086 microprocessor. (08 Hrs.)

UNIT-II

Programming-Addressing modes, instruction set, assembly language programming, program for multi byte addition/subtraction, multiplication, Division, block transfer. (08 Hrs.)

UNIT-III

Interfacing- basic principles of interfacing memory and I/O devices. Data transfer techniques-programmed interrupt and DMA. Details of interfacing devices 8255 and 8253. Interfacing of D/A and A/D converter. (08 Hrs.)

UNIT-IV

Semi conductor memory- Read only memories, random access memories. Interfacing of memories with 8085/86. (08 Hrs.)

UNIT-V

Microcontroller- Architecture of 8051 micro controller. Interrupt, serial and timer control. Instruction set and programming. Interfacing with D/A and A/D converter. Applications of microprocessors and microcontrollers. (08 Hrs.)

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Text Book

Author	**Title**	**Publisher**
R.S. Goonkar	Microprocessor Architecture programming and Application	Penram international
K.J. Ayala	"8051 Microcontroller" Microprocessor	Penram international. Dhanpat Rai
Santhil Kumar	Microprocessor-8085	Oxford

EE 5203 MEASUREMENT & INSTRUMENTS

L T P **Credits: 03**

3 0 2

UNIT-I

Philosophy of measurement method of measurement, Measurement system, Classification of instrument System, Characteristics of instruments and measurement system. Errors in measurement and its analysis, Standards. (04 Hrs.)

UNIT-II

Analog measurement of Electrical Quantities – Electro dynamic, Thermocouple, Electrostatic and Rectifier type Ammeters and Voltammeters. Electrodynamics Wattmeter, three phase wattmeter, Power in three phase System, errors and remedies in wattmeter and energy meter. Instrument Transformer and their applications in the extension of instrument range, Introduction to measurement of speed, frequency and power factor (06 Hrs.)

UNIT – III

Measurement of Parameters- Different method of measuring Low, Medium and high resistances, Measurements of inductance and Capacitance with the help of AC bridge, Q meter

(06 Hrs.)

UNIT –IV

AC potentiometer- polar type and Co-ordinate type AC potentiometers. Application of AC Potentiometers in electrical measurement. (06 Hrs.)

UNIT- V

Magnetic Measurement – Ballistic Galvanometer, Flux meter. Determination of hysteresis loop, Measurement of Iron loss (06 Hrs.)

UNIT-VI

Digital Measurement of Electrical Quantities – Concept of digital measurement, Block diagram study of digital voltmeter, Electric multimeter. (06 Hrs.)

UNIT – VII

Cathode Ray oscilloscope – Basic CRO Circuit (Block diagramme), Cathode ray tube (CRT) and it's Components. Application of CRO in measurement, Lissajous Pattern, (06 Hrs.)

Reference Books:-

Author	Title	Publishers
A. K. Sowhney	Electrical measurement and measuring instrument	Dhanpat Rai and Sons.
W.D. Cooper	Electronic Instrument and Measurement Technique	Prentice Hall International
J. B. Gupta	Electrical Measurement and measuring instruments	S.K. Kataria and Sons.
E.W. Golding & R.C. Widdis	Electrical Measurement and measuring instruments	H. Wheeler and Co. India.

EE 5204 ELECTRICAL MACHINES – II

L T P **Credits: 03**
3 0 2

UNIT-I

Construction of Alternator, Review of armature reaction and Synchronous impedance. Determination of Voltage regulation, Synchronization of Alternators to the infinite bus with different load and excitation. (08 Hrs.)

UNIT-II

Two reaction theory. Torque-Power angle, Hunting. (06 Hrs.)

UNIT-III

Revision of 3-Phase induction motor, deep bar and double Cage motor, emf injection, Slip power transfer, Circle Diagram of induction motor and it's application Construction and Operational Characteristics of induction. (08 Hrs.)

UNIT-IV

Single Phase Induction motor:- Construction, Double revolving field theory. Cross field theory. Starting Methods. Speed-Torque Characteristics, Phaser diagram Condition of maximum torque, Determination of equivalent Circuit Parameters. Application Single phase AC Series motor. Compensated and uncompensated motors. (10 Hrs.)

UNIT-V

Special Electromechanical Devices:- Principle and Construction of Switched reluctance motor, Permanent magnet machines. Brushless D.C machines Stepper motor, Tacho generators. Synchros and resolvers, and AC servo motors. Principle. (10 Hrs.)

Reference Book:-

Author	**Title**	**Publishers**
P.S. Bhimra	Electrical Machinery	Khanna Publishers
I.I. Nagrath and P.P. Kothari	Electrical Machines	TMH
Irving L Koskow	Electrical Machinery and Transformers	PHI
Bhag S. Guru and H.R. Hiziroglu	Electrical Machinery and Transformers	Oxford

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EE 5205 POWER SYSTEMS-I

L T P **Credits: 03**
3 0 2

UNIT- I

Load Characteristic: Introduction, Advantage of electrical energy. Load, connected Load, Demand, Maximum demand, Demand Factor, Average Load factor, Diversity factor, Load Diversity, Utilization factor Plant Capacity Factor Load Curve information obtain from Load Curve, Utility of Load curves (4Hrs.)

UNIT- II

Supply System: Introduction, Basic Structure of an AC power System, Distribution Voltage Level, Sub transmission level. Transmission level. Layout of Power supply Network. Comparison of DC and AC Transmission Advantage of high voltage transmission. System Voltage and Transmission efficiency. Standardization of Transmission voltage. Comparison of Conductor cost in Various system. Criterion of equal maximum voltage to earth, Criterion of equal maximum voltage between line Conductor. (6 Hrs.)

UNIT- III

Line Parameter: Consultant of a Transmission line, Resistance of a Transmission line, Skin effect, flux linkage inductance of a Single Phase overhead line, inductance of a 3- Phase overhead line, Concept of Self GMD inductance formulas in terms of GMD, Electric Potential, Capacitance of a Single phase overhead line. Capacitance of a 3 Phase overhead line.
(6 Hrs.)

UNIT- IV

Transmission Line: Classification of overhead Transmission line, important term, Performance of Single phase short transmission lines, three Phase short transmission Lines, effect of Load power factor on regulation and efficiency, Medium Transmission Lines, End Condenser method, Nominal T method, Nominal T method, Long Transmission line, Exact Solution of a long Physical interpretation of the long line equation. Propagation Constant, wave length and velocity of Propagation. Characteristic impedance Z. Evaluation of ABCD Parameters. Ferranti effect surge impedance. (8Hrs.)

UNIT- V

Power Factor Improvement: Introduction, Disadvantage of a low power factor, causes of Law Power factor, Power factor improvement. Power factor correction by static Capacitors. Capacitor rating Calculations. **Automatic** Power factor correction in three phase systems. Advantages and limitations of static Capacitors. Location of capacitors. Power factor correction by synchronous motors. Economics of Power factor improvement. Most economical power factor when KW demand is Constant. Most economical power factor when KVA demand is Constant. (8 Hrs.)

UNIT- VI

Symmetrical fault: Introduction, Type of fault, effect of fault. Symmetrical faults on 3 phase system, Limitation of fault current, Percentage Reactance, Percentage reactance and base KVA, Short circuit KVA, Reactor Control of short circuit currents, Location of reactors. Steps for symmetrical fault Calculation. (5 Hrs.)

UNIT-VII

Unsymmetrical fault: Unsymmetrical fault on 3 phase system, symmetrical Components in terms of phase currents, some facts about sequence currents, sequence impedance, sequence impedance of power system elements. Analysis of unsymmetrical faults. Single line to ground fault. Line to line fault double line to Ground fault, sequence Networks reference bus for sequence Networks. (5 Hrs.)

Recommended Books:

Power system analysis--- Nagsarkar ----Oxford
Power system stability,Volumes-I,II,III----Kimbark-----Wiley India
Electric power system: Afirst course---Mohan---- Wiley India
Power system----C.L Wadha---New age

Note: 1) Grounding system must be included along with lightning protection

2) Thermal engineering should be included as a prime mover of alternator. CI and SI engine are also too.

B. Tech Programme
Semester III

AM 6102 ENGINEERING MATHEMATICS-III

L T P **Credits: 03**
3 0 0

UNIT-I

Errors in arithmetic operations and functions, Round-off error, truncation error, Absolute error, Relative error, Percentage error, Principles of equal effect, Significant digits, Intermediate value property, Bisection method, Method of false position, Secant Method, Newton-Raphson method, Iterative method, Convergence of these methods. (11 Hrs.)

UNIT-II

Gauss Elimination method (with and without partial pivoting), Gauss-Seidel, Jacobi's methods, Triangularization method, Eigen value problem, Rayleigh's power method, Finite differences-forward, backward and central differences, Shift and averaging operators. (11 Hrs.)

UNIT-III

Newton's forward, backward and divided difference interpolation formulae, Lagrange's formula, Gauss forward and backward difference interpolation formulae, Spline interpolation – quadratic and cubic, Numerical differentiation using Newton's forward and backward difference formulae. (12 Hrs.)

UNIT-IV

Numerical integration – Trapezoidal rule, Simpson's one third and three-eighth rules, Romberg's integration, Error in integration, Taylor series method, Picard's method, Euler method, Modified Euler's method, Runge-Kutta methods (Upto fourth order) for solution of ODE of first order. (12 Hrs.)

RECOMMENDED BOOKS:

Text Book

S.S. Sastry, Introductory Method of Numerical Analysis, PHI
Gerald Wheatley, Applied Numerical Analysis, Pearsons Education

Reference Books

M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Sc. and Engg. Computation, P.B Patial & U P Verma, Numerical Computational Mathematics, Narosa
J.H. Mathew, Numerical Methods for Maths., Science and Engg., PHI

EE 6101 POWER SYSTEMS – II

L T P **Credits: 03**
3 0 2

UNIT-I

HVDC Transmission System: Introduction Choice of HVDC Transmission HVDC Transmission Systems. Control of HVDC Link. Circuit Arrangements. Tyristor value for HVDC Converter Reversal of power. Typical Layout of HVDC Conversion of sub- station. (6 Hrs.)

UNIT-II

Control of Voltage and reactive power: Method of voltage control, Tap- changing transformers. shunt reactors, Shunt Capacitor, Series Capacitors. Series Reactor. Proactive Schemes for schemes for series Capacitor Series Capacitor versus shunt Capacitor. Sychronous phase modifier, Static Var System SVS system, thyristor controlled reactor '(TCR), TCS, FC-TCR type VA Compensator TCS- TCR Scheme. Advantage of SVS. Application of SVS. (8 Hrs.)

UNIT-III

Power System Stability: Introduction Stability limit and power Transmission Capability, steady v state stability Criteria, Transient stability swing equation Swing Curve Equal- Area criterion of stability. Application to Sudden increase in mechanical power input, one of the parallel lines suddenly switched off. System fault and subsequent circuit isolation. System and reclosing Method of improving Stability. Swing of transmission line and remedy. Dancing of transmission line and control

(10 Hrs.)

UNIT-IV

Load flow Analysis:-Introduction, Load flow Problem. Bus admittance matrix Y bus. Static Load flow equation method of load flew solution Gauss seidel method using Y bus. Computation for load buses, computation for PV buses. Acceleration factors. Newton – Raphson method for load flow solution. Computational Procedure for Newton- Raphson method. Power flow through lines and slack bus power, Decoupled load flow method DC load flow method. Comparison of load flow analysis between different methods.

(10 Hrs.)

UNIT-V

Economic operation of Power System:-Introduction, Incremental fuel cast, Economic dispatch neglecting transmission losses Transmission loss as a function of Plant generation. General loss formula. Optimum load dispatch considering transmission losses. Iterative method of solving coordination Equation. (6 Hrs.)

Recommended Books:

Power system analysis--- Nagsarkar ----Oxford
Power system stability,Volumes-I,II,III----Kimbark-----Wiley India
Electric power system: Afirst course---Mohan---- Wiley India
Power system----C.L Wadha---New age

HU 6101 INDUSTRIAL MANAGEMENT

L T P **Credits: 03**
3 0 0

UNIT-I

Basic concepts of management, objectives, classification and hierarchy, different schools of management thought, principal functions of management, Management as an organizing and directing force, Structure of the management decision making process, (10 Hrs.)

UNIT-II

Organization structure, authority and responsibility, Organization dynamics, Managerial leadership, communication systems, Managing human factors in business and industry, Industrial relation, Union activities, trade union acts, collective arraigning, disciplinary procedure. (02 Hrs.)

UNIT-III

Organizational objectives and long range forecasting, planning, organizing, programming and controlling process, managerial control strategies; quantity and quality control, cost benefit analysis, present work and breakeven analysis, budgetary control, use of management science for the efficient administration of economic Units, production, financial and marketing management. (10 Hrs.)

UNIT-IV

Adoption of statistical and computer methods and techniques to managerial research and managerial decision making and general management. (10 Hrs.)

Recommended Books:

1. Industrial Management - S C Jain, W S Bawa, Dhanpat Rai & Co. (P) Ltd.
2. Industrial Management, Vol.1 L.C. Jhamb, EPH,
3. Industrial Engineering & Production Management – Martand Telsang, S. Chand
4. Industrial & Business Management - Martand T. Telsang, S. Chand
5. Introduction to Materials Management - J Tony Arnold & Stephen N. Chapman, Pearson Education Asia
6. Production & Operations Management – Adam, Pearson Education /PHI
7. Industrial Relations, Trade Unions & Labour Legislation - Sinha, Pearson Education Asia
8. Business Organisation & Management - Tulsian, Pearson Education Asia.

EE 6102 CONTROL SYSTEMS-I

L T P **Credits: 03**
3 0 2

UNIT-I

Mathematical Modeling: Introduction, Open loop and closed loop Control System. Elements or component of closed loop Systems. Transfer function of single Input and Single out put System. Poles and Zero of transfer function, Linear and non-linear Control System. Linear and Non-linear Control System. Comparison between open loop and closed loop System. Analog and digital Control System. Time-invariant and time variant model. Linear and non- linear model state mathematical model of mechanical translation Systems. Rotational System. Mathematical modeling of electrical element. Analogous System – Force Voltage analogy. Force current Analogy Electrical analogous of mechanical rotational System. Mathematical model of liquid level System. Mathematical model of or mature Controlled D C motor. Mathematical model of field Controlled D C motor. (06 Hrs.)

UNIT-II

Signal flow graph: Introduction, properties of Signal flow Graph from equation Signal flow graph for differential equation. Construction of Signal flow Graph from block diagram. Mason's gain formula Block diagram from Signal flow Graph. Effect of feedback on sensitivity, Effect of feed back on overall gain. Effect of feedback on stability.
(04 Hrs.)

UNIT-III

Control System Component: Gyroscope, Synchros, Techno meter. AC servo motors. Stepper motors. (02 Hrs.)

UNIT-IV

Time Domain Analysis: Introduction, Transient response and steady State response, Transfer function, Time Constant form, Pole Zero from S-Plane. First order System. Time response of first order system. Speed of response, unit ramp response of a first order System Second order System. Impulse response of Second order System, unit step response of second order System. Unit step response of second order System. Time domain Speciation. Evaluation of time domain Specification (Rise time, Peak time, maximum peak over shoot. Settling time).

Ramp response of a second order System. Steady state error and error constant (Position error, velocity error, acceleration error.) Steady State error with Unity feedback (Type-0, Type-1 Type-2 System). Effect of adding a zero to a system. Compensation, Derivative error Compensation, Derivative output Compensation. Integral error Compensation PID Controller (Proportional Control. Integral Control, integral Controller, Derivative Control).
(10 Hrs.)

UNIT-V

Stability analysis: Stability criterion. Relation between System Parameter and Pole location. Routh-Stability Criteria. Root locus technique. Compensation using root locus technique. Effects of addition of Poles. Effects of the addition of Zeros. Lead and Lag networks.

Realization of lead and log networks. Lead Compensation using root locus technique. Step to design a lead Compensator. Step to design a log Compensator. (10 Hrs.)

UNIT-VI

Frequency response Analysis: Introduction, Advantage of frequency response. The Concept of frequency response. Bode Plot. Gain margin. Stability via bode plots. Transfer function from bode plot. Polar plot. Nyquist Stability criterion, Relative Stability using Nyquist criterion. Constant M and N circles. Nichols Chart.

Control Systems Design by Frequency Response: Lead Compensator. Characteristic of lead Compensator. Design Procedure for the design of lead compensator, Lag Compensation.

(8 Hrs.)

Recommended Books:

Text Books

1. Gopal M: Digital Control and State Variable Methods, 2e, – TMH
2. Roy Choudhuri, D., Control System Engineering, PHI
3. Nagrath I J &GopalM: Control Systems Engg. - New Age International
4. Anand, D.K, Zmood, R.B., Introduction to Control Systems 3e,(Butterworth-Heinemann)Asian Books

Reference Books:

1. Goodwin, Control System Design, Pearson Education
2. Bandyopadhyaya, Control Engg. Theory and Practice, PHI
3. Kuo B.C.: Digital Control System- Oxford University Press.
4. Houpis, C.H, Digital Control Systems, McGraw Hill International.
5. Ogata, K., Discrete Time Control Systems, Prentice Hall, 1995
6. Jury E.I.: Sampled Data Control System- John Wiley & Sons Inc.
7. Umez-Eronini, Eronini., System Dynamics and Control, Thomson
8. Dorf R.C. & Bishop R H: Modern Control System- Pearson Education.
9. Ramakalyan, Control Engineering, Vikas
10. Natarajan A/Rameshbabu, Control Systems Engg., Scitech
11. Lyshevski, Control System Theory with Engineering Applications, Jaico
12. Gibson J E: Nonlinear Control System - McGraw Hill Book Co.

EE 6103 POWER ELECTRONICS

L T P **Credits: 03**
3 0 2

UNIT-I

Principle of operation of single phase and three phase half wave, half controlled, full controlled converters with R, R-L and R-L-E loads. Effect of free wheeling diodes and source inductance on the Performance of Converters. External Performance Parameters of the Converters. Techniques of Power factor improvement, Single phase and three Phase dual converter, semi converter. Resonant Converter. (10 Hrs.)

UNIT-II

Choppers:- Classification, Applications, Principle of operation, Control strategies of copper Types of Chopper Circuits based on quadrant of operation performance parameters. Multiphase choppers and switching mode regulators. (10 Hrs.)

UNIT-III

Inverter:- Classification and industrial application, voltage source inverters, single phase VSI circuits. Three Phase VSI circuits. PWM based inverters. Current source inverter, Single phase and three phase CSI circuits. (08 Hrs.)

UNIT-IV

AC Voltage Controller (AC VC) – Classification and industrial application. Single phase half wave and full wave AC VCs. Sequence Control of AC VC; there phase AC VC. (06 Hrs.)

UNIT-V

Cyclo- Converters:-Principle of operation of Cyclo Converters. Circulating and Circulating mode of operation. Single phase to Single phase step up and step down cyclo converters. Three phase to single cyclo converters. Three phase to three phase Cyclo converters (06Hrs.)

Recommended Books:

Power electronics—P.S.Bhimbra—Khanna Pub
Power electronics-Moorthi—Oxford
Power electronics—Haribabu—Scitech
Power electronics—P.C.Sen---S.Chand
Power electronics essentials and application---Umanand---Wiley India

MC 6104 VALUE EDUCATION & SPIRITUALITY

L T P **Credits: 0**
2 0 0

UNIT- I

The importance and the needs of spirituality and value education; Personal Development & Values in life; Humanity vs. enmity, cruelty, violence, injustice, exploitation, corruption as well as gross violation of human rights; Exploring Spirituality. (10 Hrs.)

UNIT- II

Understanding Value Education, The Basic Human Aspirations-Continuous Happiness and prosperity, Self-Exploration as the Process for Value Education, Imbalance in human personality & society. (08 Hrs.)

UNIT- III

Understanding the harmony at various levels, Understanding the Human Being as co-existence of self and body, Harmony in Self, family, society, nature and existence; providing the Basis for Universal Human values and Ethical Human Conduct (08 Hrs.)

UNIT- IV

Vision for Holistic Technologies, Production Systems and Management Models; Holistic education relative to the present crisis; Change through knowledge; Meditation & Values in Society; Values for excellence in life; A spiritual life style (10 Hrs.)

Text books / References:

7. Discovering Myself: A graded series of ten books on value education
   Author(s) : Andre Bruylants S.J & Bruylants

Title	Introduction to Values Education
Author	E. Palispis
Publisher	Rex Bookstore, Inc.
ISBN	9712317927, 9789712317927

8. Law, Ethics and Communication
   Author: B S Jolly
   Publisher: Tata Mc-graw Hill Publishing Co.ltd. (2012)
9. Vivekananda: His Call to the Nation**Author:** Swami Vivekananda
   Publisher: Advaita Ashrama
10. Inspiring Thoughts, Publisher-Raj Pal & Sons.
11. Gospel of Shri Rama Krishna,Author: Rama Krishna,Pubilsher: Create Space
12. Study Materials of value education from Education wing of Brahma Kumaris Raj Yoga Education Research Foundation

OPEN ELECTIVE-I

OE 601A DIGITAL SIGNAL PROCESSING

L T P **Credits: 03**

3 0 0

UNIT-I

Introduction to signals and systems discrete time signals and systems, Z-transforms, structures for digital filters, design procedures for FIR and IIR filters. Frequency transformations: linear phase design; DFT. Methods for computing FFT. Noise analysis of digital filters, power spectrum estimation. Signals and signal Processing: characterization & classification of signals, typical Signal Processing operations, example of typical Signals, typical Signal Processing applications. (08 Hrs.)

UNIT-II

Time Domain Representation of Signals & Systems- Discrete Time Signals, Operation son Sequences, the sampling process, Discrete-Time systems, Time-Domain characterization of LTI Discrete-Time systems, state-space representation of LTI Discrete-Time systems, random signals. (08 Hrs.)

UNIT-III

Transform-Domain Representation of Signals-The Discrete-Time Fourier Transform, Discrete Fourier Transform, DFT properties, computation of the DFT of real sequences, Linear Convolution using the DFT. Z-transforms, Inverse transform, properties of z-transform, transform domain representations of random signals. Transform-Domain Representation of LTI Systems: the frequency response, the transfer function, types of transfer function, minimum-phase and maximum-Phase transfer functions, complementary transfer functions, Discrete-Time processing of random signals. (08 Hrs.)

UNIT-IV

Digital Processing of Continuous-Time Signals - sampling of Continuous Signals, Analog Filter Design, Anti-aliasing Filter Design, Sample-and Hold circuits, A/D & D/A converter, Reconstruction Filter Design. (08 Hrs.)

UNIT-V

Digital Filter Structure and Design- Block Diagram representation, Signal Flow Graph Representation, Equivalent Structures, bone FIR Digital Filter Structures, IIR Filter Structures, State-space structure, all pass filters, tunable IIR Digital filters. cascaded Lattice realization of II Rand FIR filters, Parallel all pass realization of IIR transfer function, Digital Sine-Cosine generator. Digital Filter Design: Impulse invariance method of IIR filter design, Bilinear Transform method of IIR Filter Design, Design of Digital IIR notch filters, FIR filter Design based on truncated fonnersens, FIR filter design based on Frequency Sampling approach. (08 Hrs.)

Text Books:

1. Proakis J.G., and Manolakis, Introduction to DSP, PHI, 2007
2. Sanjit K. Mitra, “Applications DSP a Computer based approach”, TMH, 2006

Reference Books:

1. Allan Y. Oppenhein& Ronald W. Schater , "Applications DSP”,.
2. C.SydneyBurrus (Eds), DSP and Digital Filter Design

OE 601B RURAL TECHNOLOGY & COMMUNITY DEVELOPMENT

L T P **Credits: 03**
3 0 0

UNIT-I

Data Analysis and Measures of Central Tendency- Meaning, nature, scope and limitations of statistics, collection of statistical data, classification, tabulation and diagrammatic representation of data, Measures of central tendency: Statistical averages Mean, Median, Mode. (08 Hrs.)

UNIT- II

Data, Information and Knowledge; concept of information, need of information (professional, educational, research), qualities of information, value of information, difference between data and information, properties of the needed information. Information and Management; planning, organizing, co-ordinating and controlling, (08 Hrs.)

UNIT-III

Concepts of marketing; difference between marketing selling and retailing; marketing mix, market-segmentation, marketing planning.Strategy and Approaches; modern concept of marketing. (08 Hrs.)

UNIT- IV

Community development; concept, definition, meaning, need, history, principles, objectives and scope. Community Building: Coming of Age, Regenerating Community, Community Model. (08 Hrs.)

UNIT-V

Consensus Organizing Model, What's Behind Building Healthy Communities? Participatory Democracy, The Role of various NGOs in Community Development. The Role of Business and Government in Community Development Initiatives How to Form a Non-profit Corporation Fund Raising and Grant Writing. (08 Hrs.)

Text/Reference Books:

1. Biddle, William Wishart. 1968. Encouraging Community Development: A Training Guide for Local Workers. New York: Holt, Rinehart and Winston.
2. Clark, Kenneth B. and Jeannette Hopkins, eds. 1969. A Relevant War Against Poverty: A Study of Community Action Programs and Observable Social Change. New York: Harper and Row.
3. Clinard, Marshall Barron. 1970. Slums and Community Development: Experiments in Self-Help. New York: Free Press.
4. Creevey, Lucy E., ed. 1986. Women Farmers in Africa: Rural Development in Mali and the Sahel. Syracuse, NY: Syracuse University Press.
5. Dobyns, Henry F., Paul L. Doughty, and Harold D. Lasswell, eds. 1971. Peasants, Power, and Applied Social Change: Vicos as a Model. Beverly Hills, CA: Sage.
6. Edwards, Allen David and Dorothy G. Jones. 1976. Community and Community Development. The Hague, Netherlands: Mouton.
7. Green, Tova and Peter Woodrow. 1994. Insight and Action: How to Discover and Support a Life of Integrity and Commitment to Change. Philadelphia, PA: New Society Publishers.

OE 601C SIGNALS AND SYSTEMS

L T P **Credits: 03**

3 0 0

UNIT-I

Introduction to signals and system, Signals, transformation of independent variables, basic discrete time signals. (06 Hrs.)

UNIT-II

Properties of systems. Linear time-invariant systems, LII continuous and discrete the systems. (10 Hrs.)

UNIT-III

Convolution integral and sum, differential and difference equations. (04 Hrs.)

UNIT-IV

Fourier analysis for continuous time signals and systems. Fourier analysis for discrete time Signals and Systems. (10 Hrs.)

UNIT-V

State variable equation and Computer simulations. (10 Hrs.)

Books:

l. Signals and System by Oppenheim, Willlsky PHI, 1995
2. Signals and Systems by Chen, Oxford University Press, 2001
3. Linear System theory by Chen. Oxford University Press, 2005

OE 601D ENGINEERING SYSTEM MODELLING AND SIMULATION

L T P **Credits: 03**

3 0 0

UNIT-I

Introduction-Systems, System types, System Modelling, Types of system modelling, Classification and comparison of simulation models, attributes of modelling, Comparison of physical and computer experiments, Application areas and Examples (12 Hrs.)

UNIT-II

Mathematical and Statistical Models- Probability concepts, Queuing Models, Methods for generating random variables and Validation of random numbers. (06 Hrs.)

UNIT-III

Language-System modelling, programming languages, comparison of languages, Identifying and selection of programming language, feasibility study of programming language for the given application. (10 Hrs.)

UNIT-IV

Experiments-Simulation of different systems, Analysis, validation and verification of input and output simulated data, study of alternate techniques. (06 Hrs.)

UNIT-V

Case study-Developing simulation model for information centres, inventory systems and analysis of maintenance systems. (06 Hrs.)

Text Books:

1. Geoffrey Gordon, "System Simulation", Second edition, Prentice Hall, India, 2002.
2. Jerry Banks and John S. Carson, Barry L. Nelson, David M. Nicol, "Discrete Event System Simulation", Thirdedition, Prentice Hall, India, 2002.
3. Nagrath & Gopal- "System Modelling & Analysis." McGraw Hill Book Co.

Reference Books:

1. Robert E. Shannon, "System Simulation The art and science", Prentice Hall, New Jersey, 1995.
2. D.S. Hira, "System Simulation", S.Chand and company Ltd, New Delhi, 2001.

PROFESSIONAL ELECTIVE-I

EE 61A1 ELECTRIC DRIVES

L T P **Credit-03**
3 0 2

UNIT-I

Introduction- Classifications of Electric Drives, components of electric drives, advantages of electric drives, Review of characteristics and speed control of D.C. and A.C. motors.(04 Hrs.)

UNIT-II

Dynamics of Electric Drives:- Fundamental torque equation, speed-torque conventions and multi quadrant operation, equivalent values of drive parameters, components of load torques, nature and classification of load torques, calculation of time and energy-loss in transient operations, criteria for steady state stability, load equalization. (06 Hrs.)

UNIT-III

Rating and Heating of Motors- Thermal model of motor for heating and cooling, classes of motor duty, determination of motor rating, frequency of operation of motors subjected to intermittent loads. (04 Hrs.)

UNIT-IV

Rectifier Control of D.C. Drives- Controlled rectifier circuits, 1-phase fully controlled rectifier-fed separately excited D.C. motor, 1-phase half-controlled rectifier-fed separately excited D.C. motor, 3-phase fully controlled rectifier-fed separately excited D.C. motor, multi quadrant operation of fully-controlled rectifier-fed D.C. motor. (06 Hrs.)

UNIT-V

Chopper Control of D.C. Drives- Principle of operation and control techniques, motoring operation of separately excited and series excited motors, multi quadrant control of chopper-fed motors.

(04 Hrs.)

UNIT-VI

Induction Motor (IM) Drives:- 3-phase A.C. voltage controller-fed IM drive, voltage source inverter (VSI) and current source inverter (CSI) variable frequency drives, comparison of VSI and CSI drives, cyclo-converter-fed IM drive, static rotor resistance control of 3-phase slipring IM. (06 Hrs.)

UNIT-VII

Synchronous Motor Drives- VSI drive, CSI drive, CSI drive with load commutation, cyclo-converter drive, (06 Hrs.)

UNIT-VIII

Braking methods- Various methods of braking D.C. and A.C. motors, regenerative braking of D.C. motors during chopper control, static scherbius drive, commutatorless Kramer drive. Introduction to Microprocessor Control of Electric Drives. (04 Hrs.)

Text/Reference Books:

1.G.K. Dubey, "Fundamentals of Electrical Drives" Narosa Publishing House, 1995.
2.SKPillai, "A First course on Electrical Drives" Wiley Eastern Ltd.
3.V. Subrahmanyam, " Electric Drives: Concepts and Applications", Tata McGraw HillPublishing Co. Ltd., 1994.
4.GK Dubey, " Power Semiconductor Controlled Drives, "Prentice Hall, Englewood cliffs, NewJersey, 1989.
5.EL- Sharkawi& A Mohamad " Fundamental of Electric Drive", Vikas Publishing House

EE 61A2 ADVANCED INSTRUMENTATION

L T P **Credit- 03**
3 0 2

UNIT-I

Introduction: Introduction to Intelligent Instrumentation: Historical Perspective, current status, software based instruments. (8 Hrs.)

UNIT-II

Virtual Instrumentation: Introduction to graphical programming, data flow &graphical programming techniques, advantage of VI techniques, VIs and sub-VIs loops and charts , arrays, clusters and graphs, case and sequence structures, formula nodes, string and file I/O, Code Interface Nodes and DLL links. (12 Hrs.)

UNIT-III

Data Acquisition Methods: Analog and Digital IO, Counters, Timers, basic ADC designs, interfacing methods of DAQ hardware, software structure, use of simple and intermediate VIs. Use of Data Sockets for Networked Communication and Controls. (8 Hrs.)

UNIT-IV

PC Hardware Review & Instrumentation Buses: Structure, timing, interrupts, DMA, operating system, ISA, PCI, USB, PCMCIA buses. IEEE488.1 & 488.2 Serial Interfacing -RS232C, RS422, RS423, RS485; USB, VXI, SCXI, PXI. (12 Hrs.)

Text/Reference Books:

1. G.C. Barney, „Intelligent Instrumentation", Prentice Hall, 1995.
2. A.S. Moris, „Principles of Measurement & Instrumentation", Prentice Hall, 1993.
3. S. Gupta, J.P. Gupta, „PC interfacing for Data Acquisition & Process Control", ISA,
4. Gary Johnson, „Lab VIEW Graphical Programming", II Edition, McGraw Hil 1997.

EE61A3 MECHATRONICS

L T P **Credit-03**
3 0 2

UNIT-I

Introduction to Mechatronics and its Systems; Evolution, Scope, Measurement Systems, Control Systems, open and close loop systems, sequential controllers, microprocessor based controllers, mechatronics approach. (06 Hrs.)

UNIT-II

Basics of Digital Technology Number System, Boolean algebra, Logic Functions, Karnaugh Maps, Timing Diagrams, Flip-Flops, Applications. (04 Hrs.)

UNIT-III

Sensors and transducers -Introduction, performance terminology-Displacement, Position and Proximity, Velocity and motion, force, Fluid Pressure-Temperature Sensors-Light Sensors-Selection of Sensors-Signal Processing. (06 Hrs.)

UNIT-IV

Pneumatic and Hydraulic actuation systems: actuation systems, Pneumatic and hydraulic systems, directional control valves, pressure control valves, cylinders, process control valves, rotary actuators. (04 Hrs.)

UNIT-V

Mechanical actuation systems -Mechanical systems, types of motion, kinematics chains, cams, gear trains, ratchet and pawl, belt and chain drives, bearings, mechanical aspects of motor selection. (04 Hrs.)

UNIT-VI

Microprocessors-Introduction, Architecture, Pin Configuration, Instruction set, Programming of Microprocessors using 8085 instructions-Interfacing input and output devices-Interfacing D/A converters and A/D converters, Applications, Temperature control, Stepper motor control, Traffic light controller. (06 Hrs.)

UNIT-VII

Programmable Logic Controller- Introduction, Basic structure, Input/ Output Processing, Programming, Mnemonics, Timers, Internal relays and counters, Data handling, Analog Input / Output, Selection of a PLC. (06 Hrs.)

UNIT-VIII

Robotics- Introduction, types of robots, Robotic control, Robot drive systems Robot end effectors, selection parameters of a robot, applications. (04 Hrs.)

Text/Reference Books:

1. Bolton W., "Mechatronics", Longman, Second Edition, 2004.
2. Histand Michael B. & Alciatore David G., "Introduction to Mechatronics & Measurement Systems", McGraw Hill, 2003.
3. HMT Ltd., "Mechatronics", Tata McGraw Hill Publishing Co. Ltd., 1998.
4. Nitaigour Premchand Mahalik, "Mechatronics Principles, Concepts * Applications", TMH 2003.

EE 61A4 COMPUTER NETWORK

L T P **Credit- 03**
3 0 2

UNIT-I

Introduction- Goals and applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design-Delay Analysis, Back Bone Design, Local Access Network Design. (8 Hrs.)

UNIT-II

Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling. Medium Access Control sub layer: Medium Access sub layer-Channel Allocation, LAN protocols-ALOHA protocols-Overview of IEEE standards – FDDI, Data Link Layer –Elementary data Link Protocols, Sliding Window protocols, Error Handling. (10 Hrs.)

UNIT-III

Network Layer: Network Layer – Point – to Point Networks, routing, Congestion control, Internetworking – TCP /IP –IP packet, IP address, IP v6. (6 Hrs.)

UNIT-IV

Transport Layer: Transport Layer – Design issues, connection management, session Layer – Design issues, remote procedure call, Presentation Layer – Design issues, data compression techniques, cryptography – TCP Window Management. (8 Hrs.)

UNIT-V

Application Layer: Application Layer-File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application, Example Networks – Internet and Public Networks. (8 Hrs.)

Text/Reference Books:

1. Behrouz A. Forouzan, “Data Communication and Networking”, Tata McGraw Hill.
2. A.S. Tanenbaum, “Computer Networks”, 3rd Edition, Prentice Hall India.
3. S. Keshav, “An Engineering Approach on Computer Networking”, Addition Wesley.
4. W. Stallings, “Data and Computer Communication”, Macmillan Press.

B. Tech Programme, Semester IV

EE 6201 CONTROL SYSTEMS-II

L T P **Credits: 03**
3 0 2

UNIT- I

Control System Design by frequency response: Introduction, Lead Compensator, Characteristics of lead compensator. Design procedure for the design of lead compensator. Lag Compensator. Characteristics of lag compensator. Selection for Compensator. Design procedure for the design of lag compensator. Lag Lead Compensation. Characteristics of lag lead compensator. Procedure for design of lag –lead Compensator. (10 Hrs.)

UNIT-II

State variable Analysis: Introduction, Advantage of state space representation for Electrical Network, nth order differential equations. State space representation for transfer function. Solution of Homogenous State equation. Laplace Transformed method. Properties of State Transition matrices. Computation of State Transition matrix by Laplace Transform method. Eigen values Eigen vectors. Diagonalization. Derivation of transfer Eigen vectors. Diagonalization. Derivation of transfer function from state model Controllability and observability. (12 Hrs.)

UNIT-III

Non- linear System Analysis:- Introduction, Some Common types of Non-linearities (Saturation, Dead zone, Friction, Relays), Describing Function method. Limitations Describing Function for Saturation, Describing Function for ideal relay. Describing Function for Combination of Dead Zone and Saturation. Stability Analysis with Describing Function. (10 Hrs.)

UNIT-IV

Phase plane Analysis:- The Phase plane Technique phase portraits. Phase Trajectory of a second order System using method of Isoclines. Calculation of Time from phase Trajectory Stability from the phase plane. Autonomous System. (08 Hrs.)

Text Books

1. Gopal M: Digital Control and State Variable Methods, 2e, – TMH
2. Roy Choudhuri, D., Control System Engineering, PHI
3. Nagrath I J &Gopal M: Control Systems Engg. - New Age International
4. Anand,D.K, Zmood, R.B., Introduction to Control Systems 3e,(Butterworth-Heinemann)Asian Books

Reference Books:

1. Goodwin, Control System Design, Pearson Education
2. Bandyopadhyaya, Control Engg.Theory and Practice, PHI
3. Kuo B.C.: Digital Control System- Oxford University Press.
4. Houpis, C.H, Digital Control Systems, McGraw Hill International.
5. Ogata, K., Discrete Time Control Systems, Prentice Hall, 1995
6. Jury E.I.: Sampled Data Control System- John Wiley & Sons Inc.
7. Umez-Eronini, Eronini., System Dynamics and Control, Thomson
8. Dorf R.C. & Bishop R H: Modern Control System- Pearson Education.
9. Ramakalyan, Control Engineering, Vikas

EE 6202 HIGH VOLTAGE ENGINEERING

L T P **Credit-03**
3 0 2

UNIT-I

Electrostatic field and its Measurement using latest Computational method FDM (Finite Difference Method). FEM (Finite Element Method), CSM (Charge Simulation Method) Boundary Element Method (7 Hrs.)

UNIT-II

Generation of High Voltage DC Voltage doubler circuit, Cock-craft Walton Voltage multiplier circuit; Impulse-multistage, marx circuit; Impulse current generation (6 Hrs.)

UNIT-III

Measurement of High AC, DC and Impulse Voltage and Current, Dielectric Losses, Measurement of Dielectric Constant, Loss factor and resistivity Large Capacitance (8 Hrs.)

UNIT-IV

Break down Mechanism in gas, Liquid and Solid Dielectric (6 Hrs.)

UNIT-V

Partial discharge, RSG; Transients in power System, travelling waves on transmission line, lightening phenomenon, Insulation and over-voltage protection due to lightening and switching Surge. (8 Hrs.)

UNIT-VI

High Voltage insulators and Bushing, Voltage grading, Corona phenomenon and Loss Radio interference and its measurement. (6 Hrs.)

Reference Books:

Author	Title	Publishers
C.L. Wadhwa	High Voltage Engineering	Newage International
Naidu Kamaraju	High Voltage Engineering	Tata Mc Grew Hill Publishers
Dieter, Kurt	High Voltage test Technique	Newnes Publishers

EE 6203 DESIGN OF ELECTRICAL MACHINES

L T P **Credit-03**
3 0 2

UNIT-I

General Consideration with machine design flew chart, over view of electrical engineering materials, design Specifications as per BIS, ISI, IEC etc, Basic design principles and limitations, output equation, Main dimensions, Size of machine, Choice of Specific magnetic and specific electric loading, effects of increasing linear dimensions of machine. (08 Hrs.)

UNIT-II

Over view on laws of magnetic Circuits, Air gap and teeth Calculations, Magnetic Circuit of Induction motor, permeance, leakage flux, leakage reactance, magnetic pull. (08 Hrs.)

UNIT-III

Transformer design- Classifications, Main Parts and its design aspects, output equation, optimum design strategies, choice of flux density and Current density, resistance and leakage reactance of windings, mechanical forces, aspects of temperature rise and cooling. Tests on transformer. (08 Hrs.)

UNIT-IV

Rotating AC Machine design- Induction motor design, output and input equations in terms of KV4 (1-Phase, 3- Phase), Choice of Specific magnetic and specific electric loadings, Design of stator and rotor Circuits, Aspects of overload Capacity, design of Starters, Design of Synchronous machine. Output equation, choice of specific magnetic and specific electric loadings, effects of SCR on Synchronous Machines. (08 Hrs.)

UNIT-V

DC machine design- output equation, Choice of Specific magnetic and electric loadings design of Starter for different types of DC machines. (08 Hrs.)

Reference Books:-

Title	Author	Publishers
A Course in Electrical Machine Design	A.K. Sawhney	Dhanpat Rai and Sons
Performance and design of AC and DC Machines	M.G. Say	CBS Publishers
Electrical Machine Design Data Book	G. Gangadharan and R. Pillai	Wiley Eastern Ltd.

OPEN ELECTIVE-II

OE 602A ARTIFICIAL INTELLIGENCE AND ROBOTICS

L T P **Credits: 03**
3 0 0

UNIT-I

Scope of AI -Games, theorem proving, natural language processing, vision and speech processing, robotics, expert systems, AI techniques- search knowledge, abstraction. (08 Hrs.)

UNIT-II

Problem solving - State space search; Production systems, search space control: depth first, breadth-first search, heuristic search - Hill climbing, best-first search, branch and bound. Problem Reduction, Constraint Satisfaction End, Means-End Analysis (08 Hrs.)

UNIT-III

Knowledge Representation- Predicate Logic: Unification, modus pones, resolution, dependency directed backtracking. Rule based Systems : Forward reasoning: conflict resolution, backward reasoning: use of no backtrack. Structured Knowledge Representation: Semantic Nets: slots, exceptions and default frames, conceptual dependency, scripts.(08 Hrs.)

UNIT-IV

Handling uncertainty and learning- Non-Monotonic Reasoning, Probabilistic reasoning, use of certainty factors, fuzzy logic. Concept of learning, learning automation, genetic algorithm, learning by inductions, neural nets. (08 Hrs.)

UNIT-V

Robotics : Robot Classification, Robot Specification, notation; Direct and Inverse Kinematics: Co-ordinates Frames, Rotations, Homogeneous Coordinates, Arm Equation of four Axis SCARA Robot, TCV, Inverse Kinematics of Four Axis SCARA Robot. (08 Hrs.)

Text Books:

1. E. Rich and K. Knight, "Artificial intelligence", TMH, 2nd ed., 1992.
2. N.J. Nilsson, "Principles of AI", Narosa Publ. House, 2000.
3. Robin R Murphy, Introduction to AI Robotics PHI Publication, 2000

Reference Books:

1. D.W. Patterson, "Introduction to AI and Expert Systems", PHI, 1992.
2. R.J. Schalk off, "Artificial Intelligence - an Engineering Approach", McGraw Hill Int. Ed., Singapore, 1992.
3. George Lugar, .Al-Structures and Strategies for and Strategies for Complex Problem solving., 4/e, 2002, Pearson Educations.

OE 602B DIGITAL COMMUNICATION

L T P **Credits: 03**
3 0 0

UNIT-I

Pulse Modulation-Sampling process –PAM- other forms of pulse modulation – Bandwidth – Noise trade off –Quantization –PCM- Noise considerations in PCM Systems-TDM Digital multiplexers-Virtues, Limitation and modification of PCM-Delta modulation –Linear prediction –differential pulse code modulation – Adaptive Delta Modulation (08 Hrs.)

UNIT-II

Baseband Pulse Transmission- Matched Filter- Error Rate due to noise –Inter-symbol Interference- Nyquist‟s criterion for Distortion-less Base band Binary Transmission- Correlative level coding –Baseb and M-ary PAM transmission –Adaptive Equalization –Eye patterns (08 Hrs.)

UNIT-III

Passband Data Transmission-Introduction – Pass band Transmission model- Generation, Detection, Signal space diagram, bit error probability and Power spectra of BPSK, QPSK, FSK and MSK schemes –Differential phase shift keying – Comparison of Digital modulation systems using a single carrier – Carrier and symbol synchronization. (08 Hrs.)

UNIT-IV

Errorr Control Coding- Discrete memory-less channels – Linear block codes – Cyclic codes - Convolutional codes –Maximum likelihood decoding of convolutional codes-Viterbi Algorithm, Trellis coded Modulation, Turbo codes. (08 Hrs.)

UNIT-V

Spread Spectrum Modulation- Pseudo- noise sequences –a notion of spread spectrum – Direct sequence spread spectrum with coherent binary phase shift keying – Signal space Dimensionality and processing gain – Probability of error – Frequency –hop spread spectrum – Maximum length and Gold codes. (08 Hrs.)

Text Books:

1. Simon Haykins, “Communication Systems” John Wiley, 4th Edition, 2001
2. Taub&Schilling , “Principles of Digital Communication “ Tata McGraw-Hill” 28th reprint, 2003

Reference Books:

1.SamK.Shanmugam “Analog & Digital Communication” John Wiley

OE 602C PROJECT MANAGEMENT

L T P **Credits:03**
3 0 0

UNIT – I

Introduction to Project management**:** Characteristics of projects, Definition and objectives of Project Management, Stages of Project Management, Project Planning Process, Establishing Project organization. (10 Hrs.)

UNIT – II

Work definition: Defining work content, Time Estimation Method, Project Cost Estimation and budgeting, Project Risk Management, Project scheduling and Planning Tools: Work Breakdown structure, LRC, Gantt charts, CPM/PERT Networks. (10 Hrs.)

UNIT – III

Developing Project Plan (Baseline), Project cash flow analysis, Project scheduling with resource constraints: Resource Leveling and Resource Allocation. Time Cost Trade off: Crashing Heuristic. (10 Hrs.)

UNIT – IV

Project Implementation: Project Monitoring and Control with PERT/Cost, Computers applications in Project Management, Contract Management, Project Procurement Management. (06 Hrs.)

UNIT – V

Post-Project Analysis. (04 Hrs.)

Text/Reference Books:

1. Shtub, Bard and Globerson, Project Management: Engineering, Technology, and Implementation, PrenticeHall, India
2. Lock, Gower, Project Management Handbook.
3. Cleland and King, VNR Project Management Handbook.
4. Wiest and Levy, Management guide to PERT/CPM, Prentice Hall. Ibdia
5. HoraldKerzner, Project Management: A Systemic Approach to Planning, Scheduling and Controlling, CBSPublishers, 2002.
6. S. Choudhury, Project Scheduling and Monitoring in Practice.
7. P. K. Joy, Total Project Management: The Indian Context, Macmillan India Ltd.

OE 602D ENGINEERING SAFETY

L T P **Credits-03**
3 0 0

UNIT-I

Introduction to the structure of systems of plant operation, maintenance and safety. System interactions and degree of freedom with man, material and equipment. (10 Hrs.)

UNIT-II

Factory rules and procedures with Indian and International specifications in operation, maintenance and safety. Effects of economic design criteria in optimum plant operation. (10 Hrs.)

UNIT-III

Trouble shooting operation and maintenance in presence of uncertainty. Simulation for interpretation in difficult plant operation. Introduction to microprocessor based operations. (8 Hrs.)

UNIT-IV

Inspection, testing and analysis of tolerance limit and types of failure. Contains based maintenance and its economical viability. Hazards and operative (HAZOP) analysis. Accidents and emergency preventive procedures. Insurance claim and loss analysis. Case studies on Food and Biochemical plants. (12 Hrs.)

Recommended Books:

The handbook of safety engineering (principle & applications) Frank R. Spellman, Nancy E.Whiting; Published by Government Institutes

Safety professional's reference and study guide, W.David Yates

PROFESSIONAL ELECTIVE-II

EE 62A1 NON-CONVENTIONAL ENERGY SOURCES AND APPLICATIONS

L T P **Credit-02**
2 0 0

UNIT-I

Introduction: Limitations of conventional energy sources, need and growth of alternate energy sources, basic schemes and applications of direct energy conversion. (04 Hrs.)

UNIT-II

MHD Generators: Basic principles and Hall Effect, generator and motor effect, different types of MHD generators, conversion effectiveness. Practical MHD generators, applications and economic aspects. (06 Hrs.)

UNIT-III

Solar Energy: Photovoltaic effect, characteristics of photovoltaic cells, conversion efficiency, solar batteries and applications. Solar energy in India, solar collectors, solar furnaces & applications. (06 Hrs.)

UNIT-IV

Wind Energy: History of wind power, wind generators, theory of wind power, characteristics of suitable wind power sites, scope in India, advantages and limitations. (06 Hrs.)

UNIT-V

Thermo-electric Generators: See back effect, peltier effect, Thomson effect, thermo electric convertors, brief description of the construction of thermoelectric generators, applications and economic aspects. (08 Hrs.)

UNIT-VI

Fuel Cells: Principle of action, gibbs free energy, general description of fuel cells, types, construction, operational characteristics and applications. (06 Hrs.)

UNIT-VII

Miscellaneous Sources: Geothermal system, characteristics of geothermal resources, choice of generators, electric equipment and precautions. Low head hydro plants, definition of low head hydro power, choice of site and turbines. Tidal energy, idea of tidal energy, tidal electric generator, limitations. (06 Hrs.)

Text/Reference Books:

1. D.S.Chauhan, „Non Conventional Energy Resources‟ New Age Publication
2. G.D. Rai, „Non-conventional energy sources‟, Khanna Publishers
3. B.H.Khan, „Non Conventional Energy Resources‟ TMH.
4. H.P.Garg and Jai Prakash, „Solar Energy Fundamentals and Applications‟, TMH

EE 62A2 POWER PLANT ENGINEERING

L T P **Credit-02**
2 0 0

UNIT- I

Importance of electric Power Plant, Source of energy, Energy sources in India. Types of Power Plant Site Stream Generators and Water Treatment: operation of condensing and non-condensing power Plants Choice of steam pressure and temperature. Salient features of a modern coal-fired steam power plant Steam Generators and Water Treatment: Classification of boiler, Rating of boiler and efficiency boiler UNIT. Lancashire boiler. Super pressure steam power plants. Difference between Sub critical and super critical steam generation. Treatment of water, Water hardness and PH values, method of water treatment. (06 Hrs.)

Rankin cycle, Re-heat cycle, Methods of re-heating Regenerative cycle, Flow of steam through nozzle, mass flow rate of steam through nozzle, critical pressure ratio. Types of turbines, work done in impulse turbine, Reaction turbine, Losses in steam turbine. (06 Hrs.)

UNIT-II

Super heater and re-heaters, Economizers. Air pre-heater, feed water heaters. Evaporators. Function of Condensers. Types of condensers. Condensers efficiency. (06 Hrs.)

UNIT-III

Cooling ponds, cooling towers Types of cooling Towers method of coal handling. Oil burning, Dust Collection.Ash handling in a modern pulverized fuel steam plant. (06 Hrs.)

UNIT-IV

Hydro Electric Power Plant: Introduction on Hydro Electric Power Plant. Selection of site for a Hydro Electric Power Plant. Classification of Hydro- Plants. Runoff, Hydrograph and flow duration curve.The mass curve.

Hydraulic Turbine: Selection of water turbine, Impulse turbine, Reaction turbine, Pelton turbine. Operating Characteristics of hydraulic turbines. Surge tanks Plant layout. Comparison of hydro-power stations with thermal stations. (08 Hrs.)

UNIT-V

Nuclear Power Plant:- Introduction on Nuclear Power Plant Site Selection on Nuclear Physics. Nuclear reactor. Classification reactors cooling system of nuclear reactor. Fuel cycle, Methods of enriching uranium. Economics of nuclear power plants Safety. (08 Hrs.)

Text/Reference Books:

Power Plant engineering------ Melba Mary---Scitech
Power Plant engineering-----P.K. Nag----Tata Mcgreaw Hill
Power Plant engineering---- A.K. Raja, Amit Prakash---New age
Power Plant engineering---Gupta, Monoj kumar---PHI

EE 62A3 MATERIALS IN ELECTRICAL SYSTEMS

L T P **Credit- 02**
2 0 0

UNIT-I

Materials- Conductors-free electron theory and electron scattering Dielectrics-Polarization, solid, liquid and gas dielectrics Insulators-Classification, Application in electric devices. Magnetic materials-classification based on orientation of magnetic dipoles, Optoelectronic materials, Semiconductors-simple and compound, Refractory Materials. Solders and contacts, Superconductivity and super conducting materials. (14 Hrs.)

UNIT-II

Components- Resistors and Capacitors. Display UNITs:-LED, LCD and Monitors. Effect of environment on components. (6 Hrs.)

UNIT-III

Processes- Basic processes used in the manufacture of integrated circuits such as Epitaxy, masking, photolithography, diffusion, oxidation, Etching, metallization, Scribing, wire bonding and Encapsulation. Induction and Dielectric heating. Electron beam welding and cutting. (12 Hrs.)

UNIT-IV

Cables- Calculations of capacity of cables, charging current, stress, grading, heating of cables, Construction and characteristics of HV & EHV cable. (08 Hrs.)

Text/Reference Books:

1. S.O. Kasap, Principles of Electrical Engineering Materials, MGH.
2. Mahajan, Principles of growth and processing of semiconductors, MGH.
3. Dhir, Electronic components and Materials Principles manufacturing and Maintenance, TMH.
4. Allison, Electronic Engineering Materials and Devices, TMH.
5. Ruska N Scot, Microelectronic processing – an introduction to the manufacture of integrated circuits, MGH.
6. Decker, Electrical Engineering Materials, PHI.

EE 62A4 ADVANCED POWER SYSTEMS

L T P **Credit-02**
2 0 0

UNIT-I

Introduction- Structure of power systems, Power system control centre and real time computer control, SCADA system Level decomposition in power system Power system security. (4 Hrs.)

UNIT-II

Various operational stages of power system Power system voltage stability, Deregulation and electricity market (2 Hrs.)

UNIT-III

Economic Operation : Concept and problems of unit commitment Input-output characteristics of thermal and hydro-plants System constraints Optimal operation of thermal units without and with transmission losses, Penalty factor, incremental transmission loss, transmission loss formula (without derivation) (8 Hrs.)

UNIT-IV

Hydrothermal scheduling long and short terms Concept of optimal power flow (4 Hrs.)

UNIT-V

Load Frequency Control : Concept of load frequency control, Load frequency control of single area system: Turbine speed governing system and modelling, block diagram representation of single area system, steady state analysis, dynamic response, control area concept, P-I control, load frequency control and economic dispatch control. Load frequency control of two area system. (8 Hrs.)

UNIT-VI

Tie line power modelling, block diagram representation of two area system, static and dynamic response (2 Hrs.)

UNIT-VII

Automatic Voltage Control : Schematic diagram and block diagram representation, different types of Excitation systems & their controllers. (4 Hrs.)

UNIT-VIII

Voltage and Reactive Power control : Concept of voltage control, methods of voltage control-control by tap changing transformer. Shunt Compensation, series compensation, phase angle compensation. State Estimation: Detection and identification, Linear and non-linear models. (4 Hrs.)

UNIT-IX

Flexible AC Transmission Systems: Concept and objectives FACTs controllers: Structures & Characteristics. (4 Hrs.)

Text/Reference Books:

1. D.P. Kothari & I.J. Nagrath, "Modern Power System Analysis" Tata McGraw Hill
2. P.S.R. Murty, "Operation and control in Power Systems" B.S. Publications.

3. N. G. Hingorani & L. Gyugyi, " Understanding FACTs" Concepts and Technology of Flexible AC
Transmission Systems"
6. J. Wood & B.F. Wollenburg," Power Generation, Operation and Control", John Wiley
7. O.I. Elgerd, "Electric Energy System Theory", Tata McGraw Hill.
8. P. Kundur, "Power System Stability and Control", McGraw Hill.
9. M.H. Rashid, "Power Electronics: Circuits, devices and Applications", PHI
10. T. K. Nagsarkar &M.S. Sukhiza, " Power System Analysis", Oxford University Press.

PROFESSIONAL ELECTIVE-III

EE62B1 ADVANCED POWER ELECTRONICS

L T P **Credit-02**
2 0 0

UNIT-I

D.C. to D.C. Converter: Classification of choppers. Principle of operation, steady state analysis of class A chopper, step up chopper, switching mode regulators: Buck, Boost, Buck-Boost, Cuk regulators. Current commutated and voltage commutated chopper. (08 Hrs.)

UNIT-II

A.C. to A.C. Converter: Classification, principle of operation of step up and step down cyclo converter. Single phase to single phase cyclo converter with resistive and inductive load. Three phase to single phase cycloconverter: Half wave and full wave. Cosine wave crossing technique. Three phase to three phase cycloconverter. Output voltage equation of cycloconverter. (08 Hrs.)

UNIT-III

D.C. to A.C. Converter: Classification, basic series and improved series inverter, parallel inverter, single phase voltage source inverter, steady state analysis, Half bridge and full bridge inverter: Modified Mc Murray and Modified Mc Murray Bedford inverter, voltage control in single phase inverters, PWM inverter, reduction of harmonics, current source inverter, three phase bridge inverter. (08 Hrs.)

UNIT-IV

Power Supplies: Switched mode D.C. and A.C. power supplies. Resonant D.C. and A.C. power supplies. (08 Hrs.)

UNIT-V

Applications: Dielectric and induction heating. Block diagram of D.C. and A.C. motor speed control. (08 Hrs.)

Text/Reference Books:

1. Jacob, Michael Power Electronics: Principles & Application, Vikas Publishing House
2. M.H. Rashid, Power Electronics : Circuits, devices and applications , PHI.
3. Ned Mohan, Tore M. Undeland, William P. Robbins, Power Electronics : Converters, Applications and
Design , John Wiley & Sons.
4. P.S. Bimbhra, „Power Electronics" ,Khanna Publishers.
5. M. RamamoorthyAn Introduction to Thyristors and their applications East-West Press.
6. M.D. Singh and K.B. Khanchandani, Power Electronics, Tata McGraw-Hill.
7. A.K. Gupta & L.P. Singh, Power Electronics and Introduction to Drives Dhanpat Rai Publishers

EE62B2 UTILIZATION OF ELECTRICAL ENERGY & ELECTRIC TRACTION

L T P **Credit-02**
2 0 0

UNIT-I

Illumination- Nature of light, important definitions, laws of illumination, principle of production of light- discharge through gases under pressure – incandescence/sources of light-filament lamp, halogen lamp-discharge lamp-sodium discharge lamp, high pressure mercury discharge lamp, dual lamps, fluorescent lamps, lamp efficiency, requirements of good lighting, illumination level, absence of contrasts, shadows, glare, colour rendering-lamp fittings. Lighting schemes, design of indoor & outdoor lighting system-street lighting, flood lighting, photometers. (08 Hrs.)

UNIT-II

: Electric Heating- Advantages of electric heating, classification of heating methods, detailed study of resistance heating, arc heating, electron bombardment heating, induction heating & dielectric heating and their control. (06 Hrs.)

UNIT-III

Electrolytic Processes- Fundamentals of electro deposition-laws of electrolysis applications of electrolysis, electro deposition, manufacture of chemicals, anodizing, electro polishing, electro-cleaning, electro-parting, electrometallurgy, electric supply. (06 Hrs.)

UNIT-IV

Train Mechanics- Types of services, characteristics of each type of service, speed time curve, simplified speed time curve, average speed, schedule speed, factors affecting schedule speed, tractive effort for propelling a train, power of the traction motor, specific energy output, specific energy consumption, factors affecting specific energy consumption, mechanics of train movement, coefficient of adhesion, factors affecting slip. (08 Hrs.)

UNIT-V

Electric Traction- D.C. & A.C. traction motors, their characteristics Traction Motor Control: Starting and speed control of D.C. series motors, shunt transition, bridge transition, drum controller employing shunt transition, energy saving with series parallel starting, metadyne control, multiple unit control, braking of traction motors. (08 Hrs.)

UNIT-VII

Current Collection Systems- Conductor rail equipment, current collection gear for OHE: Cable collector, pole collector, bow collector, pantograph collector. (04 Hrs.)

Text/Reference Books:

1. E. Openshan Taylor, “Utilization of Electric Energy”, Orient Longmans.
2. P.V. Gupta et. al, “A Course in Electrical Power”, Dhanpat Rai & Sons Delhi
3. H. Partap, “Art & Science of Utilization of Electrical Energy”.
4. N.V. Suryanarayana, “Utilization of Electric Power” .
5. BR Sharma, “Utilization of Electrical. Energy”.
6. AT Dover, “Electric Traction”, Pitman.

EE 62B3 ELECTRONIC DEVICES AND SYSTEMS

L T P **Credit-02**
2 0 0

Analog:

UNIT-I

Transistor biasing circuits: CE, CC & CB amplifiers, Darlington amplifier. parameters and their application in analysis. Class A, B, C, D and S power amplifiers. Pushpull operation. JFET: Biasing and CS, CD and CG amplifier. MOSFET: Depletion type, Enhancement type MOSFET and their biasing. (08 Hrs.)

UNIT-II

OP-AMP, Differential amplifier and its DC, AC analysis, OP-AMP characteristics, Non-Inverting/Inverting Voltage and Current feedback. Regulated power supplies; Oscillators and Timer (555) (08 Hrs.)

Digital:

UNIT-III

Logic gates and Logic Families: Logic gates, Universal gates, transistor as a switching element, Combinational Logic gates Introduction to combinational circuits, arithmetic and logical operation, design of Half adder & full adder, subtractor circuits, parity generator & and checker, code converter, decoders, multiplexers, demultiplexers, comparators. (10 Hrs.)

UNIT-IV

Sequential Circuits- Flip-flops, bistable circuits: RS, JK, D, T, Master/Slave Flipflop, race around condition, latches, synchronous and asynchronous counters up & down counters, shift registers, state transition diagram (06 Hrs.)

UNIT-V

A/D & D/A Converters- D/A converter, accuracy, resolution and precision, variable resistor network, binary ladder, A/D converter, accuracy and resolution, simultaneous conversion, counter method, continuous A/D converter, dual slope, successive approximation method.

(08 Hrs.)

Text/Reference Books:

Analog:

1. Millman and Halkias, “Integrated Electronics”, McGraw Hill.
2. R. Boylested and L. Nashelsky, “Electronics Devices and Circuits”, Prentice Hall India.
3. Millman and Halkias, “Electronics Devices and Circuits”, TMH Edition.
4. Malcolm Goodge, “Analog Electronics Analysis and Synthesis”, TMH Edition.
5. Malvino, “Electronics Principles”, TMH Edition.

Digital:

1. RP Jain, „Modern Electronics‟.
2. AP Malvino and DP Leach, „Digital Principles and applications‟.
3. Floyd, „Digital Circuits‟.
4. Charles Roth, „Fundamentals of Logic Design‟.
5. H. Taub and D. Schilling, „Digital Integrated Electronics‟.
6. Gothman, “Digital Electronics”.

EE 62B4 SWITCHGEAR AND RELAYING

L T P **Credit-02**
2 0 0

UNIT-I

: Switchgear- Introduction, functions of a circuit breaker, contacts separation and arc phenomenon, theory of arc formation and its extinction, recovery voltage, restriking voltage, interruption of capacitive and inductive currents, resistance switching, double frequency transients, circuit breaker ratings, clearing time, reclosing time, classification of circuit breakers, oil, air-blast, vacuum and SF6 circuit breakers.

(08 Hrs.)

UNIT-II

Protection Against Lightning- Lightning mechanism and its characteristics, over voltages due to lightning, protection of lines and sub-stations against lightning using shield wires, tower footing resistance, counterpoises, ground wires, rod gaps, lightning arrestors, their construction, working and ratings, surge absorbers and surge diverters.

(08 Hrs.)

UNIT-III

Insulation Co-ordination: Impulse volt-time characteristics of electrical apparatus, basic impulse insulation level, insulation levels of sub-station equipments.

(06 Hrs.)

UNIT-IV

Protective Relays: Introduction, basic requirements, operating principles and characteristics of electromagnetic type over-current, differential, impedance and admittance relays. Detail of protection against abnormal conditions for alternators, transformers, feeders transmission lines, and bus-bars. Carrier current protection for long lines. (08 Hrs.)

UNIT-V

Static Relays: Introduction, comparison with electromagnetic relays, working of instantaneous, definite time, inverse time and directional over current relays, introduction to digital relays.

(06 Hrs.)

UNIT-VI

Sub-Stations: Types of sub-stations, sub-station equipments and outdoor yard layout, types of bus-bars, key diagrams and bus-bar arrangements. (04 Hrs.)

Text/Reference Books:

1. A Chakrabarti, ML Soni, PV Gupta and US Bhatnagar, “Power System Engineering” Dhanpat Rai & Sons.
2. IJ Nagrath and DP Kothari,”Power System Engineering” Tata McGraw-Hill.
3. CL Wadhwa, “Electric Power Systems”, Wiley Eastern Limited.
4. Sunil S. Rao, “Switchgear, Protection and Power Systems”, Khanna Publishers.
5. Badriram and DN Vishwakarma, “Power System Protection and Switchgear”, TMH

MECHANICAL ENGINEERING

B. TECH. PROGRAMME MECHANICAL ENGINEERING (ME)

BRIDGE COURSE SEMESTER I (AUGUST TO DECEMBER)

Sl. No.	Course Code	Course Tile	L	T	P	Credit	GKCIET Diploma	Others Diploma
1.	AM B101	Comprehensive Mathematics-I	3	0	0	3	No	Yes
2.	AP B101	Engineering Physics	3	0	0	3	No	Yes
3.	AC B101	Engineering Chemistry	3	0	0	3	No	Yes
4.	ME B101	Fluid Mechanics & Fluid Machinery	3	0	0	3	No	Yes
5.	ME B102	Material Science & Metallurgy	2	0	0	2	No	Yes
6.	HU B101	Business Communication & Presentation Skill	3	0	0	3	No	Yes
7.	AP B151	Engineering Physics Lab.	0	0	3	2	No	Yes
8.	AC B151	Engineering Chemistry Lab.	0	0	3	2	No	Yes
9.	ME B151	Fluid Mechanics & Fluid Machinery Lab.	0	0	4	2	No	Yes
10	HU B151	Business Communication & Presentation Skill lab.	0	0	3	2	No	Yes
		Total	17	0	13	25		

BRIDGE COURSE SEMESTER II (JANUARY TO MAY)

Sl. No.	Course Code	Course Tile	L	T	P	Credit	GKCIET Diploma	Others Diploma
1.	AM B201	Comprehensive Mathematics-II	3	0	0	3	No	Yes
2.	EE B201	Basic Electrical & Electronics Engineering	3	0	0	3	No	Yes
3.	ME B201	Mechanics of Solid	3	1	0	4	No	Yes
4.	ME B202	Engineering Thermodynamics	4	0	0	4	No	Yes
5.	CS B201	Programming in C/C++	3	0	0	3	No	Yes
6.	HU B201	Sociology & Elements of Indian History for Engineers	3	0	0	3	No	Yes
7.	EE B251	Basic Electrical & Electronics Lab.	0	0	3	2	No	Yes
8.	ME B251	I. C. Engines and Automobile Engg. Lab.	0	0	3	2	No	Yes
9.	CS B251	Programming in C/C++ Lab.	0	0	3	2	No	Yes
10.	ME B252	Fabrication Shop & Mechanical Engg. Lab.	0	0	3	2	No	Yes
		Total	19	1	12	28		

DEGREE SEMESTER-I (AUGUST TO DECEMBER)

Sl. No.	Course Code	Course Tile	L	T	P	Credit	GKCIET Diploma	Others Diploma
1.	AM 5101	Engineering Mathematics-I	3	0	0	3	Yes	Yes
2.	AP 5101	Engineering Physics	3	0	0	3	Yes	Yes
3.	HU 5101	Environmental Science	2	0	0	2	Yes	Yes
4.	ME 5101	Design of Machine Element	4	0	0	4	Yes	Yes
5.	ME 5102	Primary Manufacturing Processes	3	0	0	3	Yes	Yes
6.	ME 5103	Heat and Mass Transfer	3	0	0	3	Yes	Yes
7.	CS 5101	Database Technology	2	0	0	2	Yes	Yes
8.	MC 5101	Technical Communication & Soft Skills	2	0	0	0	Yes	Yes
9.	ME 5151	Machine Design Practice-I	0	0	3	2	Yes	Yes
10.	ME 5152	Heat Transfer and Heat Power Laboratory	0	0	3	2	Yes	Yes
11.	CS 5151	Database Technology Lab.	0	0	3	2	Yes	Yes
12.	AP 5101	Engineering Physics lab.	0	0	3	2	Yes	Yes
		Total	**22**	**0**	**12**	**28**		

DEGREE SEMESTER- II (JANUARY TO MAY)

Sl. No.	Course Code	Course Tile	L	T	P	Credit	GKCIET Diploma	Others Diploma
1.	AM 5201	Engineering Mathematics- II	3	0	0	3	Yes	Yes
2.	AC 5201	Engineering Chemistry	2	0	0	2	Yes	Yes
3.	HU 5201	Economics for Engineers	3	0	0	3	Yes	Yes
4.	ME 5201	Design of Machine Component	3	0	0	3	Yes	Yes
5.	ME 5202	Machine Tools & Machining	3	0	0	3	Yes	Yes
6.	ME 5203	Elements of Mechatronics	3	0	0	3	Yes	Yes
7.	ME 5204	Kinematics & Mechanics of Machine	3	0	0	3	Yes	Yes
8.	AC 5251	Engineering Chemistry Lab.	0	0	3	2	Yes	Yes
9.	ME 5251	Mechatronics Lab.	0	0	3	2	Yes	Yes
10.	ME 5252	Machine Shop & Production Lab.	0	0	4	2	Yes	Yes
		Total	**20**	**0**	**10**	**26**		

DEGREE COURSE SEMESTER- III A (JUNE TO AUGUST)

Sl. No.	Course Code	Course Title	L	T	P	Credit	GKCIET Diploma	Other Diploma
1.	IT 6170	Industrial Training	0	0	0	3	Yes	Yes

DEGREE COURSE SEMESTER- III B (AUGUST TO DECEMBER)

Sl. No.	Course Code	Course Tile	L	T	P	Credit	GKCIET Diploma	Others Diploma
1.	AM 6101	Engineering Mathematics-III	3	0	0	3	Yes	Yes
2.	ME 6101	Dynamics of Machine	3	0	0	3	Yes	Yes
3.	HU 6101	Production & Operation Management	3	0	0	3	Yes	Yes
4.	ME 6102	Advanced Mechanics of Solid	3	0	0	3	Yes	Yes
5.	ME 6103	Non-Conventional Machining	3	0	0	3	Yes	Yes
6.	MC 6104	Value Education and Spirituality	3	0	0	0	Yes	Yes
7.	OE 601*	Open Electives-I	3	0	0	3	Yes	Yes
8.	ME 61A*	Professional Electives- I	3	0	0	3	Yes	Yes
9.	ME 6190	Assignments and Term Paper	0	0	0	2	Yes	Yes
10.	ME 6151	Dynamics of Machine Lab.	0	0	3	2	Yes	Yes
11.	ME 6151	Material Testing Lab.	0	0	3	2	Yes	Yes
		Total	**24**	**0**	**6**	**30**		

DEGREE SEMESTER- IV (JANUARY TO MAY)

Sl. No.	Course Code	Course Tile	L	T	P	Credit	GKCIET Diploma	Others Diploma
1.	ME 6201	CAD/CAM	3	0	0	3	Yes	Yes
2.	ME 6202	Refrigeration & Air Conditioning	3	0	0	3	Yes	Yes
3.	ME 6203	Metrology, Quality Control and Reliability	3	0	0	3	Yes	Yes
4.	OE 602*	Open Electives -II	3	0	0	3	Yes	Yes
5.	ME 62A*	Professional Electives- II	3	0	0	3	Yes	Yes
6.	ME 62B*	Professional Electives- III	3	0	0	3	Yes	Yes
7.	ME 6202	Refrigeration & Air Conditioning lab.	0	0	3	2	Yes	Yes
8.	ME 6202	CAD/CAM Lab.	0	0	2	1	Yes	Yes
9.	ME 6260	Comprehensive Viva-voce	0	0	0	2	Yes	Yes
10.	ME 6290	Project work & seminar	0	0	0	4	Yes	Yes
		Total	**18**	**0**	**5**	**27**	Yes	Yes

OPEN ELECTIVE-I

Sl. No.	Course Code	Course Tile
1.	OE 601A	Rural Technology & Community Development
2.	OE 601B	Computer Networking &Web based Technology
3.	OE 601C	Knowledge Management
4.	OE 601D	Global Strategy and Technology
5.	OE 601E	Renewable Energy Technology
6.	OE 601F	Value Engineering

OPEN ELECTIVE-II

Sl. No.	Course Code	Course Tile
1.	OE 602A	Maintenance & Safety Engineering Safety
2.	OE 602B	Production Planning & Control
3.	OE 602C	Project Management
4.	OE 602D	Planning for Sustainable Development
5.	OE 602E	Infrastructure Systems Planning

PROFESSIONAL ELECTIVE - I

Sl. No.	Course Code	Course Tile
1.	ME 61A1	I. C. Engine
2.	ME 61A2	Aerodynamics
3.	ME 61A3	Turbo machines
4.	ME 61A4	Finite Element Methods

PROFESSIONAL ELECTIVE - II

Sl. No.	Course Code	Course Tile
1.	ME 62A1	Theory of Elasticity
2.	ME 62A2	Management of Production System
3.	ME 62A3	Non-Prime Mover Design
4.	ME 62A4	Mechanical Vibration
5.	ME 62A5	Mechanical Handling of Materials
6.	ME 62A6	Non-Conventional Energy Sources
7.	ME 62A7	Power Plant Engineering

PROFESSIONAL ELECTIVE - III

Sl. No.	Course Code	Course Tile
1.	ME 62B1	Boundary Layer Theory
2.	ME 62B2	Industrial Robotics
3.	ME 62B3	Non-Destructive Evaluation & Testing
4.	ME 62B4	Instrumentation & Control Engineering
5.	ME 62B5	Welding Technology
7.	ME 62B6	Rapid Prototyping

BRIDGE COURSE SEMESTER-I
AM B101-COMPREHENSIVE MATHEMATICS-I

L T P **Credits: 03**
3 0 0

UNIT-I

Review of distance formula and section formula, Equation of straight line in various standard forms, Intersection of two straight lines, Angle between two lines, Condition of parallelism and perpendicularity, Perpendicular distance formula. General equation of a circle, Diameter form, Centre and radius of a circle, Circle through three non-collinear points, Tangent and normal to a circle at a given point on it, Condition of tangency. Verification of known formulae. (10 Hrs)

UNIT-II

Introduction to conic section, Standard equation of parabola, Ellipse and hyperbola (without proof), Writing equations when directrix, Focus and eccentricity are given; Finding focus, directrix, Latus-rectum, Axes, Eccentricity and vertex when equation is given. Arithmetic progression, Geometric progression, Arithmetic-geometric series, Special series: $\sum n$, $\sum n^2$, $\sum n^3$.Functions, Domain and range. Concept of limit, continuity of a function (with simple examples). Physical & geometric meaning of $\frac{dy}{dx}$, differentiation of $x^n, \sin x, \cos x, \tan x, e^x, a^x$ and $\log x$ from the first principle. Differentiation of sum, Difference, Product, Quotient. (10 Hrs)

UNIT-III

Differentiation of function of a function. Chain rule of differentiation of inverse trigonometric functions, Logarithmic and parametric differentiation, Differentiation of implicit function. Equations of tangent and normal (for explicit function only).Successive differentiation, Leibnitz's theorem. Fundamental theorems: Rolle's Theorem & Lagrange's mean value theorem. Expansion of function using Taylor and McLauren's series. Indeterminate forms, L'Hospital rule. Equation of tangent and normal (for explicit function only). Concept of integration, Integration of rational and irrational functions. (10 Hrs)

UNIT-IV

Organization of data. Measures of Central Tendency- Mean, median, mode. Measures of Disperson - Standard deviation. Karl Pearson's coefficient of correlation. Probability and its laws. Conditional probability. Baye's theorem (without proof). Random Variable, Discrete and Continuous probability Distributions, Binomial and Poisson distributions. Probability mass function, Probability density function; Distribution Function, Expectation, Variance, Probability correlation and Regression, Method of Least Squares: Linear Curve Fitting.(10 Hrs)

RECOMMENDED BOOKS:

Text books on Mathematics for XI, NCERT, New Delhi
Text books on Mathematics for XII, NCERT, New Delhi
Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern Ltd
Probability and Statistics for Science and Engineering, G Shanker Rao
Schaum's Outline Series, Probability & Statistics, Tata McGraw Hill
Engineering Mathematics, Koneru Sarveswara Rao
Ordinary and Partial Differential equations –M.D Rai singhania

AP B101: ENGINEERING PHYSICS

L T P **Credit: 3**
3 0 0

UNIT-I

Moment of Inertia: Moment of Inertia of rigid body, Radius of gyration, Theorem of parallel and perpendicular axes, Moment of inertia of a straight rod, Circular ring, Circular disc, Cylinder(solid and hollow) ,Sphere, relation between torque and moment of inertia, Kinetic energy and angular momentum, Motion of cylinder and sphere rolling without slipping on an inclined plane. Numerical problems. (8 Hrs)

UNIT-II

Kinetic Theory of Gases: Introduction, Fundamental assumption of kinetic theory of gases, Pressure exerted by gas, K.E of molecules, Kinetic interpretation of temperature, Derivation of gas laws from kinetic theory of gases. Numerical Problems. (5 Hrs)

UNIT-III

Wave Optics: Wave front and Huygen's principle, Interference of light, Young's double slit experiment, Qualitative idea of Spatial and Temporal Coherence, Conservation of energy and intensity distribution, Newton's ring. (4 Hrs)

Diffraction of light, Fresnel and Fraunhofer class, Fraunhofer diffraction due to a single slit. (3 Hrs)

Polarisation: General concepts of polarisation, Plane of vibration and plane of polarisation, Qualitative discussion on plane, Circularly and elliptically polarised light, Polarisation through reflection and Brewster's law. Numerical Problems. (3 Hrs)

Fiber Optics: Core and cladding, Step index and graded index fibers, Acceptance angle, Numerical aperture, Losses, Applications. (4 Hrs)

UNIT-IV

Cathode Rays: Discharge through gases at varying pressure, Cathode rays and their properties, Specific charge on electron by J.J.Thomson, Determination of charge of an electron, Millikan's oil drop method. (5 Hrs)

Nuclear Physics: Introduction, Isotopes, Isotones and isobars, Atomic mass unit, Mass defect and packing fraction, Nuclear stability, Radioactive laws, Nature of radiation emitted from the radioactive substance, Half-life and average life, Decay, Nuclear Fission and Fusion. Energy sources of stars and the sun. Numerical Problems. (5 Hrs)

Recommended Books:
Text Books:
Arthur Beiser - Concepts of Modern Physics (McGraw Hill)
College Physics – C.R. Dasgupta

Reference Books:
University Physics – Sears and Zemansky

AC B101: ENGINEERING CHEMISTRY

L T P **Credit: 3**
3 0 0

UNIT- I

Organic chemistry: Functional Group: (Cyanides, Isocyanides, Nitro compounds and amines) Nomenclature of Cyanides, Isocyanides, Nitro compounds and amines and their methods of preparation, Physical, Chemical properties and uses. (7 Hrs)

UNIT- II

Transition Metals and Coordination Chemistry: Transition Metals: Electronic configuration, General characteristic properties, And Oxidation states of transition metals. First row transition metals and general properties of their compounds oxides, Halides and sulphides. (5 Hrs)

Coordination Compounds: Nomenclature, isomerism in coordination compounds, Bonding in coordination compounds, Stability of coordination compounds, Application of coordination compounds, Compounds containing metal-carbon bond;Application of organo-metalics. (5 Hrs)

UNIT -III

Chemical Thermodynamics: First law of Thermodynamics: Internal energy, enthalpy, and application of first law of thermodynamics, Second and third law of thermodynamics: Entropy, Free energy, spontaneity of a chemical reaction, Free-energy change and chemical equilibrium. (7 Hrs)

Surface Chemistry: Surfaces: Adsorption, Colloids (preparation and general properties), Emulsions, Micelles; Catalysis: Homogeneous and heterogeneous, structure of catalyst. (4 Hrs)

UNIT- IV

Bio-molecules: Carbohydrates: Monosaccharide, Disaccharides, Polysaccharides; Amino acids and peptides: Structure and classification; Proteins and Enzymes: Structure of proteins, role of enzymes Nucleic acids: DNA and RNA; Lipids: Structure, Membranes and their functions. (6 Hrs)

Chemistry in Action: Dyes: Classification of dyes with examples; Chemicals in medicines: Antipyretics, Antibiotics, Analgesics, Antiseptics, Disinfectants, Anti-malarial, Tranquilizers, Germicides and anaesthetics, (only definition and examples); Rocket propellants: Types of propellants- solid, liquid and hybrid. (6Hrs)

Text Book:

1. A text book of Engineering Chemistry: Sashi Chawla
2. Engineering Chemistry: Amrita lal De, Abhranil De
3. Advance Chemistry: Philip Matthew
4. Engineering Chemistry: WILEY-INDIA
5. General and Inorganic Chemistry: R. P. Sarkar.

Reference Book:

1. Inorganic Chemistry: Huheey, Keiter, Keiter, Medhi
2. Physical Chemistry: Atkins
3. Physical Chemistry: Leidler
4. Chemical Kinetics: Laidler
5. Organic Chemistry: S. K. Ghosh
6. Organic Chemistry: McMurry and Simanek

ME B101: FLUID MECHANICS AND FLUID MACHINERY

L T P **Credits: 3**
3 0 0

UNIT- I

Introduction: Scope of fluid mechanics and its development as a science. Physical property of Fluid: Density, Specific gravity, Specific weight, Specific volume, Surface tension and capillarity, Viscosity, Compressibility and bulk modulus, Fluid classification.

Fluid statics: Pressure, Pascal's Law, Pressure variation for incompressible fluid, Atmospheric pressure, Absolute pressure, Gauge pressure and vacuum pressure, Manometer.

Hydrostatic Forces on Surfaces: Hydrostatic forcess on submerged surface, Force on a horizontal submerged plane surface, Force on a vertical submerged plane surface.

Buoyancy and floatation: Archimedes' principle, Stability of immersed and floating bodies, Determination of metacentric height.

Fluid kinematics: Introduction, Description of fluid flow, Classification of fluid flow. Reynold's number, Acceleration of fluid particles, Flow rate and continuity equation, Differential equation of continuity. (12 Hrs.)

UNIT- II

Fluid dynamics: Introduction, Euler's equation along a streamline, Energy equation, Bernoulli's equation and its application to siphon, Venturimeter, Orificemeter, Pitot tube.

Flow in pipes and ducts: Loss due to friction, Minor energy losses in pipes Hydraulic Gradient Line (HGL), Total Energy Line (TEL), Power transmission in the fluid flow in pipes, Fluid flow in pipes in series and parallel. Flow through nozzles. (8 Hrs.)

UNIT- III

Hydraulic turbine: Classification, Impulse and Reaction turbine; Tangential, Radial and axial turbine, Impulse turbine, Pelton wheel, Bucket dimensions, Number of buckets in pelton wheel, Efficiency and performance curves.

Reaction Turbines: Francis turbine and Kaplan turbine, Velocity triangle and efficiencies, Performance curve. Function of draft tube and casing cavitation. (10 Hrs.)

UNIT- IV

Centrifugal Pump: Constructional features, Vane shape, Velocity triangles, Efficiencies, Multi stage centrifugal pumps, Pump Characteristic, NPSH and Cavitation.

Positive displacement pumps: Reciprocating Pump, Working principle, Discharge, work done and power requirement, Slip, Indicator diagram. (10 Hrs.)

Text Books

1. Fluid Mechanics and Hydraulic Machines, Modi & Seth
2. Introduction to Fluid Mechanics and Fluid Machines by S.K. Som and G. Biswas, TMH
3. Fluid Mechanics, A.K.Jain, Khanna Publishers

Reference Books:

1. Fluid Mechanics by A.K. Mohanty, PHI
2. An Introduction to Fluid Dynamics by G.K.Batchelor, Cambridge University Press
3. Engineering Fluid Mechanics by Garde et. al., Scitech
4. Fluid Mechanics and Hydraulic Machines by R. K Bansal, Laxmi Publication.
5. Fluid Mechanics and Machinery by Ojha, Brerndtsson and chandramouli, Oxford University Press

ME B102: MATERIAL SCIENCE AND MEATALLURGY

L T P **Credits: 2**
2 0 0

UNIT-I

Nature and properties of materials: Classification of Engineering Materials, Engineering properties of materials. Crystal structures and lattices, Crystal imperfections, Concept of plastic deformation of metals, Slip and dislocations, Phase diagrams, Solidification and structure of metals and alloys, Iron-carbon diagram, Various types of bonds, Binary phase equilibrium characteristics of alloy, Ternary phase diagram. Hot and cold working of metals, Recovery, Recrystallisation and grain growth. (10 Hrs)

UNIT-II

Heat Treatment of Steels: Austenitic grain growth grain size and effect on heat treatment, Annealing, Normalizing, Hardening, Tempering, Spherodising, Austenitizing, Stress relieving, TTT and CCT diagrams

Case Hardening: Introduction to case hardening, Advantages of case hardening & its methods, Carburizing, Nitriding, cyaniding, Carbonitriding, and induction hardening. (10 Hrs)

UNIT-III

Alloy Steels: Industrial importance of alloys, Types of cast iron and steels, The properties and applications of various types of cast iron and steels, Coding of steel and other alloys, SG iron. (8 Hrs)

UNIT-IV

Plastic: Thermosetting and thermoplastics.

Ceramics: Types, structure, Mechanical properties, application

Composite Materials: Agglomerated Materials: Cermets .Reinforced Materials: Reinforced Concrete. Glass fiber reinforced plastics, Carbon fibre reinforced plastics, Fibre reinforced plastics, Laminated plastic sheets. Tefnol, Properties of composites, Metal matrix composites, manufacturing procedure for fiber reinforced composite.

Nano-materials: Introduction to Nano-materials. (12 Hrs)

Text Books:

1. Engineering Physical Metallurgy and Heat Treatment by Y.Lakhtin, Mir Publisher, Moscow.
2. Introduction to Physical Metallurgy by Avner, Tata McGraw Hill
3. Materials Science and Engineering by W.D.Callister, Wiley and Sons Inc.

Reference Books

1. Elements of Material Science and Engineering, L.H.Van Vlack, Addison Wesley
2. Physical Metallurgy: Principles and Practice by Ragahvan, PHI
3. Materials Science and Engineering by V.Raghavan, Prentice Hall of India Pvt.Ltd.
4. Processes and Material of manufacture by Lindberg, PHI.
5. Elements of Materials Science & Engineering by Van Vlack, Pearson
6. Mechanical Metallurgy by Dieter, Tata MacGraw Hill
7. Materials Science and Metallurgy By Daniel Yesudian, Scitech
8. Materials Science and Metallurgy by R.B.Choudhary, Khanna Publishers
9. Material Science and Processes by S.K.Hazra Chowdhury, Indian Book distributing Co.
10. Materials Science by M.S. Vijaya , G.Rangarajan, TMH
11. Materials Science by V. Rajendra, A. Marikani, , TMH

HU B101: BUSINESS COMMUNICATION AND PRESENTATION SKILLS

L T P **Credits: 3**
3 0 0

UNIT-I

Business communicationcovering, Role of communication in information age; Concept and meaning of communication; skills necessary for technical communication; Communications in a technical organization; Barriers to the process of communication. (6 Hrs)

Style and organization in technical communicationcovering, Listening, speaking, reading and writing as skills; Objectivity, clarity, precision as defining features of technical communication; Various types of business writing: Letters, reports, notes, memos; Language and format of various types of business letters; Language and style of reports; Report writing strategies. (8 Hrs)

UNIT-II

Communication and personality development covering, Psychological aspects ofCommunication, cognition as a part of communication; Emotional Intelligence; Politeness andEtiquette in communication; Cultural factors that influence communication. (6 Hrs)

UNIT-III

Oral Presentation and professional speakingcovering, Basics of English pronunciation; Elements of effective presentation; Body Language and use of voice during presentation; Connecting with the audience during presentation; Projecting a positive image while speaking; Planning and preparing a model presentation; Organizing the presentation to suit the audience and context; Basics of public speaking; Preparing for a speech. (10 Hrs)

UNIT-IV

Career Oriental Communicationcovering, Resume and bio data: Design & style; applying for a job: Language and format of job application. Job Interviews: purpose and process; How to prepare for interviews; Language and style to be used in interview; Types of interview questions and how to answer them; Group Discussion: structure and dynamics; Techniques of effective participation in group discussion; Preparing for group discussion. (10 Hrs)

Recommended Books:

1. Fred Luthans, Organizational Behaviour, McGraw Hill
2. M. Ashraf Rizvi, Effective Technical Communication, McGraw Hill
3. Wallace and masters, Personal Development for Life and Work, Thomson Learning
4. Malcolm Goodale, Professional Presentations
5. Farhathullah, T. M. Communication skills for Technical Students
6. Michael Muckian, John Woods, The Business letters Handbook
7. MLA Handbook for Writers of Research Paper

BRIDGE COURSE SEMESTER - II
AM B5201 - COMPREHENSIVE MATHEMATICS-II

L T P **Credit-03**
3 0 0

UNIT-I

Functions of two or more variables: Partial derivatives, homogenous functions. Euler's theorem , total derivative of an implicit function, tangent and normal to a surface, change of variables, Jacobians, Taylor's theorem for a function of two variables, maxima and minima of a function to two variables , Lagrange's method of undetermined multipliers. Line integral, double integral, change of order of integration, triple integral , change of variables. Applications to area and volume, beta and gamma functions, surface area of revolution, moment of inertia, centre of gravity. (10 Hrs.)

UNIT-II

Differential Equations: Higher order linear differential equation with constant coefficients, complementary function and particular integral, Method of variation of parameter, Solution of Cauchy -Euler's homogeneous equations. Solution of simple simultaneous differential equations, Cauchy's and Legendre's equation formation of partial differential equations. Non-linear differential partial differential equation of first order, Charpit's method, Homogeneous linear partial differential equations with constant coefficients. Non-linear equation of second order, separation of variables, Formation and solution of wave equation ,one dimensional heat flow equation and solution, two dimensional heat flow equation and solution. (10 Hrs.)

UNIT-III

Elementary transformations on a matrix: Row reduced Echelon forms, Rank of a matrix, consistency of system of linear equations, Gauss elimination process for solving a system of linear equations in three unknowns, Eigen values and Eigen vectors, properties of Eigen values, Reduction to diagonal form, Cayley- Hamilton Theorem, Inverse of a non-singular matrix, Idempotent matrices, complex matrices. (10 Hrs)

UNIT-IV

Scalar and vector fields: Definition and Terminologies; product- Dot, Cross, Box; vector triple product, differentiation of a variable vector, Scalar and Vector point functions; Vector Operator- Del, Gradient, curl and Divergence- their physical interpretation and applications, Directional derivative, line surface and volume integral, tangent planes and normal and related problems. Theorems of Green (in plane), Gauss and Stoke's theorem, their verification and applications. (10 Hrs)

Text Book:

1. R.K.Jain, S.R.K. Iyengar , Advanced Engg. Mathematics, Narosa
2. V. Krishnamurthy, An Introduction to Linear Algebra (for section I)
3. Thomas & Finney, Calculus, Pearson Education (for sections II, III, IV)
4.Linear Algebra in action –harry Dym
5.Differential equations with applications and programmes – S.Balachandra Rao, H.R. Anuradha

Reference Books:

1. Denial A Murray, Elementary Course in Differential Equations, Longman
2. Erwin Kreyszig, Advanced Engg. Mathematics, Wiley Eastern Limited, New Delhi
3. M.R.Spiegal, Advanced Calculus – Theory and Problems, Schaum Publications, New York

EE B01: BASIC ELECTRICAL ELECTRONICS ENGINEERING

L T P **Credits: 3**
3 0 0

UNIT - I

Introduction: Concept of current, Potential difference, Active and passive components, Power and energy resistivity, Effect of temperature on resistance, Heating effect of electric current, Ohm's Law, Kirchoff's Law. Application of Ohm's Law and Kirchoff's Law to solve simple DC circuits, Star-Delta transformation of resistors, Superposition theorem, Thevenin's Theorem, Norton theorem, Maximum power transfer theorem, Reciprocity Theorem. (10 Hrs)

UNIT - II

AC Fundamentals: Single phase AC, RMS and average values of different waveforms their mathematical relations, Form factor, Peak factor, Various types of power, Power factor, 3 phase AC system; Star-Delta connections; Inter-Relation between phase voltage, Current & line voltage, Current; 3 phase power and power factor measurement methods and numerical problems. (10 Hrs)

UNIT - III

Electromagnetism: Concept of MMF, Flux, Reluctance, Permeability, Analogy with electric circuits, Faraday's Law of Electromagnetic Induction, Lenz's idea of Hysteresis , Eddy currents and its significance. Basic Principle and construction of AC/DC motors, classification of AC/DC motors, EMF equation, Starting of motors, Advantages of AC/DC Motors; Transformer-basic Principle and construction, Classification, EMF equation, Transformation ratio, Losses and efficiency. (10 Hrs)

UNIT - IV

Basic Electronics: Basic details of elements e.g. Diode, Zener Diode, Transistor, Thyristor, Diac, Triac and their applications, Transistors in CE, CB, CC configurations. Oscillators and amplifiers, Advantages and disadvantages of +ve and –ve feedbacks, Introduction to OP-amp. Basic logic gates Number system, Binary octal and hexadecimal numbers; Basic Introduction to the concept of modulation, Need and modulation, Modulation index, Noise, AM, FM and their comparison. Introduction to transmitter and receiver. (10 Hrs)

RECOMMENDED BOOKS:

Title	**Author**	**Publisher**
Text Books:		
Basic Electrical Engineering	D P Kothari & I J Nagrath	TMH
Principles of Electrical & Electronics	J.S. Dhillon, Jarnail Singh Dhillon & Diljinder Singh	Kalyani
Reference Books:		
Electrical Machines	I. J. Nagrath & Gopal	TMH
Electronic Devices & Circuits	Millman & Halkias	McGraw Hill
Electrical Technology	B. L.Theraja	S.Chand

ME B101: MECHANICS OF SOLIDS

L T P **Credits: 4**
3 1 0

UNIT- I

Simple stress and strain: Load, Stress, Principle of St.Venant, Principle of Superposition, Strain, Hooke's law, Modulus of Elasticity, Stress-Strain Diagrams, Working Stress, Factor of safety, Strain energy in tension and compression, Resilience, Impact loads,

Analysis of Axially Loaded Members: Composite bars in tension and compression - temperature stresses in composite rods, statically indeterminate problems.

Shear stress, Complimentary shear stress, Shear strain, Modulus of rigidity, Poisson's ratio, Bulk Modulus, Relationship between elastic constants.

Members in Biaxial State of Stress: Analysis of Biaxial Stress. Plane stress, Principal stress and strain, Principal plane, strain rosettes, Mohr's Circle for Biaxial Stress. (10 Hrs.)

UNIT –II

Shear Force and Bending Moment for Simple Beams: Shear force and bending moment. Types of load and Types of support. Support reactions, Relationship between bending moment and shear force, Point of inflection. Shear Force and Bending Moment diagrams.

Simple Bending of Beams: Theory of simple bending of initially straight beams, Bending stresses, Shear stresses in bending, Distribution of normal and shear stress, Beams of two materials, Composite beams. (10 Hrs.)

UNIT –III

Torsion: Torsion in solid and hollow circular shafts, Twisting moment, Strain energy in shear and torsion, Strength of solid and hollow circular shafts. Stresses due to combined bending and torsion, Strength of shafts in combined bending and twisting.

Deflection of Beams: Differential equation of the elastic line, Slope and deflection of beams by integration method and area - moment method. (10 Hrs)

UNIT –IV

Theory of Columns and Strut: Eccentric loading of a short strut, Long columns, Euler's column formula, Lateral buckling, Critical Load, Slenderness ratio, Secant's formula, Empirical Column's formula.

Spring: Close - Coiled helical springs. Determination of spring stiffness for parallel and series combinations. (10 Hrs.)

TEXT BOOKS:

1. Elements of Strength of Materials by S.P.Timoshenko and D.H.Young, Affiliated EWP.
2. Strength of Materials by G. H. Ryder, Macmillan Press
3. Strength of Materials by James M. Gere and Barry J. Goodno, Cengage Learning

REFERENCE BOOKS:

1. Mechanics of Materials by Beer and Johnston, Tata McGraw Hill
2. Mechanics of Materials by R.C.Hibbeler, Pearson Education
3. Strength of Materials by S.S.Rattan, Tata Mc Graw Hill
4. Strength of Materials by R.Subramaniam, Oxford University Press
5. Strength of Materials by Sadhu Singh, Khanna Publishers

ME B202: ENGINEERING THERMODYNAMICS

L T P **Credits: 4**
4 0 0

UNIT I

Introduction and scopes: Thermodynamics systems, Surroundings, Open system and closed systems, Thermodynamics states, Process and cycles, Microscopic point of view, Properties-Intensive and Extensive properties, Thermodynamic equilibrium, Quasi-state processes, Zeroth law of thermodynamics, Heat and work, Path function and state function, P-V diagrams, Work done at moving boundary for a quasi-static process. First law of thermodynamics for a closed system undergoing process, Different types of non-flow processes and their thermodynamic analysis from first law, First law of thermodynamic for an open systems, Internal energy enthalpy steady flow energy equation and its application to different flow processes. (10 Hrs)

UNIT II

Second law of thermodynamic: Limitations of first law of thermodynamics, Concept of heat engines and heat pump, Classical statement of second law of thermodynamics and their equivalence, concept of reversible and irreversibility processes, Factors affecting reversibility of a process. Corollaries of second law of thermodynamics, Reversible cycle and its efficiency, Thermodynamic temperature scale, Clausius inequality, Enthalpy, Entropy change during process. Temperature – Entropy diagrams, Principle of entropy increase. (8 Hrs)

UNIT III

Properties of pure substance: Gas laws, Ideal gases and equation of state, CP and CV definition and relations properly relations, P-V-T surfaces, Properties of pure substance, Use of properties table and charts of pure substance. (6 Hrs)

Air standard cycle: Joule cycle, Otto cycle, Diesel cycle, Dual cycle, Efficiency of cycles, Mean effective pressure, Steam power cycles- Rankine cycle, Modified Rankine cycle, Efficiency calculations. (10 Hrs)

UNIT IV

Thermodynamic Relations: Maxwell's relation, Coefficient of expansion and compressibility, Energy relations for a simple system, Specific heat relations, Joule-Thomson coefficient, Relations of enthalpy and entropy. (6 Hrs)

Text Books:

1. Engineering Thermodynamics by P. K. Nag, Publisher:TMH
2. Fundamentals of Thermodynamics by Sonntag, Borgnakke, Van Wylen, John Wiley & Sons
3. Fundamentals of Engineering Thermodynamics by E. Rathakrishnan, PHI

Reference:

1. Engineering Thermodynamics by Y.V.C. Rao, University Press
2. Thermodynamics and Thermal Engg. by Kothandaraman & Domkundwar, Dhanpat Rai
3. Applied Thermodynamics by P.L.Ballaney, Khanna Publishers
4. Fluid Mechanics by J.F.Douglas, J.M.Gasiorek, J.A.Swaffield and L.B.Jack, Pearson Education.
5. Applied Thermodynamics – Rajput, Laxmi
6. Introduction to Thermodynamics - Rogers & Mayhew, Pearson

CS B201: PROGRAMMING IN C/C++

L T P **Credits: 3**
3 0 0

UNIT – I

Introduction: What is object oriented programming? Why do we need object oriented. Programming characteristics of object-oriented languages. C and C++.

C++ Programming basics: Output using cout. Directives. Input with cin. Type bool. The set manipulator. Type conversions. (8 Hrs)

UNIT – II

Functions: Returning values from functions. Reference arguments. Overloaded function. Inline function. Default arguments. Returning by reference.

Object and Classes: Encapsulation, Abstraction, Polymorphism, Classes, Messages Association, Interfaces, Implementation of class in C++, C++ object as data types constructor. Object as function arguments. The default copy constructor, returning object from function. Structures and classes. Classes objects and memory static class data. Const and classes.(10 Hrs)

UNIT – III

Arrays and string arrays fundamentals. Arrays as class Member Data: Arrays of object, string, The standard C++ String class

Operator overloading: Overloading unary operations. Overloading binary operators, Data conversion, Pitfalls of operators overloading and conversion keywords. Explicit and Mutable.

Inheritance: Concept of inheritance. Derived class and based class. Derived class constructors, Member function, Class hierarchies, Public and private inheritance, Aggregation : Classes within classes, Inheritance and program development. (10 Hrs)

UNIT – IV

Pointer: Addresses and pointers. The address of operator and pointer and arrays, Memory management: New and Delete, Pointers to objects, Debugging pointers.

Virtual Function: Virtual Function, Friend function, Static function, Assignment and copy initialization, This pointer, Dynamic type information. (6 Hrs)

UNIT – V

Streams and Files: Streams classes, Stream Errors, Disk File I/O with streams, File pointers, error handling in file I/O with member function, Overloading the extraction and insertion operators, Memory as a stream object, Command line arguments, and printer output.

Templates and Exceptions:

Function templates, Class templates Exceptions, The Standard Template Library (6 Hrs)

Text/References Books:

TITLE	AUTHOR	PUBLISHER
C++ : The Complete Reference	Herbert Schildt	Tata McGraw Hill Education
Object Oriented Programming in C++	R Rajaram	New Age International
Object Oriented Programming in C++	Sourav Sahay	Oxford University Press

HU B201: SOCIOLOGY & ELEMENTS OF INDIAN HISTORY FOR ENGINEERS

L T P **Credits: 3**
3 0 0

UNIT- I

The objective of this course is to familiarize the prospective engineers with elements of Indian history and sociological concepts and theories by which they could understand contemporary issues and problems in Indian society. The course would enable them to analyze critically the social processes of globalization, Modernization and social change. All of this is a part of the quest to help the students imbibe such skills that will enhance them to be better citizens and human beings at their work place or in the family or in other social institutions. (4 Hrs)

UNIT- I A

Introduction to Elements of Indian History: What is history? History Sources- Archaeology, Numismatics, Epigraphy & Archival research; Methods used in History; History & historiography. (3 Hrs)

UNIT- I B

Introduction to sociological concepts-structure, System, Organization, Social institutions, Culture social stratification (caste, class, gender, power). State & civil society. (6 Hrs)

UNIT- II A

Indian history & per iodization; evolution of urbanization process: First, Second & third phase of urbanization; Evolution of polity; Early states to empires; Understanding social structures feudalism debate. (4Hrs)

UNIT- II B

Understanding social structure and social processes: Perspectives of Marx, Weber & Durkheim; (5 Hrs)

UNIT- III A

From Feudalism to colonialism-the coming of British; Modernity & struggle for independence. (3 Hrs)

UNIT- III B

Political economy of Indian society. Industrial, Urban, Agrarian and Tribal society; Caste, Class, Ethnicity and Gender; Ecology and Environment; (5 Hrs)

UNIT- IV A

Issues & concerns in post-colonial India (up to 1991); Issues & concerns in postcolonial India 2nd phase (LPG decade post 1991) (3 Hrs)

UNIT- IV B

Social change in contemporary India: Modernization and globalization, Secularism and communalism, Nature of development, Processes of social exclusion and inclusion, Changing nature of work and organization. (5 Hrs)

Text/Reference Books:

(a) History
1. Desai, A.R. (2005), Social Background of Indian Nationalism, Popular Prakashan
2. Guha, Ramachandra (2007), India After Gandhi, Pan Macmillan

3. Thapar, Romila (2002), Early India, Penguin
4. Sharma R.S.(1965), Indian Feudalism, Macmillan
5. Deshpande, Satish (2002), Contemporary India: A Sociological View, Viking
6. Gadgil, Madhav & Ramachandra Guha(1993), This Fissured Land: An Ecological History of India, OU Press

(b) Sociology:
7. Giddens, A (2009), Sociology, Polity, 6th edn.
8. Haralambos M, RM Heald, M Holborn (2000), Sociology, Collins
9. Xaxa, V (2008), State, Society and Tribes Pearson
10. Chandoke, Neera & Praveen Priyadarshi (2009), Contemporary India: Economy, Society and Politics,Pearson
11. Oommen,T.K.(ed.) (1997), Citizenship and National Identity: From Colonialism to Globalization, Sage.
12. Mohanty, M (ed.) (2004), Class, Caste & Gender- Volume 5, Sage
13. Dhanagare, D.N. , Themes and Perspectives in Indian Sociology, Rawat
14. Ramaswamy, E.A. and Ramaswamy,U.(1981), Industry and Labour, OU Press
15. Bhowmik, S (ed.) (2010), Street Vendors in the Global Urban Economy, Routledge
16. Rao, M.S.A. (ed.) (1974), Urban Sociology, Orient Longmans

DEGREE SEMESTER - I (AUGUST TO DECEMBER)

AM 5101: ENGINEERING MATHEMATICS - I

LT P **Credits: 3**
3 0 0

UNIT-I

Vector space: Vector space over the field of real numbers, subspace of a vector space and a criterion for a sub-space, Linear combination, Linear independence and linear dependence of vectors, Basis and dimension of vector space; Liner transformations: Kernel and images of a linear transformation; Kernel and Images of a linear transformation formation subspaces, Nullity and Rank of a linear transformation, Inner Product space; Norm of a vector; Orthogonal and ortho-normal set of vectors. (10 Hrs.)

UNIT-II

Sequences: Convergence and divergence of an infinite series and typical examples of convergent and divergent series. Series of positive terms. Test of convergence:- Comparison test, Integral test, Ratio test, Raabe's test, logarithmic test, Cauchy's root test, alternating series, Leibnitz's rule. Absolute and conditional convergence, power series. (10 Hrs.)

UNIT-III

Three dimensional geometry: Distance formula, section formula, direction ratios and direction cosines, Equation of a plane (general form, normal form and intercept form),Equations of a straight line, Condition for a line to lie in a plane , Coplanar lines, shortest distance between two lines, Intersection of three planes, Point of intersecting planes representing a straight line. Equation of a sphere, cone and cylinder. Equation of tangent Planes to sphere, Cone, cylinder. Rectangular Cartesian, Spherical polar & Cylindrical polar co-ordinate system. (10 Hrs)

UNIT-IV

Series solution of a differential equations and it's applications: Introduction, Validity of series solution of an equation, General method to solve equation type:$P_0y^{"} + P_1y' + P_2y = 0$, Bessel's equation, Legendre's equation, Legendre function, recurrence formula for Legendre function, Orthogonality. Verification of Legendre function$(P_n(x))$ and Bessel function $(J_n(x))$ as the solutions of Legendre and Bessel equations respectively, Graphical representation of these solutions. (10hrs)

Text Book:

1. R.K.Jain, S.R.K. Iyengar , Advanced Engg. Mathematics, Narosa
2. V. Krishnamurthy, An Introduction to Linear Algebra (for section I)
3. Thomas & Finney, Calculus, Pearson Education (for sections II, III, IV)

Reference Books:

1. Denial A Murray, Elementary Course in Differential Equations, Longman
2. Erwin Kreyszig, Advanced Engg. Mathematics, Wiley Eastern Limited, New Delhi
3. M.R.Spiegal, Advanced Calculus – Theory and Problems, Schaum Publications, New York

AP 5101: ENGINEERING PHYSICS

L T P **Credits: 3**
3 0 0

UNIT-I

Mathematical Preliminaries: Vector triple Product, Gradient, Divergence and curl of vectors, Vector identities, Line, Surface and Volume integral of vectors, Divergence theorem and Stokes theorem (No deduction necessary). Expression of grad, Div, Curl and Laplacian in spherical and cylindrical coordinates. (6 Hrs)

UNIT-II

Modern Physics: Special Theory of Relativity: Objective and Result of Michelson Morley experiment, Postulate of special theory of relativity, Galilean transformation, Lorentz transformation, Relativity of simultaneity, Length contraction and time dilation, Relativistic addition of velocities, Mass energy equivalence, Relativistic energy – momentum relationship, mass less particles. (7 Hrs)

Quantum Mechanics : Blackbody radiation, Planck's radiation law, Compton effect, wavelength shift and recoil of electrons; De Broglie hypothesis, Wave group, group velocity and particle velocity; Uncertainty relation (qualitative) and its applications, Operators, Schrodinger time dependent and time independent equation, Expectation values of physical quantities(position, momentum and energy) application to free particle and particle in a box(1D and 3D potential well), Discussion on degenerate levels. (8 Hrs)

UNIT-III

Statistical Mechanics: Introduction, Principle of equal a prior probability, Equilibrium state of a dynamic system, Thermodynamic probability, Distribution of particles in compartments, Phase space, Microstates and Macrostates, Maxwell-Boltzmann statistics, Speed distribution; need for quantum statistics, Bose-Einstein statistics, Planck's, Wien's displacement and Stefan's laws; Fermi-Dirac statistics, Free electron gas model, Fermi energy, average KE and speed of electron at 0K. (8 Hrs)

UNIT-IV

Solid State Physics and Semiconductor Devices: Lattice and basis, Idea of symmetry and seven crystal systems, Atomic packing factor for cubic systems, Miller indices, X-ray diffraction and Bragg's Law. Classification of bonding, Band theory of solids (qualitative). Conductors, Insulators, Semiconductors, Intrinsic & Extrinsic, Semiconductors, P-N junction diode, depletion region, Potential barrier, Forward and reverse biasing, Diode as rectifier. (7 Hrs)

Laser: Spontaneous and Stimulated emission, Einstein's A and B coefficients, Population inversion, Optical resonator and condition for Lasing action, Types of lasers (He-Ne, Ruby, CO_2 and semiconductor laser), Applications of Lasers. (4 Hrs)

Text Books:

Arthur Beiser - Concepts of Modern Physics (McGraw Hill)
College Physics – C.R. Dasgupta

Reference Books:

University Physics – Sears and Zemansky

HU 5101: ENVIRONMENTAL SCIENCES

L T P **Credits: 2**
2 0 0

UNIT- I

Introduction: Basic ideas of environment, Basic concepts related to environmental perspective, Man, Society and environment, Their inter relationship. (4 Hrs)
Mathematics of population growth and associated problems, Definition of resource, Types of resource, renewable, Non-renewable, potentially renewable, Effect of excessive use vis-à-vis population growth,definition of pollutant and contaminant. Environmental impact assessment. (5 Hrs.)

Environmental degradation: Toxic element, particulates etc. and its effect on man. Overall methods for pollution prevention, Environmental problems and sustainable development, Components of environment. (5 Hrs)

UNIT- II

Ecology: Renewable and Non-renewable Resources; Biosphere; Ecosystem and its Components, Nutrient cycles (C, N, P); Energy Flow; Food Chain; Food Pyramid; Bio magnification; Terrestrial and Aquatic ecosystem; Biodiversity. (5 Hrs)

Water Pollution: Water and Wastewater Quality Parameter (Temperature, Turbidity, Taste and Odour, Colour, Solids, pH, Metals - Fe, Mn, As, Hardness, Alkalinity, Chloride, Fluoride, Nitrate, Organic Matters- BOD & COD, Pathogens- Indicator Organisms), Brief Overview on Water Treatment; Water quality standard. (6Hrs)

UNIT- III

Air Pollution: Environmental Lapse Rate, Simple global temperature model, Particulate Control Devices - Types and Working Principle; Stack and plume; Air quality standard. (5Hrs.)

Solid Waste Management: Sources; Types and Characteristics; Disposal Methods of Municipal Solid Waste - Sanitary Landfill, Composting, Incineration; Biomedical Waste. (3 Hrs)

UNIT- IV

Noise Pollution: Classification - Continuous, Intermittent, Impulsive; Sound Levels – Pressure Level, Intensity Level, Power Level; Noise Measurement Criteria - Leq, Adding and Averaging of Noise levels; Noise quality standard. (5 Hrs)

Environmental Issues: EIA –definition and applicability; Pollution Control Acts. (2 Hrs)

Recommended Books:
Text Book:
Environment & Ecology by Gourkrishna Dasmohapatra
Introduction to Environmental Science and Engineering by Amal Kumar Dutta
Introduction to Environmental Science by Gilbert M. Masters
Reference Book:
Fundamentals of Ecology by M. C. Dash
Environmental Engineering by Peavy, Rowe and Tchobanoglous

ME 5101: DESIGN OF MACHINE ELEMENT - I

L T P **Credits: 4**
4 0 0

[Only specified data book as mentioned in the syllabus is permitted during examination]

UNIT- I

Fundamentals of Machine Design: Stages in design, Standardization, Interchangeability, Preferred numbers, Fits and Tolerances, Engineering materials, Ferrous, Non-ferrous, Non-metals, Indian standard specifications for Ferrous materials, Allowable stress, Factor of safety, Use of Code/Data books.

Design of Joints: Riveted joints, Boiler joints, Welded and bolted joints based on different types of loading. Illustrative problems with solutions. (12Hrs.)

UNIT- II

Cotter joint: Design of Cotter joints with socket and spigot, with a Gib. Design of knuckle joint. Illustrative problems with solutions.

Design of shafts: Solid and hollow based on strength and on rigidity. Illustrative problems with solutions. (9 Hrs.)

UNIT- III

Design of keys and pins: Suck key, Feather key, Taper pin. Illustrative problems with solutions.

Design of shaft couplings: Rigid Flange coupling, Flexible Flange coupling.

Design of belt and pulley: Power screw design with square thread, Such as screw jack. Illustrative problems with solutions. (10 Hrs.)

UNIT- IV

Design of springs: Design of circular section, Helical springs, Tension and compression types, Design of leaf springs: Cantilever and semi-elliptical types. Illustrative problems with solutions.

Levers: Classification, Design of Foot levers, Hand lever, Cranked lever, Lever of lever loaded – safety - valve. (9 Hrs.)

TEXT BOOKS:

1. Mechanical Engineering Design, J.E.Shigley, C.R.Mischke, R.G.Budynas and K.J.Nisbett, TMH.
2. Machine Design, P.Kanaiah, Scietech Publications

REFERENCE BOOKS:

1. Design of Machine Elements, V.B. Bhandari, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2nd Edition 2007.
2. Machine Design, P.C.Sharma and D.K.Agrawal, S.K.Kataria & Sons
3. Machine Design, Pandya and Shah, Charotar Book Stall
4. Machine Design**,** Robert L. Norton, Pearson Education Asia, 2001.
5. A Text Book of Machine Design, R.S.Khurmi and J.K.Gupta, S.Chand Publication.
6. Machine Design, H.Timothy and P.E.Wentzell, Cengage Learning.
7. Computer Aided Analysis and Design, S.P.Regalla, I.K.International Publishing.

DESIGN DATA HAND BOOKS:

1. P.S.G.Design Data Hand Book**,** PSG College of Tech Coimbature.
2. Design Data Hand Book**,** K. Lingaiah, McGraw Hill, 2nd Ed. 2003.
3. Design Hand Book by S.M.Jalaluddin ; Anuradha Agencies Publications.

ME 5102: PRIMARY MANUFACTURING PROCESSES

L T P **Credits: 3**
3 0 0

UNIT- I

Foundry: Types of patterns, pattern materials and pattern allowances. Composition of molding sand, Properties of molding sand and sand testing. Casting processes of ferrous and non-ferrous metals including sand casting, Die casting, Investment casting, Centrifugal casting, and continuous casting. Melting furnaces - cupola, Resistance furnace, Induction and arc furnace. Solidification principles, Design of moulds, Risering, Sprues and Gating system, Casting defects. Degasification and inoculation of metals. (12Hrs.)

UNIT- II

Metal Joining Processes: Introduction to gas welding, cutting, Arc welding and equipment's. TIG, MIG, Submerged Arc Welding, Friction Welding, resistance welding and Thermit welding. Weldablity. Metal transfer in arc welding, Modern Welding methods like plasma Arc, Laser Beam, Electron Beam, Ultrasonic etc. Soldering, Brazing, Welding defects. (12Hrs.)

UNIT- III

Plastic Deformation of Metals: Deformation by slip and twinning, Recrystallization**.** Hot and cold working of metal. Hot forming, cold forming, Rolling, Forging, Drawing, and Stamping, Piercing, Shearing, Coining, Punching and Extrusion. (8 Hrs.)

UNIT- IV

Force analysis in forming and rolling operations: Calculation of roll pressure, etc., Force analysis in extrusion operation, Frictional and frictionless drawing, Extrusion and tube drawing. (8 Hrs.)

Text Books:

1. Manufacturing technology - by P.N.Rao Vol.-I, Tata McGraw Hill publication.
2. Welding Technology by R.A. Little, TMH
3. Manufacturing Science by A.Ghosh and A K Malick, EWP

Reference Books:

1. Fundamentals of metal casting technology by P.C. Mukherjee, Oxford PIBI.
2. Mechanical Metallurgy by Dieter, Mc-Graw Hill
3. Processes and Materials of Manufacture by R.A Lindberg, Prentice hall (India)
4. A Text Book of Production Engineering by P.C.Sharma, S.Chand
5. Production Engineering Sciences by P.C.Pandey and C.K.Singh, Standard Publishers Ltd.
6. Manufacturing Technology,Radhakrishnan,Scitech
7. Principles of Manufacturing Materials and Processes, James S.Campbell, TMH.
8. Manufacturing Engineering Technology, K. Jain, Pearson Education

ME 5103: HEAT & MASS TRANSFER

L T P **Credits: 3**
3 0 0

UNIT- I

Introduction to heat transfer: Modes of heat transfer-conduction, Convection and radiation, Basic equation and application; Generalized conduction differential equation simple steady and unsteady state solutions, One dimensional heat conduction with or without heat generation, composite walls, Cylinder and spheres, Electrical analogies of thermal system. (11 Hrs)

UNIT- II

Two-dimensional heat conduction: Analytical and graphical methods of solution, Shape factors, Numerical methods and it's application. Review of definition and various laws of thermal radiation, Black body, real surfaces, Radiation properties, Gas radiation, Shape factor, Radiating surfaces, Gray surfaces, Irradiation, 3-surface system, Errors in temperature measurements. (10 Hrs)

UNIT- III

Mass transfer: Molecular diffusion, convective mass transfer. Convective heat transfer: Concept of boundary layer, Velocity boundary layer, Thermal boundary layer, Turbulent and laminar flow, Continuity equation, Momentum equation, Energy equation. (8 Hrs)

UNIT- IV

Dimensional analysis: Nusselt number correlation, Constant heat flux, Turbulent flow, Flow across cylinders, Force convection for internal flow-Laminar and turbulent. Natural convection, Grashoff number analytical method, Constant heat flux, Horizontal and incline flat surfaces & cylindrical surfaces, Combine forced and free conversion. Types of heat exchanger-LMTD, Effectiveness, Special cases, NTU, Boiling processes and mechanism (basic idea only). (11 Hrs)

Text Books:

1. Fundamentals of Engineering Heat and Mass Transfer: R.C.Sachdeva, New Age International Publishers, 4th Edition
2. Heat Transfer : J.P.Holman, TMH Publications
3. Basic Heat Transfer by Necati Ozisik, Mcgrawhills Publications

References Books:

1 Heat Transfer: P.S.Ghosdastidar, Oxford University Press
2. Heat Transfer by P.K. Nag, TMH
3. Heat Transfer by S.P. Sukhatme, TMH
4. Heat Transfer: A.F.Mills and V.Ganesan, Pearson Education, 2nd Edition
5. Heat and Mass Transfer: Domkundwar and Arora, Danpatrai and sons
6. Heat Transfer: R.K.Rajput, Laxmi Publications
7. Heat and Mass Transfer: A Practical Approach, Y.A.Cengel, Tata Macgraw Hills Education Private Limited

CS 5101: DATABASE TECHNOLOGY

L T P **Credits: 2**
2 0 0

UNIT-I

Introduction to databases: Basic concepts, DBMS, why DBMS, Relational Model: Relations, Entity, Attribute, Relationships, Key: Super key, Candidate Key and Primary Key, Foreign key; E-R model, Data Constraints, Basic Normalization concepts, Basic transaction concepts. (13 Hrs)

UNIT – II

Introduction to SQL: Basic table concepts, Creating table, Inserting data into table, Updating table data, Modifying table structure, Viewing table data etc. (5 Hrs)

UNIT – III

Grouping data: LIKE clause, Arithmetical and logical operations on table data, views.

(8 Hrs)

UNIT – IV

SQL security clauses: GRANT and REVOKE clause, Introduction to PL/SQL. (14 Hrs)

Text/References:

TITLE	AUTHOR	PUBLISHER
SQL, PL/SQL: The Programming Language of Oracle	Ivan Bayros	BPB Publications
Oracle Database 11g PL/SQL Programming	Michael Mclaughlin	Tata McGraw-Hill Education
SQL in easy steps	Mike McGrath	Tata McGraw-Hill Education

MC 5101: TECHNICAL COMMUNICATION & SOFT SKILLS

L T P **Credits: 0**
2 0 0

UNIT-I

Speech Mechanism: Organs of speech, Consonants & Vowels (basics) Cardinal Vowel Scale, Production of Speech Sounds, Description & Classification of Speech Sounds. Introduction to Linguistics, Sociolinguistics; Language Usage. (12 Hrs)

UNIT-II

Business Communication: Business Letters, Drafting Notices, Memos, Agenda and Minutes of Meetings, Applications for Jobs, Facing Interviews (10 Hrs)

UNIT-III

Basics of Grammar: Narration, Voice, Words Often Confused, (05 Hrs)

UNIT-IV

Prepositions. Rhetoric/ Figures of Speech, Writing Skills, Oral Skills.
Introduction to poetry: Poem-I: Reading/ Explanation & Poem-II: Reading/ Explanation (13 Hrs)

Recommended books:

Title	Author	Publisher
An Introduction to Pronunciation of English	Gimson	ELBS
Modern Linguistics: an Introduction	Verna and Krishanswamy	Oxford University
Modern Prose: Stories, Essays and Sketches	Michael Thorpe	Oxford University
Writing Skills	Oliviera and Motta	Penguin
Oxford Guide to Effective Writing &Speaking	John Seely	Oxford University Press
English Pronouncing Dictionary	Daniel Jones	ELBS
New International Business English	Leo Jones	Cambridge
Collins Cobuild English Grammar	John Sinclair	ed. Collins
Rhetoric/ Figures of Speech	Bose and Sterling	

DEGREE SEMESTER- II (JANUARY TO MAY)

AM5201- ENGINEERING MATHEMATICS- II

L T P **Credits: 3**
3 0 0

UNIT-I

Laplace transformations of elementary functions: Properties of Laplace transform, Transform of derivative and integrals, Evaluations of integrals by Laplace transforms , Inverse Laplace transforms, Convolution theorem, Solution of ordinary differential equations, Unit step function and unit impulse function, Engineering applications . Z-transform and inverse Z-transform. (10 Hrs)

UNIT-II

Fourier series: Euler's formula, Problems on general Fourier series, Conditions for Fourier expansion, Fourier expansions of discontinuous functions , Change of interval , Even and odd functions, Half range series, Application to standard wave forms, Parseval's identity, Fourier transform and its properties, Inverse Fourier transform, Fourier transform of derivative, application of Fourier transform in solving partial differential equations-Laplace's equation, Heat conduction equation and wave equation. (10 Hrs)

UNIT-III

Limit of a complex function: Differentiation, Analyticity, Cauchy-Riemann equations, harmonic functions , Conformal mapping , Some special transformations – translation, inversion and rotation, Bilinear transformation, Line integral , Cauchy's theorem (proof using Green's theorem),Cauchy's integral formula , Morera's theorem , Cauchy's inequality, Poisson's integral formulae .Power series .Taylor's and Laurent's series .Singularities .Zeros. Residues, Cauchy's residue theorem. Integration around unit circle, integration over semi-circular contours (with or without real poles), Integration over rectangular contours. (10 Hrs)

UNIT-IV

Graph Theory: Graph, Sub-graphs, Operations on graphs, Isomorphism, Walk, Path, Circuit, Shortest path, Tree, Properties of tree, Binary Tree, Pendant Vertices, Distance and centers in a tree, Rooted and binary trees, Spanning trees, Counting of tree, Linear programming problem & Game Theory. (10 Hrs)

Text Book:

R.K.Jain&S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa Publishing House
G.B. Thomas & R.L. Finney, Calculus: Analytical Geometry, Addison Wesley

Reference Books:

Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern
David Widder, Advanced Calculus, PHI
Glyn James, Advanced Modern Engg. Mathematics, Pearson

AC 5201: ENGINEERING CHEMISTRY

L T P
2 0 0 **Credits: 2**

UNIT- I

Solid state chemistry: Introduction to stoichiometric defects (Schottky & Frenkel) and non-stoichiometric defects (Metal excess and metal deficiency); Role of silicon and germanium in the field of semiconductor, Transistors, Elements of band theory, Conductors, Semi-conductors and insulators. (5 Hrs)

Bio - Chemistry :(Enzymes): Physiochemical nature of enzymes, Importance, classification and nomenclature, Mechanism of enzyme action, Factors affecting enzyme activity. Coenzyme and their role in biological systems. (5 Hrs)

UNIT- II

Applied Chemistry :(Corrosion): Direct, Chemical corrosion and mechanism, Electrochemical corrosion and mechanism, Galvanic corrosion, Concentration cell corrosion, Atmospheric corrosion, Passivity, Pitting corrosion, Factors influencing corrosion, Prevention of corrosion. (5 Hrs)

Lubricants: Classification of lubricants, Lubricating oils, Semisolid lubricants, Solid and synthetic lubricants. Properties of lubricating oils (viscosity, Flash and fire points cloud and pour point, Mechanical stability and saponification number). (5 Hrs)

UNIT- III

Biochemical Techniques: Ion exchange chromatography, Gas chromatography, Liquid chromatography, Thinlayer chromatography. (5 Hrs)

Polymerization: Concepts, classifications and industrial applications; Polymerization processes, Degree of polymerization (addition and condensation polymerization); Preparation, structure and use of some common polymers: Plastic (PE, PP, PVC Bakelite), Rubber (natural rubber, SBR, NBR), Fibre (nylon 6,6, polyester);Conducting and semiconducting polymers. (6 Hrs.)

UNIT -IV

Industrial Chemistry: Solid, liquid and gaseous fuels; Constituents of coal, Carbonization of coal, Coal analysis, Proximate and ultimate analysis; Classification of coal. Petroleum, gasoline, Octane number, Aviation fuel, Diesel, Cetane number; Natural gas, water gas. (5 Hrs)

Analytical Chemistry: (Spectroscopic Techniques in Chemistry) Introduction, Principle and concept of UV, IR and NMR. (4 Hrs)

Text Book: 1. A text book of Engineering Chemistry: Sashi Chawla
2. Engineering Chemistry: Amrita lal De,Abhranil De
3. Advance Chemistry: Philip Matthew
4. Engineering Chemistry: WILEY-INDIA5. General and Inorganic Chemistry: R. P. Sarkar

Reference Book:

1. Inorganic Chemistry: Huheey, Keiter, Keiter, Medhi
2. Physical Chemistry: Atkins
3. Physical Chemistry: Leidler
4. Chemical Kinetics: Laidler
5. Organic Chemistry: S. K. Ghosh
6. Organic Chemistry: McMurry and Simanek.

HU 5201 ECONOMICS FOR ENGINEERS

L T P **Credits: 3**
3 0 0

UNIT-I

Basic Principles and Methodology of Economics: Demand/Supply – elasticity –Government Policies and Application. Theory of the Firm and Market Structure. Basic Macroeconomic Concepts (including GDP/GNP/NI/Disposable Income) and Identities for both closed and open economies. Aggregate demand and Supply (IS/LM). Price Indices (WPI/CPI), Interest rates, Direct and Indirect Taxes. (12 Hrs)

UNIT-II

Public Sector Economics: Welfare, Externalities, Labour Market. Components of Monetary and Financial System, Central Bank –Monetary Aggregates; Commercial Banks &their functions; Capital and Debt Markets. Monetary and Fiscal Policy Tools & their impact on the economy – Inflation and Phillips Curve. (12Hrs)

UNIT -III

Elements of Business/Managerial Economics and forms of organizations: Cost &Cost Control –Techniques, Types of Costs, Budgets, Break even Analysis, Capital Budgeting, Investment Analysis – NPV, ROI, IRR, Payback Period. (08Hrs)

UNIT-IV

Issues of Inclusion: Sectors, States/Regions, Groups of people (M/F), Urbanization. Employment–Informal, Organized, Unorganized, Public, Private. Challenges and Policy Debates in Monetary, Fiscal, Social, Externalsectors. (08Hrs)

Recommended Books:

1. Mankiw Gregory N., Principles of Economics (2002), Thompson Asia.
2. V. Mote, S. Paul, G. Gupta., Managerial Economics (2004), Tata McGraw Hill.
3. Misra, S.K. and Puri., Indian Economy (2009), Himalaya.
4. Pareek Saroj, Textbook of Business Economics (2003), Sunrise Publishers.

ME 5201: DESIGN OF MACHINE COMPONENTS

L T P **Credits: 3**
3 0 0

UNIT- I

1. **Review of axial, bending and torsional stresses in machine parts:** Theories of Failure, Applications in practical problems.
2. **Variables stresses in machine parts:** Variables stresse (Fatigue), Endurance limit, S - N curve, Fatigue stress concentration factor, Goodman, Gerber and Soderberg criteria, Application to design and practical problems.
3. **Design of Pressure vessels:** Thin cylindrical and spherical shells, Design of end closures, Thick cylindrical shells, Application to practical problems. (12 Hrs.)

UNIT- II

4. **Design of clutch:** Friction clutch, Cone clutch and Centrifugal clutch,
5. **Design of Brake:** Block & Band brake, Internal expanding shoe brake. (8 Hrs.)

UNIT- III

6. **Sliding contact bearings**: Design of sliding contact bearings, Journal bearing, foot step bearing
7. **Ball and roller bearings:** Types and selection of ball and roller bearings, Dynamic and static load ratings, Bearing life, Problem illustration. (8 Hrs.)

UNIT- IV

8. **Design of gears:** Design of straight and Helical spur gears, Bevel gears.
9. **Design of Engine components**: Piston, Connecting Rod, Crank Shaft, Flywheel, Illustrative problems with solutions. (12 Hrs.)

DESIGN DATA HAND BOOKS:

1. Design Hand Book by S.M.Jalaluddin ; Anuradha Agencies Publications
2. P.S.G.Design Data Hand Book**,** PSG College of Tech Coimbatore
3. Machine Design Data Book, K.Lingaiah, Tata Mcgraw Hill

TEXT BOOKS:

1. A Text Book of Machine Design, R.S.Khurmi and J.K.Gupta, S.Chand Publication, 14th Edn,
2. Design of Machine Elements, V.B. Bhandari, Tata McGraw Hill Publishing Company Ltd., New Delhi, 3rd Edn

REFERENCE BOOKS:

1. Mechanical Engineerng Design, J.E.Shigley, C.R.Mischke, R.G.Budynas and K.J.Nisbett, TMH
2. Design of Machine Elements, M.F.Spotts,
3. Machine Design, P.C.Sharma and D.K.Agrawal, S.K.Kataria & Sons
4. Machine Design**,** Robert L. Norton, Pearson Education Asia, 2001.
5. Fundamentals of Machine Component Design, Robert C. Juvinall and Kurt M Marshek, Wiley India Pvt. Ltd., New Delhi, 3rd Edition, 2007
6. Machine Design, P.Kanaiah, Scietech Publications

ME 5202: MACHINE TOOLS AND MACHINING

L T P **Credits: 3**
3 0 0

UNIT-I

Metal Cutting: Fundamentals of metal cutting, Geometry of cutting tools in ASA and ORS, Effect of Geometrical parameters on cutting force and surface finish, Mechanics of chip formation, Merchant's theory, Force relationship and velocity relationship, Cutting tool materials, Types of Tool Wear: Flank wear, Crater wear, Wear measurement, Cutting fluid and its effect; Machinability Criteria, Tool life and Taylor's equation, Effect of variables on tool life and surface finish, Measurement of cutting force, Lathe tool dynamometer, Drill tool dynamometer. Economics of machining. (13 Hrs.)

UNIT-II

Conventional machining process and machine tools: Turning, Drilling, Shaping, Planning, Milling, Grinding. Machine tools used for these processes, Their specifications and various techniques used. (13 Hrs.)

UNIT-III

Tooling: Jigs and fixtures, Principles of location and clamping; Batch Production and Mass Production.

Operations on Capstan and Turret Lathes, Single Spindle Automats. Tool holding and job holding methods in different Machine tools, Types of surface generated, Indexing mechanism and thread cutting mechanism, Quick return mechanism. (7 Hrs.)

UNIT-IV

Finishing: Microfinishing Operations like honing, Lapping and superfinishing. (7 Hrs.)

Text Books :

1. Fundamentals of Machining and Machine Tools, G.Boothroyd and W.A.Knight, CRC Press.
2. Metal Cutting Principles, M.C.Shaw, Oxford University Press
3. Metal Cutting Theory and Practice, A.Bhattacharya, Central Book Publishers

Reference Books :

1. Manufacturing Technology – by P.N.Rao, Tata McGraw Hill publication.
2. Manufacturing Science, Ghosh and Mallik, East West Press.
3. Metal Cutting Theory and Practice, D.A.Stephenson and J.S.Agapiou, CRC Press
4. Machining Technology; Machine Tools and Operation, H.A.Youssef and H. El-Hofy, CRC Press
5. Machine Tools and Manufacturing Technology, Krar, Rapisarda and Check, Cengage Learning
6. Technology of Machine Tools, Krar, Gill and Smidt, Tata McGraw Hill
7. Principles of Metal Cutting, G.Kuppuswamy, Universities Press
8. Metal Cutting and Machne Tools, G.T.Reddy, Scitech
9. Fundamentals of tool Engineering Design, S.K.Basu, S.K.Mukherjee, R. Mishra , Oxford & IBH Pub Co.
10. Elements of workshop Technology, SK Chaudhry and Hajra, Asia Publishing House.

ME5203: ELEMENTS OF MECHATRONICS

L T P **Credits: 3**
3 0 0

UNIT – I

Fluid power systems: Components, Advantages, Applications in the field of M/c tools, Material handling, Hydraulic presses, Mobile & stationary machines, Clamping & indexing devices etc. Transmission of power at static & dynamic states.

Types of Hydraulic fluid petroleum based, Synthetic & water based. Properties of fluids. Selection of fluids, additives, Effect of temperature & pressure on hydraulic fluids. Seals, Sealing materials, Selection of seals. Filters strainers, Sources of contamination of fluid & its Control. JIC Symbols/ISO Symbols for hydraulic & pneumatic circuits. (10 Hrs)

UNIT – II

Pumps: Types, Classification, principle of working & constructional details of vane pump, Gear pumps, radial & axial plunger pumps, Power and efficiency calculations, Char, Curves, selection of pumps for hydraulic power transmission.

Reciprocating & rotary compressors, Roots-blower, Air preparation units, Filter, Regulators & lubricators, Actuators, Air motors, Pressure regulating valves.

Accumulators & intensifiers: Types & functions of accumulators, Intensifiers, Applications, Selection & design procedure. (10 Hrs)

UNIT – III

Control of fluid power: Necessity of pressure control directional control, Flow control valves, Principle of pressure control valves, Direct operated, Pilot operated, Relief valves pressure reducing valve, Sequence valve & methods of actuation of valves. Directional control valves, Solenoid operated, Push button; & lever control valves. Flow control valves. Check valves methods of actuation, Mechanical, Pneumatic & electrical etc.

Flow control valves: Principle of operation, Pressure compensated, Temp. Compensated flow control valves, Meter in & meter out flow control circuits, Bleed off circuits.

Direction control valves : Check valves, types of D.C. Valves : Two way two position, Four way three position, Four way two position valves, Open center, Close center tandem center valves, Method of actuation of valves, Manually operated solenoid operated, Pilot operated etc. (10 Hrs)

UNIT – IV

Actuators: Linear & Rotary actuators, Hydraulic motors, - Types, Vane, Gear piston, Radial piston. Methods of control of acceleration types of cylinder & mountings calculations of piston velocity, Thrust under static & dynamic applications. Design consideration for cylinders.

Hoses & Pipes: Types, Materials, Pressure drop in hoses/pipes. Hydraulic piping connections. (10 Hrs)

TEXT BOOKS:

1. Introduction to Fluid Power by Sahashtrabudhe, Nirali Prakashan Pune
2. Industrial Hydraulics by J.J. Pipenger, mcgraw Hill Co,
3. Pneumatics circuits By D.S. Mujumdar.

REFERENCE BOOKS:

1. Pinches, “Industrial Fluid Power; Prentice Hall
2. Vickers manuals on Industrial Hydraulics
3. H.L. Stewart,” Hydraulics & Pneumatics, “Industrial Press
4. Yeaple, “Fluid Power Design Handbook.”

ME 5204: KINEMATICS AND MECHANICS OF MACHINES

L T P **Credit: 3**
3 0 0

UNIT- I

Mechanisms : Basic Kinematic concepts and definitions, Mechanism, Link, Kinematic Pair, Classification of kinematic pairs, Degrees of freedom, Kinematic chain, Binary Ternary and Quaternary joints and links, Degrees of freedom for plane mechanism, Gruebler's criterion, Inversion of mechanism, Four bar chains and their inversions, Single slider crank chain, Double slider crank chain and their inversion.

Kinematic Analysis : Determination of velocity using graphical and analytical techniques, Instantaneous centre method, Relative velocity method, Kennedy theorem, Velocity in four bar mechanism, Slider crank mechanism, Rubbing velocity at a Pin-joint.

Acceleration Diagram for a slider: crank mechanism, Corioli's component of acceleration and its application. (13 Hrs.)

UNIT- II

Inertia forces in reciprocating Parts : Velocity and acceleration of piston by analytical method, Angular velocity and angular acceleration of connecting rod by analytical method and by graphical method, Piston effort, Force acting along the connecting rod, Crank effort, Turning moment on crank - shaft.

Dynamically equivalent system: compound Pendulum, correction couple. Turning moment diagrams for different types of engines, Fluctuation of energy and fluctuation of speed. (9 Hrs.)

UNIT- III

Brakes & Dynamometers: Classification of brakes, Analysis of simple block, Band and internal expanding shoe brake, Braking of a vehicle.

Absorption and transmission dynamometers, Prony brake, Rope brake, Band brake dynamometer, Belt transmission dynamometer, Torsion dynamometer.

Gear Trains: Simple Train, Compound train, Reverted train, Epicyclic train and their applications. (9 Hrs.)

UNIT- IV

Friction of a screw and nut: Square threaded screw, V-threaded screw, Pivot and collar friction, friction circle, Friction axis, Friction clutches, Transmission of power by single plate, mutiplate and cone clutches.

Belt, rope and chain drives: Initial tension, Effect of centrifugal tension on power transmission, Maximum power transmission capacity, Belt creep and slip. (9 Hrs.)

Text Books:

1. Theory of Machines by Thomas Bevan, CBS Publications
2. Theory of Machines by S.S.Rattan, Tata MacGraw Hill

Reference Books:

1. Kinematics and Dynamics of Machinery by Charles E. Wilson and J.Peter Saddler, Pearson Education
2. Theory of Machines and Mechanisms (India Edition) by John J. Uicker Jr., Gordon R. Pennock and Joseph E. Shigley, Oxford University Press
3. Theory of Machines and Mechanisms by P.L.Ballaney, Khanna Publishers
4. Mechanism and Machine Theory by J.S.Rao and R.V.Dukipatti, New Age International
5. Theory of Machines by R.S.Khurmi and J.K.Gupta, S.Chand Publication
6. A Textbook of Theory of Machines by R. K. Bansal, Laxmi Publication

DEGREE COURSE SEMESTER- III (AUGUST TO DECEMBER)

AM6101- ENGINEERING MATHEMATICS-III

L T P **Credits: 03**
3 0 0

UNIT-I

Errors in arithmetic operations and functions, Round-off error, truncation error, Absolute error, Relative error, Percentage error, Principles of equal effect, Significant digits, Intermediate value property, Bisection method, Method of false position, Secant Method, Newton-Raphson method, Iterative method, Convergence of these methods. (10 Hrs)

UNIT-II

Gauss Elimination method (with and without partial pivoting), Gauss-Seidel, Jacobi's methods, Triangularization method, Eigen value problem, Rayleigh's power method, Finite differences-forward, backward and central differences, Shift and averaging operators. (10 Hrs)

UNIT-III

Newton's forward, backward and divided difference interpolation formulae, Lagrange's formula, Gauss forward and backward difference interpolation formulae, Spline interpolation – quadratic and cubic, Numerical differentiation using Newton's forward and backward difference formulae. (10 Hrs)

UNIT-IV

Numerical integration – Trapezoidal rule, Simpson's one third and three-eighth rules, Romberg's integration, Error in integration, Taylor series method, Picard's method, Euler method, Modified Euler's method, Runge-Kutta methods (Upto fourth order) for solution of ODE of first order. (10 Hrs)

RECOMMENDED BOOKS:

Text Book

S.S. Sastry, Introductory Method of Numerical Analysis, PHI
Gerald Wheatley, Applied Numerical Analysis, Pearsons Education

Reference Books

M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Sc. and Engg. Computation,
P.B Patial & U P Verma, Numerical Computational Mathematics, Narosa
J.H. Mathew, Numerical Methods for Maths., Science and Engg., PHI

ME-6101: DYNAMICS OF MACHINES

L T P **Credits: 3**
3 0 0

UNIT-I

Dynamics Fundamental: Introduction, dynamic model, D'Alembert Principles, Energy method- Virtual work. Force Analysis: Static force analysis – static equilibrium of two- and three force members, members with two forces and torque. Dynamic Force Analysis: Force analysis of a four bar mechanism, Slider crank mechanism, and Whitworth quick return mechanism.

Cams : Types of cams, Types of followers, Types of follower motions - Simple Harmonic, Uniform Velocity and Constant Acceleration & Retardation Types, Analysis for Displacement, velocity and Acceleration of Follower, Generation of Cam Profiles by Graphical Method, Introduction on Cams with specified contours. (10 Hrs)

UNIT-II

Gears: Introduction, Classification, terminology, Law of Gearing Spur Gear, Velocity of sliding in mating teeth, Involute and Cycloidal teeth & their comparison, Length of path of contact, Contact Ratio, Interference, Number of teeth on wheel, Pinion & rack to avoid interference, Introduction to helical and worm gears.

Gyroscope: Gyroscopic torque, Gyroscopic effect on naval ship, Stability of an automobile, stability of a two wheeler. (10 Hrs)

UNIT-III

Flywheel & Governors: Introduction, an approximate analysis, Flywheel in punching, inertia force analysis of reciprocating engine, Fluctuation of energy, Speed, energy in flywheel, Type of governors, Function of governors, Sensitivity analysis, Stability of governors, Isochronous governors, Hunting, Power and efforts of Governors, Controlling force diagrams. (10 Hrs)

UNIT-IV

Balancing: Static and Dynamic Balancing, Balancing of Single Rotating Mass by Balancing Masses in Same plane and in Different planes. Partial balance of single cylinder engines. Primary and Secondary Balance of Multi-cylinder In-line Engines.

Vibrations: Introduction to Mechanical Vibration – Longitudinal, Torsional & Transverse Systems, Concept on Degrees of Freedom. Free and Forced Vibration of Un-damped and Damped Single Degree Freedom Systems, Vibration isolation and transmissibility, whirling of shafts and Evaluation of Critical Speeds of shafts. (10 Hrs)

Text Books

1. Theory of Machines by Thomas Bevan, CBS Publications
2. Theory of Machines by S.S.Rattan, Tata MacGraw Hill
3. Theory of Mechanisms and Machines by A.. Ghosh and A.. K.. Mallik, EWP

Reference

1. Kinematics and Dynamics of Machinery by R.L.Norton, Tata MacGraw Hill
2. Theory of Machines and Mechanisms by P.L.Ballaney, Khanna Publishers
3. Mechanism and Machine Theory by J.S.Rao and R.V.Dukipatti, New Age International
4. Theory of Machines by R.S.Khurmi and J.K.Gupta, S.Chand Publication
5. Theory of Machines by Shah Jadwani, Dhanpat Rai
6. A Textbook of Theory of Machines by R. K. Bansal, Laxmi Publication

HU 6101: PRODUCTION & OPERATION MANAGEMENT

L T P **Credits: 3**

3 0 0

Objective: The course aims at acquainting all engineering graduates irrespective of their specializations the basic issues and tools of managing production and operations functions of an organization.

UNIT-I

Operations Function in an Organization: Manufacturing Vrs Service Operations, System view of Operations, Strategic Role of Operations, Operations Strategies for Competitive Advantage, Operations Quality and Productivity Focus, Meeting Global Challenges of Production and Operations Imperatives. (5 Hrs.)

Designing Products, Services and Processes: New Product Design- Product Life Cycle, Product Development Process, Process Technology: Project, Jobshop, Batch, Assembly Line, Continuous Manufacturing; Process Technology Life Cycle, Process Technology Trends, FMS, CIM, CAD, CAM; Design for Services, Services Process Technology. (5 Hrs.)

UNIT-II

Work Study: Methods Study- Techniques of Analysis, recording, improvement and standardization; Work Measurement : Work Measurement Principles using Stopwatch Time Study, Predetermined Motion Time Standards and Work Sampling, Standard Time Estimation. (5 Hrs.)

Location Planning: Factor Influencing Plant and Warehouse Locations, Impact of Location on cost and revenues. Facility Location Procedure and Models: Qualitative Models, Breakeven Analysis.

Layout Planning: Layout Types : Process Layout, Product Layout, Fixed Position Layout Planning, Block diagramming, Line balancing, Computerized layout planning- overview. Group Technology. (5 Hrs.)

UNIT-III

Forecasting: Principles and Method, Moving Average, weighted Moving Average, Exponential Smoothing, Winter's Method for Seasonal Demand, Forecasting Error. (5 Hrs.)
Manufacturing Planning and Control: The Framework and Components: Aggregate Planning, Master Production Scheduling, Rough-cut-Capacity Planning, Material Requirements Planning, Capacity Requirements Planning. (5 Hrs.)

UNIT-IV

Sequencing and Scheduling: Single Machine Sequencing: Basics and Performance Evaluation Criteria, Methods for Minimizing Mean Flow Time, Parallel Machines: Minimization of Makespan, Flowshop sequencing: 2 and 3 machines cases : Johnson's Rule and Jobshop Scheduling : Priority dispatching Rules. (5 Hrs.)

Inventory Control: Relevant Costs, Basic EOQ Model, Model with Quantity discount, Economic Batch Quantity, Periodic and Continuous Review Systems, Safety Stock, Reorder Point and Order Quantity Calculations. ABC Analysis. (5 Hrs.)

Reference Book:

1. S.N.Chary, "Production and Operations Management", Tata McGraw Hill.
2. R. Paneerselvam, "Production and Operations Management, Prentice Hall of India.
3. Aswathappa & Bhatt – Production & Operations Management, HPH.
4. Gaither & Frazier - Operations Management, Cengage Publication
5. Russell & Taylor - Operations Management, PHI Publication

ME 5102: ADVANCED MECHANICS OF SOLID

L T P **Credits: 3**
3 0 0

UNIT- I

Elementary concept of elasticity: Stresses in three dimensions, Principal Stresses, Stress Invariants, Mohr's Circle for 3-D state of stress, Octahedral Stresses, State of pure shear, Differential equations of equilibrium and compatibility conditions, plane stress.
Analysis of strain: State of strain at a point, Strain Invariant, Principal Strains, Plane state of strain, Strain measurements. (10 Hrs.)

UNIT- II

Energy Methods: Work done by forces and elastic strain energy stored. Reciprocal relations, Theorem of virtual work, Castigliano's theorems,
Bending of beams: Asymmetrical bending, Shear centre, Bending of curved beams, Stress distribution in beam with rectangular, Circular and trapezoidal cross section, Stresses in crane hooks, Ring and chain links., Deflection of thick curved bars. (10 Hrs.)

UNIT- III

Axisymmetric problems: Thick walled cylinder subjected to internal and external pressures, Compound cylinders, Shrink fit,
Repeated stresses and fatigue in metals: Fatigue tests and fatigue design theory, Goodman, Gerber and Soderberg criteria, Concept of stress concentration, Notch sensitivity. (10 Hrs.)

UNIT- IV

Theories of Failure: Various yield criteria.
Introduction to Mechanics of Composite Materials: Lamina and Laminates, Micromechanics of FRP Composites.
Introduction to Fracture Mechanics: Basic modes of fracture, Fracture toughness evaluation. (10 Hrs.)

Text book:

1. Advanced Mechanics of Solids, L.S. Srinath, Tata McGraw Hill
2. Advanced Mechanics of Materials : Boresi and Schmdt, Willey

Reference book:

1. Advanced Mechanics of Materials : Siley and Smith
2. Strength of Materials Vol.II, by S.Timoshenko
3. Mechanical Metallurgy by Dieter
4. Strength of Materials by G. H. Ryder, Macmillan Press
5. Mechanics of Materials by Beer and Johnston, Tata McGraw Hill
6. Mechanics of Materials by R.C.Hibbeler, Pearson Education
7. Mechanics of Materials by William F.Riley, Leroy D.Sturges & Don H.Morris, Wiley Student.
8. Mechanics of Materials by James M. Gere, Thomson Learning
9. Engineering Machanics of Solids by Egor P. Popov, Prentice Hall of India
10. Strength of Materials by S.S.Rattan, Tata Mc Graw Hill

ME-6103: NON CONVENTIONAL MACHINING

L T P **Credits: 3**
3 0 0

UNIT-I

Introduction: Classification, Advantages & limitations of non-conventional machining, Ultrasonic machining (USM)-Principle of operation, Process details, Applications and advantages, Limitations of USM. (10 Hrs)

UNIT-II

Abrasive and Water Jet Machining: Basic principle, Mechanism of material removal, Working principle of Abrasive jet machining (AJM), Water jet machining (WJM), Merits & demerits, Application. (10 Hrs)

UNIT-III

Chemical Machining (CM): Working principle, Process characteristics, Procedures, advantages & disadvantages of chemical machining.

Electrochemical Processes: Fundamentals, details of machining setup, Materials and selection of tools, Applications, Concept of others processes like ECG, Electrochemical deburring etc. (10 Hrs)

UNIT-IV

Thermal Metal Removal Processes: Working principles, Mechanism of material removal, Process parameters, Advantages & limitations, applications of processes like electric discharge machining(EDM), Electron Beam Machining (EBM), Ion beam machining (IBM), Plasma arc machining (PAM), Laser beam machining(LBM). (10 Hrs)

Text Books/ Reference Books:

1. Modern machining process, Pandey and Shan, Tata McGraw Hill 2000
2. Manufacturing Engg. & Technology, Kalpakjian , Pearson Education
3. Manufacturing Science, A.Ghosh & A.K. Mallik, EWP
4. Production Technology, HMT, Tata McGraw Hill. 2001
5. Non-Conventional Machining, P.K.Mishra, The Institution of Engineers (India) Test book series, Narosa Publishing House – 2005.
6. Modern Machining Process, Aditya. 2002

MC 6104: VALUE EDUCATION AND SPIRITUALITY

L T P **Credits: 0**
2 0 0

UNIT- I

The importance and the needs of spirituality and value education: Personal Development & Values in life; Humanity vs. enmity, Cruelty, violence, Injustice, Exploitation, Corruption as well as gross violation of human rights; Exploring Spirituality. (6 Hrs.)

UNIT- II

Understanding Value Education: The Basic Human Aspirations-Continuous Happiness and prosperity , Self-Exploration as the Process for Value Education, Imbalance in human personality & society. (6 Hrs)

UNIT- III

Understanding the harmony at various levels: Understanding the Human Being as co-existence of self and body, Harmony in Self, family, Society, Nature and existence; Providing the Basis for Universal Human values and Ethical Human Conduct. (6 Hrs)

UNIT- IV

Vision for Holistic Technologies: Production Systems and Management Models; Holistic education relative to the present crisis; Change through knowledge; Meditation & Values in Society; Values for excellence in life; A spiritual life style. (6 Hrs)

Text books / References:

13. Discovering Myself: A graded series of ten books on value education
    Author(s) : Andre Bruylants S.J & Bruylants

Title	Introduction to Values Education
Author	E. Palispis
Publisher	Rex Bookstore, Inc.
ISBN	9712317927, 9789712317927

14. Law, Ethics and Communication
    Author: B S Jolly
    Publisher: Tata Mc-graw Hill Publishing Co.ltd. (2012)
15. Vivekananda: His Call to the Nation**Author:** Swami Vivekananda **Publisher:** Advaita Ashrama
16. Inspiring Thoughts, Publisher-Raj Pal & Sons.
17. Gospel of Shri Rama Krishna,Author: Rama Krishna,Pubilsher: Create Space
18. Study Materials of value education from Education wing of Brahma Kumaris Raj Yoga Education Research Foundation.

DEGREE SEMESTER- IV (JANUARY TO MAY)

ME-6201: CAD/CAM

L T P **Credits: 4**
3 0 0

UNIT-I

Fundamentals of CAD: Design process, Applications of computer for design, Creating the Manufacturing Database, The Design workstation, Graphical Terminal, Operator input Devices, Plotters and other devices, Central Processing Unit, Memory types. (10 Hrs)

UNIT-II

Computer graphics Software and Database: Configuration, Graphics Packages, Constructing the Geometry, Transformations of geometry, Database structure and content, Wire frame versus solid modeling, Constraint– Based modeling, Geometric commands, Display control commands, Editing. (10 Hrs)

UNIT-III

Fundamentals of Numerical Control: Principles of NC, Types of NC machines, Classification of NC: Motion control, Control loops, Power drives, Positioning systems, NC, CNC, DNC, Combined CNC/DNC systems. Components of NC machines: Prime movers, Transducers, Lead screw, Control loops and interpolation. (10 Hrs)

UNIT-IV

Numerical Control Programming: Block format and codes, Tool length and radius compensation, Manual and interactive part programming, Tool path simulation of lathe and milling, Post processor and auxiliary statements.

Adaptive Control Systems: Types, Advantages, Adaptive control for proper cutting speed, Feed in turning operation. (10 Hrs)

Text Books:

1. CAD/CAM Computer Aided Design and Manufacturing, M.P.Goover and E.W.Zimmers, Jr., Pearson

Reference Books:

1. CAD/CAM Theory and Practice, Zeid and Subramanian, TMH
2. CAD/CAM Principles, Practice and Manufacturing Management, McMahon and Browne, Pearson Education
3. CAD/CAM Concepts and Applications, C.R.Alavala, PHI
4. Computer Aided Design and Manufacturing, Lalit Narayan, Mallkarjuna Rao and Sarcar, PHI
5. CAD/CAM Theory and Conepts, K.Sareen and C.Grewal, S.Chand Publication
6. CAD/CAM/CAE, N.K.Chougule, Scitech
7. Principle of Interactive Computer Graphics, W.W.Newman, R.F.Sproull, TMH
8. Numerical Control and Computer Aided Manufacture, Kundra, Rao, Tiwari, Tata Mc Graw
9. Computer Aided Design and Manufacturing, Besant and Lui, EWP.

ME 6202: REFRIGERATION & AIR CONDITIONING

L T P **Credits: 3**
3 0 0

UNIT- I

Air Refrigeration System: Introduction, Unit of refrigeration, Coefficient of performance, Reversed Carnot Cycle, Temperature limitations, maximum COP, Bell Coleman air cycle, Simple Air Cycle System for Air-craft with problems.

Vapour Compression System: Analysis of theoretical vapour compression cycle, Representation of cycle on T - S and p - h diagram, Simple saturation cycle, Sub-cooled cycle and super-heated cycle, Effect of suction and discharge pressure on performance, Actual vapour compression cycle. Problem illustration and solution. (10 Hrs.)

UNIT- II

Multi-stage compression and Multi-evaporator systems: Different arrangements of compressors and inter-cooling, Multistage compression with inter-cooling, Multi-evaporator system, Dual compression system. Simple problems

Vapour Absorption System: Simple Ammonia - absorption system, Improved absorption system, Analysis of vapour absorption system (Specifically of analyzing coloumn and rectifier), Electrolux / Three fluid system, Lithium-bromide-water vapour absorption system, Comparison of absorption system with vapour compression system. Simple Problems and solution. (10 Hrs.)

UNIT- III

Refrigerants: Classification of refrigerants and its degignation- Halocarbon (compounds, Hydrocarbons, Inorganic compounds, Azeotropes, Properties of refrigerants, Comparison of common refrigerants, Uses of important refrigerants, Brines. Alternative refrigerants (Organic and inorganic compounds).

Psychrometrics: Properties of air-vapour mixture, Law of water vapour-air mixture, Enthalpy of moisture, Psychrometric chart, Simple heating and cooling, Humidification, De-humidification, Mixture of air streams. Review question and discussions. (10 Hrs.)

UNIT- IV

Requirements of comfort air conditioning: Oxygen supply, Heat removal, Moisture removal, air motion, purity of air, Thermodynamics of human body, Comfort and comfort chart, Effective temperature, Factors governing optimum effective temperature

Air Conditioning System: Process in air conditioning: Summer air conditioning, Winter air conditioning and year round air conditioning, Cooling load calculations. Review question and discussions. (10 Hrs.)

Text Books :

1. Refrigeration and Air Conditioning by R.C. Arora , PHI Publication
2. Refrigeration and Air Conditioning by S.C. Arora and S. Domkundwar, Dhanpat Rai & Sons.
3. Refrigeration and Airconditioning Data book by Manohar Prasad

Reference Books :

1. Refrigeration and Air conditioning by P.L. Balloney, Khanna Publishers.
2. Refrigeration and Air conditioning by Manohar Prasad,New Age international publishers.
3. Refrigeration and Air conditioning by C.P. Arora, Tata McGraw Hill.

ME-6203: METROLOGY, QUALITY CONTROL & REALIABILITY

L T P **Credits: 3**
3 0 0

UNIT – I

A. METROLOGY

Principles of Measurements, Line and End & optical Standards, Calibration, Accuracy and Precision, Random error and systemic error.

Measurement of Surface Roughness, Measurement of straightness, Flatness and circularity. Screw Thread and Gears.

Limits, Fits and Gauges, Assembly by full, Partial and group interchangeability, Geometric tolerances. (12 Hrs.)

UNIT – II

B. QUALITY CONTROL

Some useful Probability Distribution, Testing of hypothesis, Type I and Type II errors, Control limit theorem.

Causes of Variation, Standard error of mean, Process capability, PCR, RPI, Natural tolerance Limits, Specification Limits, Trial and Revised control Limits, Rational subgroups, Control charts for variable (X,R,S, CUSUM, EWMA), Control charts for fraction, Non-conforming control charts for non-conformation.

Design of single sampling plan. Double, Multiple and sequential sampling plans, O.C. curve, AOQ, AOQL. (12 Hrs.)

UNIT – III

C. RELIABILITY

Definition, Bath-tub-curve, System reliability, Reliability improvement, Maintainability and availability, Availability of single repairable system using Markov model, Life tests, acceptance sampling plan based on life tests, Sequential acceptance sampling plan based on MTTF & MTBF. (8 Hrs.)

UNIT – IV

Taguchi's Loss function, Orthogonal Arrays, Linear Graphs, parametric design, Signal-to noise Ratio, ANOVA, TQM, Taguchi, Total Productive Maintenance, ISO 9000, ZIT, Quality circle Kaizen, Poka Yoke, Supply Chain Management. (8 Hrs.)

Test Books

1. Engineering Metrology, R.K. Jain, Khanna Publisher, Delhi
2. Quality control and Application, B.L. Hansen and P.M. Ghare, Prentice Hall of India.
3. Reliability Engg. And Terotechnology , A.K. Gupta, Macmillan India.
4. Taguchi methods Explained Practical steps to Robust design T.P. Bagchi, PHI

Reference Books

1. A text book of Engineering Metrology I.C. Gupta, Dhanpat Rai & sons, Delhi.
2. E.L. Grant and R.S. Leveaworth, Statistical quality Control", 7e, MC-Graw Hill.
3. Introduction to Statistical Quality control, D.C. Montgonery, John Wiley & sons.
4. Introduction to /reliability and Maitainability Engg E. Ebeling, MC-Graw Hill.
5. Statistical Quality Control, M. Mahajan, Dhanpat Rai & Sons.
6. Statistical Process Control and Improvement, A. Mitra, Pearson.

OPEN ELECTIVE-I

OE 601A: RURAL TECHNOLOGY & COMMUNITY DEVELOPMENT

L T P **Credits: 3**
3 0 0

UNIT-1

Data Analysis and Measures of Central Tendency- Meaning, nature, Scope andlimitations of statistics, Collection of statistical data, classification, Tabulation and diagrammaticrepresentation of data, Measures of central tendency : Statistical averages Mean, Median, Mode. (08 Hrs)

UNIT- II

Data, Information and Knowledge; Concept of information, Need of information(professional, educational, research), Qualities of information, Value of information, Difference between data and information, Properties of the needed information. Information and Management;planning,organizing, Co-ordinating and controlling. (08 Hrs)

UNIT-III

Concepts of marketing; Difference between marketing selling and retailing; Marketing mix, market-segmentation, Marketing Planning. Strategy and Approaches; Modern concept of marketing.

Community development; Concept, Definition, Meaning, Need, History, Principles, Objectives and scope. Community Building: Coming of Age, Regenerating Community, Community Model. (16 Hrs)

UNIT- IV

Consensus Organizing Model, What's Behind Building Healthy Communities, Participatory Democracy, The Role of various NGOs in Community Development.The Role ofBusiness and Government in Community Development Initiatives How to Form a Non-profitCorporation Fund Raising and Grant Writing. (08 Hrs)

Text/Reference Books:

1. Biddle, William Wishart. 1968. Encouraging Community Development: A Training Guide for Local Workers. New York: Holt, Rinehart and Winston.
2. Clark, Kenneth B. and Jeannette Hopkins, eds. 1969. A Relevant War Against Poverty: A Study of Community Action Programs and Observable Social Change. New York: Harper and Row.
3. Clinard, Marshall Barron. 1970. Slums and Community Development: Experiments in Self-Help. New York: Free Press.
4. Creevey, Lucy E., ed. 1986. Women Farmers in Africa: Rural Development in Mali and the Sahel. Syracuse, NY: Syracuse University Press.
5. Dobyns, Henry F., Paul L. Doughty, and Harold D. Lasswell, eds. 1971. Peasants, Power, and Applied Social Change: Vicos as a Model. Beverly Hills, CA: Sage.
6. Edwards, Allen David and Dorothy G. Jones. 1976. Community and Community Development. The Hague, Netherlands: Mouton.
7. Green, Tova and Peter Woodrow. 1994. Insight and Action: How to Discover and Support a Life of Integrity and Commitment to Change. Philadelphia, PA: New Society Publishers.

OE 601B: COMPUTER NETWORKING AND WEB BASED TECHNOLOGY

L T P **Credits: 3**
3 0 0

UNIT -I

Evolution of computer networks: LAN and WAN Layered networks, Architecture - Standards and protocols; Data communication concepts; Network topologies and transmission media. Data link protocols; Reliable communication and flow control. Switching and rotuing protocols - Circuit and packet switching; Centralized and distributed control; congestion control. Medium access techniques - ALOWA, CSMA/CD, IEEE Standard 802 for LAN, satellite and packet radio networks. Inter networking - repeaters, bridges and routers. (10 Hrs)

UNIT -II

Case studies: Ethernet, TCP/IP, ISDN, FDDI, ATM. Network reliability and security. Introduction to Open Distributed Systems and Client Server Model. Unix network programming, the socket interface, Remote Procedure Call (RPC). Tools for developing distributed applications. Network management – SNMP protocol. Issues in the design of distributed information systems. (10 Hrs)

UNIT -III

World wide web: basic concepts, www client and web server, HTTP protocol, Universal resource locator (URL).

Creating web pages: HTML basics, Tags and categories including hyperlinks, Images and multimedia. Forms and clickable maps, Common gateway interface (CGI) scripts.

Scripting languages: Javascript, Jscript, Perl. (10 Hrs)

UNIT -IV

Java: its relevance in the internet scenario, the JAVA virtual machine. The Java language: basic syntax, variable types, control constructs.

Applications and applets: security issues. (10 Hrs)

References Books:

1. Computer Network by Andrew S. Tanenbaum, PHI
2. Internet & World Wide Web – How to program – by Deitel, Deitel & Neito, Pearson Education
3. Data Communication & Networking by Behrouz A. Forouzan, TMH
4. Computer Network Theory,Prasad,Scitech

OE 601C: KNOWLEDGE MANAGEMENT

L T P **Credits: 3**
3 0 0

UNIT-I

Introduction: Definition, evolution, need, drivers, scope, approaches in Organizations, strategies in organizations, components and functions, understanding knowledge; Learning

Organization: five components of learning organization, knowledge sources, and documentation. (8 Hrs)

UNIT-II

Essentials of Knowledge Management; knowledge creation process, knowledge management techniques, systems and tools. (8 Hrs)

UNIT-III

Organizational knowledge management; architecture and implementation strategies, building the knowledge corporation and implementing knowledge management in organization.(8 Hrs)

UNIT-IV

Knowledge management system life cycle, managing knowledge workers, knowledge audit, and knowledge management practices in organizations, few case studies. Futuristic KM: Knowledge Engineering, Theory of Computation, Data Structure. (16 Hrs)

Text Books:

1. Knowledge Management – a resource book – A Thohothathri Raman, Excel, 2004.
2. Knowledge Management- Elias M. Awad Hasan M. Ghazri, Pearson Education

Reference Books:

1. The KM Toolkit – Orchestrating IT, Strategy & Knowledge Platforms, Amrit Tiwana, Pearson, PHI, II Edn.
2. The Fifth Discipline Field Book – Strategies & Tools For Building A learning Organization – PeterSenge et al. Nicholas Brealey 1994
3. Knowledge Management – Sudhir Warier, Vikas publications
4. Leading with Knowledge, Madanmohan Rao, Tata Mc-Graw Hill.

OE 601D: GLOBAL STRATEGY & TECHNOLOGY

L T P **Credits: 3**
3 0 0

UNIT - I

Introduction to Global Strategy: What the motivations to expand abroad are and how firms can manage conflicting demands in terms of global integration, local responsiveness and worldwide learning. How Global are We? How global most MNCs are? The End of Corporate Capitalism Beyond Off shoring Distance Still Matters Going International. (8 Hrs)

UNIT - II

Location and Global Strategy: Home-Country Effects: Shifting global leadership in the watch industry Success of Swatch as a company in this industry Potential threat on the horizon that could once again cause the decline of the Swiss watch industry. Distance and Global Strategy: Host Country Choices: The Globalization of CEMEX The benefits that CEMEX has derived from expanding across borders Challenges that CEMEX is likely to confront in the future How far can Cemex‟s competitive advantage travel. Industry Characteristics and Global Strategy: Host - country choices: Characteristics of the global large appliances industry Design of an effective competitive strategy Haier‟s current global strategy Good rationale for Haier to make global expansion its top strategic priority. (12 Hrs)

UNIT - III

International Corporate Governance: International Corporate Governance with Chinese Characteristics Corporate governance matters in China‟s capital market Corporate governance model in China differ from international standards Special problems associated with Petro China‟s corporate governance model Conditions required for further reforms in Petro China‟s corporate governance system. Cross-cultural Negotiation: Learn from the MOUSE negotiation Issues/factorsaffect positively or negatively & the negotiation outcome Issues crucial in aligning different parties interests. Negotiators attitudes and culture in reaching the agreement The role of information acquisition in reaching an agreement in this negotiation. Foreign Market Entry Strategies: Issues around geographic market diversification and different strategies of internationalization Different entry modes into a foreign market Stages of internationalization International operations Tensions of a family-owned enterprise going international. (12Hrs)

UNIT - IV

Technology: Productivity and Diffusion: Productivity Impact and Managing Diffusion Science, Technology and Productivity. Technology, Markets and Competition Incumbents and Entrants Commercialization Intellectual Property and Complementary Assets. (8 Hrs)

Text/Reference Books:

1. Sumantra Ghoshal, “Global Strategy: an organizing framework.” Strategic Management Journal (1987), pp. 425- 440.
2. Ghemawat & Hout (2008) Tomorrow's Global Giants? Not the Usual Suspects, HBR Michael E. Porter, “The Competitive Advantage of Nations” HBR, 1990.
3. Pankaj Ghemawat, “Distance Still Matters: The Hard Reality of Global Expansion” Harvard Business Review Sept. (2001), pp. 137-147.

4. George S. Yip, “Global Strategy in a World of Nations?” Sloan Management Review (Fall 1989), pp. 29-41.
5. Larker and Tayan, “Models of Corporate Governance: Who's the Fairest of them all?” Stanford Business School Case, 2008, CG11.

6. Aguilera, R. V. (2005) “Corporate Governance” In J. Beckert and M. Zafirovski, International Encyclopedia of Economic Sociology. London: Rutledge.
7. Adler, Nancy “Negotiating Globally,” in International Dimensions of Organizational Behavior, Cincinnati, OH: South-Western College Publishing, 1997 (3rd edition.), pp. 189-232.
8. Brett, Jeanne M. 2001. “Making decisions and managing conflict in multi-cultural teams,” in Negotiating Globally. How to Negotiate Deals, Resolve Disputes, and Make Decisions across Cultural Boundaries. San Francisco: Joseey- Bass, pp. 136-166.
9. Kumar, V. and Subramaniam, V. “A Contingency Framework for the Mode of Entry Decision, ”Journal of World Business, 32(1) (Spring 1997), pp. 53-72.
10. Horn, J. T., Lovallo. D. P., and Viguerie, S. P. 2005. “Beating the Odds in Market Entry,” The McKinseyQuarterly, 4: 35-45.

OE 601E: RENEWABLE ENERGY TECHNOLOGY

L T P **Credits: 3**
3 0 0

UNIT- I

Biological fuel generation; Biomass as a Nene work energy source; type of Biomass; agriculture, Forest & animal residues; Industrial and domestic organic wastes; Conversion of biomass to clean fuels and Petrochemical substitutes by Physiochemical and/ or fermentation process. (10 Hrs)

UNIT- II

Hydrogen Production by photosynthetic bacteria bio photolysis of water and by fomentation; Microbial recovery of petroleum by bio polymers, bio surfactant. (10 Hrs)

UNIT- III

Biogas from anaerobic digestion; Thermal energy from biomass combustion; Ethanol from biomass. (8 Hrs)

UNIT- IV

Solar energy; Solar collectors, solar pond, Photovoltaic cells, Chemical storage; Geothermal energy & wind energy; Use of geothermal energy; Operating Principles of different types of wind energy mills; Nuclear reactions and power generation; Tidal wave energy. (10 Hrs)

Text/Reference Books:

1. Handbook of Renewable Energy Technology, Edited by Ahmed F. Zobaa, Ramesh C. Bansal, World Sceintific.
2. Renewable Energy Technologies, By Jean-Claude Sabonnadiere, Wiley
3. Renewable Energy Technologies: A Practical Guide for Beginners, by Chetan Singh Solanki, PHI

OE 601F: VALUE ENGINEERING

L T P **Credits: 3**
3 0 0

UNIT -I

Value Engg. : Concept theory and practice, Relevance to Indian Scenario, Value Engineering. (08 Hrs)

UNIT -II

Job plan and techniques: Phases of VE, Functional, Creative, Evaluation, Investigation, Implementation, Kinds of value, Value analysis. (8 Hrs)

UNIT -III

Fundamental analysis: Family tree, Logic question, Numerical evaluation FAST diagram. Function cost analysis, Worth, Project selection, Team selection, VE case studies, Production and productivity. (14 Hrs)

UNIT- IV

Herringbone diagram: VE application in discards vendor assistance.
Expertise various check list and audit. Quantity analysis. (10 Hrs)

Text / References :

1. Value Engineering., - S.S.Iyer, New Age International
2. Managing quality concepts and tasks - N.S.Sreenivasan, TMGH
3. Aesthetics and motivations in arts and science - K.C.Gupta.

OPEN ELECTIVE-II

OE 602A: MAINTENANCE AND SAFETY ENGINEERING

L T P **Credits: 3**
3 0 0

UNIT- I

Introduction: Importance of maintenance, Functions of maintenance, Type of maintenance, including total productive maintenance and its implementation, Organization of maintenance.

Wear and service life of equipment: (i) Methods of assembly and fitting – assembly of keyed joints, Splined joints, Fixed joints, Assembly of ball and roller bearings, Repairs and assembly of gears.

(ii)Wear of machines- types and reasons of wear, Defects due to wear of equipment, Corrosion and its prevention.

(iii)Recovery and strengthening of machine elements various methods of recovery and increasing service life. (12 Hrs)

UNIT- II

Maintenance of Production Equipment: Maintenance and repair of shafts, Bearings, spindles, Couplings and clutches, Gears, Bed services and link mechanisms.

Restoring The Guide Ways Of Machine Tools: Test of repaired equipment, fault-tracing sequence in fault tracing, Drawing decision tree.

Planning and Scheduling Maintenance Work: Factors involved in effective planning of maintenance work, Various methods of scheduling work, Categorization of plant/equipment for the purpose of priorities, VAIN analysis. (12 Hrs)

UNIT- III

Preventive Maintenance: Philosophy of PM, methods & schedules. Maintenance cost & replacement economics, Types of cost, Maintenance cost, Methods of cost comparisons, Factors in equipment Replacement, MAPI methods, Economics, Concept of maintainability. (8 Hrs)

UNIT- IV

Safety Engg.: Background of Industrial safety, Accident Causation, Industrial hazards, Accident investigation, Prevention, Safety education, Safety consideration in design of equipment, Legal aspects of Ind.. Safety. (8 Hrs)

Text Books:

Maintenance Engineering and management - R.C. Mishra & K. Pathak, - PHI publication
Maintenance Engineering and management - K. VenkatRamana, - PHI publication
Maintenance of Ind. Equipments - Gellery & Pakelts, - MIR publications
Ind. Maintenance - H.P. Garg, - S. Chand & company
Maintenance Engg. Handbook - Morrow
Modern Maintenance Management - Miller & Blood

OE 602B: PRODUCTION PLANNING & CONTROL

L T P **Credits: 3**
3 0 0

UNIT -I

Forecasting and methods of forecasting. **(**6 Hrs)

UNIT -II

Product design and development. **(**6 Hrs)

UNIT -III

Product planning and process planning. **(**6 Hrs)

UNIT -IV

Loading and scheduling of production systems. **(**6 Hrs)

UNIT- V

Dispatching and different types of dispatching for PPC. **(**6 Hrs)

UNIT -VI

Production control methods, Systems concepts in PPC. **(**6 Hrs)

Text/References:

1. Production , Planning and Control - Samuel Eilon, Universal Book Co.
2. Production , Planning and Control - J.R..King, Pergamon Press
3. Production and Inventory Control - Plossi and Wight, TMGH
4. Production and Operations Management- K.C.Arora

OE 602C: PROJECT MANAGEMENT

L T P **Credits: 3**
3 0 0

UNIT – I

Introduction to Project management: Characteristics of projects, Definition and objectives of Project Management, Stages of Project Management, Project Planning Process, Establishing Project organization. (10 Hrs)

UNIT – II

Work definition: Defining work content, Time Estimation Method, Project Cost Estimation and budgeting, Project Risk Management, Project scheduling and Planning Tools: Work Breakdown structure, LRC, Gantt charts, CPM/PERT Networks. (10 Hrs)

UNIT – III

Developing Project Plan (Baseline): Project cash flow analysis, Project scheduling with resource constraints: Resource Leveling and Resource Allocation. Time Cost Trade off: Crashing Heuristic. (06 Hrs)

UNIT – IV

Project Implementation: Project Monitoring and Control with PERT/Cost, Computers applications in Project Management, Contract Management, Project Procurement Management. (10 Hrs)

Post-Project Analysis: Introduction to Post-Project Analysis (04 Hrs)

Text/Reference Books:

1. Shtub, Bard and Globerson, Project Management: Engineering, Technology, and Implementation, Prentice Hall, India
2. Lock, Gower, Project Management Handbook.
3. Cleland and King, VNR Project Management Handbook.
4. Wiest and Levy, Management guide to PERT/CPM, Prentice Hall. Ibdia
5. Horald Kerzner, Project Management: A Systemic Approach to Planning, Scheduling and Controlling, CBSPublishers, 2002.
6. S. Choudhury, Project Scheduling and Monitoring in Practice.
7. P. K. Joy, Total Project Management: The Indian Context, Macmillan India Ltd.

OE 602D: PLANNING FOR SUSTAINABLE DEVELOPMENT

L T P **Credits: 3**
3 0 0

UNIT – I

Sustainable Development-explains and critically evaluates the concept of sustainable development, Environmental degradation and poverty Sustainable development: Its main principles, The evolution of ideas about sustainability, Strategies for promoting sustainable development, Resistances to the concept, and some alternative approaches. Examine some important current issues and areas of debate in relation to sustainable development. (10 Hrs)

UNIT – II

Innovation for sustainable development- Environmental management and innovation strategies. (10 Hrs)

UNIT – III

Societal transformations. Institutional theory. (08 Hrs)

UNIT – IV

Governance for sustainable development. Policy responses to environmental degradation.

Capacity development for innovation. Research methods. (12 Hrs)

Text/Reference Books:

1. Harris, J.M. (2204) Basic Principles for Sustainable Development, Global Development and Environment Institute, working paper 00-04. Available at: http://ase.tufts.edu/gdae/publications/Working_Papers/Sustainable%20Development.PDF
2. Robinson, J. (2004) Squaring the circle? Some thoughts on the idea of sustainable development Ecological Economics 48(4): 369-384.
3. Hjorth, P. and A. Bagheri (2006) Navigating towards Sustainable Development: A System Dynamics Approach, Futures 38: 74-92.
4. Mog, J.M. (2004) „Struggling with Sustainability – A Comparative Framework for Evaluating Sustainable Development Programs", World Development 32(12): 2139–2160. IISD Commentary on the OECD's Draft Principles for International Investor Participation in Infrastructure (PDF – 68 kb)
5. Arundel, A., R. Kemp, and S. Parto (2004) Indicators for Environmental Innovation: What and How to Measure, forthcoming in International Handbook on Environment and Technology Management (ETM), edited by D. Annandale, J. Phillimore and D. Marinova, Cheltenham, Edward Elgar.
6. Douthwaite, B. (2002) Enabling Innovation. A practical guide to understanding and fostering innovation, London, Zed Books.

OE 602E: INFRASTRUCTURE SYSTEMS PLANNING

L T P **Credits: 3**
3 0 0

UNIT – I

Infrastructure Systems Planning: An Overview Definitions, Infrastructure management activities, Evolutions of Systems since 1960s (Mainframes-to-Midrange-to-PCs-to-Client-server computing-to-New age systems) and their management, Growth of internet, Current business demands and IT systems issues, Complexity of today's computing environment, Total cost of complexity issues, Value of Systems management for business. (10 Hrs)

UNIT – II

Preparing for Infrastructure Systems Planning & Management: Factors to consider in designing IT organizations and IT infrastructure, Determining customer's Requirements, Identifying System Components to manage, Exist Processes, Data, Applications, Tools and their integration, Patterns for IT systems management, Introduction to the design process forinformation systems, Models, Information Technology Infrastructure Library (ITIL). (8 Hrs)

UNIT –III

Service Delivery Processes: Service-Level Management, Financial Management & Costing, IT Services Continuity Management, Capacity Management, Availability Management. Service Support Processes,Configuration Management, Service desk. Incident Management, Problem Management, Change Management, Release Management.

System thinking method for model-building of infrastructural planning Model observation, Construction of model structure, Simulation analysis, Multi-agent system. (10 Hrs)

UNIT – IV

Storage and Security Management: Introduction Security, Identity management, Single sign-on, Access Management, Basics of network security, LDAP fundamentals, Intrusion detection, Firewall; security information management Introduction to Storage, Backup & Restore, Archive & Retrieve, Space Management, SAN & NAS, Disaster Recovery, Hierarchical space management, Database & Application protection, Bare machine recovery, Data retention. (10 Hrs)

Text/Reference Books:

1. Foundations of IT Service Management: based on ITIL, by Jan Van Bon, Van Haren Publishing, 2005.
2. High Availability: Design, Techniques & Processes, by Floyd Piedad, Michael Hawkins, Prentice Hall, 2000.
3. IT Organization: Building a World class Infrastructure, by Harris Kem, Stuart Gaiup, Guy Nemiro, Prentice Hall, 2000.
4. IT Systems Management: Designing, Implementing, and Managing World-Class Infrastructures Rich Schiesser,Prentice Hall; 2001.

PROFESSIONAL ELECTIVE-I

ME 61A1: INTERNAL COMBUSTION ENGINES

L T P **Credits: 3**
3 0 0

UNIT- I

Review of basics of IC Engines : Basic components and nomenclature, Classification of IC engines, SI and CI engine, 2- and 4-stroke engine, Working principles of engines, Air standard cycles – Carnot cycle, Stirling cycle, Ericson cycle, Otto cycle, Diesel and Dual cycles, Comparison of Otto, Diesel & Dual cycles.

Fuel-air cycle and their analysis: Significance of cycle, Comparison with air standard cycle, Basis of cycle analysis, Variable specific heat, etc. Actual cycles and their analysis: Time loss factor, Heat loss factor, Exhaust blowdown. (12 Hrs)

UNIT- II

Fuels: Classification, Properties, Characteristics and rating, Alternate fuels; Air and fuel induction : Carburetion – factors affecting carburetion, Air-fuel mixture and requirements at different loads and speeds, Principle of carburetion, and essential parts of carburetor, Calculation of air-fuel ratio, Compensating devices, Types of carburetor. Injection systems – functional requirement, Classification, Components of injection system, Electronic injection systems. (7 Hrs)

UNIT- III

Fluid motions in combustion chamber: Turbulence, Swirl, Tumble, Squish, Cerevic flow, Blowby, Combustion in SI Engine : Stages of combustion, Factors influencing flame speed, Rate of pressure rise, Abnormal combustion – Pre-ignition, Detonation, Factors causing abnormal combustion, Combustion chamber for SI Engines

Combustion in CI Engine: Stages of combustion, Factors influencing delay period, Knocking in CI engine, Factors causing abnormal combustion, Combustion chamber for CI Engines, Comparison of knock in SI and CI engine. (9 Hrs)

UNIT- IV

Engine heat transfer: Variation of gas temperature, Piston and cylinder temperature distribution, heat transfer, Parameters affecting engine heat transfer, Need for cooling systems, Types of cooling system. Fundamentals of engine friction and lubrication.

Engine performance parameter: Engine performance parameters such as various efficiencies, Average piston speed, Specific fuel consumptions, etc. Engine operating characteristics, Heat balance, Supercharged and turbo charged engine. Engine emission and their control. (12 Hrs)

Text/References:

1. I.C.Engines - Gill and Smith, Oxford & IBH
2. I.C.Engines - V.Ganeshan, TMGH
3. I.C.Engines - V.L. Maleev, MGH
4. I.C.Engines - C.R. Ferguson, John wiley & Sons

ME 61A2: AERODYNAMICS

L T P **Credits: 3**
3 0 0

UNIT- I

Introduction: Governing equations, Potential flows, Kulta-Joukowski's theorem, Flow over arbitrary bodies. Incompressible flow over aerofoils: Aerofoil nomenclature and characteristics; Thin Aerofoil theorem- Kutta condition, Kelvin's circulation theorem. (8 Hrs)

UNIT- II

Vortex panel model: Effect of camber and thickness; Estimation of Aerodynamic forces and moments from pressure distribution.

Incompressible flow over finite wings: Down wash and induced drag, Biot-Savart law and Helmholtz's Vortex theorem. (13 Hrs)

UNIT- III

Prandtle's classical lifting line model, lifting surface theory.

Numerical Vortex Lattice method: Compressible flow over aerofoils: Wave patterns-Oblique shock, expansion waves. (12 Hrs)

UNIT- IV

Trailing edge boundary condition: Prandtle-Gluert's theory; Supersonicsaerofoils. Ackert's theorem, Wave drag; Area rule; Conical flow; Axisymmetric flow. Introduction to stability Control of aircraft. (7 Hrs)

Text/References

1. Fundamentals of aerodynamics - J.D.Anderson. Jr., MGH
2. Aerodynamics for engineers - J.J.Bertin and M.L.Smith, MGH
3. Introduction to flight - J.D.Anderson. Jr., MGH
4. Aerodynamics theory - W.F.Durrand, PHI

ME 61A3: TURBOMACHINES

L T P **Credits: 3**
3 0 0

UNIT- I

Introduction : Dimensional analysis & similitude as applied to turbomachines – Performance laws, Incompressible flow analysis, Performance characteristics, Variable geometry turbomachines (Axial, Radial & Mixed flow machines), Specific speed & cavitation, Compressible gas flow relations and compressible fluid analysis, Inherent unsteadiness of flow within turbomachines (6 Hrs)

UNIT -II

Two dimensional Cascades : Cascade nomenclature & geometry, Analysis of cascade forces, Energy losses, Lift & drag, Circulation and lift, Efficiency of compressor cascades, Performance of two-dimensional cascades, Cascade wind tunnel & instrumentation, Cascade test results, Compressor cascade correlations, Turbine cascade correlation, Comparison of profile loss in a cascade and in a turbine stage, Optimum space-chord ratio. (8 Hrs)

UNIT- III

Axial flow turbines-Two dimensional Theory: Velocity diagrams, Stage losses and efficiency, stage reaction, Diffusion within blade rows, Design point efficiency, Max. Total-to-static efficiency of a reversible turbine stage.

Axial flow compressors and fans : 2-D analysis, Velocity diagram & thermodynamics of compressor stage, Stage losses & efficiency, Reaction ratio & stage loading, Off-design performance, Stage pressure rise, Pressure ratio in a multistage compressor, Estimation of compressor stage efficiency, Axial flow ducted fans, Blade element theory. (13 Hrs)

UNIT- V

Radial flow theory and its applications : Steam turbines : Losses & efficiencies, Work & power calculations, Velocity triangles & thermal design; Radial flow Gas turbines : Types of inward flow radial turbines, Thermodynamics of IFR turbines, Rotor design, nominal design point efficiency, Loss coefficients, Incidence losses, Clearance & windage losses, Significance & application of specific speed.

Centrifugal pumps, fans & compressors : Some definitions, Theoretical analysis, Inlet casing and impeller, Conservation of rothalpy, Diffuser, Limitation of inlet velocity, Optimum design of pump & compressor inlet, slip factor, Performance characteristics, Choking in a compressor stage. (13 Hrs)

Texts / References

1. Fluid mechanics and thermodynamics of Turbomachinery: S. L. Dixon, Elsvier
2. Pumps, fans and compressors : Cherkasky
3. Turbines, fans and compressors : S.M. Yahya, Satya Prakashan
4. Steam Turbine theory and Practice : W.J. Kearton
5. Steam & Gas turbines : R. Yadav, Central Publishing house
6. Gas Turbines : V. Ganeshan

ME 61A4: FINITE ELEMENT METHODS

L T P **Credits: 3**
3 0 0

UNIT- I

Fundamental concepts of finite element methods: Direct equilibrium method, Work or energy method, Method of weighted residuals, Variational principles, Interpolation and shape function, General formulae for element matrices, Nodal loads produced by traction and body force. (9 Hrs)

UNIT- II

One dimensional finite element analysis : Linear spring/ plane stress/ space truss (axial displacement) , 1 D torsion (torsional rotation), 1 D heat conduction (temperature), 1 D seepage (fluid potential), FE based on displacement field. Two - Dimensional finite element analysis (using CST) : 2- D stress analysis, 2-D confined seepage analysis, Applications of 3-D equations for 2-D analysis (Axisymmetric situation). (10 Hrs)

UNIT- III

Two- dimensional isoparametric elements and numerical integration: Introduction, Four node, quadrilaterals, Higher order elements.
Beams : Formulation, Load vector, Boundary considerations, Shear force and bending moment. (12 Hrs)

UNIT- IV

Computer implementation of FEM : Use of symmetry and anti-symmetry conditions in reducing a problems, Static condensations, Storage scheme for global stiffness matrix, Application of boundary condition. (9 Hrs)

Text/References:

1. Introduction to finite element engineering - T.R.Chandrupatla and A.D.Belegundu,PHI.
2. Finite elements procedures - K.J.Bathe, PHI.
3. Finite elements approximations - O.C.Eienkiewicg and K.Morgan, Mc Graw Hill.
4. Finite element method in fluid mechanics - Baker, Mc Graw Hill.

PROFESSIONAL ELECTIVE - II

ME 62A1: THEORY OF ELASTICITY

L T P **Credits: 3**
3 0 0

UNIT- I

Introduction: Elasticity, Stress, Components of stresses, Components of strains, Generalised law. Plane Stress and Plane Strain : Plane stress and plane strain, Stress at a point, Strain at a point, Differential equation of equilibrium, Boundary condition stress 2D Problems in Rectangular Co- ordinates. (8 Hrs)

UNIT- II

Solution by polynomial: stvenant's principle, Determination of displacement. Bending of cantilevers loaded at the ends, Bending of beams by uniform loads etc. (10 Hrs)

UNIT- III

2D Problems in Polar Co-ordinates: General equation in polar co-ordinates, Stress distribution, symmetrical about an axis. Pure bending of curve bars, Strain components in polar coordinates.

Displacement for symmetrical stress distribution: Rotating disks, Bending of a curved bar by a force at the end. (12Hrs)

UNIT- IV

Photo-elasticity: Experimental method and verification, Circular polariscope, Photo elastic stress-distribution, Determination of principle stresses, 3- dimensional photoelasticity function. 2D Problems in Rectangular Co- ordinates. (10 Hrs)

Text/References:

1. Theory of elasticity - Timoshenko and Goodier, Mc Graw Hill.
2. Experimental Stress Analysis- Dally and Riley, Mc Graw Hill.

ME 62A2: MANAGEMENT OF PRODUCTION SYSTEM

L T P **Credits: 3**
3 0 0

UNIT- I

Job, Batch, Mass , Cellular production systems , Automation in production systems, MTL and its mathematical models, Material handling. (8 Hrs)

UNIT- II

AGVS,TTW, Productivity Engg. and methods of improvement, Cost analysis, Marketing and sales, Inventory, Production Planning and Control. (8 Hrs)

UNIT- III

Automated layout and flow analysis, Systems concepts in production systems CAD, CIM .

Shop floor management techniques, Job card design, Work centers, Work study, time study applications. (10Hrs)

UNIT- IV

Quality circles, productivity quality teams, works force planning.
TQM, ISO 9000, Future factories and MAP, Group technology and FMS. (10 Hrs)

Text /References :

1 Production and Operations Management - Martinch, Wiley Eastern Ltd.
2 Production and Operations Management - Ralph M. Barnes, Wiley Eastern Ltd.
3 Modern production and operation management - E.S.Buffa, Wiley Eastern Ltd.

ME 62A3: NON PRIME MOVER DESIGN

L T P **Credits: 3**
3 0 0

UNIT- I

Design of centrifugal pumps: Design inputs and Specific speed calculation; Selection of type, No. of stages specific diameter etc; Velocity triangles; Layout preparation. (8 Hrs)

UNIT- II

Design of blade geometry: Design of guide vanes, Design of volute casings; (10 Hrs)

UNIT- III

Selection of bearing & lubrication system: Design of packing and seals; Shaft design.

Design of reciprocating pumps: Design inputs, Selection of no. of stages, and types of cylinders. (10 Hrs)

UNIT- IV

Design of cylinder and valves: Design of suction & delivery systems;

Design & selection of other accessories: Design & selection of other accessories like strainer, Crank & slider mechanism, Pressure vessel etc. (10 Hrs)

Text /References :

1. Theory of Vibration - W.T. Thompson, CBS Publisher.
2. Theory of Vibration - Groover, Nem Chand & Brothers.
3. Fundamentals of Mechanical Vibrations- S. G. Kelly, Mc Graw Hill.

ME 62A4: MECHANICAL VIBRATION

L T P **Credits: 3**
3 0 0

UNIT- I

Single degree of freedom (SDF), free vibration.

SDF force vibration-single degrees of freedom, Introduction to multi degrees of freedom, Multi degree of freedom system. (10Hrs)

UNIT- II

Vibration isolation, Base excitation, Vibration instruments. (7 Hrs)

UNIT- III

Two degree freedom system.

Dynamic vibration, absorber. (10 Hrs)

UNIT- IV

Transverse vibration of two and three rotors systems. Tensional vibration of two and three degree rotor system, Critical speed. (10 Hrs)

Text/References

1. Theory of Vibration - W.T. Thompson, CBS Publisher.
2. Theory of Vibration - Groover, Nem Chand & Brothers.
3. Fundamentals of Mechanical Vibrations- S. G. Kelly, Mc Graw Hill.

ME 62A5: MECHANICAL HANDLING OF MATERIALS

L T P **Credits: 3**
3 0 0

UNIT- I

Definition of material handling; Classification of materials, Bulk load, UNIT load, Their characteristics. Classification of mechanical handling equipments; Different types of elevators and lowerers for handling materials in bulk and for UNIT loads and their working principles and estimation of handling capacity. (9 Hrs)

UNIT- II

Belt conveyor; Picking belts, Their construction, Capacity and power requirements; Other conveyors like apron, steel plate and slat conveyors; Flight and screw conveyors; Vibrating and oscillating trough conveyors estimation of their handling capacity and power requirement. (9 Hrs)

UNIT- III

Automatic feeding devices for elevators and conveyors. Gravity chutes and gravity roller runways, Humper, stacker and gadget; Live rollers; Pneumatic and hydraulic methods of conveying; Endless rope and chain haulage; Aerial ropeways, Monorails, Telphers and blast furnace hoists. (9 Hrs)

UNIT- IV

Loading/ unloading and operation of railway wagons, Motor trucks and fork lift trucks.
Wire ropes, Pulley blocks, Crab winch, Grabs and lifting magnets; Different types of cranes.
Definition and types of robots- basic concept, Working principle and application of robotics; manipulators. (13 Hrs)

Text / References

1. Material Handling Systems and Terminology, Edward Frazelle, Lionheart Pub

2. Plant Layout and Material Handling, Fred E. Meyers, Prentice Hall

3. Manufacturing Facilities Design and Material Handling, Meyers, Stephens, Prentice Hall

ME 62A6: NON-CONVENTIONAL ENERGY SOURCES

L T P **Credits: 3**
3 0 0

UNIT- I

Energy, Ecology and environment: Introduction, Classification of Energy Resources, Common Forms of Energy, Energy Chain, Advantages and Disadvantages of Conventional Energy Sources, Importance and Salient Features of Non-Conventional Energy Sources, Environmental and ecological Aspects of Energy use, Environment-Economy-Energy and Sustainable Development, World Energy Status, Energy Scenario in India.
Energy Conservation and Energy Storage: Salient Features of "Energy Conservation Act, 2001", Various Aspects of Energy Conservation, Principles of Energy Conservation, General Electrical ECO's (Energy Conservation Opportunities) (7 Hrs.)

UNIT- II

Solar Energy: Basics, The Sun as a Source of Energy, Sun, Earth Radiation Spectrums, Extraterrestrial and Terrestrial Radiations, Spectral Energy Distribution of Solar Radiation, Depletion of Solar Radiation, Measurements of Solar Radiation, Solar Time (Local Apparent Time), Solar Radiation Geometry, Solar Day Length, Empirical Equations for Estimating Solar Radiation(Hourly Global, Diffuse and Beam Radiations) on Horizontal Surface Under Cloudless and Cloudy Skies, Solar Radiation on Inclined Plane Surface only (empirical relations for numerical)
Solar Thermal Systems: Solar Collectors: Flat plate and concentric collectors, Solar Water Heater, Solar Passive Space - Heating and Cooling Systems, Solar Refrigeration and Air-Conditioning Systems, Solar Cookers, Solar Furnaces, Solar Green House, Solar Dryer, Solar Distillation (or Desalination of Water) (10 Hrs.)

UNIT- III

Solar Photovoltaic Systems: Solar Cell Fundamentals, Solar Cell Characteristics, Solar Cell Classification, Solar Cell, Module, Panel and Array Construction, Solar PV Systems, Solar PV Applications.
Wind Energy: Origin of Winds, Nature of Winds, Wind Turbine Siting, Major Applications of Wind Power, Wind Turbine Types and Their Construction, Wind Energy Conversion Systems (WECS), Effects of Wind Speed and Grid Condition (System Integration). (8 Hrs.)

UNIT- IV

Biomass Energy: Photosynthesis Process, Usable Forms of Biomass, their Composition and Fuel Properties, Biomass Resources , Biomass Conversion Technologies, Urban Waste to Energy Conversion, Biomass Gasification ,Biomass Liquefaction, Biomass to Ethanol Production, Biogas Production from Waste Biomass, Energy Farming.
Miscellaneous Non-conventional Technologies
Geothermal Energy: Applications, Origin and Distribution of Geothermal Energy, Types of Geothermal Resource.

Ocean Energy: Tidal Energy, Wave Energy, Ocean Thermal Energy

Fuel Cell Technology: Types, Principle of operation, Advantages and disadvantages.

(15 Hrs.)

Text Book:

1. Non Conventional Energy Sources: B.M Khan, TMH Publications
2. Renewable Energy Sources and Emerging Technology: D.P.Kothari and etal., PHI
3. Renewable Energy Sources & Conversion Technology: N.K.Bansal, Manfred Kleenman & Michael Meliss, TMH Publication.

Reference:

1. Renewable Energy Sources:Fundamentals & Applications:G.N.Tiwari & M.K.Ghosal, Narosa Pub
2. Non Conventional Energy Resources: D.S. Chauhan and S.K.Srivastava, New Age International
3. Non Conventional Energy Sources: H.P.Garg
4. Non-Conventional Energy Systems: G.D.Rai, Khanna publications
5. Solar Energy Technology: Sukhatme and Nayak, TMH
6. Renewable Energy, Godfrey Boyle, Oxford University Press

ME 62A7: POWER PLANT ENGINEERING

L T P **Credits: 3**
3 0 0

UNIT- I

Introduction to types, layouts and working cycles: Layouts of diesel-electric, Hydro-electric, Nuclear, Gas turbine, Steam, Cogeneration, MHD, and other power plants – Site selection – Reheat and Regenerative steam cycles – Binary vapour cycle – combined cycle – Topping cycle – Power plant instrumentation and control- air flow, Furnace pressure, Steam temperature control system- Governing system- Steam turbine. (8 Hrs)

UNIT – II

Fuels, combustion and burning methods: Fuel classification – Solid, Liquid and gaseous – Compositions and heating values – Classification of coal – Combustion process, Atmosphere and control -ESP Furnace construction - stokers – suspension firing – pulverised fuel firing – oil and gas burners and systems – Fuel control - Burner management system - FSSS– Ash handling system. (8 Hrs)

UNIT- III

Steam power plant: Steam generators - Fire tube, Water tube, Forced circulation, Once through, Super charged, Super critical, Lamont, Loeffler, Schmide, Hortmen and Velox boilers, Fluidised Bed & Circulated Fluidised Bed boilers - Natural, artificial, balanced and steam jet drafts - Simple problems –Functions of super heaters, Economisers, Air-heaters, Deaerators, Feed heaters, air ejectors- Feed pumps - Injectors – Feed water control- Condensers - Jet, surface - Simple problems - cooling towers. (11 Hrs)

UNIT- IV

Nuclear power plant: Introduction, Nuclear fuels, Nuclear fission, Reactor components, & materials and classification,, Boiling Water Reactor (BWR), Pressurized water Reactor (PWR), CANDU Reactor, Gas Cooled Reactors, Liquid metal fast breeder Reactor. Heavy water Reactors. Waste disposal and Safety of Nuclear power plant

Economics and safety: Actual load curves - Fixed and operating costs - Tariff methods for electrical energy - peak load and variable load operations - Selection of generation type and general equipment. Introduction to safety aspects in power plants- Environmental impacts assessment for Thermal power plant. (13 Hrs)

Text Books:

1. Power Plant Engineering by Rajput
2. Arora C.P. and Domkundwar, A course in Power Plant Engineering,Dhanpat Rai Pub .
3. P.K.Nag, Power Plant Engineering, Tata McGraw Hill, New Delhi
4. G.R. Nagpal, Power plant Engineering, Khanna Pub.2004.

Reference Books:

1. Moarse, Power plant engineering,
2. M.M.El-Wakil, Power plant Technology, Tata McGraw Hill, New Delhi,
3. Vopat and Skrotzki, Power Plant Engineering, Tata McGraw Hill, New Delhi
4. Geldart, Fluidised Bed Technology
5. Howard, Fluidised Bed Technology.

PROFESSIONAL ELECTIVE - III

ME 62B1: BOUNDARY LAYER THEORY

L T P **Credits: 3**
3 0 0

UNIT- I

Outline of fluid motion with friction, Real and perfect fluids, Viscosity and compressibility, similarity principles, Comparison between theoretical experimental and numerical study of flow. Concept of boundary layer, Boundary layer separation and vortex formation.

Navier Stokes equation; Fundamental equation of motion and continuity applied to fluid flows; Stokes hypothesis and N-S equation. (12 Hrs)

UNIT- II

Simplification of N-S equation; Normalisation of N-S equation; Order of magnitude and simplification of N-S equation; Prandtle's Boundary layer Theory & Boundary layer equation (6 Hrs)

UNIT- III

Laminar boundary layer, Boundary layer equation for 2 –D incompressible flow; Separation & control of boundary layer, Momentum integral equation for boundary layer. Some exact solutions steady state boundary layer equation flow past a wedge, Flow in a convergent channel, flow past a cylinder. (9Hrs)

UNIT- IV

Approximate methods; approximate solution for flow over flat plate at zero incidence, flow past a circular cylinder; fundamentals of turbulent boundary layer. Reynolds equation; Prandtles mixing length.

Introduction to thermal boundary layer, Heat conduction equation from boundary layer equation; general properties of thermal boundary layers; Force and natural flows; Adiabatic walls. (13 Hrs)

Text/References:

1. Viscous fluid flow - F.M.White, MGH
2. Mechanics of fluid - Duncun, Thom & Young., Arnold Publications
3. Mechanics of fluid - B.S.Massey.
4. Boundary layer theory - H.Schlichting, MGH

ME 62B2: INDUSTRIAL ROBOTICS

L T P **Credits: 3**
3 0 0

UNIT- I

Introduction to Robotics, Classification of robots and manipulators, Industrial applications of Robots. (8 Hrs)

UNIT- II

Design criteria for end effectors.

Kinematics and dynamics of linkage with special emphasis to the open loop controls. (12 Hrs)

UNIT- III

Actuators and drive elements, Robot sensors and vision.

Control of robots and manipulators, Robot programming. (12 Hrs)

UNIT –IV

Problems related to design of grippers and robot models. (8 Hrs)

Text/References:

1. Robotics for engineers - Y.Koren, MGH
2. Robotics - J.J.Craig, Addison Wesely Longman
3. Robotics - K.S.Fu, R.C.Gonzales & C.S.G.Lee., MGH
4. Industrial Robotics- Ganesh S. Hegde, second Edition

ME 62B3: NON-DESTRUCTIVE EVALUATION AND TESTING

L T P **Credits: 3**
3 0 0

UNIT-I

Introduction and Visual Methods: Optical aids, In-situ metallography, Optical holographic methods, Dynamic inspection; Penetrant Flaw Detection- Principles: Process: Penetrant systems: Liquid penetrant materials: Emulsifiers: Cleaners, Developers: Sensitivity: Advantages: Limitations: Applications. (08 Hrs)

UNIT-II

Radiographic Methods: Limitations: Principles of radiography: sources of radiation, Ionising radiation - X-rays sources, Gama-rays sources Recording of radiation: Radiographic sensitivity: Fluoroscopic methods: Special techniques: Radiation safety; Ultrasonic Testing ofMaterials- Advantages, disadvantages, Applications, Generation of. Ultrasonic waves, general characteristics of ultrasonic waves: Methods and instruments for ultrasonic materials testing: special techniques. (10 Hrs)

UNIT-III

Magnetic Methods: Advantages, Limitations, Methods of generating fields: magnetic particles and suspending liquids Magnetography, Field sensitive probes: applications. Measurement of metal properties; Electrical Methods- Eddy current methods: potential-drop methods, applications. (08 Hrs)

UNIT-IV

Electromagnetic Testing: Magnetism: Magnetic domains: Magnetization curves: Magnetic Hysteresis: Hysteresis loop tests: comparator - bridge tests Absolute single-coil system: applications.

Other Methods: Acoustic Emission methods, Acoustic methods: Leak detection: Thermal inspection. (12 Hrs)

Text/Reference Books:

1. P. Halmshaw ;Non-Destructive Testing
2. Metals Handbook Vol. II, Non-destructive inspection and quality control.

ME 62B4: INSTRUMENTATION & CONTROL ENGINEERING

L T P **Credits: 3**
3 0 0

UNIT- I

Basics of measuring instruments, Study of transducers, Display and recording instruments. Control system. Feed back. Open & closed loop system. Elements of Electrical, Electronic, hydraulic, Pneumatic and Microprocessor based control.
(10 Hrs)

UNIT- II

Static and dynamic characteristic of instruments.
Principles of automotive controls, Open and closed loop systems.

(10 Hrs)

UNIT- III

Transfer function, Proportional, Derivatives and integral control.
Principles of hydraulic and pneumatic control.

(10 Hrs)

UNIT- IV

Transient and steady state response, Frequency response and analysis. Root locus method, Stability analysis. (8 Hrs)

Text/References:

1. Automatic Control engineering - F.H.Raven, Mc Graw Hill.
2. Modern Control engineering - K.Ogata, PHI.
3. Measurement System : Application & Design - Doeblin., TMH
4. Instrumentation – Kumar, Tata Mc Graw Hill, New Delhi.

ME 62B5: WELDING TECHNOLOGY

L T P **Credits: 3**
3 0 0

UNIT-I

Introduction: Welding as a production process – Its advantages and limitations. Gas welding process, Types of fuels, Acetylene, Indane, Butane etc. Gas welding equipment, Gas welding technique. Electric arc welding – Manual metal arc welding – Power supplies, Cables and other accessories for arc welding, Welding technique - Atomic, Hydrogen welding, Thermit welding, Soldering, Brazing and Braze welding. (8 Hrs)

UNIT-II

Special Welding Processes: Power sources, Equipments and accessories, Application limitation and other characteristics of: (a) Gas tungsten arc (TIG) welding (b) Gas metal arc (MIG) welding (c) Submerged arc welding (d) Electro slag welding processes. Resistance welding processes- principle-Types (spot, seam, projection, percussion, flash), Equipment required for each application. (8 Hrs)

UNIT-III

Modern Welding Processes: Electron beam welding, Laser beam welding, Plasma arc welding, Friction welding, Explosive welding, Ultrasonic welding, Stud welding, Under water welding, Diffusion bonding, Cold welding, Welding of dissimilar metals. (8 Hrs)

UNIT-IV

Weldment Testing: Defects in welding in various processes-Causes and remedies; Destructive testing of weldments - Strength, Hardness, Ductility, Fatigue, creep properties etc. Nondestructive testing of weldments; Ultrasonic dye penetrant, Magnetic particle inspection. X ray testing procedures and identification of defects – Case studies. Weld thermal cycle – Residual stressed distortion in welding stress relieving techniques. (8 Hrs)

UNIT-V

Weldability, Automation And Design In Welding: Weldability –Definition. Temperature distribution in welding –Heat affected zone weldability of steel, Cast iron. Aluminum, Pre heating and post heating of weldments. Estimation of transition temperature. Automation in welding – Seam tracking vision and arc sensing welding robots. Design of weldments-Welding symbols positions of welding joint and groove design. Weld stress –Calculations – Design of weld size. (8 Hrs)

Text/Reference Books:

1. Abbott, J., & Smith, K. M.Welding Technology: Texas State Technical College Publishing.
2. Radhakrishnan.V.M. Welding Technology and Design, New Age International Pub. Ltd.,
3. Little R.L.,Welding Technology Tata McGraw-Hill
4. Partner R.S.Welding Process and Technology, Khanna Publishers
5. Lancaster J.F.,Metallurgy of Welding,George Allen and Unwin.
6. "AWS Welding Hand Book", Volume 1 to 4, AWS.

ME 62B6: RAPID PROTOTYPING

L T P **Credits: 3**
3 0 0

UNIT -I

Product Development: Classification of manufacturing processes, Different manufacturing systems, Introduction to rapid Prototyping (RP), Need of RP in context to batch production, FMS and CIM and its application. Product prototyping – Solid modeling and Prototype representation, Reverse engineering, Prototyping and manufacturing using CNC machining. (10 Hrs.)

UNIT -II

Basic principles of RP: Steps in RP, Process chain in RP in integrated CAD-CAM environment, Advantages of RP.

Rapid Manufacturing Process Optimization: Factors influencing accuracy. Data preparation errors, Part building errors, Error in finishing, Influence of build orientation.

Classification of different RP techniques based on raw materials, Layering technique (2D or 3D) and energy sources. (10 Hrs.)

UNIT -III

Process technology of RP: Process technology and comparative study of stereo lithography (SL) with photo-polymerisation, SL with liquid thermal polymerization, Solid foil polymerization, Selective Laser sintering, Selective powder binding, Ballastic particle manufacturing – both 2D and 3D, Fused deposition modeling, Shape melting. (10 Hrs.)

UNIT -IV

Various RP Technology: Laminated object manufacturing, solid ground curing, Repetitive masking and deposition.

Beam interference solidification, Holographic interference solidification special topic on RP using metallic alloys, Programming in RP modeling, Slicing, Internal Hatching, Surface skin films, Support structure.

Software for RP: STL files, Overview of Solid view, Magics, Imics, Magic communicator, etc. Internet based software, Collaboration tools. (10 Hrs.)

Text Book :

1. Rapid Prototyping and Engineering Applications, Frank W. Liou, CRC Press
2. Introduction to Rapid Prototyping, Amitav Ghosh, North West Publication, New Delhi

Reference Books :

1. Rapid Manufacturing, Flham D.T & Dinjoy S.S Verlog London 2001.
2. Rapid Prototyping Materials, Gurumurthi, IISc Bangalore.
3. Rapid Automated, Lament wood. Indus press New York
4. Stereo Lithography and other RP & M Technologies**,** Paul F. Jacobs: SME, NY 1996.
5. Rapid Prototyping**,** Terry Wohlers Wohler's Report 2000" Wohler's Association 2000