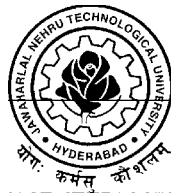# ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

30

AGRICULTURAL ENGINEERING

For
B.TECH. FOUR YEAR DEGREE COURSE
(Applicable for the batches admitted from 2013-14)
(I - IV Years Syllabus)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
KUKATPALLY, HYDERABAD - 500 085.

ACADEMIC REGULATIONS R13 FOR B. TECH. (REGULAR)

Applicable for the students of B. Tech. (Regular) from the Academic Year 2013-14 and onwards

1. **Award of B. Tech. Degree**
    A student will be declared eligible for the award of B. Tech. Degree if he fulfils the following academic regulations:
    1.1 The candidate shall pursue a course of study for not less than four academic years and not more than eight academic years.
    1.2 After eight academic years of course of study, the candidate is permitted to write the examinations for two more years.
    1.3 The candidate shall register for 224 credits and secure 216 credits with compulsory subjects as listed in Table-1.

Table 1: Compulsory Subjects

Serial Number	Subject Particulars
1	All practical subjects
2	Industry oriented mini project
3	Comprehensive Viva-Voce
4	Seminar
5	Project work

2   The students, who fail to fulfill all the academic requirements for the award of the degree within ten academic years from the year of their admission, shall forfeit their seats in B. Tech. course.

3   **Courses of study**

The following courses of study are offered at present as specializations for the B. Tech. Course:

Branch Code	Branch
01	Civil Engineering
02	Electrical and Electronics Engineering
03	Mechanical Engineering
04	Electronics and Communication Engineering
05	Computer Science and Engineering
08	Chemical Engineering
10	Electronics and Instrumentation Engineering

11	Bio-Medical Engineering
12	Information Technology
14	Mechanical Engineering (Mechatronics)
17	Electronics and Telematics Engineering
18	Metallurgy and Material Technology
19	Electronics and Computer Engineering
20	Mechanical Engineering (Production)
21	Aeronautical Engineering
22	Instrumentation and Control Engineering
23	Biotechnology
24	Automobile Engineering
25	Mining Engineering
26	Mining Machinery
27	Petroleum Engineering
28	Civil and Environmental Engineering
29	Mechanical Engineering (Nano Technology)
30	Agricultural Engineering
31	Computer Science & Technology

4   Credits

	I Year		Semester	
	Periods / Week	Credits	Periods / Week	Credits
Theory	03+1/03	06	04	04
	02	04	—	—
Practical	03	04	03	02
Drawing	02+03	06	03 06	02 04
Mini Project	—	—	—	02
Comprehensive Viva Voce	—	—	—	02
Seminar	—	—	6	02
Project	—	--	15	10

5   Distribution and Weightage of Marks

5.1   The performance of a student in each semester or I year shall be evaluated subject-wise for a maximum of 100 marks for a theory and 75 marks for a practical subject. In addition, industry-oriented mini-project, seminar and project work shall be evaluated for 50, 50 and 200 marks, respectively.

5.2   For theory subjects the distribution shall be 25 marks for Internal Evaluation and 75 marks for the End-Examination.

5.3   For theory subjects, during a semester there shall be 2 mid-term examinations. Each mid- term examination consists of one objective paper, one essay paper and one assignment. The objective paper and the essay paper shall be for 10 marks each with a total duration of 1 hour 20 minutes (20 minutes for objective and 60 minutes for essay paper). The Objective paper is set with 20 bits of multiple choice, fill-in the blanks and matching type of questions for a total of 10 marks. The essay paper shall contain 4 full questions (one from each unit) out of which, the student has to answer 2 questions, each carrying 5 marks. While the first mid-term examination shall be conducted on 1 to 2.5 units of the syllabus, the second mid-term examination shall be conducted on 2.5 to 5 units. Five (5) marks are allocated for Assignments (as specified by the subject teacher concerned). The first Assignment should be submitted before the conduct of the first mid-examination, and the second Assignment should be submitted before the conduct of the second mid-examination. The total marks secured by the student in each mid-term examination are evaluated for 25 marks, and the average of the two mid-term examinations shall be taken as the final marks secured by each candidate. However, in the I year, there shall be 3 mid term examinations, each for 25 marks, along with 3 assignments in a similar pattern as above (1st mid shall be from Unit-I, 2nd mid shall be 2 &3 Units and 3rd mid shall be 4 & 5 Units) and the average marks of the examinations secured (each evaluated for a total of 25 marks) in each subject shall be considered to be final marks for the internals/sessionals. If any candidate is absent from any subject of a mid-term examination, an on-line test will be conducted for him by the University.

The details of the Question Paper pattern without deviating from the R13 regulations as notified in the website is as follows:

- *The End semesters Examination will be conducted for 75 marks which consists of two parts viz. i). Part-A for 25 marks, ii). Part –B for 50 marks.*

- *Part-A is compulsory question which consists of ten sub-questions. The first five sub-questions are from each unit and carries 2 marks each. The next five sub-questions*

are one from each unit and carries 3 marks each.

- *Part-B consists of five Questions (numbered from 2 to 6) carrying 10 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an "either" "or" choice (that means there will be two questions from each unit and the student should answer any one question)*

5.4   For practical subjects there shall be a continuous evaluation during a semester for 25 sessional marks and 50 end semester examination marks. Out of the 25 marks for internal evaluation, day-to-day work in the laboratory shall be evaluated for 15 marks and internal practical examination shall be evaluated for 10 marks conducted by the laboratory teacher concerned. The end semester examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed from the clusters of colleges which are decided by the examination branch of the University.

5.5   For the subject having design and/or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and Estimation, the distribution shall be 25 marks for internal evaluation (15 marks for day-to-day work and 10 marks for internal tests) and 75 marks for end semester examination. There shall be two internal tests in a Semester and the average of the two shall be considered for the award of marks for internal tests. However, in the I year class, there shall be three tests and the average will be taken into consideration.

5.6   There shall be an industry-oriented Mini-Project, in collaboration with an industry of their specialization, to be taken up during the vacation after III year II Semester examination. However, the mini-project and its report shall be evaluated along with the project work in IV year II Semester. The industry oriented mini-project shall be submitted in a report form and presented before the committee. It shall be evaluated for 50 marks. The committee consists of an external examiner, head of the department, the supervisor of the mini-project and a senior faculty member of the department. There shall be no internal marks for industry-oriented mini-project.

5.7   There shall be a seminar presentation in IV year II Semester. For the seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his understanding of the topic, and submit it to the department. It shall be evaluated by the departmental committee consisting of head of the department, seminar supervisor and a senior faculty member. The seminar report shall be evaluated for 50 marks. There shall be no external examination for the seminar.

5.8   There shall be a Comprehensive Viva-Voce in IV year II semester.

The Comprehensive Viva-Voce will be conducted by a Committee consisting of Head of the Department and two Senior Faculty members of the Department. The Comprehensive Viva-Voce is intended to assess the student's understanding of the subjects he studied during the B. Tech. course of study. The Comprehensive Viva-Voce is evaluated for 100 marks by the Committee. There are no internal marks for the Comprehensive Viva-Voce.

5.9 Out of a total of 200 marks for the project work, 50 marks shall be allotted for Internal Evaluation and 150 marks for the End Semester Examination (Viva Voce). The End Semester Examination of the project work shall be conducted by the same committee as appointed for the industry-oriented mini-project. In addition, the project supervisor shall also be included in the committee. The topics for industry oriented mini project, seminar and project work shall be different from one another. The evaluation of project work shall be made at the end of the IV year. The Internal Evaluation shall be on the basis of two seminars given by each student on the topic of his project.

5.10 The Laboratory marks and the sessional marks awarded by the College are subject to scrutiny and scaling by the University wherever necessary. In such cases, the sessional and laboratory marks awarded by the College will be referred to a Committee. The Committee will arrive at a scaling factor and the marks will be scaled accordingly. The recommendations of the Committee are final and binding. The laboratory records and internal test papers shall be preserved in the respective institutions as per the University rules and produced before the Committees of the University as and when asked for.

6 <u>Attendance Requirements</u>

6.1 A student is eligible to write the University examinations only if he acquires a minimum of 75% of attendance in aggregate of all the subjects.

6.2 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester or I year may be granted by the College Academic Committee

6.3 Shortage of Attendance below 65% in aggregate shall not be condoned.

6.4 A student who is short of attendance in semester / I year may seek re-admission into that semester/I year when offered within 4 weeks from the date of the commencement of class work.

6.5 Students whose shortage of attendance is not condoned in any semester/I year are not eligible to write their end semester examination of that class and their registration stands cancelled.

6.6 A stipulated fee shall be payable towards condonation of shortage of attendance.

6.7 A student will be promoted to the next semester if he satisfies the attendance requirement of the present semester/I year, as applicable, including the days of attendance in sports, games, NCC and NSS activities.

6.8 If any candidate fulfills the attendance requirement in the present semester or I year, he shall not be eligible for readmission into the same class.

7 Minimum Academic Requirements
The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.6.

7.1   A student is deemed to have satisfied the minimum academic requirements if he has earned the credits allotted to each theory/ practical design/drawing subject/project and secures not less than 35% of marks in the end semester exam, and minimum 40% of marks in the sum total of the mid-term and end semester exams.

7.2 A student shall be promoted from first year to second year if he fulfills the minimum attendance requirement.

7.3 A student will not be promoted from II year to III year unless he fulfils the academic requirement of 34 credits up to II year I semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in II year II semester.

7.4 A student shall be promoted from III year to IV year only if he fulfils the academic requirements of 56 credits up to III year I semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.

7.5 A student shall register and put up minimum attendance in all 224 credits and earn 216 credits. Marks obtained in the best 216 credits shall be considered for the calculation of percentage of marks.

7.6 Students who fail to earn 216 credits as indicated in the course structure within ten academic years (8 years of study + 2 years additionally for appearing for exams only) from the year of their admission, shall forfeit their seat in B.Tech. course and their admission stands cancelled.

8 Course pattern

8.1 The entire course of study is for four academic years. I year shall be on yearly pattern and II, III and IV years on semester pattern.

8.2 A student, eligible to appear for the end examination in a subject, but absent from it or has failed in the end semester examination, may

write the exam in that subject during the period of supplementary exams.

8.3 When a student is detained for lack of credits/shortage of attendance, he may be re-admitted into the next semester/year. However, the academic regulations under which he was first admitted, shall continues to be applicable to him.

9 Award of Class

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he shall be placed in one of the following four classes:

Class Awarded	% of marks to be secured	
First Class with Distinction	70% and above	**From the aggregate marks secured from 216 Credits.**
First Class	Below 70 but not less than 60%	
Second Class	Below 60% but not less than 50%	
Pass Class	Below 50% but not less than 40%	

The marks obtained in internal evaluation and end semester / I year examination shall be shown separately in the memorandum of marks.

10 Minimum Instruction Days

The minimum instruction days for each semester/I year shall be 90/180 days.

11 There shall be no branch transfers after the completion of the admission process.

12 There shall be no transfer from one college/stream to another within the Constituent Colleges and Units of Jawaharlal Nehru Technological University Hyderabad.

13 WITHHOLDING OF RESULTS

If the student has not paid the dues, if any, to the university or if any case of indiscipline is pending against him, the result of the student will be withheld and he will not be allowed into the next semester. His degree will be withheld in such cases.

14. TRANSITORY REGULATIONS

14.1 Discontinued, detained, or failed candidates are eligible for readmission as and when next offered.

14.2 After the revision of the regulations, the students of the previous batches will be given two chances for passing in their failed subjects, one supplementary and the other regular. If the students cannot

clear the subjects in the given two chances, they shall be given equivalent subjects as per the revised regulations which they have to pass in order to obtain the required number of credits.

14.3 In case of transferred students from other Universities, the credits shall be transferred to JNTUH as per the academic regulations and course structure of the JNTUH.

15. General

15.1 Wherever the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".

15.2 The academic regulation should be read as a whole for the purpose of any interpretation.

15.3 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.

15.4 The University may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the University.

15.5 The students seeking transfer to colleges affiliated to JNTUH from various other Universities/Institutions, have to pass the failed subjects which are equivalent to the subjects of JNTUH, and also pass the subjects of JNTUH which the candidates have not studied at the earlier Institution on their own without the right to sessional marks. Further, though the students have passed some of the subjects at the earlier institutions, if the same subjects are prescribed in different semesters of JNTUH, the candidates have to study those subjects in JNTUH in spite of the fact that those subjects are repeated.

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Academic Regulations R13 For B.Tech. (Lateral Entry Scheme)

Applicable for the students admitted into II year B. Tech. (LES) from the Academic Year 2013-14 and onwards

1 **Eligibility for award of B. Tech. Degree (LES)**
   I.   The LES candidates shall pursue a course of study for not less than three academic years and not more than six academic years.
   II.   They shall be permitted to write the examinations for two more years after six academic years of course work.

2.   The candidate shall register for 168 credits and secure 160 credits from II to IV year B.Tech. Program (LES) for the award of B.Tech. degree with compulsory subjects as listed in Table-1.

Table 1: Compulsory Subjects

Serial Number	Subject Particulars
1	All practical subjects
2	Industry oriented mini project
3	Comprehensive Viva-Voce
4	Seminar
5	Project work

3.   The students, who fail to fulfil the requirement for the award of the degree in 8 consecutive academic years (6 years of study + 2 years additionally for appearing exams only) from the year of admission, shall forfeit their seats.

4.   The attendance regulations of B. Tech. (Regular) shall be applicable to B.Tech. (LES).

5.   **Promotion Rule**
   A student shall be promoted from second year to third year if he fulfills the minimum attendance requirement.
   A student shall be promoted from III year to IV year only if he fulfils the academic requirements of 34 credits up to III year I semester from all the examinations, whether or not the candidate takes the examinations.

6.   **Award of Class**
   After a student has satisfied the requirement prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he shall be placed in one of the following four classes:

Class Awarded	% of marks to be secured	
First Class with Distinction	70% and above	**From the aggregate marks secured from 216 Credits.**
First Class	Below 70 but not less than 60%	
Second Class	Below 60% but not less than 50%	
Pass Class	Below 50% but not less than 40%	

The marks obtained in the internal evaluation and the end semester examination shall be shown separately in the marks memorandum.

7. All the other regulations as applicable to **B. Tech. 4-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme)**.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/ Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.

2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.

4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is

	any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work

		and shall not be permitted for the remaining examinations of the subjects of that semester/ year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/ year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/ year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical

| 12. | If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment. | |

Malpractices identified by squad or special invigilators
1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions : (if the squad reports that the college is also involved in encouraging malpractices)
   (i) A show cause notice shall be issued to the college.
   (ii) Impose a suitable fine on the college.
   (iii) Shifting the examination centre from the college to another college for a specific period of not less than one year.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. TECH. AGRICULTURAL ENGINEERING

I YEAR

Code	Subject	L	T/P/D	C
A10001	English	2	-	4
A10002	Mathematics – I	3	1	6
A10302	Engineering Mechanics	3	-	6
A10004	Engineering Physics	3	-	6
A10005	Engineering Chemistry	3	-	6
A10501	Computer Programming	3	-	6
A10301	Engineering Drawing	2	3	6
A10581	Computer Programming Lab.	-	3	4
A10081	Engineering Physics & Engineering Chemistry Lab.	-	3	4
A10083	English Language Communication Skills Lab.	-	3	4
A10082	IT Workshop / Engineering Workshop	-	3	4
	Total	**19**	**16**	**56**

II YEAR I SEMESTER

Code	Subject	L	T/P/D	C
A303001	Fluid Mechanics and Open Channel Hydraulics	4	-	4
A30009	Environmental Studies	4	-	4
A30007	Mathematics – III	4	-	4
A30106	Properties & Strength of Materials	4	-	4
A30207	Electrical Systems	4	-	4
A30108	Surveying	4	-	4
A303081	Fluid Mechanics and Open Channel Hydraulics Lab	-	3	2
A30184	Surveying Lab	-	3	2
	Total	**24**	**6**	**28**

II YEAR II SEMESTER

Code	Subject	L	T/P/D	C
A43005	Principles of Soil Science and Agronomy	4	-	4
A43003	Heat and Mass Transfer	4	-	4
A43006	Theory of Machines	4	-	4
A40113	Soil Mechanics	4	-	4
A43004	Hydrology	4	-	4
A43002	Farm Machinery and Equipment - I	4	-	4
A43082	Soil Science and Agronomy Field Lab	-	3	2
A40381	Machine Drawing and Computer Graphics Lab	-	3	2
	Total	**24**	**6**	**28**

III YEAR I SEMESTER

Code	Subject	L	T/P/D	C
A50327	Thermodynamics and Refrigeration systems	4	-	4
A53010	Soil and Water Conservation Engineering	4	-	4
A53008	Agricultural Process Engineering	4	-	4
A50324	Renewable Energy Sources	4	-	4
A53009	Engineering Properties of Biological Materials and Food Quality	4	-	4
A53007	Agricultural Extension Techniques & Business Management	4	-	4
A53083	Farm Machinery Lab	-	3	2
A50086	Advanced Communications Skills Lab	-	3	2
	Total	**24**	**6**	**28**

III YEAR II SEMESTER

Code	Subject	L	T/P/D	C
A63013	Irrigation and Drainage Engineering	4	-	4
A63015	Tractor Systems and Control	4	-	4
A63012	Design of Soil and Water Conservation Structures	4	-	4
A63011	Dairy and Food Engineering	4	-	4
A63014	Theory of Structures	4	-	4
A60018 A60117 A60017	**Open Elective** Human Values and Professional Ethics Disaster Management Intellectual Property Rights	4	-	4
A63084	Agricultural Process Engineering Lab	-	3	2
A63085	Soil and Water Engineering Lab	-	3	2
	Total	**24**	**6**	**28**

IV YEAR I SEMESTER

Code	Subject	L	T/P/D	C
A73021	Micro Irrigation Engineering	4	-	4
A73018	Farm Machinery and Equipments – II	4	-	4
A73022	Post Harvest Engineering for Horticulture Produce	4	-	4
A73016	Agro Industries and Bi-product Utilization	4	-	4
A70352 A73017 A70010 A73019	**ELECTIVE – I** Operations Research Drying and Storage Engineering Managerial economics & financial Analysis Food Processing Plant Design and Layout	4	-	4
A70145 A73020 A70338	**ELECTIVE – II** Watershed Management Mechanical Measurements and Instrumentation Computational Fluid Dynamics	4	-	4
A73087	Field Operation and Maintenance of Tractors and Farm Machinery Lab	-	3	2
A73086	Dairy and Food Engineering Lab	-	3	2
	Total	**24**	**6**	**28**

IV YEAR II SEMESTER

Code	Subject	L	T/P/D	C
A83024	Design of Agricultural Machinery	4	-	4
A83026 A83027 A83025	**ELECTIVE – III** GIS and Remote Sensing Human Engineering and Safety Design of Tractors	4	-	4
A83023 A83028 A80129	**ELECTIVE – IV** Agricultural and Farm Structures Hydraulic Devices and Control Principles of Entrepreneurship	4	-	4
A80087	Industry Oriented Mini Project	-	-	2
A80089	Seminar	-	6	2
A80088	Project Work	-	15	10
A80090	Comprehensive Viva	-	-	2
	Total	**12**	**21**	**28**

Note: All End Examinations (Theory and Practical) are of three hours duration.
T-Tutorial   L – Theory   P – Practical   D-Drawing   C – Credits

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I Year B.Tech. Ag. Engg.	L	T/P/D	C
	2	-/-/-	4

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(A10001) ENGLISH

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Introduction:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competencies of Engineering students. The prescribed books and the exercises are meant to serve broadly as students' handbooks.

In the English classes, the focus should be on the skills of reading, writing, listening and speaking and for this the teachers should use the text prescribed for detailed study. For example, the students should be encouraged to read the texts/selected paragraphs silently. The teachers can ask comprehension questions to stimulate discussion and based on the discussions students can be made to write short paragraphs/essays etc.

The text for non-detailed study is for extensive reading/reading for pleasure. Hence, it is suggested that they read it on their own the topics selected for discussion in the class. The time should be utilized for working out the exercises given after each section, as also for supplementing the exercises with authentic materials of a similar kind for example, from newspaper articles, advertisements, promotional material etc.. However, the stress in this syllabus is on skill development, fostering ideas and practice of language skills.

Objectives:

- To improve the language proficiency of the students in English with emphasis on LSRW skills.

- To equip the students to study academic subjects more effectively using the theoretical and practical components of the English syllabus.

- To develop the study skills and communication skills in formal and informal situations.

SYLLABUS:

Listening Skills:

Objectives

1. To enable students to develop their listening skill so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation.

2. To equip students with necessary training in listening so that they

can comprehend the speech of people of different backgrounds and regions.

Students should be given practice in listening to the sounds of the language to be able to recognise them, to distinguish between them to mark stress and recognise and use the right intonation in sentences.

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

Speaking Skills:

Objectives

1. To make students aware of the role of speaking in English and its contribution to their success.
2. To enable students to express themselves fluently and appropriately in social and professional contexts.

- Oral practice
- Describing objects/situations/people
- Role play – Individual/Group activities (Using exercises from the five units of the prescribed text: **Skills Annexe -Functional English for Success)**
- Just A Minute(JAM) Sessions.

Reading Skills:

Objectives

1. To develop an awareness in the students about the significance of silent reading and comprehension.
2. To develop the ability of students to guess the meanings of words from context and grasp the overall message of the text, draw inferences etc.

- Skimming the text
- Understanding the gist of an argument
- Identifying the topic sentence
- Inferring lexical and contextual meaning
- Understanding discourse features
- Scanning
- Recognizing coherence/sequencing of sentences

NOTE : The students will be trained in reading skills using the prescribed

text for detailed study.

They will be examined in reading and answering questions using 'unseen' passages which may be taken from authentic texts, such as magazines/ newspaper articles.

Writing Skills :

Objectives

1. To develop an awareness in the students about writing as an exact and formal skill.

2. To equip them with the components of different forms of writing, beginning with the lower order ones.

- Writing sentences
- Use of appropriate vocabulary
- Paragraph writing
- Coherence and cohesiveness
- Narration / description
- Note Making
- Formal and informal letter writing
- Describing graphs using expressions of comparison

TEXTBOOKS PRESCRIBED:

In order to improve the proficiency of the student in the acquisition of the four skills mentioned above, the following texts and course content, divided into Five Units, are prescribed:

For Detailed study: First Textbook: "Skills Annexe -Functional English for Success", Published by Orient Black Swan, Hyderabad

For Non-detailed study

1. **Second text book "Epitome of Wisdom",** Published by Maruthi Publications, Guntur

   • The course content and study material is divided into Five Units.

Unit –I:

1. Chapter entitled **'Wit and Humour**' from **"Skills Annexe -Functional English for Success"**, Published by Orient Black Swan, Hyderabad

2. Chapter entitled **'Mokshagundam Visvesvaraya'** from **"Epitome of Wisdom**", Published by Maruthi Publications, Hyderabad.

L- Listening For Sounds, Stress and Intonation

S- Greeting and Taking Leave, Introducing Oneself and Others (Formal and Informal Situations)

R-   Reading for Subject/ Theme
W-   Writing Paragraphs
G-   Types of Nouns and Pronouns
V-   Homonyms, homophones synonyms, antonyms

Unit –II

1.   Chapter entitled **"Cyber Age"** from **"Skills Annexe -Functional English for Success"** Published by Orient Black Swan, Hyderabad.

2.   Chapter entitled **'Three Days To See'** from **"Epitome of Wisdom"**, Published by Maruthi Publications, Hyderabad.

L –   Listening for themes and facts
S –   Apologizing, interrupting, requesting and making polite conversation
R-   for theme and gist
W-   Describing people, places, objects, events
G-   Verb forms
V-   noun, verb, adjective and adverb

Unit –III

1.   Chapter entitled **'Risk Management'** from **"Skills Annexe - Functional English for Success"** Published by Orient Black Swan, Hyderabad

2.   Chapter entitled **'Leela's Friend'** by R.K. Narayan from **"Epitome of Wisdom"**, Published by Maruthi Publications, Hyderabad

L –   for main points and sub-points for note taking
S –   giving instructions and directions; Speaking of hypothetical situations
R –   reading for details
W –   note-making, information transfer, punctuation
G –   present tense
V –   synonyms and antonyms

Unit –IV

1.   Chapter entitled **'Human Values and Professional Ethics'** from **"Skills Annexe -Functional English for Success"** Published by Orient Black Swan, Hyderabad

2.   Chapter entitled **'The Last Leaf'** from **"Epitome of Wisdom"**, Published by Maruthi Publications, Hyderabad

L -   Listening for specific details and information
S-   narrating, expressing opinions and telephone interactions
R -   Reading for specific details and information

W-   Writing formal letters and CVs

G-   Past and future tenses

V-   Vocabulary - idioms and Phrasal verbs

Unit –V

1.   Chapter entitled **'Sports and Health'** from **"Skills Annexe - Functional English for Success"** Published by Orient Black Swan, Hyderabad

2.   Chapter entitled **'The Convocation Speech'** by N.R. Narayanmurthy' from **"Epitome of Wisdom"**, Published by Maruthi Publications, Hyderabad

L-   Critical Listening and Listening for speaker's tone/ attitude

S-   Group discussion and Making presentations

R-   Critical reading, reading for reference

W-   Project proposals; Technical reports, Project Reports and Research Papers

G-   Adjectives, prepositions and concord

V-   Collocations and Technical vocabulary

Using words appropriately

*   Exercises from the texts not prescribed shall also be used for classroom tasks.

REFERENCES :

1.   Contemporary English Grammar Structures and Composition by David Green, MacMillan Publishers, New Delhi. 2010.

2.   Innovate with English: A Course in English for Engineering Students, edited by T Samson, Foundation Books.

3.   English Grammar Practice, Raj N Bakshi, Orient Longman.

4.   Technical Communication by Daniel Riordan. 2011. Cengage Publications. New Delhi.

5.   Effective English, edited by E Suresh Kumar, A RamaKrishna Rao, P Sreehari, Published by Pearson

6.   Handbook of English Grammar& Usage, Mark Lester and Larry Beason, Tata Mc Graw –Hill.

7.   Spoken English, R.K. Bansal & JB Harrison, Orient Longman.

8.   Technical Communication, Meenakshi Raman, Oxford University Press

9.   Objective English Edgar Thorpe & Showick Thorpe, Pearson Education

10. Grammar Games, Renuvolcuri Mario, Cambridge University Press.
11. Murphy's English Grammar with CD, Murphy, Cambridge University Press.
12. Everyday Dialogues in English, Robert J. Dixson, Prentice Hall India Pvt Ltd.,
13. ABC of Common Errors Nigel D Turton, Mac Millan Publishers.
14. Basic Vocabulary Edgar Thorpe & Showick Thorpe, Pearson Education
15. Effective Technical Communication, M Ashraf Rizvi, Tata Mc Graw – Hill.
16. An Interactive Grammar of Modern English, Shivendra K. Verma and Hemlatha Nagarajan , Frank Bros & CO
17. A Communicative Grammar of English, Geoffrey Leech, Jan Svartvik, Pearson Education
18. Enrich your English, Thakur K B P Sinha, Vijay Nicole Imprints Pvt Ltd.,
19. A Grammar Book for You And I, C. Edward Good, MacMillan Publishers

Outcomes:

• Usage of English Language, written and spoken.

• Enrichment of comprehension and fluency

• Gaining confidence in using language in verbal situations.

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(A10002) MATHEMATICS -I

Objectives: To learn

- The types of Matrices and their properties
- Concept of rank of a matrix and applying the concept of rank to know the consistency of linear equations and to find all possible solutions, if exist.
- The concept of eigenvalues and eigenvectors of a matrix is to reduce a quadratic form into a canonical form through a linear transformation.
- The mean value theorems and to understand the concepts geometrically.
- The functions of several variables and optimization of these functions.
- The evaluation of improper integrals, Beta and Gamma functions.
- Multiple integration and its applications.
- Methods of solving the differential equations of 1st and higher order
- The applications of the differential equations to Newton's law of cooling, Natural growth and decay, Bending of beams etc.
- The definition of integral transforms and Laplace Transform.
- Properties of Laplace transform.
- Inverse Laplace Transform.
- Convolution theorem.
- Solution of Differential equations using Laplace transform.

UNIT-I

Theory of Matrices: Real matrices – Symmetric, skew – symmetric, orthogonal. Complex matrices: Hermitian, Skew-Hermitian and Unitary Matrices. Idempotent matrix, Elementary row and column transformations-Elementary matrix, Finding rank of a matrix by reducing to Echelon and normal forms. Finding the inverse of a non-singular square matrix using row/ column transformations (Gauss- Jordan method). Consistency of system of linear equations (homogeneous and non- homogeneous) using the rank of a matrix. Solving m x n and n x n linear system of equations by Gauss elimination.

Cayley-Hamilton Theorem (without proof) – Verification. Finding inverse of a matrix and powers of a matrix by Cayley-Hamilton theorem, Linear dependence and Independence of Vectors. Linear Transformation –

Orthogonal Transformation. Eigen values and eigen vectors of a matrix. Properties of eigen values and eigen vectors of real and complex matrices. Finding linearly independent eigen vectors of a matrix when the eigen values of the matrix are repeated.

Diagonalization of matrix – Quadratic forms up to three variables. Rank – Positive definite, negative definite, semi definite, index, signature of quadratic forms. Reduction of a quadratic form to canonical form.

UNIT – II

Differential calculus methods: Rolle's Mean value Theorem – Lagrange's Mean Value Theorem – Cauchy's mean value Theorem – (all theorems without proof but with geometrical interpretations), verification of the Theorems and testing the applicability of these theorem to the given function.

Functions of several variables: Functional dependence- Jacobian- Maxima and Minima of functions of two variables without constraints and with constraints-Method of Lagrange multipliers.

UNIT – III

Improper integration, Multiple integration & applications: Gamma and Beta Functions –Relation between them, their properties – evaluation of improper integrals using Gamma / Beta functions

Multiple integrals – double and triple integrals – change of order of integration-change of variables (polar, cylindrical and spherical) Finding the area of a region using double integration and volume of a region using triple integration.

UNIT – IV

Differential equations and applications: Overview of differential equations-exact, linear and Bernoulli (NOT TO BE EXAMINED). Applications of first order differential equations – Newton's Law of cooling, Law of natural growth and decay, orthogonal trajectories.

Linear differential equations of second and higher order with constant coefficients, Non-homogeneous term of the type $f(X) = e^{ax}$, Sin ax, Cos ax, and x, eV(x), xV(x), method of variation of parameters. Applications to bending of beams, Electrical circuits and simple harmonic motion.

UNIT – V

Laplace transform and its applications to Ordinary differential equations Definition of Integral transform, Domain of the function and Kernel for the Laplace transforms. Existence of Laplace transform. Laplace transform of standard functions, first shifting Theorem, Laplace transform of functions when they are multiplied or divided by "t". Laplace transforms of derivatives and integrals of functions. – Unit step function – second shifting theorem – Dirac's delta function, Periodic function – Inverse Laplace transform by

Partial fractions(Heaviside method) Inverse Laplace transforms of functions when they are multiplied or divided by "s", Inverse Laplace Transforms of derivatives and integrals of functions, Convolution theorem –- Solving ordinary differential equations by Laplace transforms.

TEXT BOOKS:

1.   Advanced engineering Mathematics by Kreyszig, John Wiley & Sons Publishers.

2.   Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers.

REFERENCES:

1.   Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyengar, 3rd edition, Narosa Publishing House, Delhi.

2.   Engineering Mathematics – I by T.K. V. Iyengar, B. Krishna Gandhi & Others, S. Chand.

3.   Engineering Mathematics – I by D. S. Chandrasekhar, Prison Books Pvt. Ltd.

4.   Engineering Mathematics – I by G. Shanker Rao & Others I.K. International Publications.

5.   Advanced Engineering Mathematics with MATLAB, Dean G. Duffy, 3rd Edi, CRC Press Taylor & Francis Group.

6.   Mathematics for Engineers and Scientists, Alan Jeffrey, 6th Edi, 2013, Chapman & Hall/ CRC

7.   Advanced Engineering Mathematics, Michael Greenberg, Second Edition, Pearson Education.

Outcome:

- After learning the contents of this Unit the student is able to write the matrix representation of a set of linear equations and to analyze solutions of system of equations.

- The student will be able to understand the methods of differential calculus to optimize single and multivariable functions.

- The student is able to evaluate the multiple integrals and can apply the concepts to find the Areas, Volumes, Moment of Inertia etc., of regions on a plane or in space.

- The student is able to identify the type of differential equation and uses the right method to solve the differential equation. Also able to apply the theory of differential equations to   the real world problems.

- The student is able to solve certain differential equations using Laplace Transform. Also able to transform functions on time domain to frequency domain using Laplace transforms.

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(A10302) ENGINEERING MECHANICS

UNIT – I

Introduction to Engineering Mechanics – Basic Concepts. **Resultants of Force System:** Parallelogram law **–**Forces and components- Resultant of coplanar Concurrent Forces – Components of forces in Space – Moment of Force - principle of moments – Coplanar Applications – Couples - Resultant of any Force System.

Equilibrium of Force Systems : Free Body Diagrams, Equations of Equilibrium - Equilibrium of planar Systems - Equilibrium of Spatial Systems.

UNIT – II

Friction: Introduction **–** Theory of Friction – Angle of friction - Laws of Friction – Static and Dynamic Frictions – Motion of Bodies: Wedge, Screw, Screw-jack, and Differential Screw-jack.

Transmission of Power: Flat Belt Drives - Types of Flat Belt Drives – Length of Belt, tensions, Tight side, Slack Side, Initial and Centrifugal – Power Transmitted and Condition for Max. Power.

UNIT – III

Centroids and Centers of Gravity: Introduction – Centroids and Centre of gravity of simple figures (from basic principles) – Centroids of Composite Figures - Theorem of Pappus – Center of gravity of bodies and centroids of volumes.

Moments of Inertia : Definition – Polar Moment of Inertia –Radius of gyration - Transfer formula for moment of inertia - Moments of Inertia for Composite areas - Products of Inertia, Transfer Formula for Product of Inertia.

Mass Moment of Inertia : Moment of Inertia of Masses- Transfer Formula for Mass Moments of Inertia - mass moment of inertia of composite bodies.

UNIT – IV

Kinematics of a Particle: Motion of a particle – Rectilinear motion – motion curves – Rectangular components of curvilinear motion– Kinematics of Rigid Body - Types of rigid body motion -Angular motion - Fixed Axis Rotation

Kinetics of particles: Translation -Analysis as a Particle and Analysis as a Rigid Body in Translation – Equations of plane motion - Angular motion - Fixed Axis Rotation – Rolling Bodies.

UNIT – V

Work – Energy Method: Work energy Equations for Translation - Work-

Energy Applications to Particle Motion – Work energy applied to Connected Systems - Work energy applied to Fixed Axis Rotation and Plane Motion. Impulse and momentum.

Mechanical Vibrations : Definitions and Concepts – Simple Harmonic Motion – Free vibrations, simple and Compound Pendulums – Torsion Pendulum – Free vibrations without damping: General cases.

TEXT BOOKS:

1. Engineering Mechanics - Statics and Dynamics by Ferdinand.L. Singer / Harper International Edition.

2. Engineering Mechanics/ S. Timoshenko and D.H. Young, Mc Graw Hill Book Compan.

REFERENCES:

1. Engineering Mechanics / Irving Shames / Prentice Hall

2. A text of Engineering Mechanics /YVD Rao/ K. Govinda Rajulu/ M. Manzoor Hussain, Academic Publishing Company

3. Engg. Mechanics / M.V. Seshagiri Rao & D Rama Durgaiah/ Universities Press

4. Engineering Mechanics, Umesh Regl / Tayal.

5. Engg. Mechanics / KL Kumar / Tata McGraw Hill.

6. Engg. Mechanics / S.S. Bhavikati & K.G. Rajasekharappa

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(A10004) ENGINEERING PHYSICS

Objectives:

It gives

- to the students basic understanding of bonding in solids, crystal structures and techniques to characterize crystals.

- to understand the behavior of electron in a solid and thereby one can determine the conductivity and specific heat values of the solids.

- to study applications in Engineering like memory devices, transformer core and Electromagnetic machinery.

- to help the student to design powerful light sources for various Engineering Applications and also enable them to develop communication systems using Fiber Technology.

- to understand the working of Electronic devices, how to design acoustic proof halls and understand the behavior of the materials at Nano scale.

UNIT-I

Crystallography: Ionic Bond, Covalent Bond, Metallic Bond, Hydrogen Bond, Vander-Waal's Bond, Calculation of Cohesive Energy of diatomic molecule-Space Lattice**,** Unit Cell, Lattice Parameters, Crystal Systems, Bravais Lattices, Atomic Radius, Co-ordination Number and Packing Factor of SC, BCC, FCC, Miller Indices, Crystal Planes and Directions, Inter Planar Spacing of Orthogonal Crystal Systems, Structure of Diamond and NaCl.

X-ray Diffraction & Defects in Crystals: Bragg's Law, X-Ray diffraction methods: Laue Method, Powder Method**:** Point Defects: Vacancies, Substitutional, Interstitial, Frenkel and Schottky Defects, line defects (Qualitative) & Burger's Vector.

UNIT-II

Principles of Quantum Mechanics: Waves and Particles, de Broglie Hypothesis , Matter Waves, Davisson and Germer' Experiment, Heisenberg's Uncertainty Principle, Schrödinger's Time Independent Wave Equation - Physical Significance of the Wave Function – Infinite square well potential, extension to three dimensions

Elements of Statistical Mechanics & Electron theory of Solids: Phase space, Ensembles, Micro Canonical , Canonical and Grand Canonical Ensembles **-** Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac Statistics (Qualitative Treatment), Concept of Electron Gas, , Density of States, Fermi

Energy- Electron in a periodic Potential, Bloch Theorem, Kronig-Penny Model (Qualitative Treatment), E-K curve, Origin of Energy Band Formation in Solids, Concept of Effective Mass of an Electron, Classification of Materials into Conductors, Semi Conductors & Insulators.

UNIT-III

Dielectric Properties: Electric Dipole, Dipole Moment, Dielectric Constant, Polarizability, Electric Susceptibility, Displacement Vector, Electronic, Ionic and Orientation Polarizations and Calculation of Polarizabilities: Ionic and Electronic - Internal Fields in Solids, Clausius - Mossotti Equation, Piezo - electricity and Ferro- electricity.

Magnetic Properties & Superconducting Properties: Permeability, Field Intensity, Magnetic Field Induction, Magnetization, Magnetic Susceptibility, Origin of Magnetic Moment, Bohr Magneton, Classification of Dia, Para and Ferro Magnetic Materials on the basis of Magnetic Moment, Domain Theory of Ferro Magnetism on the basis of Hysteresis Curve, Soft and Hard Magnetic Materials, Properties of Anti-Ferro and Ferri Magnetic Materials and their Applications, Superconductivity, Meissner Effect, Effect of Magnetic field, Type-I & Type-II Superconductors, Applications of Superconductors.

UNIT-IV

Optics: Interference-Interference in thin films (Reflected light), Newton rings experiment- Fraunhofer diffraction due to single slit, N-slits, Diffraction grating experiment , Double refraction-construction and working of Nicol's Prism

Lasers & Fiber Optics: Characteristics of Lasers, Spontaneous and Stimulated Emission of Radiation, Einstein's Coefficients and Relation between them, Population Inversion, Lasing Action, Ruby Laser, Helium-Neon Laser, Semiconductor Diode Laser, Applications of Lasers- Principle of Optical Fiber, Construction of fiber, Acceptance Angle and Acceptance Cone, Numerical Aperture, Types of Optical Fibers: Step Index and Graded Index Fibers, Attenuation in Optical Fibers, Application of Optical Fiber in communication systems.

UNIT-V:

Semiconductor Physics: Fermi Level in Intrinsic and Extrinsic Semiconductors, Calculation of carrier concentration in Intrinsic &, Extrinsic Semiconductors, Direct and Indirect Band gap semiconductors, Hall Effect-Formation of PN Junction, Open Circuit PN Junction, Energy Diagram of PN Diode, Diode Equation, I-V Characteristics of PN Junction diode, Solar cell, LED & Photo Diodes. **Acoustics of Buildings & Acoustic Quieting:** Reverberation and Time of Reverberation, Sabine's Formula for Reverberation Time, Measurement of Absorption Coefficient of a Material, factors affecting the Architectural Acoustics and their Remedies

Nanotechnology: Origin of Nanotechnology, Nano Scale, Surface to Volume

Ratio, Quantum Confinement, Bottom-up Fabrication: Sol-gel, Top-down Fabrication: Chemical Vapour Deposition, Characterization by TEM.

TEXT BOOKS:

1. Engineering Physics,K. Malik, A. K. Singh, Tata Mc Graw Hill Book Publishers.

2. Engineering Physics, V. Rajendran, Tata Mc Graw Hill Book Publishers.

REFERENCES:

1. Fundamentals of Physics, David Halliday, Robert Resnick, Jearl Walker by John Wiley & Sons.

2. Sears and Zemansky's University Physics (10th Edition) by Hugh D. Young Roger A. Freedman, T. R. Sandin, A. Lewis FordAddison-Wesley Publishers.

3. Applied Physics for Engineers – P. Madhusudana Rao (Academic Publishing company, 2013).

4. Solid State Physics – M. Armugam (Anuradha Publications).

5. Modern Physics – R. Murugeshan & K. Siva Prasath – S. Chand & Co. (for Statistical Mechanics).

6. A Text Book of Engg Physics – M. N. Avadhanulu & P. G. Khsirsagar– S. Chand & Co. (for acoustics).

7. Modern Physics by K. Vijaya Kumar, S. Chandralingam: S. Chand & Co.Ltd.

8. Nanotechnology – M.Ratner & D. Ratner (Pearson Ed.).

9. Introduction to Solid State Physics – C. Kittel (Wiley Eastern).

10. Solid State Physics – A.J. Dekker (Macmillan).

11. Applied Physics – Mani Naidu Pearson Education.

Outcomes:

- The student would be able to learn the fundamental concepts on behavior of crystalline solids.

- The knowledge on Fundamentals of Quantum Mechanics, Statistical Mechanics enables the student to apply to various systems like Communications Solar Cells, Photo Cells and so on.

- Design, Characterization and study of properties of materials help the student to prepare new materials for various Engineering applications.

- This course also helps the student exposed to non-destructive testing methods.

- Finally, Engineering Physics Course helps the student to develop problem solving skills and analytical skills.

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(A10005) ENGINEERING CHEMISTRY

Objective:

An engineer is as someone who uses scientific, natural and physical principles to design something of use for people or other living creatures. Much of what any engineer does involves chemistry because everything in our environment has a molecular make up. Engineering requires the concepts of applied chemistry and the more chemistry an engineer understands, the more beneficial it is. In the future, global problems and issues will require an in-depth understanding of chemistry to have a global solution. This syllabus aims at bridging the concepts and theory of chemistry with examples from fields of practical application, thus reinforcing the connection between science and engineering. It deals with the basic principles of various branches of chemistry which are fundamental tools necessary for an accomplished engineer.

UNIT I:

Electrochemistry & Corrosion: Electro Chemistry – Conductance - Specific, Equivalent and Molar conductance and their Units; Applications of Conductance (Conductometric titrations). **EMF:** Galvanic Cells, types of Electrodes – (Calomel, Quinhydrone and glass electrodes); Nernst equation and its applications ; concept of concentration cells, electro chemical series, Potentiometric titrations, determination of P^H using glass electrode-Numerical problems.

Batteries: Primary cells (dry cells) and secondary cells (lead-Acid cell, Ni-Cd cell, Lithium cells). Applications of batteries. **Fuel cells** – Hydrogen – Oxygen fuel cell; methanol – oxygen fuel cell ; Advantages and Applications.

Corrosion and its control: Causes and effects of corrosion; Theories of corrosion – Chemical & Electrochemical corrosion; Types of corrosion (Galvanic, Water line, Pitting and Intergranular); Factors affecting rate of corrosion – Nature of metal and Nature of Environment – Corrosion control methods – Cathodic protection (sacrificial anodic and impressed current). Surface coatings: Metallic coatings & methods of application of metallic coatings - hot dipping (galvanization & tinning), Cementation, cladding, electroplating (copper plating) Electroless plating (Ni plating) - Organic coatings – Paints - constituents and their functions.

UNIT II:

Engineering Materials: Polymers: Types of Polymerization (Chain & Step growth).**Plastics:** Thermoplastic & Thermo setting resins; Compounding &

fabrication of plastics (Compression and injection moulding).Preparation, properties, engineering applications of PVC, Teflon and Bakelite. **Fibers-** Charcterstics of fibers – preparation, properties and uses of Nylon – 6,6 and Dacron – Fiber Reinforced Plastics (FRP) – applications. **Rubbers** – Natural rubber and its vulcanization. Elastomers – Buna-s, Butyl rubber and Thiokol rubber.

Conducting polymers: Polyacetylene, Polyaniline, Mechanism of Conduction, doping; applications of Conducting polymers. **Bio-degradable Polymers**- preparation and Applications of Poly vinyl acetate and Poly lactic acid - **Cement:** composition of Portland cement, setting & hardening of cement (reactions), **Lubricants:** Classification with examples- Characterstics of a good lubricant & mechanism of lubrication (thick film, thin film and extreme pressure) – properties of lubricants: viscosity, Cloud point, flash and fire points. **Refractories:** Classification, characteristics of a good refractory and applications.

Nanomaterials: Introduction, preparation by sol-gel & chemical vapour deposition methods. Applications of nanomaterials.

UNIT III:

Water and its Treatment: Hardness of Water: Causes of hardness, expression of hardness – units – types of hardness, estimation of temporary & permanent hardness of water by EDTA method - numerical problems. Boiler troubles – Scale & sludges, Priming and foaming, caustic enbrittlement and boiler corrosion; Treatment of boiler feed water – Internal treatment (Phosphate, Colloidal and calgon conditioning) – External treatment – Lime Soda process, Zeolite process and ion exchange process. Numerical Problems. **Potable Water**- Its Specifications – Steps involved in treatment of potable water – Disinfection of water by chlorination and ozonisation. Reverse osmosis & its significance.

Unit – IV :

Fuels & Combustion: Fuels – Classification – soild fuels : coal – analysis of coal - proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining – cracking – types – fixed bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol, Bergius and Fischer-Tropsch's process: Gaseous fuels - constituents, characteristics and applications of natural gas, LPG and CNG. Analysis of flue gas by Orsat's apparatus – Numerical Problems.

Combustion – Definition, Calorific value of fuel – HCV , LCV; Determination of calorific value by Junker's gas calorimeter – theoretical calculation of Calorific value by Dulong's formula – Numerical problems on combustion.

UNIT V:

Phase Rule & Surface Chemistry : **Phase Rule:** Definition of terms: Phase,

component, degree of freedom, phase rule equation. Phase diagrams – one component system- water system. Two component system Lead- Silver, cooling curves, heat treatment based on iron-carbon phase diagram - hardening, annealing and normalization.

Surface Chemistry: **Adsorption –** Types of Adsorption, Isotherms – Freundlich and Langmuir adsorption isotherm, applications of adsorption; **Colloids**: Classification of Colloids; Electrical & optical properties, micelles, applications of colloids in industry.

TEXT BOOKS:

1.   Engineering Chemistry by R.P. Mani,K.N. Mishra, B. Rama Devi / CENGAGE learning.

2.   Engineering Chemistry by P.C Jain & Monica Jain, Dhanpatrai Publishing Company (2008).

REFERENCE BOOKS

1.   Engineering Chemistry by B. Siva Shankar Mc.Graw Hill Publishing Company Limited, New Delhi (2006).

2.   Engineering Chemistry J.C. Kuriacase & J. Rajaram, Tata McGraw Hills Publishing Company Limited, New Delhi (2004).

3.   Text Book of Engineering Chemistry by S.S. Dara & Mukkati S. Chand & Co Publishers, New Delhi (2006).

4.   Chemistry of Engineering Materials by CV Agarwal,C.P Murthy, A.Naidu, BS Publications.

Outcome:

• Students will demonstrate a depth of knowledge and apply the methods of inquiry in a discipline of their choosing, and they will demonstrate a breadth of knowledge across their choice of varied disciplines.

• Students will demonstrate the ability to access and interpret information, respond and adapt to changing situations, make complex decisions, solve problems, and evaluate actions.

• Students will demonstrate awareness and understanding of the skills necessary to live and work in a diverse engineering world.

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(A10501) COMPUTER PROGRAMMING

Objectives:

- To understand the various steps in Program development.
- To understand the basic concepts in C Programming Language.
- To learn how to write modular and readable C Programs.
- To learn to write programs (using structured programming approach) in C to solve problems.
- To introduce the students to basic data structures such as lists, stacks and queues.
- To make the student understand simple sorting and searching methods.

UNIT - I

Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Program Development.

Introduction to the C Language – Background, C Programs, Identifiers, Types, Variables, Constants, Input / Output, Operators (Arithmetic, relational, logical, bitwise etc.), Expressions, Precedence and Associativity, Expression Evaluation, Type conversions, Statements- Selection Statements (making decisions) – if and switch statements, Repetition statements (loops)-while, for, do-while statements, Loop examples, other statements related to looping – break, continue, goto, Simple C Program examples.

UNIT - II

Functions-Designing Structured Programs, Functions, user defined functions, inter function communication, Standard functions, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Limitations of recursion, example C programs, Preprocessor commands.

Arrays – Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multidimensional arrays, C program examples.

UNIT - III

Pointers – Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, Pointer Applications-Arrays and Pointers, Pointer Arithmetic and arrays, Passing an array to a function,

memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions.

Strings – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion, C program examples.

UNIT - IV

Enumerated, Structure, and Union Types– The Type Definition (typedef), Enumerated types, Structures –Declaration, initialization, accessing structures, operations on structures, Complex structures, structures and functions, Passing structures through pointers, self referential structures, unions, bit fields, C programming examples, command –line arguments.

Input and Output – Concept of a file, streams, text files and binary files, Differences between text and binary files, State of a file, Opening and Closing files, file input / output functions (standard library input / output functions for files), file status functions (error handling),Positioning functions, C program examples.

UNIT – V

Searching and Sorting – Sorting- selection sort, bubble sort, Searching-linear and binary search methods.

Lists- Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Push and Pop Operations, Queues- Enqueue and Dequeue operations.

TEXT BOOKS:

1. Computer Science: A Structured Programming Approach Using C, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.

2. Programming in C. P. Dey and M Ghosh , Oxford University Press.

REFERENCE BOOKS:

1. C& Data structures – P. Padmanabham, Third Edition, B.S. Publications.

2. C for All, S. Thamarai Selvi, R.Murugesan, Anuradha Publications.

3. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, 7th Edition, Pearson education.

4. Programming in C, Ajay Mittal, Pearson.

5. Programming with C, B.Gottfried, 3rd edition, Schaum's outlines, TMH.

6. Problem solving with C, M.T.Somasekhara, PHI

7. Programming with C, R.S.Bickar, Universities Press.

8. Computer Programming & Data Structures, E.Balagurusamy, 4th edition, TMH.

9. Programming in C – Stephen G. Kochan, III Edition, Pearson

Education.

10. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI.

11. C Programming with problem solving, J.A. Jones & K. Harrow,Dreamtech Press.

Outcomes:

- Demonstrate the basic knowledge of computer hardware and software.

- Ability to apply solving and logical skills to programming in C language and also in other languages.

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(A10301) ENGINEERING DRAWING

UNIT – I

Introduction to Engineering Drawing: Principles of Engineering Drawing/ Graphics – Various Drawing Instruments – Conventions in Drawing – **Lettering practice** – BIS Conventions.

Curves: Constructions of Curves used in Engineering Practice:

a) Conic Sections including the Rectangular Hyperbola – General method only.

b) Cycloid, Epicycloid and Hypocycloid

c) Involute.

Scales: Construction of different types of Scales, Plain, Diagonal, Vernier scale.

UNIT – II

Orthographic Projections in First Angle

Projection: Principles of Orthographic Projections – Conventions – First and Third Angle projections.

Projections of Points : including Points in all four quadrants.

Projections of Lines : Parallel, perpendicular, inclined to one plan and inclined to both planes. True length and true angle of a line. Traces of a line.

Projections of Planes: Plane parallel, perpendicular and inclined to one reference plane. Plane inclined to both the reference planes.

UNIT – III

Projections of Solids: Projections of regular solids, cube, prisms, pyramids, tetrahedran, cylinder and cone, axis inclined to both planes.

Sections and Sectional Views: Right Regular Solids – Prism, Cylinder, Pyramid, Cone – use of Auxiliary views.

UNIT – IV

Development of Surfaces: Development of Surfaces of Right, Regular Solids – Prisms, Cylinder, Pyramids, Cone and their parts. frustum of solids.

Intersection of Solids:- Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone.

UNIT – V

Isometric Projections : Principles of Isometric Projection – Isometric Scale – Isometric Views– Conventions – Plane Figures, Simple and Compound

Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of parts with Spherical surface.

Transformation of Projections : Conversion of Isometric Views to Orthographic Views. Conversion of orthographic views to isometric views – simple objects.

Perspective Projections : Perspective View : Points, Lines and Plane Figures, Vanishing Point Methods (General Method only).

TEXT BOOKS

1.   Engineering Drawing – Basant,   Agrawal, TMH

2.   Engineering Drawing, N.D. Bhatt

REFERENCES :

1.   Engineering Graphics. P I Varghese Tata McGraw Hill Education Pvt. Ltd.

2.   Engineering drawing – P.J. Shah .S.Chand Publishers.

3.   Engineering Drawing- Johle/Tata Macgraw Hill Book Publishers.

4.   Engineering Drawing – M.B. Shah and B.C. Rana, Pearson.

5 .   Engineering Drawing by K.Venu Gopal & V.Prabu Raja New Age Publications.

6.   Engineering Drawing by John. PHI Learning Publisher.

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(A10581) COMPUTER PROGRAMMING LAB

Objectives:

- To write programs in C to solve the problems.
- To implement linear data structures such as lists, stacks, queues.
- To implement simple searching and sorting methods.

Recommended Systems/Software Requirements:

- Intel based desktop PC
- ANSI C Compiler with Supporting Editors

Week I

a) Write a C program to find the sum of individual digits of a positive integer.

b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

c) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

Week 2

a) Write a C program to calculate the following Sum:

Sum=$1-x^2/2! +x^4/4!-x^6/6!+x^8/8!-x^{10}/10!$

b) Write a C program to find the roots of a quadratic equation.

Week 3

a) The total distance travelled by vehicle in 't' seconds is given by distance s = $ut+1/2at^2$ where 'u' and 'a' are the initial velocity (m/sec.) and acceleration (m/sec^2). Write C program to find the distance travelled at regular intervals of time given the values of 'u' and 'a'. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of 'u' and 'a'.

b) Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

Week 4

a) Write C programs that use both recursive and non-recursive functions

i)   To find the factorial of a given integer.

ii)   To find the GCD (greatest common divisor) of two given integers.

Week 5

a) Write a C program to find the largest integer in a list of integers.

b) Write a C program that uses functions to perform the following:

    i)   Addition of Two Matrices

    ii)   Multiplication of Two Matrices

Week 6

a) Write a C program that uses functions to perform the following operations:

    i)   To insert a sub-string in to a given main string from a given position.

    ii)   To delete n Characters from a given position in a given string.

b) Write a C program to determine if the given string is a palindrome or not

Week 7

a) Write a C program that displays the position or index in the string S where the string T begins, or – 1 if S doesn't contain T.

b) Write a C program to count the lines, words and characters in a given text.

Week 8

a) Write a C program to generate Pascal's triangle.

b) Write a C program to construct a pyramid of numbers.

Week 9

Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression:

$1+x+x^2+x^3+\ldots\ldots\ldots+x^n$

For example: if n is 3 and x is 5, then the program computes 1+5+25+125.

Print x, n, the sum

Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if n<0, then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal? If so, test for them too.

Week 10

a) 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.

b) Write a C program to convert a Roman numeral to its decimal equivalent.

Week 11

Write a C program that uses functions to perform the following operations:

     i) Reading a complex number

     ii) Writing a complex number

     iii) Addition of two complex numbers

     iv) Multiplication of two complex numbers

(Note: represent complex number using a structure.)

Week 12

a) Write a C program which copies one file to another.

b) Write a C program to reverse the first n characters in a file.

(Note: The file name and n are specified on the command line.)

Week 13

a) Write a C program to display the contents of a file.

b) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

Week 14

a) Write a C program that uses non recursive function to search for a Key value in a given list of integers using Linear search.

b) Write a C program that uses non recursive function to search for a Key value in a given sorted list of integers using Binary search.

Week 15

a) Write a C program that implements the Selection sort method to sort a given array of integers in ascending order.

b) Write a C program that implements the Bubble sort method to sort a given list of names in ascending order.

Week 16

Write a C program that uses functions to perform the following operations:

     i) Create a singly linked list of integer elements.

     ii) Traverse the above list and display the elements.

Week 17

Write a C program that implements stack (its operations) using a singly linked list to display a given list of integers in reverse order. Ex. input: 10 23 4 6   output: 6 4 23 10

Week 18

Write a C program that implements Queue (its operations) using a singly linked list to display a given list of integers in the same order. Ex. input: 10

23 4 6 output: 10 23 4 6

Week 19

Write a C program to implement the linear regression algorithm.

Week 20

Write a C program to implement the polynomial regression algorithm.

Week 21

Write a C program to implement the Lagrange interpolation.

Week 22

Write C program to implement the Newton- Gregory forward interpolation.

Week 23

Write a C program to implement Trapezoidal method.

Week 24

Write a C program to implement Simpson method.

TEXT BOOKS:

1.   C programming and Data Structures, P. Padmanabham, Third Edition, BS Publications

2.   Computer Programming in C, V. Rajaraman, PHI Publishers.

3.   C Programming, E.Balagurusamy, 3rd edition, TMH Publishers.

4.   C Programming, M.V.S.S.N.Prasad, ACME Learning Pvt. Ltd.

5.   C and Data Structures, N.B.Venkateswarlu and E.V.Prasad,S.Chand Publishers

6.   Mastering C, K.R. Venugopal and S.R. Prasad, TMH Publishers.

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(A10081) ENGINEERING PHYSICS / ENGINEERING CHEMISTRY LAB

ENGINEERING PHYSICS LAB
(Any TEN experiments compulsory)

Objectives

This course on Physics lab is designed with 13 experiments in an academic year. It is common to all branches of Engineering in B.Tech Ist year.

The objective of the course is that the student will have exposure to various experimental skills which is very essential for an Engineering student.

The experiments are selected from various areas of Physics like Physical Optics, Lasers, Fiber Optics, Sound, Mechanics, Electricity & Magnetism and Basic Electronics.

Also the student is exposed to various tools like Screw gauge, Vernier Callipers, Physics Balance , Spectrometer and Microscope.

1. Dispersive power of the material of a prism – Spectrometer

2. Determination of wavelength of a source – Diffraction Grating.

3. Newton's Rings - Radius of curvature of plano convex lens.

4. Melde's experiment – Transverse and longitudinal modes.

5. Time constant of an R-C circuit.

6. L-C-R circuit.

7. Magnetic field along the axis of current carrying coil – Stewart and Gees method.

8. Study the characteristics of LED and LASER sources.

9. Bending losses of fibres & Evaluation of numerical aperture of a given fibre.

10. Energy gap of a material of p-n junction.

11. Torsional pendulum.

12. Wavelength of light –diffraction grating - using laser.

13. Characteristics of a solar cell

LABORATORY MANUAL:

1. Laboratory Manual of Engineering Physics by Dr.Y.Aparna & Dr.K.Venkateswara Rao (V.G.S Publishers)

Outcomes

The student is expected to learn from this laboratory course the concept of error and its analysis. It also allows the student to develop experimental skills to design new experiments in Engineering.

With the exposure to these experiments the student can compare the theory and correlate with experiment.

ENGINEERING CHEMISTRY LAB

List of Experiments (Any 12 of the following)

Titrimetry:

1.   Estimation of ferrous iron by dichrometry.

2.   Estimation of hardness of water by EDTA method.

Mineral analysis:

3.   Determination of percentage of copper in brass.

4.   Estimation of manganese dioxide in pyrolusite.

Instrumental Methods:

Colorimetry:

5.   Determination of ferrous iron in cement by colorimetric method

6.   Estimation of copper by colorimetric method.

Conductometry:

7.   Conductometric titration of strong acid vs strong base.

8.   Conductometric titration of mixture of acids vs strong base.

Potentiometry:

9.   Titration of strong acid vs strong base by potentiometry.

10.   Titration of weak acid vs strong base by potentiometry.

Physical properties:

11.   Determination of viscosity of sample oil by redwood / oswald's viscometer.

12.   Determination of Surface tension of lubricants.

Preparations:

13.   Preparation of Aspirin

14.   Preparation of Thiokol rubber

Adsorption:

15.   Adsorption of acetic acid on charcoal.

TEXT BOOKS:

1.   Practical Engineering Chemistry by K. Mukkanti, etal, B.S. Publications, Hyderabad.

2.   Inorganic quantitative analysis, Vogel.

REFERENCE BOOKS:

1.   Text Book of engineering chemistry by R. N. Goyal and Harrmendra Goel, Ane Books Private Ltd.,

2.   A text book on experiments and calculation Engg. S.S. Dara.

3.   Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications.

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(A10083) ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

The **Language Lab** focuses on the production and practice of sounds of language and familiarises the students with the use of English in everyday situations and contexts.

Objectives

- To facilitate computer-aided multi-media instruction enabling individualized and independent language learning

- To sensitise the students to the nuances of English speech sounds, word accent, intonation and rhythm

- To bring about a consistent accent and intelligibility in their pronunciation of English by providing an opportunity for practice in speaking

- To improve the fluency in spoken English and neutralize mother tongue influence

- To train students to use language appropriately for interviews, group discussion and public speaking

Syllabus: English Language Communication Skills Lab shall have two parts:

a.   Computer Assisted Language Learning (CALL) Lab

b.   Interactive Communication Skills (ICS) Lab

The following course content is prescribed for the **English Language Communication Skills Lab**

Exercise – I

CALL Lab: Introduction to Phonetics – Speech Sounds – Vowels and Consonants

ICS Lab: Ice-Breaking activity and JAM session

Articles, Prepositions, Word formation- Prefixes & Suffixes, Synonyms & Antonyms

Exercise – II

CALL Lab: Structure of Syllables - Past Tense Marker and Plural Marker – Weak Forms and Strong Forms - Consonant Clusters.

ICS Lab: Situational Dialogues – Role-Play- Expressions in Various Situations

– Self-introduction and Introducing Others – Greetings – Apologies – Requests – Social and Professional Etiquette - Telephone Etiquette.

Concord (Subject in agreement with verb) and Words often misspelt-confused/misused

Exercise - III

CALL Lab: Minimal Pairs- Word accent and Stress Shifts- Listening Comprehension.

ICS Lab: Descriptions- Narrations- Giving Directions and guidelines.

Sequence of Tenses, Question Tags and One word substitutes.

Exercise – IV

CALL Lab: Intonation and Common errors in Pronunciation.

ICS Lab: Extempore- Public Speaking

Active and Passive Voice, –Common Errors in English, Idioms and Phrases

Exercise – V

CALL Lab: Neutralization of Mother Tongue Influence and Conversation Practice

ICS Lab: Information Transfer- Oral Presentation Skills

Reading Comprehension and Job Application with Resume preparation.

Minimum Requirement of infra structural facilities for ELCS Lab:

1. Computer Assisted Language Learning (CALL) Lab:

    The Computer aided Language Lab for 40 students with 40 systems, one master console, LAN facility and English language software for self- study by learners.

System Requirement (Hardware component):

Computer network with Lan with minimum 60 multimedia systems with the following specifications:

i)   P – IV Processor

    a)   Speed – 2.8 GHZ

    b)   RAM – 512 MB Minimum

    c)   Hard Disk – 80 GB

ii)   Headphones of High quality

2. Interactive Communication Skills (ICS) Lab :

    The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public Address System,

a T. V., a digital stereo –audio & video system and camcorder etc.

Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems):

1. Suresh Kumar, E. & Sreehari, P. 2009. *A Handbook for English Language Laboratories.* New Delhi: Foundation

2. *Speaking English Effectively* 2nd Edition by Krishna Mohan and N. P. Singh, 2011. Macmillan Publishers India Ltd. Delhi.

3. Sasi Kumar, V & Dhamija, P.V. *How to Prepare for Group Discussion and Interviews.* Tata McGraw Hill

4. Hancock, M. 2009. *English Pronunciation in Use. Intermediate.* Cambridge: CUP

5. Spoken English: A Manual of Speech and Phonetics by R. K. Bansal & J. B. Harrison. 2013. Orient Blackswan. Hyderabad.

6. Hewings, M. 2009. *English Pronunciation in Use. Advanced.* Cambridge: CUP

7. Marks, J. 2009. *English Pronunciation in Use. Elementary.* Cambridge: CUP

8. Nambiar, K.C. 2011. *Speaking Accurately. A Course in International Communication.* New Delhi : Foundation

9. Soundararaj, Francis. 2012. *Basics of Communication in English. New Delhi: Macmillan*

10. **Spoken English** (CIEFL) in 3 volumes with 6 cassettes, OUP.

11. **English Pronouncing Dictionary** Daniel Jones Current Edition with CD.

12. **A textbook of English Phonetics for Indian Students** by T. Balasubramanian (Macmillan)

13. **Prescribed Lab Manual:** A Manual entitled "*English Language Communication Skills (ELCS) Lab Manual- cum- Work Book*", published by Cengage Learning India Pvt. Ltd, New Delhi. 2013

DISTRIBUTION AND WEIGHTAGE OF MARKS

English Language Laboratory Practical Examination:

1. The practical examinations for the English Language Laboratory shall be conducted as per the University norms prescribed for the core engineering practical sessions.

2. For the Language lab sessions, there shall be a continuous evaluation

during the year for 25 sessional marks and 50 year-end Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The year- end Examination shall be conducted by the teacher concerned with the help of another member of the staff of the same department of the same institution.

Outcomes:

- Better Understanding of nuances of language through audio- visual experience and group activities.
- Neutralization of accent for intelligibility.
- Speaking with clarity and confidence thereby enhancing employability skills of the students.

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(A10082) IT WORKSHOP / ENGINEERING WORKSHOP

Objectives:

The IT Workshop for engineers is a training lab course spread over 54 hours. The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel and Power Point.

PC Hardware introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers. In addition hardware and software level troubleshooting process, tips and tricks would be covered. **The students should work on working PC to disassemble and assemble to working condition and install Windows and Linux on the same PC. Students are suggested to work similar tasks in the Laptop scenario wherever possible.**

Internet & World Wide Web module introduces the different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet. Usage of web browsers, email, newsgroups and discussion forums would be covered. In addition, awareness of cyber hygiene, i.e., protecting the personal computer from getting infected with the viruses, worms and other cyber attacks would be introduced.

Productivity tools module would enable the students in crafting professional word documents, excel spread sheets and power point presentations using the Microsoft suite of office tools and LaTeX. (**Recommended to use Microsoft office 2007 in place of MS Office 2003)**

PC Hardware

Week 1 – Task 1 : Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Week 2 – Task 2 : Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Week 3 – Task 3 : Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Week 4 – Task 4 : Every student should install Linux on the computer. This

computer should have windows installed. The system should be configured as dual boot with both windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Week 5 – Task 5: Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva

Week 6 – Task 6 : Software Troubleshooting : Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

Internet & World Wide Web

Week 7 - Task 1 : **Orientation & Connectivity Boot Camp :** Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Week 8 - Task 2 : Web Browsers, Surfing the Web : Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Week 9 - Task 3 : **Search Engines & Netiquette :** Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Week 10 - Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to first install antivirus software, configure their personal firewall and windows update on their computer. Then they need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

Week 11- Task 5: Develop your home page using HTML Consisting of your photo, name, address and education details as a table and your skill set as a list.

Productivity tools

LaTeX and Word

Week 12 – Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft (MS) office 2007/ equivalent (FOSS) tool word:

Importance of LaTeX and MS office 2007/ equivalent (FOSS) tool Word as word Processors, Details of the three tasks and features that would be covered in each, using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter.

Task 1 : Using LaTeX and Word to create project certificate. Features to be covered:-Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

Week 13 - Task 2: Creating project abstract Features to be covered:- Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Week 14 - Task 3 : Creating a Newsletter : Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

Excel

Week 15 - Excel Orientation: The mentor needs to tell the importance of MS office 2007/ equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the two tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text

Week 16 - Task 2 : Calculating GPA - .Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP, Sorting, Conditional formatting

LaTeX and MS/equivalent (FOSS) tool Power Point

Week 17 - Task1: Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in both LaTeX and Power point. Students will be given model power point presentation which needs to be replicated (exactly how it's asked).

Week 18- Task 2: Second week helps students in making their presentations interactive. Topic covered during this week includes: Hyperlinks, Inserting – Images, Clip Art, Audio, Video, Objects, Tables and Charts

Week 19 - Task 3: Concentrating on the in and out of Microsoft power point and presentations in LaTeX. Helps them learn best practices in designing and preparing power point presentation. Topic covered during this week

includes: - Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background, textures, Design Templates, Hidden slides.

REFERENCE BOOKS:

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
2. LaTeX Companion – Leslie Lamport, PHI/Pearson.
3. Introduction to Computers, Peter Norton, 6/e Mc Graw Hill Publishers.
4. Upgrading and Repairing, PC's 18th e, Scott Muller QUE, Pearson Education
5. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech
6. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.
7. PC Hardware and A+Handbook – Kate J. Chase PHI (Microsoft)

Outcomes:

- Apply knowledge for computer assembling and software installation.
- Ability how to solve the trouble shooting problems.
- Apply the tools for preparation of PPT, Documentation and budget sheet etc.

ENGINEERING WORKSHOP

1. TRADES FOR EXERCISES:

At least two exercises from each trade:

1. Carpentry
2. Fitting
3. Tin-Smithy and Development of jobs carried out and soldering.
4. Black Smithy
5. House-wiring
6. Foundry
7. Welding
8. Power tools in construction, wood working, electrical engineering and mechanical Engineering.

2. TRADES FOR DEMONSTRATION & EXPOSURE:

1.   Plumbing
2.   Machine Shop
3.   Metal Cutting (Water Plasma)

TEXT BOOK:

1.   Work shop Manual - P.Kannaiah/ K.L.Narayana/ Scitech Publishers.
2.   Workshop Manual / Venkat Reddy/ BS Publications/Sixth Edition.

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II Year B.Tech. Ag. Engg.-I Sem	L	T/P/D	C
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(A33001) FLUID MECHANICS AND OPEN CHANNEL HYDRAULICS

Objective: To enable the students to design efficient water conveyance systems like canals, channels and pipes from places of origin to delivery points by acquiring knowledge on the principles of mechanics of fluids, water measurement and regulation and open channel hydraulic principles.

Unit – I:

Fluids-definitions-classification-properties, dimensions. Fluid pressure–introduction– Measurement of fluid pressure–peizometer tube manometry–types of manometers. Mechanical gauges-Bourdon's tube pressure gauge-Diaphragm pressure gauge–Dead weight pressure gauge. Fluid Static force on submerged surfaces–Total force on horizontal, vertical and inclined surfaces. Center of pressure of an inclined immersed surface-Centre of pressure of a composite section. Pressure on a curved surface and its applications. Kinematics of fluid flow– introduction – continuity of fluid flow – Types of flow lines.

Unit –II:

Boundary layer theory- Thickness of Boundary layer, Thickness of Boundary layer in a laminar flow, Thickness of Boundary layer in a turbulent flow, Prandtl's Experiment of Boundary Layer separation. Dynamics of fluid flow – Various forms of energy in fluid flow, frictional loss, general equation. Bernoulli's theorem, Euler's equation of motion. Practical applications of Bernoulli's theorem, Verturimeter, pitot tube, Orifice meter.

Unit – III:

Buoyancy of flotation – metacentric height. Flow through orifices (Measurement of Discharge) – Types of orifices, Jet of water, vena contracta, Hydraulic coefficients, Experimental Method for Hydraulic Coefficients, Discharge through a rectangular orifice. Flow through Orifices (Measurement of Time) – Time of Emptying a square, rectangular or circular tank through an orifice at its bottom, time of emptying a hemispherical tank through an orifice at its bottom. Time of emptying a circular horizontal tank through an orifice at its bottom. Time of emptying a tank of variable cross-section through an orifice. Flow through Mouthpieces – Types of Mouthpieces – Loss of Head of a liquid flowing in a pipe, Discharge through a Mouthpiece. Flow over Notches- Types of notches, Discharge over a Rectangular Notch, Triangular Notch, Stepped Notch. Time of emptying a tank over a Rectangular Notch, Triangular Notch. Flow over weirs – Types of weirs, Discharge over a weir, Francis's formula for Discharge over a Rectangular weir (Effect of

End Contractions), Bazin's formula for Discharge over a rectangular weir, velocity of approach, Determination of Velocity of Approach.

Unit – IV:

Flow through simple pipes – Loss of head in pipes, Darcy's formula for loss of Head in pipes, Chezy's formula for loss of head in pipes. Transmission of power through pipes, Time of emptying a tank through a long pipe, Time of flow from one tank into another through a long pipe. Flow through compound pipes – Discharge through a compound pipe (Pipes in series)-Discharge through pipes in parallel, Equivalent size of a pipe, Discharge through branded pipes from one reservoir to another. Dimensional analysis and similitude – Rayleigh's method & Buckingham's pi theorem. Types of similarities, Dimensional analysis, dimensionless numbers, introduction to fluid machinery. Open channel hydraulics- classification of open channel and definitions. Chezy's formula for discharge through an open channel.

Unit – V:

Bazin's formula for discharge through open channel, Numerical Problems on design through open channel, Kutter's formula for discharge, Problems on design. Manning's formula for discharge through an open channel. Channels of most economical cross sections – Conditions for maximum discharge through a channel of rectangular section, trapezoidal section, circular section. Specific energy concept-Specific energy of a following fluid, specific energy diagram, critical depth, Type of flows, critical velocity. Velocity and Pressure profiles in open channels. Hydraulic jump, Types of Hydraulic Jumps, Depth of Hydraulic Jump, Loss of Head due to Hydraulic Jump.

TEXT BOOKS:

1.   Hydraulics and Fluid Mechanics, Modi P M and Seth S. M. 1973. Standard Book House, Delhi.

2.   Open Channel Hydraulics, Chow V T, 1983, McGraw Hill Book Co., New Delhi.

REFERENCES:

1.   A Text book of Hydraulics, Fluid Mechanics and Hydraulic Machines, Khurmi, R. S. 1970. S. Chand & Company Ltd., New Delhi.

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(A30009) ENVIRONMENTAL STUDIES

Objectives:

1. Understanding the importance of ecological balance for sustainable development.

2. Understanding the impacts of developmental activities and mitigation measures.

3. Understanding the environmental policies and regulations

UNIT-I :

Ecosystems: Definition, Scope and Importance of ecosystem. Classification, structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT-II:

Natural Resources: Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

UNIT-III:

Biodiversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT-IV:

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and

characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.

Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Problems and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol and Montréal Protocol.

UNIT-V:

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

SUGGESTED TEXT BOOKS:

1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.

2 Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T.Wright. 2008 PHL Learning Private Ltd. New Delhi.

2. Environmental Engineering and science by Gilbert M.Masters and Wendell P. Ela .2008 PHI Learning Pvt. Ltd.

3. Environmental Science by Daniel B.Botkin & Edward A.Keller, Wiley INDIA edition.

4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.

5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

Outcomes:

Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which inturn helps in sustainable development.

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(A30007) MATHEMATICS – III

Objectives: To learn

- Transforming the given variable coefficient equation (Cauchy's and Lagrange's) into the one with constant coefficients.
- Identifying ordinary points, singular points and regular singular points for the given ODE.
- Finding the series solution around a regular singular point.
- Solve the given ODE with variable coefficients by Frobenius method and test the convergence of its series solution.
- Series solutions for Legendre and Bessel differential equations, analyzing the properties of Legendre and Bessel polynomials.
- Differentiation and Integration of complex valued functions.
- Evaluation of integrals using Cahchy's integral formula.
- Taylor's series, Maclaurin's series and Laurent's series expansions of complex functions
- Evaluation of integrals using residue theorem.
- Transform a given function from z - plane to w – plane.
- Identify the transformations like translation, magnification, rotation and reflection and inversion.
- Properties of bilinear transformations.

UNIT – I:

Linear ODE with variable coefficients and series solutions(second order only): Equations reducible to constant coefficients-Cauchy's and Lagrange's differential equations. Motivation for series solutions, Ordinary point and Regular singular point of a differential equation , Transformation of non-zero singular point to zero singular point. Series solutions to differential equations around zero, Frobenius Method about zero.

Unit-II

Special Functions : Legendre's Differential equation, General solution of Legendre's equation, Legendre polynomials Properties: Rodrigue's formula – Recurrence relations, Generating function of Legendre's polynomials – Orthogonality. Bessel's Differential equation, Bessel functions properties: – Recurrence relations, Orthogonality, Generating function , Trigonometric expansions involving Bessel functions.

UNIT-III:

Complex Functions –Differentiation and Integration : Complex functions and its representation on Argand plane, Concepts of limit Continuity, Differentiability, Analyticity, Cauchy-Riemann conditions, Harmonic functions – Milne – Thompson method. Line integral – Evaluation along a path and by indefinite integration – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula.

UNIT-IV:

Power series expansions of complex functions and contour Integration: Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series. Singular point –Isolated singular point – pole of order m – essential singularity. Residue – Evaluation of residue by formula and by Laurent series – Residue theorem. Evaluation of integrals of the type

(a)   Improper real integrals $\int_{-\infty}^{\infty} f(x)dx$

(b) $\int_{c}^{c+2\pi} f(\cos\theta, \sin\theta)d\theta$

UNIT-V:

Conformal mapping: Transformation of z-plane to w-plane by a function, Conformal transformation. Standard transformations- Translation;

Magnification and rotation; inversion and reflection,Transformations like e^{z},

log z, z^2, and Bilinear transformation. Properties of Bilinear transformation, determination of bilinear transformation when mappings of 3 points are given .

TEXT BOOKS:

1.   Advanced Engineering Mathematics by Kreyszig, John Wiley & Sons.
2.   Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers.

REFERENCES:

1)   Complex Variables Principles And Problem Sessions By A.K.Kapoor, World Scientific Publishers
2)   Engineering Mathematics-3 By T.K.V.Iyengar andB.Krishna Gandhi Etc
3)   A Text Book Of Engineering Mathematics By N P Bali, Manesh Goyal
4)   Mathematics for Engineers and Scientists, Alan Jeffrey, 6th Edit. 2013, Chapman & Hall/CRC

5)   Advanced Engineering Mathematics, Michael Greenberg, Second Edition. Person Education

6)   Mathematics For Engineers By K.B.Datta And M.A S.Srinivas,Cengage Publications

Outcome: After going through this course the student will be able to:

- Apply the Frobenius method to obtain a series solution for the given linear 2nd ODE.

- Identify Bessel equation and Legendre equation and solve them under special conditions with the help of series solutions method. Also recurrence relations and orthogonality properties of Bessel and Legendre polynomials.

After going to through this course the student will be able to

a.   analyze the complex functions with reference to their analyticity, Integration using Cauchy's integral theorem,

b.   Find the Taylor's and Laurent series expansion of complex functions

c.   The conformal transformations of complex functions can be dealt with ease.

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(A30106) PROPERTIES AND STRENGTH OF MATERIALS

Objective: To enable the students to know about different materials used for engineering constructions like buildings, roads, farm structures and metals and other materials for manufacturing farm equipment, implements, dairy and food processing equipment.

Unit- I:

Properties of Engineering Materials, Classifications of Rocks, Sources of Stones and Natural bed of Stones, Properties, Varieties and uses of stones, Properties, Composition and uses of Bricks, Classification and tests of bricks, Properties, varieties and uses of Tiles, Properties, varieties and uses of Lime, Properties, varieties and uses of Cement, Properties, varieties and uses of Cement Mortar, Properties, Varieties and uses of Concrete, Properties, varieties and uses of Sand, Properties, varieties and uses of Paints, Properties, varieties and uses of Varnishes, Properties, varieties and uses of Distempers. Characteristics and uses of Glass, Characteristics and uses of Rubber, Characteristics and uses of Plywood, Characteristics and uses of Plastics,

Unit-II:

Characteristics and uses of Wrought Iron, Characteristics and uses of Cast Iron, Characteristics and uses of Steel, Characteristics and uses of Aluminium, Characteristics and uses of Copper, Characteristics and uses of Nickel, Alloys of Aluminium and its properties, Alloys of Copper and its properties, Alloys of Nickel and its properties, Definition and Types of Timber, Seasoning of Timber, Industrial Timber and uses of Timber, Methods of heat treatment of Steel.

Unit-III:

Introduction – Stresses, Tensile, Compressive and Shear-strains, Units-Elastic Curve- Elastic Limit – Poisons Ratio, Stresses in uniformity tapered circular sections- Stresses in bars of composite , Sections, Thermal Stresses and Strains in simple bars and composite bars, Elastic Constants- Young's Modulus (E), Bulk Modulus 9K0 and shear Modulus (G)- Relation between them, Stresses on oblique planes, Mohr's Circle method- Direct stresses in one plane, Direct Stresses in two planes- accompanied by shear stress,

Deflection of beams, Relation between slope, deflection and radios of curvature. Methods of finding out slopes & deflections of beams, Double integration method. Slope and Deflection equations off a simply supported beam with a central point load

Unit-IV:

simply supported beam with eccentric point load. Simply supported beam with a uniformly distributed load, Columns and Struts, Euler's column theory. Assumptions of Euler's column theory, Buckling load-derivations, Types of end conditions of columns; both ends hinged, both ends fixed, one end fixed and other hinged, Expression for buckling load of a column with one end fixed other free- with one end fixed and other hinged Expression for buckling load of a column with both ends hinged- with both ends

Fixed Types of end conditions of columns; both ends hinged, both ends fixed, one end fixed and other is hinged & one end fixed and other end is free. Types of end conditions of columns; both ends hinged, both ends fixed, one end fixed and other is hinged & one end fixed and other end is free. Limitations of euler's formula- Rankine's formula for columns.

Unit-V:

Riveted joints, types of joints- strength of a rivet and riveted joint-efficiency of a riveted joint Design of riveted joints, Eccentric riveted connections, Welded joist, types of welded joints, Strength of welded joints, technical terms. Design of welded joints, eccentric welded joints. Design of welded joints, eccentric welded joints. Dams, forces acting, stressed at the base of dam. Stability of dams, design of base width of dams. Propped cantilever and beams – Deflection and slope Equations, Fixed and continuous beams – Deflection and Slope Equations, Super position theorem – claypeyron's theorem of three moments, Application of Clayperon's theorem of three moments, Moment distribution methods. Analysis of statistically indeterminate beams.

TEXT BOOKS:

1.   Engineering Materials, Rangwala, S.C.1994. Charotar Publishing House, Anand.

2.   Strength of Materials by Ramamrutham S. 2003. Dhanapathrai & Sons, Nai Sarak, New Delhi.

REFERENCES:

1.   Material of constructions Deshpande RS 1977. United Book Corporation, Poona.

2.   Manufacturing Process. Hazra Choudhury 1985. Media Promoters and Publishers Private Limited, Bombay.

3.   Workshop Technology (Part-I) Chapman W.A.J. 1994. Aronold Publishers, New Delhi.

4.   Engineering Materials. Rangwala S.C. 1994. Charotar Publishing House, Anand.

5.   Mechanics of Structures (Vol.I) Junarkar S.B. 2001 - Charotar Publishing House, Anand.

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(A30207) ELECTRICAL SYSTEMS

Unit- I:

Independent, Dependent Sources and Kirchoff's Laws, Maxwell's Loop current method and its problems, Nodal Voltage Method and its problems, Thevenin's Theorem and its problems, Norton's Theorem and its problems, Superposition Theorem and its problems, Reciprocity and Maximum power Transfer, Star-Delta Conversion Method and its problems.

Unit-II:

Solution of DC circuit by Network Theorems, Sinusoidal steady state response of circuits, Instantaneous and Average Methods, Concept of Power Factor, Reactive and Apparent Poser, Concept and Analysis of Balanced Polyphase circuits, Laplace Transform method of finding step response of DC circuits, Series and Parallel Resonance.

Unit-III:

Electromotive force, Reluctance, Magnetic circuit, Determination of Ampere Turn Hysteretic losses and eddy current losses, Transformer-working principle, Construction of single phase transformer, EMF equation of transfer, Core type transformer, shall type and difference between shell and core type transformer, Electric circuit, dielectric insulation, leakage reactance in transformer. Voltage regulation, transformer test, open circuit and short circuit tests, Losses in a transformer efficiency of transformer, condition for maximum efficiency, Equivalent circuit of transformer, theory of an ideal transformer, Phaser diagram of an ideal transformer, transformer on non load, Phaser diagram of transformer on load, problems solved.

Unit IV

DC Generator, Principle of working construction, field system, armature, Commentator, other accessories of DC generator, EMF equation of DC generator, Torque equation, DC armature winding, lap winding wave winding terms used in armature winding, Armature reaction, Demagnetizing & Cross magnetizing ampere turns, methods of compensating armature reaction. Excitation of DC generator-shunt generator, series generator, compound generator, Commutation-Resistance commutation, EMF commutation, Characteristics of DC generator-separately exited, shunt, series, compound generator, DC Motor-working principle, value of back EMF, voltage equation of DC motor, Characteristics of DC motor–Characteristics of series, shunt, compound motor, Torque of DC motor, Armature Torque, shaft Torque-efficiency of DC motor.

Unit-V:

Factors controlling the speed, Flux control and armature control of shunt motors, Motors starters and their necessity, shunt motor and series motor starter, Principle of operation of single phase induction motor, double field revolving theory Equivalent circuit of single phase induction motor without core loss and with core loss, Single phase – split induction motor, shaded pole, motor, Power factor, disadvantage low power factor, power factor improvement. Measurement of power in three phase system, single watt meter, two watt meter method, Measurement of power in single phase system, using current transformer and voltage transformer, Three phase induction motor – working principle, production of rotation field, Construction – Starter, rotor, operation, Torque equation, Starting (DOL, Autotransformer, Star delta starter) and speed control methods.

TEXT BOOK:

1. A text book of Electrical Technology Vol. II -Theraja BL & Theraja A K 2005. S. Chand & Company Ltd., New Delhi.

REFERENCES:

1. Basic Electrical Engineering, ANWANI M L 1997. Dhanpat Rai & Co. (P) Ltd. New Delhi.

2. Electrical Engineering Fundamentals, Vincent DelToro 2000. Prientice – Hall of India (P) Ltd., New Delhi.

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II Year B.Tech. Ag. Engg.-I Sem	**L**	**T/P/D**	**C**
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(A30108) SURVEYING

UNIT – I

Introduction: Overview of plane surveying (chain, compass and plane table), Objectives, Principles and classifications, Scales, Conventional Symbols, Signals.

Distances and Direction: Distance measurement methods; use of chain, tape and Electronic distance measurements, Meridians, Azimuths and Bearings, declination, computation of angle.

UNIT – II

Leveling and Contouring: Concept and Terminology, Temporary adjustments- method of leveling.

Characteristics and Uses of contours- methods of conducting contour surveys and their plotting.

UNIT – III

Computation of Areas and Volumes: Area from field notes, computation of areas along irregular boundaries and area consisting of regular boundaries. Embankments and cutting for a level section and two level sections with and without transverse slopes, determination of the capacity of reservoir, volume of barrow pits.

UNIT -I V

Theodolite: Theodolite, description, uses and adjustments – temporary and permanent, measurement of horizontal and vertical angles. Principles of Electronic Theodolite. Trigonometrical leveling, Traversing.

UNIT – V

Tacheometric Surveying: Stadia and tangential methods of Tacheometry. Distance and Elevation formulae for Staff vertical position. **Curves:** Types of curves, design and setting out – simple and compound curves.

Introduction to Advanced Surveying : Total Station and Global positioning system, Introduction to Geographic information system (GIS).

TEXT BOOKS:

1. Chandra A M, "Plane Surveying" and "Higher Surveying" New age International Pvt. Ltd., Publishers, New Delhi, 2002

2. Duggal S K, "Surveying (Vol – 1 & 2), Tata Mc.Graw Hill Publishing Co. Ltd. New Delhi, 2004.

3. Text book of surveying by C.Venkataramaiah, Unversiities Press

REFERENCES:

1.   Surveying and Leveling by R. Subramanian, Second Edition Oxford University Press - 2012.

2.   Surveying Theory and Practice Seventh edition by James M. and Anderson Edward M. Mikhail TATA McGraw Hill.

3.   Arthur R Benton and Philip J Taety, Elements of Plane Surying, McGraw Hill – 2000.

4.   "Advanced Surveying Total Station GIS and Remote Sensing by Satheesh Gopi, R. Sathi Kumar and N. Madhu.

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(A33081) FLUID MECHANICS AND OPEN CHANNEL HYDRAULICS LAB

Practical:

1. Determination of metacentric height
2. Verification of Bernouli's theorem
3. Measurement of discharge with a venturimeter
4. Measurement of velocity with a pilot tube
5. Determination of coefficient of discharge of rectangular weir
6. Determination of coefficient of discharge of triangular weir
7. Determination of coefficient of discharge of trapezoidal weir
8. Determination of hydraulic coefficient of orifices
9. Experiment on broad crested weir
10. Determination of head losses in pipes
11. Experiments on open channels
12. Determination of roughness coefficients of open channels
13. Measurement of velocity and pressure profiles in open channels
14. Construction of flownet
15. Problems on construction of flownet

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II Year B.Tech. Ag. Engg.-I Sem	L	T/P/D	C
	-	-/3/-	2

(A30184) SURVEYING LAB

LIST OF EXERCISES:

1. Survey of an area by chain survey (closed traverse) & Plotting
2. Determination of distance between two inaccessible points with compass.
3. Surveying of a given area by prismatic compass (closed traverse) and plotting after adjustment.
4. Radiation method, intersection methods by plane Table survey
5. Two point and three point problems in plane table survey
6. Fly leveling (differential leveling)
7. An exercise of L.S and C.S and plotting
8. One exercise on contouring.
9. Study of theodolite in detail - practice for measurement of horizontal and vertical angles.
10. Measurement of horizontal angles by method of repetition and reiteration.
11. Trigonometric Leveling - Heights and distance problem (Two Exercises)
12. Heights and distance using Principles of tacheometric surveying (Two Exercises)
13. Area determination, traversing contouring using total station
14. Determination of remote height and state out using total station
15. Distance, gradient, Diff, height between tow inaccessible points using total station

List of Major Equipment:

1. Chains, tapes, Ranging rods, cross staff, arrows
2. Compasses and Tripods, Optical square.
3. Plane tables, Alidade, Plumbing fork, trough compasses
4. Leveling instruments and leveling staves
5. Box sextants, planimeter.
6. Theodolites, and leveling staffs.
7. Tachometers.
8. Total station.

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II Year B.Tech. Ag. Engg.-II Sem	**L**	**T/P/D**	**C**
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(A43005) PRINCIPLES OF SOIL SCIENCE AND AGRONOMY

Objective:- To impart Knowledge on Soil genesis, properties etc, so as to enable students to design implements in related to soil, soil conservation, irrigation and drainage applications. Also to enable students to understand farming principles, to grow agricultural field and orchard crop and farming practices.

Unit –I:

Soil: Definition –soil as a three phase four component system-branches of Soil science difference between surface and sub surface soil, Rocks: Definition – classification of rocks based on mode of formation-igneous sedimentary and metamorphic rocks, Minerals: Definition, classification, primary, secondary, essential, accessory, silicate, non silicate minerals, light and heavy minerals primary silicate minerals; quartz, feldspars-micas pyroxenes amphiboles secondary silicate; secondary minerals, Ca, Mg, S and Micronutrient containing minerals-chemical formulate, Weathering:- Definition-types of weathering physical weathering of rocks, agents of physical weathering, temperature, water, wind and glaciers, Chemical weathering, solution, hydration, hydrolysis carbonation-oxidation-reduction biological weathering role of plants and animals in weathering. Soil formation: Soil forming factors –active and passive soil factors and their role in soil formation, Soil forming processes: Elluviation, illuviation, humification, calcification, laterization, podzolozation, salinization, alkalization and gleization, Soil Profile, Detailed description of theoretical soil profile, Soil physical properties:- Soil separates and their properties. Specific surface, soil texture-definition-textural classes-methods of determination of soil texture, importance of soil structure, Soil structure; Definition-classification based on type, class and grade, factors influencing formation of aggregates-importance and management of soil structure, Soil structure; Definition-classification based on type, class and grade-factors influencing formation of aggregates-importance and management of soil structure, Soil consistency; Definition-forms of consistency and importance of soil consistency, Bulk density and particle density; factors influencing and their importance; porosity –types-calculation-importance, Soil water; structure o f water and the effect of H-bonding on properties of water retention of water in soils-soil moisture tension-soil moisture potential –soil moisture constants.

Unit:-II

Soil water movement; saturated, unsaturated and vapour flows, laws governing water flow-Darcy's and poiseuille's law- Infiltration; Factors-

importance. Evaporation; Factors influencing evaporation- Ways to minimize it-soil mulch-organic mulch etc, Soil air; Composition of soil air-processes of gaseous exchange –soil aeration indices –and their importance (oxygen content-ODR-aeration porosity-redox potential) management of soil air, Soil temperature; influence of soil temperature on plant growth-factors influencing soil temperature-management of soil temperature. Soil color determination importance, Soil colloids:- Definition-general properties-inorganic and organic colloids origin of charge on colloids (positive & negative).

Unit:- III

Secondary silicate clay minerals (inorganic soil colloids) Kaolinite montmoriloniteillite their structures and properties, Ion exchange, Cation and anion exchange –factors influencing ion exchange capacity of soils importance of ion exchange calculation of base saturation and exchangeable acidity, Soil organic matter: importance of organic matter CN ration of organic matter and its importance, Soil biology;- Soil flora and fauna their characteristics role of beneficial organisms mineralization–immobilization, nitrogen fixation, nitrification, denitrification, solubilization of phosphorus and sulphur, Soil fertility:- Concepts of soil fertility and soil productivity:- definitions and differences Arnon's criteria of essentiality-essential and beneficial elements-factors influencing availability of nutrients. Problem Soils:- Definition –Physical problems soil depth slope soil crust soil compaction drainage submergence (formation-adverse effects-effect on soil properties and plant growth management), Chemical problems –classification acid, saline, saline saline-sodic and calcareous soils-characteristics-nutrient availability in problem soils and their reclamation, Irrigation water:- Quality of irrigation water-classification based on EC, SAR,RSC and Boron content-use of saline waters in agriculture, Soil taxonomy:- New comprehensive system of soil classification (7th approximation) soil orders and their characteristics, Important soil groups of India:- Alluvial soils-black soils –red soils laterite soils and coastal soils.

Unit–IV:

Meaning and scope of agronomy, History of agricultural development in ancient India, Agriculture in civilization era, National and International Agricultural Research Institutes in India, Classification of crops, Classification of field crops, According to Origin, Botanical Commercial, Economical, seasonal, Ontogeny, Agronomic, Lead Morphology and Special Purpose crops, Definition of climate and weather, Definition of meteorology, Climatology, Agri-meteorology, Introduction, scope and practical utility of Agricultural meteorology, composition and structure of atmosphere, Influence of weather on crop grain development, essential Resources for crop production, factors influencing plant growth, Biotic and Abiotic factors, Crop seasons, Kharif, Rabi and summer seasons in A.P.-Agro climatic zones of

A.P. and India, tillage and tilth, Objective of tillage, characteristic of good seed bed, effect of tillage on soil properties (Pore space, texture, structure, bulk density, colour of the soil), Types of Tillage, preparatory cultivation, inter cultivation, after cultivation and preparatory cultivation for lowland rice pudding, implement used for seed bed preparation, sowing, inter-cultivation and special operation, Sowing, Methods of sowing, time and depth of sowing of major agricultural crops, Methods and time of application of manure and fertilizers.

Unit – V:

Weeds- Influence of weeds on crop production, principles and practices of weed management, Basics on soil plant-water relationship, Types of Soil Erosion, Factors influencing soil erosion, Soil conservation, erosion preventive measures, Agronomic measures for soil and water conservation, Dry land Agriculture, Problems of Crop production in dry farming, Agronomic measure in reducing evapo-transpiration losses, Watershed management, aims and Objectives, Organic farming-Sustainable Agriculture, Definition, Principles and importance.

TEXT BOOK:

1. Principles of Agronomy, Yella Manda Reddy T & Shankar Reddy, Publications.

REFERENCES:

1. Meteorology, William L Donn, 1965, McGraw-Hill Book. Co. New York.

2. Crop Production in Dry Regions, Arnon L 1972, Leonard Hill Publishing Co., London.

3. Manures and Fertilizers, Yawalkar K S and Agrawal J P, 1977, Agricultural Horticultural Publishing House, Nagpur.

4. Principle of Weed Science, Rao V S, 1992, Oxford and IBH Publishing Co. Ltd., New Delhi.

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(A43003) HEAT AND MASS TRANSFER

Objective: To enable the students to know about the transport phenomenon in metals through heat and mass transfer for applications in unit operations of dairy and food engineering.

Unit – I:

Introductory concepts, application of Heat and mass transfer-modes of heat transfer examples, Fourier's law of heat transport, Introduction to steady state heat transfer –one dimensional steady state heat conduction equation. Thermal conductivity of different materials – measurement-Insulation Materials, One dimensional steady state conduction through plane and composite walls, Conduction through tubes and spheres with and without heat generation, Conduction through multilayer tubes.

Unit – II

Electrical analogy-conduction through materials in parallel, Combined convection and conduction and overall heat transfer coefficients-problem solving, Concept of critical thickness of insulation for a cylinder-problem solving, Radiation heat transfer-Introduction. Absorptive, reflectivity and transmissivity of radiation. Black body and monochromatic radiation, Plank's law, Stefan-Boltzman law, Kichoff's law, grey bodies and emissive power, solid angle intensity of radiation, Radiation exchange between black surfaces, geometric configuration factor, Heat transfer analysis involving conduction, convection and radiation by networks.

Unit – III:

Unsteady state heat transfer-unsteady state system with negligible internal thermal resistance-equation for different geometries, Fins-heat transfer from extended surfaces-types of fins-problem Solving, Free and force convection. Newton's law of cooling, heat transfer coefficient in convection. Dimensional analysis of free and forced convection.

Unit IV:

Useful non dimensional numbers and empirical relationships for free and forced convection, Equation of laminar boundary layer on flat plate and a tube, Laminar forced convection on a flat plate and in a tube, Combined free and forced convection, Types of heat exchangers, fouling factor, log mean temperature difference, heat exchanger performance, transfer units, Heat exchanger analysis restricted to parallel and counter flow heat exchangers.

Unit – V:

Steady state molecular diffusion in fluids at rest and in laminar flow-Flick's law mass transfer coefficients-Reynold's analogy.

REFERENCES:

1.   Transport processes and Unit Operations, Geabjiokus C.J. 1978. Allyn and Bacon Inc., Newton, Massachusetts.

2.   Heat Transfer, Holman JP 1989. Mc Graw Hill Book Co., New Delhi.

3.   Fundamentals of Heat and Mass Transfer, Incropera F P and De Witt D P 1980 John Wiley and Sons. New York.

4.   Engineering Heat Transfer, Gupta CP and Prakash R 1994. Nem Chand and Bros., Roorkee.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B.Tech. Ag. Engg.-II Sem	L	T/P/D	C
	4	-/-/-	4

(A43006) THEORY OF MACHINES

Objective: To educate the students about the kinematics of machine elements, links and pairs and other systems in different machines for applications in the manufacturing of machines and their elements.

Unit–I:

Introduction, Element, Link, Pairs. Kinematics Chains and Pairs- Types, lower and higher pairs. Mechanism – types and inversions. Lower and higher pairs. Four bar chain, slider crank chain and their inversions. Determination of velocity and acceleration using graphical (relative velocity and acceleration) methods. Instantaneous center – Lindring.

Unit II

Types of gears, Law of gearing. Velocity of sliding between two teeth in mesh Involute and cucloidal profile for gear teeth. Spur gear, nomenclature, interference and undercutting. Introduction to helical, spiral, bevel and worm gear. Simple, compound, reverted and epicyclical gear trains.

Unit-III:

Determining the velocity ratio by tabular method. Turning moment Diagrams, Coefficient of fluctuation of speed and energy. Weight of fly wheel, flywheel applications. Belt drives, types of drives. Belt materials, Length of belt, Power transmitted, Velocity ratio, Belt size for flat and v-belts.

Units-IV:

Effect of centrifugal tension, creep and slop on power transmission, chain drives Types of friction, Laws of dry fiction, Friction of pivots and collars. Single disc, Multiple disc and cone clutches. Rolling friction, Anti-friction bearings.

Unit-V:

Types of Governors, Constructional details and analysis of Watt, Porter and Proell governors – Spread of governors. Effect of friction, controlling force, curves, sensitiveness, stability, hunting, Isochronism's, power and effort of a governor, Static and dynamic balancing, Balancing of rotating masses in one and different planes, Partial primary balancing of reciprocating masses. Cams and Foversees.

TEXT BOOK:

1. Theory of Mechanisms and MachinesJgdish Lal 1991. Metropolitan

Book Co. Pvt. Ltd., 1 Netaji Subash Marg, New Delhi.

2.   Theory of Machines, Khurmi R S and Gupta JK 1994. Eurasia Publishing House Pvt. Ltd., Ram Nagar, New Delhi.

REFERENCES:

1.   Theory of Machines, Thomas Bevan 1984. CBS Publishers

2.   Theory of Machines, Ballaney P L 1985 Khanna Publishers, 2- B Nath Market, Nai Sarak, New Delhi

3.   Mechanisms and Machine Theory, Rao J S and Dukkipatti R V 1990. Wiley Astern Ltd., New Delhi

4.   Theory of Machines, Rattan S B 1993. Tata McGraw Hill Publishing Co. Ltd., 12/4 Asf Ali Road, New Delhi.

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II Year B.Tech. Ag. Engg.-II Sem	L	T/P/D	C
	4	-/-/-	4

(A40113) SOIL MECHANICS

Objective: Students will be trained on concepts and analysis of soil properties, stress conditions of loaded soil, consolidation and soil failure theories. The knowledge imparted will be used in higher level design considerations for construction of soil and water conservation structures, irrigation and drainage structures.

Unit–I:

Introduction of soil mechanics – Field of Soil Mechanics. Soil on three phase systems – Physical and index properties of soil. Classification of soils - General, Particle size classification. Classification of soils - textural classification, I.S. classification. Stress condition in soils – Effective and neutral stress.

Unit-II:

Concept on Bousinesq's analysis – Vertical pressure distribution on vertical line, vertical pressure under a uniformly loaded circular area, vertical pressure due to a line load. Concept on Bousinesq's analysis – Vertical pressure under strip load, vertical pressure under a uniformly loaded rectangular area, equivalent point load method. Concept on Westerguard's analysis – Point load pressure distribution, uniformly loaded circular area. Westerguard's analysis – Uniformly loaded rectangular area, comparisons between Bousinesq's and Westerguard's solutions. Newmark's influence chart – Preparation, problems.

Unit -III

Shear strength – Introduction, Hohr's stress circle, stress systems with principal planes parallel to the coordinate axes. Shear strength – Introduction, Mohr's stress circle, stress systems with principal planes parallel to the coordinate axes. Shear strength – Mohr – Coulomb failure theory, effective stress principle. Measurement of shear strength – Introduction, direct shear test, tri-axial compression test, stress conditions in soil specimen during tri-axial testing. Measurement of Shear strength – Advantages of tri-axial test, graphical solutions, unconfined compression test, vane shear test. Problems on shear strength.

Unit-IV:

Compaction of Soils – Standard test and Modified proctor test. Abbot Compaction test. Jodhpur mini compaction test. Field compaction method and control. Consolidation of soil – one dimensional analysis spring analogy– Terzaghi's theory. Laboratory consolidation test. Calculation of coefficient

of volume change – Coefficient of consolidation.

Unit-V:

Earth pressure – Plastic equilibrium in soils. Active and Passive states of earth pressure. Rankine's theory of earth pressure. Earth pressure for cohesive soils. Simple numerical Exercises on earth pressure. Stability of slopes – infinite and finite slopes. Friction Circle method. Taylor's stability number.

TEXT BOOK:

1. Soil Mechanics and Foundations, Punmia B C, Jain A K and Jain A K, 2005. Laxmi Publications (p) LTD. New Delhi

REFERENCES:

1. Basic and Applied Soil Mechanics, Gopal Ranjan and Rao A S R 1993. Welley Easters Ltd., New Delhi.

2. Soil Engineering Vol.1, Alam Singh 1994. CBS Publishers, and Distributions, Delhi.

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II Year B.Tech. Ag. Engg.-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A43004) HYDROLOGY

Objective : To enable the students to acquire knowledge and skills on hydrological (rainfall and runoff) measurements in watersheds, hydrological design of structures, prediction of volume and rates of runoff with tools like hydrographs and unit hydrographs, reservoir planning with flood routing techniques for application in natural resources management.

Unit-I:

Hydrology-definition, hydrology cycle and its components. Forms of Precipitation Rainfall, Characteristics of rainfall in India (types of monsoon). Measurement of Rainfall and Non-Recording Rain gauges- Rain gauge network density for Presentation of Rainfall data – Mass Curve and hyetograph, Mean Precipitation over an area – Arithmetic Mean, Thiessen Polygon, Isohyetal methods, DAD Relationships and curves. Probability Analysis of Rainfall – Return Period, Plotting position by Weibull's method.

Unit-II:

Intensity-Duration-Frequency-Relationship $(i= ((KT^x)/(D+A)^n)$Determination of net effective rainfall-infiltration indices- Phi index. Runoff-definition-components of runoff-direct runoff and base flow, overload flow and interflows, pictorial representation of different routes of runoff. Runoff characteristics of streams – perennial, intermittent and ephemeral streams, Measurement of stream flows.

Unit-III:

Measurement of stage and velocities, staff gauge, wire gauge, automatic stage recorders, current meters (horizontal and vertical axis meters), calibration $(V= a N_s + b)$. Rainfall-Runoff relations $(R=a P + b)$, curve fitting and determination of 'a' and 'b' and (correlation coefficient), factors affecting runoff. Definition and Estimation of peak runoff and design peak runoff rate, rational method and curve number techniques.

Unit-IV:

Hydrographs-definitions and components, factors affecting flood hydrographs, hydrograph separation for simple and complex storms – Method I (straight line method, $N=b A^{0.2}$), other Methods II and III. Unit Hydrographs-concept and the three implications of the definitions and the two basic assumptions (linear response and time invariance). Effects of the characteristics of storms(duration of rain, time-intensity pattern, areal distribution of runoff and amount of runoff) on the shape of the resulting

hydrographs .Derivation of Unit hydrographs, average unit hydrographs from several storms of the same duration (proper procedure of computing average perk flow and time to peak). Derivation of unit hydrographs for complex storms.

Unit-V:

The conversion of unit hydrograph duration, methods for unit hydrographs of different durations, (1) method of superposition and (2) S-curve. S-curve method, explanation of concept and application. conversion of unit graph duration by S-curve method, determination of lower duration graph from the given higher duration graph and vice-versa. Synthetic unit hydrograph, Concept, Snyder' synthetic unit hydrograph, formulas relating hydrograph features (basin lag, Peak flow and time base of the unit hydrograph). Instantaneous unit hydrograph, Concept and Regulation, Flood mitigation, Floodplain mapping, Retards. Flood Routing-introduction, two broad categories of flood routing and channel routing, hydrologic routing and hydraulic routing, basic equations. Hydrologic storage routing, Schematic representation of storage routing, modified Pul's method (semi-graphical method). Explanation of the features of the modified Pul's method. Flood routing through a reservoir by modified Pul's method. Applications of Hydrology in land and water management, watershed management.

TEXT BOOKS:

1. Engineering Hydrology. Raghunath H.M. 1986. Willey Eastern Limited, New Delhi.

2. Watershed Hydrology, Suresh R. 1997. Standard Publisher and Distributors, New Delhi.

REFERENCES:

1. Engineering Hydrology. Subramanyam K. 1984. Tata Mc. Graw – Hill Publishing Co., Limited, New Delhi.

2. Hydrology for Engineers Linsly R.K. Kholer A. & Paul Hus J.L.H. 1988, Mc. Graw – Hill Book Co. New Delhi.

3. Watershed Management. Dhruvanarayana, VV. 1990. ICAR Publication, New Delhi.

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II Year B.Tech. Ag. Engg.-II Sem	L	T/P/D	C
	4	-/-/-	4

(A43002) FARM MACHINERY AND EQUIPMENTS -I

Objective: Primary and Secondary tillage implements along with earth moving machinery, seeding and plant protection equipment will be discussed to get awareness on the mechanical area of the agricultural engineering.

Unit – I:

Objectives of Farm Mechanization, sources of farm power, classification of farm machines. Materials of construction and heat treatment. Principles of operation and selection of machines used for production of crops. Field capacities of different implements and their economics. Problems on field capacities and cost of cultivation.

Unit – II

Classification and types of tillage, Primary tillage implements-Mould board plough and its parts, Disc plough, and other ploughs, Secondary tillage equipments- Disc harrows, implements-Cultivators, and intercultural implements, Forces acting on tillage tools, Problems on forces analysis, Draft measurement of tillage equipments, Draft and unit draft related problems.

Unit – III:

Earth moving equipment-terminology, Earth moving equipments, construction and their working principles, Earth moving equipment- shovels, Bulldozers, Earth moving equipments- Trenches and elevators.

Unit - IV

Seeding methods, Different types of seed metering mechanism, different types of furrow openers. Calibration of Seed drills. Adjustment of Seed Drills

Unit-V:

Objectives and uses of plant protection equipment. Types of sprayers and dusters. Sprayers calibration and selection. Constructional features of different components of sprayers and dusters and their adjustments. Transplanting methods, different types of Transplanting machinery and their working principle, adjustments in Transplanting equipment. Fertilizer application equipment – fertilizer meeting mechanism calibration of fertilizer equipment.

REFERENCES:

1. Farm Machinery, Stone A A 1958. John wiley and sons, New York.

2.   Farm Machinery and Equipment, Smith H P 1971. Tata McGraw Hill Publishing Co. Ltd., New Delhi.

3.   Principals of Agricultural Engineering, Michael A M and OJha T P 1985 Vol.I, Jain Brothers, New Delhi.

4.   Principals of Farm Machinery, Kepner R A, Bainer R and Barger E L 1987. CBS Publishers and Distributors, Delhi.

5.   Elements of Agricultural Engineering, Jagadeshwar Sahay 1992. Agro Book Agency, Patna.

6.   Land Reclamation Machinery, Borshahov Mansurov Sergecv 1988. Mir Publishers, Moscow.

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II Year B.Tech. Ag. Engg.-II Sem   L   T/P/D   C

                                             -     -/3/-   2

(A43082) SOIL SCIENCE AND AGRONOMY FIELD LAB

PART-A

1.   Study of soil profile and collection of soil samples.
2.   Determination of bulk density ad particle density of soils.
3.   Determination of soil texture.
4.   Determination of Proctor moisture content.
5.   Determination of soil moisture at different tensions.
6.   Determination of hydraulic conductivity of soil.
     Choose any six labs
7.   Determination of infiltration rate soil.
8.   Determination of soil strength and soil colour.
9.   Determination of pH and EC of soils.
10. Determination of organic carbon content in soils.
11. Estimation of available P & K of soils.
12. Determination of anions and cations in irrigation water.

PART-B

1.   Visit to college farm.
2.   Study of meteorological instruments.
3.   Measurement of rainfall and evaporation.
4.   Practice of Ploughing.
5.   Practice of pudding.
6.   Identification of crops and seeds.
7.   Identification of manures and fertilizers.
     Choose any six labs
8.   Seed bed preparation for nursery.
9.   Practice of sowing.
10. Soil moisture estimation by direct method.
11. Practice of fertilizer application.
12. Practice of inter cultivation.
13. Practice of weeding.
14. Practice of harvesting.
15. Practical examination.

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II Year B.Tech. Ag. Engg.-II Sem

L	T/P/D	C
-	-/3/-	2

(A40381) MACHINE DRAWING AND COMPUTER GRAPHICS LAB

1. Preparation of manual drawings with dimensions from Model and Isometric drawings of objects and machine components.
2. Assembly drawings of machine components – Screw jack, knuckle joint, stuffing box and cotter joint
3. Drawing of missing views.
4. Dimensioning methods and principles of dimensioning
5. Concept of sectioning, Revolved and oblique section. Explanation of full sectioning and half sectioning concepts.
6. Sectional drawing of simple machine parts – foot step bearing, shaft support, stuffing box
7. Types of rivet heads and riveted joints. Processes for producing leak proof joints. Symbols for different types of welded joints.
8. Square headed and hexagonal nuts and bolts.
9. Different types of lock nuts, studs, machine screws
10. Application of computers for design. Definition of CAD, benefits of CAD.
11. CAD System components & computer hardware for CAD.
12. Explanation of draw tool bar commands in Auto CAD software
13. Drawing of riveted joints and thread fasteners.
14. Computer Graphics for agricultural engineering applications.
15. Practice in the use of basic and drawing commands on AutoCAD.
16. Generating simple2-D drawings with dimensions using AutoCAD.
17. Small projects using CAD / CAM.

REFERENCES:

1. Elementary Engineering Drawing. Bhat. N.D. 1995. Charotar Publishing House, Anand.
2. Machine Drawing. Bhatt N.D and Panchal V.M. 1995. Charotar Publishing House, Anand.
3. Machine Drawing. Narayana K.L. Kannaiah P. and Venkata Reddy K. 1996. New Age International Ltd., New Delhi.
4. Mastering CAD / CAM with Engineering Subscription Card. Ibhrahim Zeid, McGraw-Hill Science / Engineering / Math; 1st Edition (May 21, 2004).
5. Principals of CAD / CAM / CAE/ Systems. Kunwoo Lee, Addison – Wesley.

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III Year B.Tech. Ag. Engg.-I Sem	L	T/P/D	C
	4	-/-/-	4

(A50327) THERMODYNAMICS AND REFRIGERATION SYSTEMS

Objective: To enable the students to know about the thermodynamic laws and principles, gas laws and different cycles and their efficiencies for efficient designs of heat engines, Refrigerator systems in general and Farm engines and cold storages in particular.

Unit – I:

Introduction to thermodynamic Thermodynamic system, boundary, surroundings, Classification of Thermodynamic system, Closed system-open system-isolated system, Laws of conservation of energy, heat, work, Definition of thermodynamic work and example of work, Thermodynamic properties, classification of thermodynamic systems. Laws of thermodynamic – first law, second law and zeroth law, Gas laws-Boyless' law Charles law Guy–lussac law, Thermodynamic properties of perfect gases.

Unit-II

Application of first law in heating and expansion of gases, Cycles-introduction-Applications, Carnot theorem-Carnot cycle, Entropy-introduction-physical concept of entropy, Change of entropy of gases in thermodynamics, Generation of steam-terms used latent heat, sensible heat, total heat of System, Classification of boilers, Explanation of Lancashire boiler, Explanation of locomotive boiler, Explanation of Babcock-Wilcox boilers, Boiler mounting and accessories.

Unit - III

Heat engines, Classification, Components, Working principles- Working cycle of 4- stoke and 2-stroke diesel and Petrol Engines, Comparison between 4 stroke and 2-stroke Diesel and Petrol Engines, Air standard cycle-efficiencies, Explanation of other engine efficiencies and terms, Explanation of Otto cycle-thermal efficiency equations, Explanation of diesel cycle and dual cycle, Calculation of efficiencies, Mean effective pressure and their comparison, Measurement of indicated horse power, brake horse power, Heat balance calculations, Problems on IP, BP, Engine efficiencies and performances

Unit-IV:

Principles of refrigeration- Definition of refrigeration, second law of thermodynamics, background, major uses and applications, Principles of refrigeration – Room air conditioner, domestic refrigerator, working substances in refrigeration machines, unit of refrigerating capacity, coefficient of performance, problems on refrigeration capacity, Production low

temperatures- Expansion of a liquid with flashing, reversible adiabatic expansion of a gas, irreversible adiabatic expansion (throttling) of a real gas, thermoelectric cooling, adiabatic demagnetization. Refrigeration machine, heat engines, Air refrigerators working on reverse Carnot cycle-Carnot cycle, reversed Carnot cycle, selection of operating temperatures, Problems on reverse Carnot cycle and selection of operating temperatures, Air refrigerators working on Bell Coleman cycle- Reversed Brayton or joule or Bell Coleman Cycle, Analysis of gas cycle, polytropic and multistage compression, Problems on Bell Coleman cycle, Vapour refrigeration – Vapor as a refrigerant in reversed Carnot cycle with P.V. and T s diagrams, problems on reversed Carnot cycle with vapour, gas as a refrigerant in reversed Carnot cycle, limitations of reversed Carnot cycle.

Unit-V:

Vapour compression systems –Modifications in reverse Carnot cycle with vapour as refrigerant (dry Vs wet compression, throttling Vs isentropic expansion), Vapor compression cycle, vapor compression system calculations, Vapor compression cycle – Representation of vapor compression cycle on pressure- enthalpy diagram, super heating, sub cooling, problems on vapour compression cycle, Liquid-vapour regenerative heat exchanger for vapour compression system, effect of suction vapour super heating, sub cooling, problems on vapour compression cycle, Vapour-absorption refrigeration system – Process, calculation, maximum coefficient of performance of a heat operated refrigerating machine, problems on vapour absorption refrigerating system, common, refrigerant-absorbent systems. Common refrigeration and their properties, Cold storage- Cold storage, controlled atmosphere storage, factor affecting refrigerated cold storage, hypobaric storage, Thermodynamic properties of moist air, perfect gas relationship for approximate calculation, adiabatic saturation process, ideal gas law, Amagat's law, Dalton's law, Psychometric chart –Saturation pressure, absolute humidity, percentage humidity, humid volume, total heat, enthalpy, adiabatic processes, wet bulb temperature and its measurement, psychometric chart and its use. Psychometric processes- state factor, cooling, heating, mixtures, dehumidifying, drying, air conditioning.

TEXT BOOKS:

1. Engineering Thermodynamics, Nag PK 1995, Tata Mc Graw Hill Publishing Co., Ltd., 12/4 Asaf Ali Road, New Delhi.

2. Refrigeration and Air conditioning, C P Arora.

REFERENCES:

1   A Course in Thermodynamics and Heat Engines, Kothandaraman C.P Khajuria PR and Arora SC 1992. Dhanper Rai and Sons, 1682 Nai Sarak, New Delhi

2   Engineering Thermodynamics, Khurmi R S 1992 S Chand and Co. Ltd Ram Nagar, New Delhi.

3   Thermodynamics and Heat Power Engineering, Mathur ML and Mehata fs 1992 Dhanpat Rai and Sons 1682 Nai Sarak, New Delhi

4   Thermal Engineering, Ballney PL 1994, Khanna Publishers, New Delhi

5   Refrigeration and Air Conditioning, R. K. Rajesh

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III Year B.Tech. Ag. Engg.-I Sem	L	T/P/D	C
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(A53010) SOIL AND WATER CONSERVATION ENGINEERING

Objective: To enable the students to acquire knowledge on different soil laws estimation models, run off estimation by rational, curve number, cook's etc. Land use, capability classification, Land treatment works like contour bunding, terracing, bench terraces, contour trenches and their types and complete design calculations. Also to enrich the students and familiarize the students in the design of various gully control structures, temporary and permanent, their designs with a due importance to hydrologic, hydraulic and structural phases of design.

Unit- I:

Introduction – Soil and Water conservation research centre–Its sub-centers in India–Soil Erosion–Geologic, Accelerated types. Causes and agents of erosion – Factors affecting erosion – Different stages of erosion – Rill – Sheet – Gully and Ravines-Water Erosion–Forms of water erosion–Mechanics of Erosion – Gullies and their classification, stages of gully development. Soil Loss estimation–Universal Soil Loss equation and modified soil loss equation, expansion of various terms – Estimation of their various parameters.

Unit–II:

Wind Erosion – Factors affecting wind erosion, mechanics of wind erosion, soil loss estimation, Wind erosion control measures – Vegetative, mechanical measures, wind blades and shelter belts, sand dunes stabilization – Wind erosion and its control. Runoff – Factors affecting runoff – Runoff – Peak Runoff and design peak runoff – its estimation - Rational method – Time of concentration estimation – Curve number method – Cook's method. Land use capability classification based on different criteria with a special reference to slope – Erosion control measures – Agronomic and mechanical or engineering measures.

Unit – III

Contour bunds – Design of contour bunds – Horizontal interval – Vertical interval – Cross Section of the contour bunds – Seepage line consideration. Determination Height of Bund – Loss of Area due to bunding. Design of waste weir – Construction of contour bunds in fields. Graded bunds – Design of graded bunds. Introduction to Conservation Ditching.

Unit-IV:

Terraces – Classification of Terraces-Design of narrow based and broad based terraces. Bench Terraces – Types of Bench Terraces – Derivation for

an equation for finding of vertical interval –Design of bench terraces. Contour trenching – Staggered and continuous trenche – Adaptability and types. Vegetated water ways – Types of water ways based on shapes – Expression for wetted perimeters – Areas – Hydraulic radii – types of vegetation – roughness of different grasses – Design of vegetated water ways.

Unit – V:

Sedimentation – Sedimentation in reservoirs in streams, estimation and measurement, sediment delivery ratio, trap efficiency – Estimation of useful life of reservoir based on sedimentation. Characteristics of contours and preparation of contour maps – Analysis of toposheets. Introduction to water harvesting techniques – Estimation of Earth work Design of farm ponds – Introduction to Stream water quality and pollution. Temporary gully control structures – Design – Types like Brush wood dams – Wire Mesh – Dams etc. – Introduction to permanent gully control structures – Design phases – Components of permanent structures.

TEXT BOOKS:

1. Soil and Water Conservation Engineering. Scwab G.O. Frevert R.K. Edminster T.W. and Barnes K.K. 1981 John Wiley and Sons New York.

2. Manual of Soil and Water Conservation Practicals. Gurmel Singh. Venkataramanam C. Sastry G and Joshi BP. 1994.Oxford and IBH Publishing Co. Ltd., New Delhi.

REFERENCES:

1. Land and Water Management Engineering. Murthy VVN 2004. Kalyani Publishers, New Delhi.

2. Introduction to Soil and Water Conservation Engineering. Mal B.S. 1995 Kalyani Publishers, Rajinder Nagar, Ludhiana.

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III Year B.Tech. Ag. Engg.-I Sem	L	T/P/D	C
	4	-/-/-	4

(A53008) AGRICULTURAL PROCESS ENGINEERING

Objective: To train students on unit operations of agricultural process engineering to acquaint with preliminary operations such as clearing, size reduction, mixing, separation, filtration and materials handling equipment.

Unit-I:

Scope and importance crop processing – principles and methods of food processing cleamomg amd gradomg pf cerea;s. [l;ses & oilseeds – Principles. Size reduction – Introduction, benefits, classification, determination and designation of the fineness of ground material, screen analysis, principle of comminution, mechanisms of comminution of food, particle shape, mixed particle sizes, average particle size, Size reduction – Characteristics of comminuted products, crushing efficiency. empirical relationships (Rittingen's Kick's and Bond's equations), Work index, energy utilization, methods of operating crushers, classification based on particle size, nature of the material to be crushed, Size reduction equipment – Principal types, crushers (jaw crushers, gyratory, smooth roll), hammer mills and impactors, attrition mills, buhr mill, tumbling mills, action in tumbling mills, Size reduction equipment –Ultra fine grinders (classifying hammer mills, fluid energy mill, micronized fluid jet pulverize, colloid mill), cutting machines (slicing, dicing, shredding, pulping) energy requirement of cutting operation, maintenance of cutting edges.

Unit-II:

Mixing –Introduction, theory of solids mixing, criteria of mixer effectiveness and mixing index for granular solids, missing indicters, mixing of widely different quantities, criteria of mixer effectiveness and mixing index for pastes and plastic masses, mixing index at zero time, rate of mixing index at zero time, rate of mixing, theory of liquid mixing, power requirement for liquids mixing. Mixing equipment – Mixers for low or medium viscosity liquids (paddle agitators, impeller agitators, powder-liquid contacting devices, other mixers), mixers for high viscosity liquids and pastes, misers for dry powders and particulate solids. Aerodynamics of agricultural products – drag coefficient – frictional drag and profile drag or pressure drag – and terminal velocity. Theory of separation, types of separators, cyclone separators, size of screens applications, Separator based on length, width, and shape of the grains, specific gravity density.

Unit –III:

Air-screen grain cleaner-principle and types, Design considerations of air-

screen grain cleaners, Sieve analysis-particle size determination, Ideal screen and actual screen–effectiveness of separation and related problems, Pneumatic separator, Theory of filtration, rate of filtration, pressure drop during filtration, applications, Constant-rate filtration and constant–pressure filtration derivation of equation, Filtration equipment; plate and frame filter press, rotary filters, centrifugal filters and air filters.

Unit-IV:

Threshing, Winnowing, cleaning and separation equipment, air screen cleaner, Rice millings, principles and equipments, paddy parboiling methods and equipment, wheat milling, milling of pulses and oilseeds, Scope and importance of material handling devices, study of different material handling systems–Classification, principles of operation, conveyor systems selection/ design.

Unit –V:

Belt Conveyor–Inclined belt conveyors, idler spacing, belt tension, drive tension, belt tripper, Belt Conveyor–Inclined belt conveyors, idler spacing, belt tension, drive tension, belt tripper, Chain conveyor–Principle of operation, advantages, disadvantages, capacity and speed, conveying chain, Screw conveyor – Principle of operation, capacity, power, troughs, loading and discharge, inclined and vertical screw conveyors. Bucket elevator–Principle, classification, operation, advantages, disadvantages, capacity, speed, buckets pickup, Bucket elevator – Bucket discharge, relationship between belt speed, pickup and bucket discharge, buckets types, Pneumatic conveying system- capacity and power requirement, types, air/product, Gravity conveyor design considerations – capacity and power requirement.

REFERENCES:

1.   Transport Processes and separation Process Principle, Geankoplis C J 2003 Prentics-Hall Inc., New Jersey.

2   Unit operations in Food processing, Earle R L 1983. Pergamon Press, New York

3   Post Harvest Technology of Cereals, Pulses and oil seeds, Chakravarthy A and De Ds 1988. Oxford and IBH Publishing Co. Ltd., Calcutta.

4   Unit Operations of Chemical Engineering, McCabe WL , Smith JC and Harriott P 1993 Mc Graw-Hill Book Co., Boston.

5   Unit Operations of Agricultural Processing,Sahay KM and Singh KK 1994, Vikas Publishing House Pvt. Ltd., New Delhi.

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III Year B.Tech. Ag. Engg.-I Sem	L	T/P/D	C
	4	-/-/-	4

(A50324) RENEWABLE ENERGY SOURCES

UNIT – I

Principles of Solar Radiation: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power - Physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, Solar radiation on titled surface, Instruments for measuring solar radiation and sun shine, solar radiation data.

UNIT – II

Solar Energy Collection: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

Solar Energy Storage and Applications: Different methods, sensible, latent heat and stratified storage, solar ponds. Solar applications - solar heating/ cooling techniques, solar distillation and drying, Photovoltaic energy conversion.

UNIT – III

Wind Energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics.

Bio-Mass: Principles of Bio-Conversion, Anaerobic /aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation, and economic aspects.

UNIT – IV

Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India.

OTEC : Principles, utilization, setting of OTEC plants, thermodynamic cycles.

Tidal and Wave Energy: Potential and conversion techniques, mini-hydel power plants, their economics.

UNIT –V

Direct Energy Conversion: Need for DEC, Carnot cycle, limitations, Principles of DEC. Thermo-electric generators, Seebeck, Peltier and Joule Thompson effects, figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principle, faraday's laws, thermodynamic aspects, selection of fuels and operating conditions.

TEXT BOOKS:

1.   Renewable Energy Sources / Twidell & Weir / Taylor and Francis / 2nd Special Indian Edition
2.   Non- conventional Energy Sources / G.D. Rai / Dhanpat Rai and Sons

REFERENCE BOOKS:

1.   Energy Resources Utilization and Technologies / Anjaneyulu & Francis / BS Publications/2012
2.   Principles of Solar Energy / Frank Krieth & John F Kreider / Hemisphere Publications
3.   Non-Conventional Energy / Ashok V Desai / Wiley Eastern
4.   Non-Conventional Energy Systems / K Mittal / Wheeler
5.   Renewable Energy Technologies / Ramesh & Kumar / Narosa
6.   Renewable Energy Resources / Tiwari and Ghosal / Narosa

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III Year B.Tech. Ag. Engg.-I Sem	L	T/P/D	C
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(A53009) ENGINEERING PROPERTIES OF BIOLOGICAL MATERIALS AND FOOD QUALITY

Objective: To enable the students to understand the principles and concepts of various properties of biological materials to design various processing equipment to insure food quality and safety. They are the basis for measuring instruments and sensors.

Unit –I:

Physical characteristics of different food grains, fruits and vegetables – importance. Shape and size – criteria for describing shape and size. Roundness and sphericity – Volume and density – Specific gravity – Bulk density. Porosity – surface area – measurement of the same. Rheology – basic concepts – ASTM standard definition of terms. Rheological Properties – Force deformation behavior, stress and strain behavior. Visco – elasticity – time effects – Rheological models. Kelvin and Maxwell models – electrical equivalence of mechanical models.

Unit-II:

Rheological equations – Maxwell model and generalized Maxwell model. Kelvin model – creep – stress relaxation. Friction – basic concepts – effect of load sliding velocity. Friction in agricultural materials – measurement – rolling resistance – angle of intern friction and angle of repose. Flow of bulk granular materials – gravity flow in bins and hoppers. Aerodynamics of agricultural products – drag coefficient – frictional drag and profit drag or pressure drag -and terminal velocity.

Unit –III:

Electrical properties – Di electrical properties. Thermal Properties – specific heat – thermal conductivity-thermal diffusivity. Application of engineering properties in handling and processing machines and also storage structures. Food quality – Concept, objectives and importance. Food quality, control – methods of quality control sampling – purpose.

Unit-IV:

Quality control – sampling techniques. Sampling procedures for liquid, powdered and granular materials. Sensory evaluation or organoleptic evaluation of food quality, methods. Interpretation of sensory results in statistical quality control. Total quality management (TQM – parameters of quality management. The evolution of total quality management – total quality management (TQM). Total quality control principles of quality control – consumer preference and acceptance.

Unit –V:

Food laws and regulations in India. Food grade and standards – BIS, AGMARK, PFA, FPO, CAC (Codex alimantarious Commission. Sanitation in food industry – GMP. ISO 9000 series of standards. HACCP (Hazard analysis and critical control point) – objectives – principles – Steps involved in implementation of HACCP. Application of HACCP concept to milk and milk product – problems in implementing HACCP.

TEXT BOOK:

Physical properties of plant and animal materials, Mohsenin N N 1986. Gordon and Breach Science Publishers, New York.

REFERENCES:

1   Food and Process Engineering Technology, Wilhelm LR, Suler W A and Brusewitz, G H 2004. American Society of Agricultural Engineers (ASAE), St. Joseph, MI.

2   Engineering Properties of Foods, Rao M A, Syed S H Rizvi and Ashim K Datta 2005. CRC Press – Taylor & Francis Group, Boca Raton, FL.

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III Year B.Tech. Ag. Engg.-I Sem	L	T/P/D	C
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(A53007) AGRICULTURAL EXTENSION TECHNIQUES AND BUSINESS MANAGEMENT

Unit-I:

Describe the meaning of communication, explain models of communication process along with elements and their characteristics. Classify the methods and explain the meaning, objectives, procedure involved in carrying out various individual, group and mass contact methods and describe the factors influencing selection of extension methods.

Unit-II:

Discuss about the various information tools and sources like internet, cyber cafes, kiosks, video and teleconferencing, Parishkaram (Farmers call Center) in A.P. and kisan call centers and agriclinics including agricultural journalism. Discuss about the adoption and diffusion process and explain the models of adoption process and innovation-decision process, classify adopter categories and enlist the characteristics and explain the factors affecting adoption process. Describe the importance of capacity building of extension personnel and farmers and explain the meaning of training and discuss different types of training to farmers and enumerate the objectives of Farmer's Training Centre (FTC), mandate of Krishi Vignan Kendra (KVK) and objectives of District Agricultural Advisory and Transfer of Technology Centres (DAATTC).

Unit-III:

Management – Definition, decision management, importance of management, concepts, functions of management. Management – Management cycle, planning, organization, direction, control, co – ordination, communication. Agri – business management – Meaning, definition, concept, distinctive features of agribusiness management, application of management principles in agri – business.

Unit-IV:

Agro – based industries – Importance, need, procedure to be followed to setup agro – based industries, constraints in establishing agro – based industries. Project analysis – Project meaning, project cycle, identification, formulation, appraisal, Implementation, monitoring and evaluation. Project appraisal techniques – Undisounted techniques, pay back method, rate of return/return on investment, etc. Discounted techniques – NPV, BCR, IRR, sensitivity analysis.

Unit-V:

International trade – Definition, comparison between international trade and interregional trade, free trade vs. protectionism, methods of protectionism. India's contribution to international trade in food and agricultural commodities, share of agricultural products in total imports/exports of India, export – import policy. General agreement on trade and tariff (GATT), WTO, objectives, functions and structure of WTO, why WTO, ten benefits of WTO. Principles of WTO trading systems, MFN, national treatment, predictability, promoting fair competition, encouraging development and economic reform. WTO agreements – Provisions relate to agreements in agricultural and food commodities. Agreements on agriculture (AOA) – Domestic supply, market access, export subsidies agreements on sanitary and phyto – sanitary (SPS) measures, Trade related intellectual propert5y rights (TRIPS).

REFERENCES:

1. Education and Communication for Development, Dahama O.P. and Bhatnagar O.P 1980 –Ofxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

2. Reaching the Unreached – Basics of Extension Education, Ganesh R., Mohammad Iqbal I. and Anandaraja N., Associated Publishing Company, New Delhi.

3. Essentials of Management, Joseph L Massie 1995. Prentice – Hall of India, New Delhi.

4. Agricultural Economics and Agri – business, Omri Rawlins N 1980. Prentice – Hall Inc., New Jersey.

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III Year B.Tech. Ag. Engg.-I Sem	L	T/P/D	C
	-	-/3/-	2

(A53083) FARM MACHINERY LAB

1. Study of various Farm Machiney, equipment.
2. Visit to machinery Production industry and ICAR, SAU'S research station.Determination of Field capacity and Field efficiency of primary tillage implements.
3. Draft and Fuel consumption measurement for different implements.
4. Study of different types of plough bottoms and shares of M.B. Plogh.
5. Determination of disc angle, tilt angle, concavity of a disc plough.
6. Calculation of draft and horse power.
7. Study of seed-cum-ferti drill and seed metering mechanisms.
8. Calibration of seed drill and problems.
9. Study of sprayers, dusters and measurement of nozzle discharge and field capacity.
10. Study of earth moving equipment through exposure Visit. .
11. Construction and working of rotavators and weeding equipment
12. Practical Examination.

TEXT BOOKS:

1. Principles of Farm Machinery. Kepner R.A., Bainer, R and Barger E.L., 1987. CBS Publishers and Distributors, Delhi.
2. Elements of Agricultural Engineering. Jagadeshwar Sahay. 1992. Agro Book Agency, Patna.

REFERENCES:

1. Farm Machinery. Stone A.A. 1958. John Wiley and Sons. New York.
2. Farm Machinery and Equipment. Smith H.P. 1971. Tata Mc Graw-Hills. Publishing Co. Ltd., New Delhi.
3. Principals of Agricultural Engineering, Vol. I. Michael A.M. and Ohja T.P. 1985. Jain Brothers, New Delhi.
4. Land Reclamation Machinery. Borshahov Mansurov Sergecv 1988 Mir Publishers, Moscow.

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(A50086) ADVANCED COMMUNICATION SKILLS (ACS) LAB

Introduction

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organise ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

Objectives:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

Syllabus:

The following course content to conduct the activities is prescribed for the Advanced Communication Skills (ACS) Lab:

1. **Activities on Fundamentals of Inter-personal Communication and Building Vocabulary** - Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.

2. **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.

3. **Activities on Writing Skills** – Structure and presentation of different types of writing – *letter writing/Resume writing/ e-correspondence/ Technical report writing/ Portfolio writing* – planning for writing – improving one's writing.

4. **Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/**PPTs** and written presentations through posters/projects/reports/ e-mails/assignments etc.

5. **Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

Minimum Requirement:

The Advanced Communication Skills (ACS) Laboratory shall have the following infra-structural facilities to accommodate at least 35 students in the lab:

- **Spacious room with appropriate acoustics.**
- **Round Tables with movable chairs**
- **Audio-visual aids**
- **LCD Projector**
- **Public Address system**
- **P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ**
- **T. V, a digital stereo & Camcorder**
- **Headphones of High quality**

Prescribed Lab Manual: A book titled *A Course Book of Advanced Communication Skills (ACS) Lab* published by Universities Press,

Hyderabad.

Suggested Software:

The software consisting of the prescribed topics elaborated above should be procured and used.

- **Oxford Advanced Learner's Compass**, 7th Edition
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider**, by Dreamtech
- **TOEFL & GRE**(KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- **The following software from 'train2success.com'**
    - ➢ **Preparing for being Interviewed**
    - ➢ **Positive Thinking**
    - ➢ **Interviewing Skills**
    - ➢ **Telephone Skills**
    - ➢ **Time Management**

Books Recommended:

1. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.

2. Advanced Communication Skills Laboratory Manual by Sudha Rani, D, Pearson Education 2011.

3. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.

4. Business and Professional Communication: Keys for Workplace Excellence. Kelly M. Quintanilla & Shawn T. Wahl. Sage South Asia Edition. Sage Publications. 2011.

5. The Basics of Communication: A Relational Perspective. Steve Duck & David T. McMahan. Sage South Asia Edition. Sage Publications. 2012.

6. English Vocabulary in Use series, Cambridge University Press 2008.

7. Management Shapers Series by Universities Press(India)Pvt Ltd., Himayatnagar, Hyderabad 2008.

8. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.

9. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.

10. Handbook for Technical Writing by David A McMurrey & Joanne

Buckely CENGAGE Learning 2008.

11. Job Hunting by Colm Downes, Cambridge University Press 2008.

12. Master Public Speaking by Anne Nicholls, JAICO Publishing House, 2006.

13. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hil 2009.

14. Books on TOEFL/GRE/GMAT/CAT/ IELTS by Barron's/DELTA/

Cambridge University Press.

15. International English for Call Centres by Barry Tomalin and Suhashini Thomas, Macmillan Publishers, 2009.

Learning Outcomes

Accomplishment of sound vocabulary and its proper use contextually.

Flair in Writing and felicity in written expression.

Enhanced job prospects.

Effective Speaking Abilities

DISTRIBUTION AND WEIGHTAGE OF MARKS:

Advanced Communication Skills Lab Practicals:

1. The practical examinations for the ACS Laboratory practice shall be conducted as per the University norms prescribed for the core engineering practical sessions.

2. For the English Language lab sessions, there shall be continuous evaluation during the year for 25 sessional marks and 50 End Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The End Examination shall be conducted by the teacher concerned, by inviting the External Examiner from outside. In case of the non-availability of the External Examiner, other teacher of the same department can act as the External Examiner.

Mini Project: As a part of Internal Evaluation

1. Seminar/ Professional Presentation

2. A Report on the same has to be prepared and presented.

* *Teachers may use their discretion to choose topics relevant and suitable to the needs of students.*

* *Not more than two students to work on each mini project.*

* *Students may be assessed by their performance both in oral presentation and written report.*

Outcomes

- ♦ Accomplishment of sound vocabulary and its proper use contextually.
- ♦ Flair in Writing and felicity in written expression.
- ♦ Enhanced job prospects.
- ♦ Effective Speaking Abilities

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(A63013) IRRIGATION AND DRAINAGE ENGINEERING

Unit –I:

Introduction Irrigation Engineering, advantages of irrigation, necessity and development of irrigation in India and AP and classification if irrigation projects, Irrigation terminology-GCA,CCA, Base period, crop period, Delta, Duty, Relationship between Duty and Delta (Delta= (864B) / Duty cm), Introduction soil-water plant relationships, soil physical properties such as soil texture, soil structure, capillary conductivity, soil consistency-volume-mass relationships of soil constituents, Water relations of soil, kinds of soil water-Hygroscopic, Capillary and Gravitational movement of water into soils, Infiltration, factors affecting infiltration, procedure for measurement of infiltration rate and development of infiltration equations (Kostia-Kov equations-curve fitting) Ic=KT^n+b), Soil moisture characteristic curves, difference between soil moisture stress and soil moisture tension, soil moisture constants such as saturation capacity, field capacity moisture equivalent and permanent wilting point. Terminology related with movement of water within soils-water intake, percolation, interflow, seepage, permeability, hydraulic conductivity and hydraulic gradient- Measurement soil moisture by different methods, Evaporation, transpiration and evapo-transpiration-Estimation by Blaney-Criddle Thornthwaite, penman and modified Penman equations only-Potential ET.

Unit-II:

Water requirements of crops-Importance of water in plant growth, procedures of working out the net irrigation requirement (depth of irrigation) gross irrigation requirement, irrigation frequency and Irrigation efficiency (conveyance, application, storage, distribution, water use efficiency) with few numerical examples, Water application methods-classification, border irrigation, components of border irrigation-Width, Length and Slope for different soils for different soils, Hydraulics of border irrigation(Advance curve, Recession Curve and Opportunity time through Time and Distance Curve) design of border irrigation. Derivation of Israelson's equation for the width of the border (X= (Q/W.I) (1-eity), Furrow irrigation system-advantages and disadvantages, determination of infiltration depth in furrows by inflow-outflow method (Steam size, Distance Advance time, CS area and Wetted Perimeter data problem on computation of infiltration depth), Check basin irrigation–advantages and disadvantages, estimation of infiltration under check basin conditions, adaptability and design considerations.

Unit-III:

Methods of conveyance of irrigation water-assessment of design capacity of irrigation channels. Design of irrigation canals using Lacey's and Kennedy's theories and problems, Measurement of irrigation water-units of measurements, methods of measurement, direct and indirect methods, measurement of velocity using current meter-indirect methods such as area velocity method and coordinate method for measuring discharges form pipes-dethridge meter, tracer method, Direct methods of measurement of discharges-different devices such as weirs flumes and notches and their installation procedures – Equations for Rectangular Triangular and Trapezoidal notches, Explanation on RBC flumes (critical flow flumes) Underground pipe lines for irrigation water distribution-types of pipes used for underground pipe lines, testing of pipes for its water absorption and pressure requirements, estimating the discharge capacity of pipe lines, Installation procedures of underground pipe lines and study of different structures associated with underground pipe lines.

Unit-IV:

Drainage-definition, objective and types, familiarization with the drainage problems (twin problems of water logging and salinity) and extent of areas in irrigated areas in the state, Surface drainage, effects of poor drainage, areas requiring drainage, factors affecting drainage requirement, drainage coefficient, determination of drainage coefficient based on different criteria, Types of surface drainage-random field drain system, bedding system, parallel field drain, parallel lateral open ditch, cross slope drain system interception system, design of open drainage channels using Manning's equation and alignment of open ditches (radius of curvature), Investigations on design parameters, hydraulic conductivity, drainable porosity fluctuations of depts. To water table in the areas, methods of determining hydraulic conductivity-single auger hole method and derivation of Hooghoudt's equation for 'K' with assumptions and inverse auger hole, Sub-surface drainage systems purpose and benefits, types of sub surface systems tile drains, mole drains, drainage wells, deep open drains and combinations and their suitability for different conditions and limitations.Components of Sub-surface drainage system Layouts and types –Random type herring bone, grid iron cutoff or interceptor drains, depth and spacing of drains, size of the pipe drains using Manning's equation, drain materials of burnt clay. Perforated corrugated and solid PVC and cement concrete, slope/grade for the drains, Envelope materials for sub-surface drains and selection criteria for uniform soils and graded soils, geo-textile and nylon mesh, outlets for sub surface drainage, gravity, gravity and pumped outlets.

Unit-V:

Design of sub surface drains under steady state (equilibrium) conditions

and derivation of Hooghoudt's equation for spacing, The Ernst's derivation for drain spacing, The Ernst's derivation for drain spacing. Glover-Dumm equation (only) for spacing under non-steady state conditions of water table to drop from 'm0' to 'm' in time 't', Drainage structures, Loads on conduits, ditch conduit conditions and projecting conduit conditions, construction and installation of drains, Bio-drainage, vertical drainage and drainage of irrigated and humid areas, Salt balance, classification and reclamation of saline and alkaline soils, soil amendments, leaching requirement-leaching ratio, Economic aspects of drainage with a typical example for total cost estimation SSD system and benefit – cost ratio.

TEXT BOOKS:

1.   Irrigation Engineering, Muzumdar S K, 1983, Tat-McGraw Hill Publishing's. Co. Ltd., New Delhi.

2.   Irrigation Theory & Practice, Michael A M, 2008, Vikas Publishing House, New Delhi.

3.   Drainage Engineering, Luthin J M, 1970, Wiley Eastern Ltd., New Delhi.

4.   Soil and Water Conservation Engineering, Schwab G O, Frevert R K, Edminister T w and Barner K K, 1981, John-Wiley and Sons, New Delhi.

REFERENCE:

1.   Land & Water management Engineering, Murthy V V N, 2004, Kalyani Publishers, New Delhi.

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(A63015) TRACTOR SYSTEMS AND CONTROLS

Objective: To enable the students for acquiring the knowledge pertaining to systems like transmission system clutch, types of clutches, types of Gear, sliding, constant mesh type tractor power out lets like P. T.O, belt pully, drawbar, traction theory rolling, resistance, rim pull, crawler tractor.

Unit-I:

Introduction to transmission system – Power transmission system of Tractor – Functions of a power transmission system. Clutch – Necessity of clutch in a tractor – Essential features of good clutch – Principal working of clutch – Clutch repairs and maintenance. Types of Clutch – Friction clutch, Dog clutch and Fluid coupling – Friction clutch – Single Plate clutch or single disc clutch, Multiple plate clutch or multiple disc clutch, cone clutch. Single Plate clutch or single disc clutch – constructional details and principle of working mechanism. Multiple plate clutch, splinted sleeve clutch type – constructional details and principle of working mechanism Ratchet & Pawl arrangement mechanism – constructional details and principle of working mechanism.

Unit-II:

Gears – Necessity for providing gear box – selective sliding type & constant mesh type – Mechanical advantage in gears – Torque ratio in Gears – working of Gear box. Differential unit and Final drive – Differential – Functions of crown wheel – Differential lock – functions – Final drive – functions of Final drive.

Unit-III:

Fluid coupling and torque connector – Brake mechanism – Requirements of good braking systems – classification of brakes – Mechanical brake and Hydraulic brake – working mechanism. Steering mechanism – Qualities of Steering mechanism, Main parts of steering mechanism Types of steering boxes – working of hydraulic steering. Hydraulic control system – working principals – Basic components of Hydraulic system – Types of hydraulic system – Position control –Draft control – Mixed control – Precautions for hydraulic system.

Unit-IV:

Tractor power out lets – P.T.O. Construction details, Tractor power out let – Belt pulley constructional details, Tractor power out let – Draw bar – construction details. Traction-Traction efficiency – Method for improving traction – Coefficient of traction – Rolling resistance – Wheel Slip or Track slip – Rimpull – crawler tractor.

Unit-V:

Tractor testing – Preparation of tests – Types of tests – Test at the main power take off – Test at varying speeds at full load – Test at varying load-Belt or pulley shaft test – Drawbar test-Tractor engine performance. Determination of centre of Gravity – Suspension method – Balancing method – Weighing method. Tractor chassis machines – Functions of chassis frame – Tractor chassis – Mechanics of Tractor chassis.

TEXT BOOKS:

1. Farm Tractor Maintenance and Repair. Jain. S.C. and Roy C.R. 1984. TMH Publishing Co. Ltd., New Delhi.

2. Tractors and their power units. Liledahi J.B. Carleton W.M. Turnquist P. K. and Smith D.W. 1984. AVI Publishing Co.Inc., Westport, Connecticut.

REFERENCES:

1. Elements of Agricultural Engineering. Jasgishwar Sahay. 1992. Agro Book Agency, Patna.

2. Farm Gas Engines and Tractors. Fred J.R. 1963. Allied Publisher Pvt. Ltd., Bombay.

3. Farm Machines and their Equipment. Nakra C.P., 1986. Dhanpet Rai and Sons. 1982 Nai Sarak, New Delhi.

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III Year B.Tech. Ag. Engg.-II Sem	L	T/P/D	C
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(A63012) DESIGN OF SOIL AND WATER CONSERVATION STRUCTURES

Objective: To enable the students to design and execute the structures for controlling soil erosion, water erosion and irrigation in fields and prepare cost estimates for the structures.

Unit-I:

Introduction, Classification of structures, land treatment structures, gully control structures, functions of soil erosion control structures. Flow in open channels – types of flow, state of flow, regimes of flow, energy and momentum – principles, specific energy and specific force – critical depth concept–stage discharge relationship–sequent depths. Hydraulic jump and its application, type of hydraulic jump, energy dissipation due to jump, jump efficiency, relative loss of energy – Froude number and its significance in the design of hydraulic structures.

Unit-II:

Runoff measuring structures–Parshall flume, H-Flume and weirs, Water stage recorders. Straight drop spill way-general description, functional use, advantages and disadvantages, structural parts and functions, components of spillway. Three design phases – hydrologic and hydraulic design, free board and wave free board, aeration of weirs, concept of free and submerged flow. Structural design of a drop spillway–loads on headwall, variables affecting equivalent fluid pressure. Determination of saturation line for different flow conditions, seepage under the structure, equivalent fluid pressure of triangular load diagram for various flow conditions. Creep line theory, uplift pressure estimation, safety against sliding, overturning, crushing and tension. Chute spillway- general description and its components, hydraulic design, energy dissipaters – uplift pressure diagram – analysis of various forces etc. Design criteria of a SAF stilling basic and its limitations. Drop inlet spillway – General description, types of possible flow conditions, pipe flow, orifice flow, functional use, design criteria.

Unit-III:

Design of diversions, small earth embankments – their types and design principles, farm ponds and reservoirs. Estimation of volume of earthwork of farm ponds by various methods. Irrigation Engineering structures – Various types and their purposes. Differences between soil conservation and irrigation structures. Canal Falls – types of canal falls with line diagrams (elevations). Design of trapezoidal notch fall. Design of syphon well drop type of canal falls. Cross drainage works – Locations needing cross drainage works –

aqueduct – super passage – inverted siphon aqueduct – inlets and outlets – different types of cross drainage works with line diagrams. Design principles of various cross drainage works – Design of an aqueduct.

Unit–IV:

Irrigation outlets – non modular, semi modular rigid modular outlets battle sluice irrigation modules. Diversion head works – Different components of diversions head works – head regulator and cross regulator. Different types of weirs and barrages – Difference between a weir and barrage with example locations. Operation of gates in controlling water in irrigation structures. Planning of watershed development works with people's participation. Watershed development works. Preparation of projects. Impact assessment and post assessments of the soil conservation and Irrigation structures.

Unit–V:

Cost estimation of contour bund. Cost estimation of bench terraces. Cost estimation of terraces. Cost estimation of Drop spillway. Cost estimation of construction of farm ponds. Cost estimation of check dam.

TEXT BOOKS:

1.   Soil and Water Conservation Engineering. Schwab G.O., Frevert R.K. Edminister T.W. and Barnes K.K. 1981. John Wiley and Sons, New York.

2.   Irrigation Engineering and Hydraulic Structures. Garg S.K. 1986. Khanna Publications. New Delhi.

REFERENCES:

1.   Irrigation Engineering. Mazumdar. S.K. 1983. TMH Publishing Co. Ltd., New Delhi.

2.   Irrigation Water Resources. Modi P.N. 1990. Standard Book House. Post Box No. 1074. New Delhi.

3.   Hydrology and Soil Conservation Engineering. Ghanshyam Das 2009 PHI Learning Private Limited, New Delhi.

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(A63011) DAIRY AND FOOD ENGINEERING

Objective: Knowledge on milk and food processing unit operations offer strength to students to handle pasteurization, sterilization, packaging, etc. of dairy products and control spoilage of food through process operations such as evaporation, freezing, membrane processing etc.,

Unit – I:

Dairy development in India and dairy technology- Introduction, statistics of production and consumption. Indian dairy products Concentrated whole mile products, coagulated milk products, products of the clarified butter for industry, Engineering, thermal and chemical properties of milk and milk products – Composition of milk, physic-chemical properties of milk, water content, acidity, pH, developed acidity, natural acidity, total acidity, density, specific gravity, freezing point of milk colour of milk, flavor, Rheology – basic concepts – ASTM standard definition of terms, Rheology properties – Force deformation behavior, stress and strain behavior, Visco-elasticity – time effects- Rheological models, Kelvin and Maxwell models-electrical equivalence of mechanical models, Rheological equations – Maxwell model-creep-Stress relaxation, Unit operations of various diary and food processing systems- Centrifugation, separation, separation by cyclone (Application of separation in the dairy industry, velocity of particles in a gravitational field, distribution of fat globule diameters in milk, velocity of particles in a centrifugal field, strength of centrifugal bowl, disc bowl centrifuge, design of centrifuges and methods of application, decanting centrifuge for lactose and casein, cyclones for separation from gas phase). Process flow charts for product manufacture – Pasteurized milk, flow chart, process steps, person method and mass balance method for making balances of cream and fat in making whole milk, ice cream manufacture, process steps, over run.

Unit-II:

Milk receiving – Quantity determination, quality evaluation, clearing and disinfection of transport facilities, milk returns, procedures for reception and returns, Pasteurization- Purpose, microorganisms and enzymes and their reaction to temperature and other influences, bacteria in milk, effect of temperature, Pasteurization – Methods of heating, design and mode of operation heating equipment (Vat, tubular heat exchanger, plate heat exchanger), Sterilization – UHT method (Direct and indirect heating), sterilization in the package (temperature and pressure patterns), equipment for sterilizing goods in the package (Batch autoclaves, continuously operating

sterilizers).

Unit – III:

Homogenization – Emulsifying, types of emulsions, emulsifiers, homogenizing (Application, mode of operation, technical execution, effect of the product) , Filling and packaging – Packaging of milk, cultured milk, cheese, butter, concentrated milk, products, dried milk products, and packaging materials of them, filling and metering, packaging methods, Butter manufacture – Principle, treatment of cream, churning, overrun, factors affecting churn ability, methods (Butter churn, continuous butter making), butter oil and special butter products (Composition, methods of manufacturing ,direct evaporation method, decantation, centrifugal separation, vacuum method), Dairy plant design and layout – target of minimum cost, factors in planning, importance of site selection. Location of building, size and type of dairy building, advantages of good plant layout, functional design, flow plan, Dairy plant design and layout – Operating schedule and layout, process selection, single – and multi –level construction of buildings, floor space, walls and ceiling ventilation, doors, windows and lighting, flooring, drainage. Composition and proximate analysis of food products- Carbohydrates, protein, lipids, minerals, vitamins, Deterioration in products and their controls – Food as a substitute to microorganisms, food preservation methods, principles of food preservation, causes of food spoilage and classification of food with respect to spoilage and consumption, Principles of food preservation, effects of pH and water content on growth of microorganisms, methods of controlling water content, effect of water activity, methods of measuring a oxidation-reduction potential effect on microorganisms, effect of nutrient content and effect of inhibitory substances, biological structures, Physical, chemical, and biological methods of food preservation, Change undergone by food components during processing –Changes during heating, evaporation, drying, freezing, juice extraction, filtration and separation.

Unit – IV:

Evaporation – Applications, functions, factors affecting rate of evaporation, basic evaporator construction, factors affecting liquid boiling point, thermodynamics of evaporation (phase change, boiling point elevation, Duhring plot, Evaporation – Hat and mass transfer in evaporator, factor influencing the overall heat transfer coefficient, influence of feed liquor properties on evaporation, factors influencing the economy of evaporation, boiling at a submerged surface, Evaporation – Types of evaporation equipment. Natural circulation evaporators – Batch type, horizontal short tube, vertical short tube, natural circulation with external calandria, long tube, forced circulation (General forced circulation, pate, expanding flow, mechanical /agitated thin film), Evaporation – Evaporator ancillary plant, design of evaporation systems, single effect multiple effect evaporators,

feeding methods of multiple effect evaporation systems, feed preheating, vapour recompression systems, Drying – Sorption isotherms, desorption, hysteresis, enthalpy of binding, drying process, Drying – Drying methods (radiation, dialectic, spray, form spray, roller, fluidized bed, freeze), grain drying theory, grain dryers.

Unit-V:

Freezing – Introduction, freezing point curve for food and water, freezing points of common food materials, freezing time calculation by using Plank's equation, types of freezing equipment, Juice extraction – Single stage liquid –liquid extraction processes (Introduction, equilibrium relations, single-stage equilibrium extraction) Types of equipment design for liquid-liquid extraction, continuous multistage countercurrent extraction, Juice extraction – Liquid solid leaching (process, preparation of solids. rate of leaching types of equipment of leaching, equilibrium relations and single state leaching counter current multistate leaching, Filtration – General considerations, materials for membrane construction, ultra-filtration, processing variables, applications or ultra-filtration in milk processing, reverse osmosis, mode of operation, and applications, Membrane separation – Membrane separation methods, demineralization by electro dialysis, gel filtration and on exchange, Thermal processing – Reaction kinetics (Principle, effect of time and temperature) temperatures which vary with time, Thermal processing _ Thermal death time curve, reaction kinetics of the heat treatment of milk and its use for the assessment of UHT treatment methods, change in milk produced by heating, Plant utilities requirement – Electricity, water, power.

REFERENCES:

1   Food Engineering and Dairy Technology, Kessler H G 1981. Veriag A. Kessler, Freising.

2   Outlines of Dairy Technology, Sukumar DC 2005. Oxford University Press, New Delhi

3   Principles of Food Science, Fennema OR 2006. Marcel Dekkar Inc., New York.

4   Food Science, Chemistry and Experimental Foods, Swaminathan M 2006. The Bangalore Printing & Publishing Co., Ltd., Bangalore

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. Ag. Engg.-II Sem	L	T/P/D	C
	4	-/-/-	4

(A63014) THEORY OF STRUCTURES

Objective: The Students will have acquired knowledge on the design principles of beams, slabs, columns, foundations and RCC structures, retaining walls and silos and other structures by the end of the course.

Unit-I:

Introduction to loads and BIS codes – loading of a bar, principle of superposition, classification of loaded bar, gradual, sudden, impact and shock loading, tension and compression, axially loaded bar. Design of connections. Design of thin cylindrical shells – Failure of thin cylindrical shells, stresses in a thin cylindrical shell, circumferential stress, longitudinal stress, problems on thin cylindrical shells. Design of thick cylindrical shells – Lame's theorem, stress, stress in compund thick cylindrical shells, difference of radii of shrinkage, problems on thick cylindrical shells. Design of spherical shells, thick spherical shells, problems on thick spherical shells. Combined bending and axial thrust.

Unit-II:

Design of steel roof trusses. Analysis and designing of single reinforced sections – Properties of reinforced concrete, advantages, assumptions, modular ratio, equivalent area of R.C.C., Stress and strain diagram, neutral axis, moment of resistance, design of rectangular section. Analysis of balanced over reinforced and under reinforced sections – Under reinforced sections, over reinforced sections, problems. Analysis and designing of double reinforced sections – Modular ratio for compression shell equivalent area of steel in compression, neutral axis, moment of resistance, steel beam theory, problems. Shear stresses in beams – Shear stress induced in homogeneous and R.C. beams, nominal shear stress, varying depth, effect of shear in R.C. beams, failures, shear resistance of concrete without shear reinforcement.

Unit-III:

Design of shear reinforcement, problems. Vertical stirrups and inclined bars – Development of length, development of stress in R.C.C. Anchorage for reinforced bars–Anchorage for reinforced bars, anchorage bars in tension, anchorage bars in compression. Curtailment of bars – Decision on the curtailment of bars, design considerations for bond, general concept of bond.

Unit- IV:

Design of flanges beams (CT and I beams). Design of one way slabs – Loading on slabs, arrangement of reinforcement, design of one way slab.

Design of one way slabs – Problems on design of one way slabs. Design of one way slabs – Design of reinforced brick slabs, problems. Design of one way slabs – Rankine – Grashoff theory, shear force on the edges, design, problems, Merco's method. Design of two way slabs – Torsion reinforcement, load and bending moment, problems, slabs with edges fixed. Design of two way slabs – Provision of torsion reinforcement, Marcor's method, problems. Axially loaded columns – Types of columns, effective length of columns, long and short columns, composite columns.

Unit- V:

Axially loaded columns – Basic rules for design of columns, arrangement of transverse reinforcement, problems. Foundations – Types of foundations, design criteria. Foundations – Problems on design criteria. Retaining walls – Earth pressure on a retaining wall, active earth pressure, passive earth pressure. Stability of walls – Conditions for stability of retaining walls, problems. Silos, circular or cylindrical tanks and design criteria – Permissible stresses in concrete, permissible stresses in steel, base, minimum reinforcement, design, problems. Silos, circular or cylindrical tanks and design criteria – Circular tanks with rigid joints, H. Carpenter's method, problems.

TEXT BOOKS:

1.	Mechanics of Structures Vol. I, Junarkar, S.B. 2001 – Charotar Publishing Home, Anand.

2.	Mechanics of Materials, Dr. B.C. Punmia, Laxmi Publications.

3.	Strength of Materials by Basavarajaiah and Maha devazpa, University Press.

REFERENCES:

1.	Strength of materials, R.S. Khumi 2001 – S. Chand & Company Ltd., 7361, Ram Nagar, New Delhi – 110055.

2	Treasure of R.C.C. Design, Sushil Kumar 2003 – R.K.Jain – 1705-A, Nai Sarak, Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. Ag. Engg.-II Sem	L	T/P/D	C
	4	-/-/-	4

(A60018) HUMAN VALUES AND PROFESSIONAL ETHICS
(Open Elective)

Objectives : This introductory course input is intended

· To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.

· To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Value based living in a natural way.

· To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with Nature.

Unit I:

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education. Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Unit II:

Understanding Harmony in the Human Being - Harmony in Myself! : Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

Unit III:

Understanding Harmony in the Family and Society- Harmony in Human -

Human Relationship : Understanding harmony in the Family- the basic unit of human interaction. Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; **Trust (Vishwas) and Respect (Samman) as the foundational values of relationship.** Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals. Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family!

Unit IV:

Understanding Harmony in the Nature and Existence - Whole existence as Co-existence : Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

Unit V:

Implications of the above Holistic Understanding of Harmony on Professional Ethics : Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics:

a) Ability to utilize the professional competence for augmenting universal human order,

b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,

c) Ability to identify and develop appropriate technologies and management patterns for above production systems.

Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order:

a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers

b) At the level of society: as mutually enriching institutions and organizations

TEXT BOOK

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

2.   Prof. KV Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications,3rd Edition.

EFERENCE BOOKS

1.   Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA

2.   E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.

3.   A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.

4.   Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991

5.   PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Purblishers.

6.   A.N. Tripathy, 2003, Human Values, New Age International Publishers.

7.   Subhas Palekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.

8.   Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.

9.   E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press

10.   M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethichs (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.

Relevant CDs, Movies, Documentaries & Other Literature:

1.   Value Education website, http://www.uptu.ac.in

2.   Story of Stuff, http://www.storyofstuff.com

3.   Al Gore, An Inconvenient Truth, Paramount Classics, USA

4.   Charlie Chaplin, Modern Times, United Artists, USA

5.   IIT Delhi, Modern Technology – the Untold Story

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. Ag. Engg.-II Sem	L	T/P/D	C
	4	-/-/-	4

(A60117) DISASTER MANAGEMENT
(Open Elective)

Unit-I

Environmental Hazards & Disasters: Meaning of Environmental hazards, Environmental Disasters and Environmental stress. Concept of Environmental Hazards, Environmental stress & Environmental Disasters. Different approaches & relation with human Ecology - Landscape Approach - Ecosystem Approach - Perception approach - Human ecology & its application in geographical researches.

Unit –II

Types of Environmental hazards & Disasters: Natural hazards and Disasters - Man induced hazards & Disasters - Natural Hazards- Planetary Hazards/ Disasters - Extra Planetary Hazards/ disasters - Planetary Hazards- Endogenous Hazards - Exogenous Hazards –

Unit –III

Endogenous Hazards - Volcanic Eruption – Earthquakes – Landslides - Volcanic Hazards/ Disasters - Causes and distribution of Volcanoes - Hazardous effects of volcanic eruptions - Environmental impacts of volcanic eruptions - Earthquake Hazards/ disasters - Causes of Earthquakes - Distribution of earthquakes - Hazardous effects of - earthquakes - - Earthquake Hazards in India - - Human adjustment, perception & mitigation of earthquake.

Unit –IV

Exogenous hazards/ disasters - Infrequent events- Cumulative atmospheric hazards/ disasters

Infrequent events: Cyclones – Lightning – Hailstorms

Cyclones: Tropical cyclones & Local storms - Destruction by tropical cyclones & local storms (causes , distribution human adjustment, perception & mitigation) Cumulative atmospheric hazards/ disasters : - Floods- Droughts- Cold waves- Heat waves Floods:- Causes of floods- Flood hazards India- Flood control measures (Human adjustment, perception & mitigation) Droughts:- Impacts of droughts- Drought hazards in India- Drought control measures- Extra Palnetary Hazards/ Disasters- Man induced Hazards / Disasters- Physical hazards/ Disasters-Soil Erosion

Soil Erosion:— Mechanics & forms of Soil Erosion- Factors & causes of Soil Erosion- Conservation measures of Soil Erosion

Chemical hazards/ disasters:— Release of toxic chemicals, nuclear explosion- Sedimentation processes Sedimentation processes:- Global Sedimentation problems- Regional Sedimentation problems- Sedimentation & Environmental problems- Corrective measures of Erosion & Sedimentation

Biological hazards/ disasters:- Population Explosion.

Unit –V

Emerging approaches in Disaster Management- Three Stages

1.   Pre- disaster stage (preparedness)

2.   Emergency Stage

3.   Post Disaster stage-Rehabilitation

TEXT BOOKS:

1.   Disaster Mitigation: Experiences And Reflections by Pardeep Sahni

2.   Natural Hazards & Disasters by Donald Hyndman & David Hyndman – Cengage Learning

REFERENCES

1.   R.B.Singh (Ed) Environmental Geography, Heritage Publishers New Delhi,1990

2.   Savinder Singh Environmental Geography, Prayag Pustak Bhawan, 1997

3.   Kates,B.I & White, G.F The Environment as Hazards, oxford, New York, 1978

4.   R.B. Singh (Ed) Disaster Management, Rawat Publication, New Delhi, 2000

5.   H.K. Gupta (Ed) Disaster Management, Universiters Press, India, 2003

6.   R.B. Singh, Space Technology for Disaster Mitigation in India (INCED), University of Tokyo, 1994

7.   Dr. Satender , Disaster Management t in Hills, Concept Publishing Co., New Delhi, 2003

8.   A.S. Arya Action Plan For Earthquake,Disaster, Mitigation in V.K. Sharma (Ed) Disaster Management IIPA Publication New Delhi, 1994

9.   R.K. Bhandani An overview on Natural & Man made Disaster & their Reduction,CSIR, New Delhi

10.   M.C. Gupta Manuals on Natural Disaster management in India, National Centre for Disaster Management,IIPA, New Delhi, 2001

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III Year B.Tech. Ag. Engg.-II Sem   **L   T/P/D   C**

                                          4   -/-/-   4

(A60017) INTELLECTUAL PROPERTY RIGHTS
(Open Elective)

UNIT – I

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT – II

Trade Marks : Purpose and function of trade marks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

UNIT – III

Law of copy rights : Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

Law of patents : Foundation of patent law, patent searching process, ownership rights and transfer

UNIT – IV

Trade Secrets : Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

Unfair competition : Misappropriation right of publicity, False advertising.

UNIT – V

New development of intellectual property: new developments in trade mark law ; copy right law, patent law, intellectual property audits.

International overview on intellectual property, international – trade mark law, copy right law, international patent law, international development in trade secrets law.

TEXT BOOKS & REFERENCES:

1.   Intellectual property right, Deborah. E. Bouchoux, cengage learing.

2.   Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tate Mc Graw Hill Publishing company ltd.,

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III Year B.Tech. Ag. Engg.-II Sem   **L**   **T/P/D**   **C**

                                                        -   **-/3/-**   **2**

                (A63084) AGRICULTURAL PROCESS ENGINEERING LAB

1 Preparation of flow charts and layout of a food processing plant

2 Determination of fineness modulus and uniformity index

3 Determination of mixing index of a feed mixer

4 Determinaption of the efficiency of cyclone separator

5 Tutorial on extraction by McCabe and Theile plot

6 Tutorial on use of psychrometry chart

7 Tutorial Problems on distillation

8 Tutorial on power requirement in size reduction of grain using Rittnger's law, Kick's law and Bond's law

9 Performance evaluation of hammer mill and attribution mill.

10 Separation behavior in pneumatic separation

11 Evaluation of performance of indented cylinder and screen pre cleaner

12 Mixing index and study of mixers

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III Year B.Tech. Ag. Engg.-II Sem   **L   T/P/D   C**

                                                 -   -/3/-   2

(A63085) SOIL AND WATER ENGINEERING LAB

1. Estimation of Soil Loss from using Cushocton Silt sampler and multi slot divisor.
2. Determination of sediment concentration through Oven Dry method.
3. Soil loss estimation using erosivity index and erodibility index.
4. Determination of rate of sedimentation and storage loss in reservoir.
5. Field planning for implantation of soil conservation measures.
6. Field visit to study different soil conservation structures
7. Field visit to study different gully control structures
8. Determination in filtration characteristics of soils.
9. Measurement of irrigation water with H-Flume.
10. Measurement of evapo-transpiration.
11. Visit to nearby irrigation projects
12. Use of current meter and water meter.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. Ag. Engg.-I Sem	L	T/P/D	C
	4	-/-/-	4

(A73021) MICRO IRRIGATION ENGINEERING

Objective: To impart knowledge and skills to students to design sprinkler and drip irrigation systems to improve water productivity of different crops and to perform economic analysis and to prepare project proposals and cost estimates of Micro – Irrigation Systems.

Unit – I:

Sprinkler Irrigation Historical development, Scenario in the World, Country and State, adoptability and limitations, Components of the sprinkler system, pump set, (Centrifugal, turbines and Submersible), Main lines, Lateral lines, Sprinkler heads, Debris screens, Desilting basins, booster pumps, Take-off valves, Flow control valves (individual sprinkler). Sprinkler heads, fertigation Equipment, Types of sprinkler Irrigation systems: A. Based on mechanism: i) Rotating head system, ii) Perforated pipe system, B. Based on portability: i) Portable systems, ii) Semi-portable systems, iii) Semi-permanent systems, iv) Permanent systems and v)Solid set systems.

Unit-II:

Precipitation profiles and Moisture distribution patterns, Recommended sprinkler spacings, Effects of wind speed on working of the system, Importance of distribution uniformity, Christiansen Uniformity coefficient, Design of Sprinkler system, layout, laterals and mains: i) Inventory of Resources and Conditions, ii) Types of system and Layout, iii)Sprinkler Selection and Spacing, iv) Capacity of Sprinkler Systems, v) Hydraulic Design of Sprinkler Systems, vi) Selection of pump, Operation and maintenance of system, Field evaluation of the system, Cost analysis.

Unit – III:

Drip Irrigation, Historical development, Scenario in the World, Country and State, Advantages and Limitations, Components of drip irrigation: A. Head Control- Non return valve, Air release & Vacuum breaker, Filter, Fertigation Tank, Throttle valve, Pressure gauge, other fittings, B. Wayer carrier systems-PVC pipeline, Control valve, Flush valve, other fittings, C. Water distribution systems- Drip lateral, Drippers, Emitting pie, Grommet, Start connector, Nipple, End cap, Micro tube, Barbed connector, Drip Hydraulics, Pipe section, Water flow in pipes, Velocity recommended pressure, Pressure and Hydrostatic, Pressure due to gravity, Friction and pressure losses, Coefficient of friction.

Unit-IV:

Types of Emitters: A) Based on Floe regime (Reynolds number): i) Laminar

Flow, ii)Partially turbulent flow, iii) Fully turbulent flow and B) Based on Lateral connection: i) in-line and ii)on-line, Emitter flow equation, Emitter constants, Pressure variations (%) for different emitter flow variations and x-values, Emission uniformity (EU), Distribution Uniformity and Irrigation efficiency. Planning and design of drip system- Collection of primary data, Layout, crop water requirements, hydraulic design, selection of components, Economic pipe size selection, Pressure variation Along drip Irrigation and design criteria of lateral, sub-main and mail lines, Pai-wu I design charts.

Unit – V:

Installation, operation and Maintenance of drip irrigation systems, testing and field evaluation of the system, Computer Software programs for design of drip irrigation systems, Automation of drip irrigation systems – i) Volume based, ii) time based and iii) Soil moisture bases systems.

TEXT BOOKS:

1.	Drip Irrigation & Sprinkler Irrigation, Sivanappan R K Padam Kumari O and Kumar V 1997, Keerthi Publishing House Pvt. Ltd., Coimbatore.

REFERENCES:

1.	Micro-Irrigation for Crop Production, Design, Operation and Management, Freddie R. Lamm, James E. Ayars and Francis S, Nalayama, 2006, Elsveir Publications, Singapore.

2.	Land and Water Management Principles, R. Suresh, 2008, Standard Publishers Distributors, Delhi.

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IV Year B.Tech. Ag. Engg.-I Sem	L	T/P/D	C
	4	-/-/-	4

(A73018) FARM MACHINERY AND EQUIPMENT – II

Objective: To enable the students to understand the basic principles of cutting mechanisms and to know the various available harvesting machines. To know the working principle and functions of various machine parts of mowers, reapers, windrowers, forage harvesters, threshers, combine harvesters, cotton strippers, cotton pickers, groundnut and potato and sugarcane harvesters. Students can also understand the importance of testing and evaluation of agricultural machines and different standard codes (BIS cides) available in India for testing of machinery..

Unit – I:

Harvesting – Crop harvesting machinery, history of development, manual harvesting and its classification. Principles and types of cutting mechanisms – principle of cutting mechanism, impact cutting, types of impact cutting, shear cutting Construction and adjustments of shear and impact type cutting mechanisms. Mowers – history and development, tractor mounted mowers, Trail behind tractor mower, integral Rear mounted mowers, side or central mounted tractor mower, semi-mounted mowers, safety precautions in operation and adjustments of mowers, Knife drives, cutter bar and its parts – inside and outside shoes. Cutter Bar – Guards, Ledger plates, wearing plates, knife clips, grass board and various parts of cutter bar assembly, alignment and registration of cutter bar. Windrowing – Methods of windrowing, Self propelled windrows, effects on yields and quality of Reapers, Animal drawn reaper, Tractor mounted Vertical conveyer reaper Repairs & maintenance of Harvesting equipment.

Unit-II:

Power operated vertical conveyer reapers – Reaper binders – Care and maintenance, types Forage harvesting equipment – row forage harvesting equipment, field forage harvesters, types of field forage harvesters. Field chopper harvesters, forage wagons and boxes, field flail forage harvesters, the self propelled forage harvester, silo forage blowers, silo un loaders.

Unit – III:

Thresting – Principal of threshing, threshing methods, threshing by manual, threshing by animals, threshing by machines, olpad threshers, Power thresher – types of power threshers, hammer mill type, rasp bar, spike tooth, syndicator,

Classification threshers based on feeding type, components of power thresher. Cleaning unit- Aspirator, blower, winnower, winnowing fan, cylinder adjustment, wheat thresher, groundnut thresher, terminology connected with power thresher. development of the binder, development of the combine, Harvester, advantages and disadvantages of combines, types of combines – Tractor drawn and self propelled combines. Functions performed by a combine, cutting mechanism, threshing mechanism, separating mechanism, cleaning mechanism, attachments for combine.

Unit – IV:

Corn harvesting equipment- types of corn pickers, snappers, picker husker, Picker Sheller, power transmission, gathering and snapping mechanism, conveying and elevating mechanism. Husking mechanism, shelling mechanism, factors affecting performance of corn pickers, safety rules for operating corn pickers. Root crop harvesting equipment – groundnut harvester, groundnut diggers, digger operation and adjustments – groundnut shakers, groundnut threshers and pickers, groundnut combines, different units and its operation. Potato harvesters – harvesting methods and equipment, one row harvester, two rowharvester, digging and soil separation, vine removal by harvesters, separation of stones and clods.

Unit V:

Cotton harvesting equipment – cotton stripper, types of cotton strippers, factors affecting the performance of the cotton strippers, plant characteristics – thickness of plants – conveying system. Cotton pickers – types of pickers, drum type and chain belt spindle arrangements in cotton pickers, methods of mounting spindles, doffing of the cotton, conveying systems, working, factors affecting performance of cotton pickers. Sugar cane harvesters – self propelled sugar cane harvester, cleaning and special sugar cane wagon. Sugar cane harvesters – Self propelled sugar cane harvester, conveying and special sugar cane wagon. Principles of fruit harvesting tools and machines – Harvesting methods – manual harvesters – hold on and twist type – Horticultural tools and gadgets. Testing of farm machine- Introduction, Standardization efforts, Testing programme and Procedure, Type of testing systems, national testing, prototype testing, testing for quality marketing.

TEXT BOOKS:

1.	Principals of Farm Machinery. Kepner R.A., Bainer R and Barger E.L, 1987. CBS Publishers and Distributors, Delhi.

2.   Engineering principles of Agricultural machines, Ajith k Srivatsava, Carrol E. Goering, Roger P. Rohrbach, 1993, ASAE Publishers.

REFERENCE BOOKS:

1.   Farm Machinery and Equipment. Smith H.P. 1971. Tata McGraw-Hills Publishing Co., Ltd., New Delhi.

2.   Testing and Evaluation of Agricultural Machinery. Mehta M.L., Verma S.R. Misra S.K. and Sharma V.K. Daya Publishing House, New Delhi.

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IV Year B.Tech. Ag. Engg.-I Sem	L	T/P/D	C
	4	-/-/-	4

(A73022) POST HARVEST ENGINEERING AND HORTICULTURAL PRODUCE

Unit – I:

Factors affecting fruit and vegetable quality, pre-harvest factors, Environmental Factors, Cultural factors, Post Harvest Factors, Engineering properties of Fruits and vegetables, Physical properties, Shape, Size, density, porosity, surface area, colour, serilynamie properties, dry coefficient terminal velocity Rheological properties, screen stain, Mechanical Properties, comprehension strength, tensile strength, shear resistance, Electrical properties, conductive, resistance dielectric properties, Optical properties, dielectric properties-optical properties, light transmittance, light reflectance, Handling and transportation of fruits and vegetables.

Unit-II:

Harvesting indices of different fruits and vegetables, determination of Maturity standards for fruits and Vegetable- Size, shapes, aroma, Fruit ripening, leaf charges, firmness, Juice content, sugar content, skin colour, total soluble solid, modern techniques for determination of harvesting indices/ and grading of fruits, Electrical property, Near Infrared Reflectance (NIR), Radiation, Optical method, Light reflectance, Machine vision. Cleaning of fruits & Vegetables, soaking, rinsing, Cleaning & Washing- by agitator, by spraying water, wet and dry brushing, chemical washing, factors affecting effectiveness of a sprayer, Peeling of fruits and vegetables, Hand peeling, Mechanical peeling, peeling by heat treatment, Lye peeling, Grading of fruits & vegetables, Factors affecting grading, Types of graders, screen grader, roller grader, rope and cable type grader and weight grader.

Unit-III:

Canning of fruits & Vegetables, Grading, washing, peeling, cutting, Blanching, cooling, filling, Syruping or brining, Exhausting, sealing, Heat processing, cooling to room temp, Storage, Labeling, Making of cans for canning, causes of spoilage of canned foods, Hydrogen swell, Flipper, Springer, soft swell, hard swell, Buckling, Principles of preservation of Fruits & Vegetables, Asepsis packaging, preservation by high temperature. Pasteurization, Flash Pasteurization, Sterilization, Chemical preservation with sulphur dioxide,

advantages, disadvantages, Preservation with Benzoic acid, Concentration and reverse osmosis technique applied to fruits & vegetables, Drying and dehydration of fruits & vegetables (Flow chart), types of dryers, cabinet dryer, tray dryers, tunnel dryer, Reconstitution test and rehydration, Ratio of Rehydration coefficient, Freeze drying, methods of freezing, slow freezing, quick freezing method, advantages and disadvantages, direct immersion, indirect contact with refrigerant, Air blast freezing, cryogenic freezing, De-hydro freezing, Freeze-Drying (Flow chart).

Unit – IV:

Post harvest management of Fruits and vegetables, procurement centers, Washing & grading, pre-cooling, room cooling, hydro cooling, Transportation by refrigerated trucks, Centralized cold storage centers etc, Controlled atmospheric storage, effects of CA, additional benefits, Limitations, Maintaining CA system, modified atmosphere storage/Packaging, Maintenance of MAP, active modification, passive modification, Requirements of fresh fruits package under CAS or MAS. Packaging of fruits and vegetables, packaging of fresh fruits, advantages of fresh packaging, Packaging materials, Cello pave, Poly vinyl chloride, polyethylene, Ethyl vinyl alcohol, Packaging of apples, Oranges, Mangoes, Bananas etc, Preparation of preservation of unfermented fruit beverages, selection of fruit, sorting and washing, Juice extraction, Deaeration, Filtration, Clarification, addition of sugar, fortification, preservation, Baffling, Unfermented beverages, Apple juice, grape juice, Pineapple juice, Citrus juice, Mango juice, with all flow sheets.

Unit-V:

Fermented beverages, Wine, Flow sheet for processing of grape wine, Selection of fruit, crushing, Addition of sugar, adjustment of PH, addition of preservative addition of wine yeast, Fermentation, Firing & filtration, aging, packaging, Preparation of Vinegar, Alcoholic fermentation, Acetic acid fermentation, quality characteristics of fruits and vegetable for processing, Sensory, Hidden and quantitative characteristics, Oleoresin and essential oil extraction, turmeric oleoresin, extraction of chilli oleoresin, factors responsible, Solvents used for oleoresin extraction, advantages and disadvantages, Extraction of essential oil from spices by steam distillation, flow chart.

TEXT BOOKS:

1.	Food Science by Potter, N. CBS Publishers.

2.   Fruits and Vegetable Preservation. Principles and practices by srivastava R P & Kumar S International book distributes .

REFERENCE BOOK:

1.   Fruits: Tropical and subtropical by Bose T,K & Mitre, SK Naya Prakash.

2.   Fruits and Vegetable processing by Bhatti, S and varma U CBS Publishers.

3.   Technology of food preservation by Defroshier and Defrossier CBS Publications.

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IV Year B.Tech. Ag. Engg.-I Sem	L	T/P/D	C
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(A73016) AGRO INDUSTRIES AND BI-PRODUCT UTILIZATION

Objective: Processes to convert low value byproducts from agricultural and food processing industries will be explained in detail to produce economically viable value added products. Knowledge on treatment techniques of waste water from agricultural/food industry and animal sheds for safe disposal will be imparted to the students.

Unit –I

Agro-industries-Definition, classification, factors responsible for establishment. By-products utilization-Rice husk-Introduction, characteristics, uses, production of pure silica and silicon, uses of amorphous silica, grades of silicon, structure of rice husk silica. Burning of rice husk for production of white ash, production of high purity silicon (calcium reduction process). Ceramic materials from rice husk – Classification of ceramics, advantages of rice husk white ash, raw materials for ceramics, production process, merits of process. Rice husk combustion – Furnace design calculation, efficiency of furnace, problems on rice hush combustion, design of cyclone furnace and inclined grate furnace. Rice husk – Alcoholic fermentation – Introduction, processes for manufacture of alcohol, production of ethyl alcohol by SSF process. Rice husk – Furfural – Chemistry, products properties of furfural, synthesis, production of furfural and xylose from corn cobs, furfural through RRL process.

Unit-II:

Rice bran – Oil extraction, food and chemical products processing. Coconut coir and shell utilization – Introduction. Commercial products – Edible copra, milling copra, oil milling, quality of copra and oil. Fresh kernel based products and product diversification – Desiccated coconut, canned coconut cream, coconut water. Coconut toddy production. Coir – Brown fiber milling, manufacture of white fiber. Coconut shell products. Mango stone and peel utilization – Mango vinegar, mango leather, mango flour-Cashew nut-Harvesting, processing. Cashew products – Nuts, testa, apple, cashew nut shell liquid, extraction of CNSL. Banana pseudo stem – Pseudo stem, banana stem candy, banana starch from pseudo stem, banana cheese from peel, banana pectin from peel, banana vinegar from pulp and peel, banana peel

as cattle feed. Sugarcane bagasse – Molasses, bagasse, filter mud, sugarcane wax. Paper making from agricultural wastes – paper processing – Manufacture of pulp and paper. Raw materials for paper production, paper board production from agricultural wastes.

Unit –III:

Feed processing plants – Introduction, feedstuffs from cereals, classification of feeds, specialized feeding requirements, feed manufacturing processes, forms of feed. Equipment for unit operations in feed processing – Liquid feed blenders, flaking, milling, mixing, pelleting and extruding. Formulating feeds, layout of feed mills for commercial production. Agricultural waste management – Planning waste management systems – System selection, system principles, waste utilization opportunities, waste management alternative systems. Properties of agricultural waste – characteristics of solid and liquid wastes, parameter importance, determination of DO, COD, total organic carbon, BOD. BOD analysis of industrial waste waters, determination of BOD with seed material, problems on BOD. Waste collection, storage and handling – Collection, components of waste collection systems, storage of manures and slurries, factors affecting choice of storage facility. Waste handling and transport, pumping liquid manure, sumps and mixing, mixing and agitation.

Unit-IV:

Industrial waste treatment – Physical treatment of waste – Solid-liquid separation – Settling, problems on solid-liquid separation, screening, drying, incineration, and pyrolysis. Biological treatment – Introduction. Anaerobic decomposition, lagoon systems, anaerobic lagoons, advantages and disadvantages of anaerobic lagoons. Design of anaerobic lagoons, problems on design of anaerobic lagoons, anaerobic lagoon sludge. Aerobic treatment – Introduction, reactions and processes for anaerobic treatment, advantages and disadvantages of anaerobic treatment.

Unit –V:

Types of aeration systems - Natural aeration - Introduction, planning and design, Mechanical aeration – Film reactors – Tricking filters, rotating biological contactors, problems on tricking filters. Floc reactors – Mechanically aerated lagoons, diffused air systems, Waste for reuse. Briquetting – Introduction, principle, briquetting machines. Processing – Direct compaction, carbonization and extrusion. Establishment of agro Processing industries in rural areas, factors affecting for establishing of agro

processing plants, cost benefit ratio for agro processing industries, employment generation.

REFERENCES:

1. Agricultural Waste Manual, Vandersholm D H 1984. New Zealand Agricultural, Engineering Institute, Lincoln College, New Zealand.

2. Principles of Food Sanitation, Marriott N G 1985. AVI Publishing Co. Inc., Westport, Connecticut.

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(A70352) OPERATIONS RESEARCH
(Elective-I)

UNIT – I

Development – Definition– Characteristics and Phases – Types of models – Operations Research models – applications.

Allocation: Linear Programming Problem Formulation – Graphical solution – Simplex method – Artificial variables techniques: Two–phase method, Big-M method.

UNIT – II

Transportation Problem – Formulation – Optimal solution, unbalanced transportation problem – Degeneracy.

Assignment problem – Formulation – Optimal solution - Variants of Assignment Problem- Traveling Salesman problem.

UNIT – III

Sequencing – Introduction – Flow **–**Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through 'm' machines

Replacement: Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely- Group Replacement.

UNIT – IV

Theory of Games: Introduction –Terminology– Solution of games with saddle points and without saddle points- 2 x 2 games – dominance principle – m x 2 & 2 x n games -graphical method.

Inventory: Introduction – Single item, Deterministic models – Purchase inventory models with one price break and multiple price breaks –Stochastic models – demand may be discrete variable or continuous variable – Single Period model and no setup cost.

UNIT – V

Waiting Lines: Introduction – Terminology-Single Channel – Poisson arrivals and Exponential Service times – with infinite population and finite population models– Multichannel – Poisson arrivals and exponential service times with infinite population.

Dynamic Programming:

Introduction – Terminology- Bellman's Principle of Optimality – Applications

of dynamic programming- shortest path problem – linear programming problem.

Simulation: Introduction, Definition, types of simulation models, Steps involved in the simulation process- Advantages and disadvantages-applications of simulation to queuing and inventory.

TEXT BOOK :

1. Operations Research /J.K.Sharma 4e. /MacMilan
2. Introduction to O.R/Hillier & Libermann/TMH

REFERENCE BOOKS :

1. Introduction to O.R /Taha/PHI
2. Operations Research/ NVS Raju/ SMS Education/3rd Revised Edition
3. Operations Research /A.M.Natarajan, P.Balasubramaniam, A. Tamilarasi/Pearson Education.
4. Operations Research / Wagner/ PHI Publications.
5. Operations Research/M.V. Durga Prasad, K, Vijaya Kumar Reddy, J. Suresh Kumar/ Cengage Learning.

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(A73017) DRYING AND STORAGE ENGINEERING
(Elective-I)

Objective: To enable the students to understand the principles and acquire the knowledge on moisture content determination methods, EMC models, principles and methods of drying and their analysis, study of different driers, dehydration and functional requirements, storage of grains, CAP storage, MAP storage, and study the conveying equipment.

Unit-I:

Moisture contents and methods for determination: Moisture content representation, wet basis, dry basis, direct and indirect methods of moisture content determination, problems. Importance of EMC and methods of its determination: static method, dynamic methods: desortation method and isotenoscopic method. EMC curve and EMC model: Kelvin equation, Harkins-jura equation, chung–pfost equation and Henderson equation, hysteresis effect, bound moisture, unbound moisture, free moisture. Principle of drying: Theory of diffusion, mechanism of drying – falling rate, constant rate, thin layer: determination of drying constants, remarks, effects of different factors on the drying process.

Unit-II:

Deep bed drying and their analysis, time of advance of drying front, decreasing rate period – remarks on the deep bed, problems on drying. Critical moisture content, drying models, rate of drying curves for constant drying conditions, calculation methods for falling rate drying period. Calculation of drying air temperature and air flow rate, air pressure within the grain bed, Shred's and Hukill's curve. Different methods of drying: convective drying, radiation drying, dielectric drying, chemical drying, sack drying, puff drying, foam mat drying, freeze drying etc. Study of different types of dryers: unheated air driers: air distribution systems, heated air driers: flat bed type batch dryers, reciprocating batch drier. Study of LSU dryer, baffle dryer, rotary dryer, performance, energy utilization pattern and efficiency.

Unit-III:

Types and causes of spoilage in storage, conditions for storage of perishable products. Functional requirements of storage, control of temperature and

relative humidity inside storage. Calculation of refrigeration load, control of its environment, air movement inside the storage. Storage of grains: destructive agents, respiration of grains, moisture and temperature changes in stored grains. Conditioning of environment inside storage through natural ventilation. Conditioning of environment inside storage through mechanical ventilation, artificial drying.

Unit – IV:

CAP Storage, warehouse – design and control of environment. Storage of cereal grains and their products. Storage of seeds – terminology and treatments. Principles of grain storage – parameters – effecting the grain storage. Changes occurring during storage, nutritive changes, minerals, carbohydrates, proteins and vitamins. Moisture migration, storage insects, pests and their control.

Unit-V:

Grain storage structures – bag storage of grains: different types of storage, classification planning for a bag storage complex, constructional features and basic specifications of typical bag storage structures, design aspects of bag storage structures. Bulk storage of grains: advantages of bulk handling system, types of bulk storage traditional storage structures, moral, bhukari, kothar type storage structures. Bulk storage of grains, pusa bin, brick and cement bin, bunker storage, vertical silos. Grain handling equipment-bucket elevator: types of bucket elevators, components of bucket elevators, head section, boot section, elevator legs, elevator belt, buckets, drive mechanism and power requirement problems. Belt conveyors: Salient features, design considerations, belt tension, power, design problems. Screw Conveyors: Salient features, Conveyor elements, selection of screw conveyors and power requirements–problems. Pneumatic conveyor, essential components, description of typical plant, limitations of pneumatic conveyor. Hermetically sealed and air cooled storage. Controlled Atmosphere storage of grains. Modified Atmosphere storage of grains. Tutorial problems on drying.

TEXT BOOKS:

1. Unit Operations of Agricultural Processing, Sahay K M and Singh K K 1994 Vikas Publishing House Pvt. Ltd., New Delhi.

2. Grain Storage Engineering and Technology, Vijaya Raghavan, S. 1993. Batre Bale Service New Delhi.

3. Drying and Storage of Grains and Oilseeds, CBS Publishers & distributions, New Delhi.

REFERENCES:

1. Transport Processes and Unit Operations, Geankoplis C J 1978. Aliyn and Bacon Inc., Newton, Massachusetts.

2. Unit operations in Food Processing, Earle R L 1983. Pergamon Press, New York.

3. Post Harvest Technology of Cereals, Pulses and Oil seeds, Chakravarthy A and De D S 1988 Oxford and IBH Publishing Co. Ltd., Calcutta.

4. Unit Operations of Chemical Engineering, McCabe W L and Smith J C 1993 McGraw Hill Book Co., New Delhi.

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(A70010) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS
(Elective-I)

Objectives:

To enable the student to understand and appreciate, with a practical insight, the importance of certain basic issues governing the business operations namely: demand and supply, production function, cost analysis, markets, forms of business organisations, capital budgeting and financial accounting and financial analysis.

Unit I

Introduction & Demand Analysis*: Definition, Nature and Scope of Managerial Economics. Demand Analysis: Demand Determinants, Law of Demand and its exceptions. *Elasticity of Demand*: Definition, Types, Measurement and Significance of Elasticity of Demand. *Demand Forecasting,* Factors governing demand forecasting, methods of demand forecasting.

Unit II

Production & Cost Analysis: *Production Function* – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale. *Cost Analysis***:** Cost concepts. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Managerial Significance.

Unit III

Markets & New Economic Environment: Types of competition and Markets, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly. *Pricing*: Objectives and Policies of Pricing. Methods of Pricing. *Business:* Features and evaluation of different forms of Business Organisation: Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, *New Economic Environment*: Changing Business Environment in Post-liberalization scenario.

Unit IV

Capital Budgeting: Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising capital - Trading Forecast, Capital Budget, Cash Budget. Capital Budgeting: features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (simple problems).

Unit V

Introduction to Financial Accounting & Financial Analysis: Accounting concepts and Conventions - Introduction IFRS - Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). *Financial Analysis*: Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability ratios. Du Pont Chart.

TEXT BOOKS:

1.   Varshney & Maheswari: Managerial Economics, Sultan Chand, 2009.

2.   S.A. Siddiqui & A.S. Siddiqui, Managerial Economics and Financial Analysis, New Age international Publishers, Hyderabad 2013.

3.   M. Kasi Reddy & Saraswathi, Managerial Economics and Financial Analysis, PHI New Delhi, 2012.

REFERENCES:

1.   Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.2012.

2.   H. Craig Peterson & W. Cris Lewis, Managerial Economics, Pearson, 2012.

3.   Lipsey & Chrystel, Economics, Oxford University Press, 2012

4.   Domnick Salvatore: Managerial Economics in a Global Economy, Thomson, 2012.

5.   Narayanaswamy: Financial Accounting—A Managerial Perspective, Pearson, 2012.

6.   S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas, 2012.

7.   Truet and Truet: Managerial Economics: Analysis, Problems and Cases, Wiley, 2012.

8.   Dwivedi: Managerial Economics, Vikas, 2012.

9.   Shailaja & Usha : MEFA, University Press, 2012.

10.   Aryasri: Managerial Economics and Financial Analysis, TMH, 2012.

11.   Vijay Kumar & Appa Rao, Managerial Economics & Financial Analysis, Cengage 2011.

12.   J. V. Prabhakar Rao & P.V. Rao, Managerial Economics & Financial Analysis, Maruthi Publishers, 2011.

Outcomes:

At the end of the course, the student will

•   Understand the market dynamics namely, demand and supply, demand forecasting , elasticity of demand and supply, pricing methods and pricing in different market structures.

- Gain an insight into how production function is carried out to achieve least cost combination of inputs and cost analysis
- Develop an understanding of
- Analyse how capital budgeting decisions are carried out
- Understand the framework for both manual and computerised accounting process
- Know how to analyse and interpret the financial statements through ratio analysis.

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(A73019) FOOD PROCESSING PLANT DESIGN AND LAYOUT
(Elective-I)

Objective: Students will be trained in organization of food and agricultural processing plant machinery as per process flow. Also, site selection, layout procedures, project design concepts, etc. Will be explained for bringing the talent to establish an engineering industry.

Unit –I:

Plant layout – Definition, meaning, objectives, principles. Plant layout – Factors in planning layouts. Methods of layout planning – Unit areas concept, two – dimensional layouts, scale models. Principles of plant layout – Storage layout, equipment layout, safety, plant expansion, floor space, utilities servicing, building, materials handling equipment, rail roads and roads. Types of plant layout – fruit processing plant. Salient features of rice processing plant. Salient features of maize processing plant. Salient features of pulses – processing plants. Salient features of oilseeds processing plants. Salient features of horticulture processing plants.

Unit-II:

Salient features of processing plants of vegetable crops. Salient features of processing of poultry plants. Salient features of processing of fish processing plant. Salient features of processing of meat processing plant. Salient features of milk and milk products processing plants. Salient features of milk and milk products processing plants.

Unit-III:

Location selection criteria – Plant location, factors in selecting a plant, selection of the plant site, preparation of the layout. Selection of processes – Comparison of different processes, batch versus continuous operation. Plant capacity – Equipment design and specifications, scale – up in design, safety factors, specifications, materials of construction. Project design – Process design development, general overall design considerations, cost estimation, factors affecting profitability of investments, optimum design (economic and operation). Project design – Practical considerations in design, approach. Project design – Types of designs, feasibility survey, process development, design, construction and operation, design information from the literature.

Unit –IV:

Flow diagrams-Qualitative and quantitative flow diagrams. Selection of equipments - Preliminary design, problem statement, literature survey, material

and energy balance, equipment design and selection, problems, economics. Process and controls-Control systems, instrumentation control, maintenance, computer aided design. Handling equipments - Selection, factors, pumps, piping, fittings, solid feeders, plant layout. Plant elevation -Requirement of plant building and its components, foundation for equipment and dynamic loading, flooring, walls, roof, illumination, air-conditioning. Labor requirement for processing plant - Labor costs, maintenance and repairs, common denominator, Plant installation, Power and power transmission - Systems.

Unit-V:

Food plant sanitation-Environmental protection, regulations, pollution control, air pollution abatement, particulate removal, noxious gas removal, thermal pollution control, recycling, CIP. Cost analysis - Cash flow for industrial operations, factors affecting investment and production costs, capital investment, estimation of capital investment. Cost analysis - Cost indexes, cost factors in capital investment, estimation of total product cost. Preparation of feasibility report -Types of repots, organization of reports, organization of a design report, preparing the report, rhetoric, checklist for the final report.

TEXT BOOK:

Dairy and Food Engineering, Farall F W 1992. John Wiley & Sons, New York.

REFERENCES:

1. Plant Layout and Design, James M Moor, Macmillan, New York.
2. Milk Plant Layout, Hall H S and Y. Rosen, FAO publications, Rome.
3. Principles of Food Sanitation, Marriott N G 1985. Van Nostrand Reinhold Company, New York.
4. Food Technology Processing and Aylward F 2001. Allied Scientific Publishers, Bikaner. Laboratory Control.

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(A70145) WATERSHED MANAGEMENT
(Elective-II)

UNIT-I

Introduction: Concept of watershed development, objectives of watershed development, need for watershed development in India, Integrated and multidisciplinary approach for watershed management.

Characteristics of Watershed: size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

UNIT-II

Watershed delineation – Runoff Computations from a watershed – Flood Frequency Analysis – Gumbell, Log Pearson and Weibull Methods of Analysis.

Planning of watershed management activities, peoples participation, preparation of action plan, administrative requirements

UNIT-III

Principles of Erosion: Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation.

Measures to Control Erosion: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rockfill dams, brushwood dam, Gabion.

UNIT-IV

Water Harvesting: Rainwater Harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks.

UNIT-V

Forest and Grass Land Management: Interpretation of Satellite Imageries-Land use and Land Cover. Land capability classification, management of forest, agricultural, grassland and wild land. Reclamation of saline and alkaline soils.

Ecosystem Management: Role of Ecosystem, crop husbandry, soil enrichment, inter, mixed and strip cropping, cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture, Silvi pasture, horticulture, social forestry and afforestation.

TEXT BOOKS:

1. Watershed Management by JVS Murthy, - New Age International Publishers.
2. Water Resource Engineering by R.Awurbs and WP James, - Prentice Hall   Publishers.

REFERENCE:

1. Land and Water Management by VVN Murthy, - Kalyani Publications.
2. Irrigation and Water Management by D.K.Majumdar, Printice Hall of India.

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(A73020) MECHANICAL MEASUREMENTS AND INSTRUMENTATION
(Elective-II)

Objective To enable the students to understand the principles and to acquire the knowledge on measuring systems, different types of instruments used for measuring the parameters like pressure, force, strain, temperature, sound, acceleration and displacement etc. and also to study practically using instruments for carrying out the experiments related to the concerned fields.

Unit- I:

Measurement and its significance, methods of measurement – direct methods and indirect methods and classification of measurements – primary measurements, secondary measurements and tertiary measurements. Instruments and measuring systems, their classification – according to history of instruments, according to mode of measurement and according to the functional requirement and principles of operation. Their principles of operation. Functional elements of a generalized measurement system– basic functional elements – transducer element, signal conditioning element and data precision elements and auxiliary elements. Examples of instruments for identification of basic and auxiliary elements – bourdon tube pressure gauge with out and with electrical read out, spring balance and proving ring etc. Inaccuracy in measurement and it analysis – types of errors or limiting errors – propagation of error or uncertainty.

Detector transducer elements – introduction, classification and their principles – primary and secondary transducers, mechanical transducer, pressure transducers and active, passive transducers, analogue transducers and digital transducers. Signal conditioning elements and their principles of operation, data presentation elements and types – visual display type, graphical recording type, magnetic type and digital type. Static performance characteristics of instruments: static sensitivity, independent and proportional linearity, hysteresis, threshold, resolution and drift – zero and sensitivity drifts.

Unit-II:

Measurement of pressure: Introduction, types of pressure – atmospheric pressure, gauge pressure and absolute pressure, units of measurement and conversion of units form one system or another system. Types of pressure measuring devices with examples–mechanical devices, electromechanical devices. Manometers – types: simple U tube manometer. Well type manometer and inclined well manometer – ranges and their application – fluids used in manometer – desirable properties of manometric fluids – micro

manometer for measuring very low pressures. Low pressure measurement devices – basic methods of measuring low pressures –study of McLeod pressure gauge used for measuring vacuum pressures: principles, construction, range and limitations. Electrical methods of measuring pressure – pressure sensitivity of resistance gauge – study of Bridgman pressure gauge used for measuring very high pressures: construction, principle, range and applications.

Unit- III:

Measurement of strain – introduction, strain gauge principle, metals used for manufacturing strain gauges – strain gauge theory and gauge factor. Strain gauge circuits – Wheatstone bridge circuit and unbalanced bridge. Measurement of change of resistance. Cross sensitivity and temperature compensation using dummy gauge and more than one active gauge – advantages and applications of strain gauges. Strain gauge arrangements – measurement of axial force applied to simple beams by the arrangement of one active gauge, using two active gauges and suing of active gauges. Measurement of force applied to a cantilever by using four active gauges– simple arrangement method and Poisson arrangement method. Measurement of pressure using strain gauges – diaphragm type strain gauge pressure transducer.

Unit- IV:

Measurement of temperature – introduction and classification of temperature measuring gases along with examples – bimetallic thermometer, mercury thermometer and vapor pressure thermometer. Bimetallic thermometers – principles – types: strip type and cantilever type – materials of construction – types based on shape – advantages, ranges of measurement and applications. Liquid in glass thermometers – type of liquids used – desirable properties of liquids used in thermometer – complete immersion type measurement and partial immersion type measurement – ranges – disadvantages. Liquid in metal thermometer. Thermometers based on expansion of gases – vapor pressure thermometer; construction, principles, gases used , range, merits and limitations. Electrical methods of measuring pressure – electrical resistance thermometers – conductor type and semiconductors type – metals used – platinum resistance thermometer. Thermister – principle – metals used – types based on shape – range of measurement – advantages – limitations. Comparison between thermometer and thermister. Thermometer – principle – thermocouple laws – base metal type and rear metal type thermocouples – thermocouple materials and characteristics. Comparison between resistance thermometer and thermocouple. Thermopile – principle.

Unit- V:

Measurement of sound – introduction – noise and loudness, sound pressure

level, sound power level, variation of intensity of sound with distance and combination of sounds. Sound measuring system. Microphone – principle, types: capacitor type, carbon granule type, piezo electrical crystal type and electrodynamics type-fields of application. Study of speed measuring instruments-stroboscope and tachometer-principles-construction-range. Study of proving ring for force measurement and study of linear variable differentiation transformer (LVDT) for displacement measurement-principles and construction.

TEXT BOOKS:

1   Mechanical Measurements, Sirohi RS and Radhakrishna HC 1983, Wiley Eastern Ltd., 4835/24 Ansari Road, New Delhi

2   Instrumentation, Measurement and Analysis Nakra BC and choudhary KK 1987. Tata McGraw Hill publishing co Ltd., 12/ 4 Asaf Ali Road, New Delhi

3   A course in Mechanical Measurements and Instrumentation, Shawhney A K, 1989, Dhanpat Rai and Sons, 1682, Nai Sarak, New Delhi.

REFERENCES:

1.   Engineering Measurements and Instrumentation, Adams L F,1981, The English Language Book Society and Hodder and Stoughton, London.

2.   Mechanical Measurements, Thomas G B and Buck N L,1969, Oxford and IBH Publishing Co. Ltd., 66, Janpath, New Delhi.

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(A70338) COMPUTATIONAL FLUID DYNAMICS
(Elective-II)

UNIT-I

Elementary details in numerical techniques: Number system and errors, representation of integers, fractions, floating point arithmetic, loss of significance and error propagation, condition for instability, computational methods for error estimation, convergence of sequences.

Applied Numerical Methods: Solution of a system of simultaneous Linear Algebraic Equations, iterative schemes of Matrix Inversion, Direct Methods for Matrix inversion, Direct Methods for banded matrices.

UNIT - II

Finite Difference Applications in Heat conduction and Convection – Heat conduction, steady heat conduction in a rectangular geometry, transient heat conduction, finite difference application in convective heat transfer, closure.

Finite Differences, discretization, consistency, stability, and Fundamentals of fluid flow modeling: Introduction, elementary finite difference quotients, implementation aspects of finite-difference equations, consistency, explicit and implicit methods.

UNIT - III

Introduction to first order wave equation; Stability of hyperbolic and elliptic equations, fundamentals of   fluid flow modeling, conservative property, the upwind scheme.

UNIT - IV

Review of Equations Governing Fluid Flow and Heat Transfer: Introduction, conservation of mass, Newton's second law of motion, expanded forms of Navier-stokes equations, conservation of energy principle, special forms of the Navier-stokes equations.

UNIT-V

Finite volume method: Approximation of surface integrals, volume integrals, interpolation and differentiation practices, upwind interpolation, linear interpolation and quadratic interpolation.

TEXT BOOKS:

1.   Numerical heat transfer and fluid flow / Suhas V. Patankar/ Hema shava Publishers corporation & Mc Graw Hill.

2.   Computational Fluid Flow and Heat Transfer/ Muralidaran/ Narosa

Publications

REFERENCES:

1.   Computational Fluid Dynamics: Basics with applications/John D. Anderson/ Mc Graw Hill.

2.   Fundamentals of Computational Fluid Dynamics/Tapan K. Sengupta / Universities Press.

3.   Introduction to Theoretical and Computational Fluid Dynamics/C. Pozrikidis/Oxford University Press/2nd Edition

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IV Year B.Tech. Ag. Engg.-I Sem　　　　**L　T/P/D　C**

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(A73087) FIELD OPERATION AND MAINTENANCE OF TRACTORS AND FARM MACHINERY LAB

Objectives: To enable the students for acquiring the knowledge pertaining to maintenance of tractors like periodical maintenance (50 to 100 hours, 200 to 250 hours, 480 to 500 engine working hours, 960 to 1000 hours) and trouble shooting of all systems like fuel system, lubrication system, cooling system and ignition system and remedial measures for above system.

1.　Tractor Systems - Maintenance of air fuel system – cleaning of air cleaners – Frequent troubles and Remedies – Process to remove air lock in the diesel engine – Precautions in handling diesel fuels in diesel engine.

2.　Maintenance of lubrication system – Frequent troubles and Remedies – Troubles in Lubrication system – Excessive oil consumption – Care and maintenance of lubrication system.

3　Maintenance of transmission system – General maintenance – Differential trouble shooting – Frequent troubles and Remedies.

4　Maintenance of cooling system and cleaning of radiators - Frequent troubles and Remedies – Cooling system troubles – Over heating – slow warm up of the engine – care and maintenance of cooling system.

5　Maintenance of Ignition system – Care and Maintenance of batteries – Frequent troubles and Remedies – causes of ignition failure in battery system.

6.　Maintenance of hydraulic system – Working principle – Basic components of hydraulic system – Types of hydraulic system – Frequent troubles and Remedies – Repairs and maintenance of hydraulic system – Precautions of hydraulic system.

7.　Periodical maintenance of tractors – at 8 – 10 engine working hours – At 50 – 60 engine working hours at 100-120 engine working hours – at 200-250 engine working hours – at 480-500 engine working hours – at 960 – 1000 engine working hours.

8.　Emission of smoke – Over heating of engines - maintenance of clutch brakes hydraulic problems..

9.　Maintenance of Agricultural machinery before and after use like primary tillage implements M.B. plough, Disc plough and secondary tillage implements like harrows, seed drills, weeders cultivators.

10　Driving in forward and reverse gears, Driving safety sales and study

bean trepanned.

11 Hitching and field operation of M.B. plough, disc plough and harrows.

12 Field operation and adjustments of seed drill, Trans planers.

13 Adjustment and maintenance of threshers.

REFERENCES:

1. Elements of Agricultural Engineering. Jasgishwara Sahay 1992. Agro Book Agency, Patna.

2. Farm Tractor Maintenance and Repair. Jain S.C. and Roy C.R. 1984. Tata McGraw-Hill Publishing Co. Ltd., New Delhi.

3. Tractors and their Power units. Liledahi J.B. Carleton W.M. Turnquist P.K. and Smith D.W. 1984. AVI Publishing Co., Inc., Westport, Connecticut.

4. Farm Machines and their Equipment. Nakra C.P. 1986 Dhanpet Rai and Sons. New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. Ag. Engg.-I Sem	L	T/P/D	C
	-	-/3/-	2

(A73088) DAIRY AND FOOD ENGINEERING LAB

1. To study composite pilot milk processing plant & equipments
2. To study various parts of Pasteurizer and its working
3. To study various parts of Sterilizer and its working
4. To study various parts of Homogenizer and its working
5. To study various parts of Cream Separator and its working
6. To study various parts of Butter Churner and its working
7. To study various parts of Evaporator and its working
8. To study various parts of milk dyer and its working
9. To study various parts of freezer and its working
10. Design and layout of dairy plant
11. To determine various physical properties of Food Products
12. To estimate steam requirement for various operations in diary plant
13. Visit to food industry/ dairy plant.

REFERENCES:

1. Food Engineering and Diary Technology, Kessler H G 1981. Verlag A. Kessler, Freising
2. Outlines of Dairy Technology, Sukumar D C 2005. Oxford University Press, New Delhi
3 Principles of Food Science, Fennema O R 2006. The Bangalore Printing & Publishing Co., Ltd., Bangalore

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. Ag. Engg.-II Sem	L	T/P/D	C
	4	-/-/-	4

(A83024) DESIGN OF AGRICULTURAL MACHINERY

Objective: To enable the students to understand the general procedure for designing any machine parts. To know the design of cotter and knuckle joints, leavers, springs, various types of shafts, couplings bearings and various IC engine parts.

Unit-I:

Machine Design – Definition, Classification of machine design, General considerations in machine design, General procedure in machine design. Fundamental units, Mass and Weight, inertia, laws of motion, force, moment of force, couple mass density, torque, work, power and energy. Simple stress in machine parts – Introduction, load, stress, strain, tensile stress and strain, compressive stress and strain, Young's modulus, shear stress and strain, shear modulus, bearing stress. Stress strain diagram, working stress, Factor of safety and selection, stresses in composite bars, thermal stress, linear and lateral strain, Poisson's ratio, volumetric strain, bulk modulus and relations, impact stress, resilience. Principal stresses and principal planes – Theories of failure under static load, Rankine's theory, Guest's theory, maximum distortion theory, stress concentration, notch sensitivity.

Unit-II:

Important terms used in Limit System, fits, types of cotter joints, design of socket and spigot cotter joint. Knuckle joint, Dimensions of various parts of knuckles joint, methods of failure of knuckle joint, design procedure of knuckle joint. Levers – Introduction, application of levers in engineering practice, design of lever hand levers, foot lever, cranked lever. Springs – Introduction, types of springs, material for helical springs, spring wire, terminology, springs in series and parallel, flat spiral springs, leaf springs, construction of leaf springs.

Unit-III:

Shafts – Material used for shafts, types and sizes of shafts, stresses in shafts, maximum working stresses. Design of shafts, for twisting moment, bending moments, fluctuating loads, axial load in addition to combined twisting and bending loads, design of shafts on the basis of rigidity. Keys and coupling – Introduction, types of keys, sunk keys, saddle keys, tangent keys, round keys, splines, forces acting on sunk keys, strength of sunk key. Effect of key ways, shaft couplings, types of shaft couplings, muff coupling, design of flange coupling.

Unit-IV:

Fly wheel – Introduction, Coefficient of fluctuation of speed, fluctuation of energy, maximum fluctuation of energy, energy stored in a flywheel. Bearing – Introduction, classification of bearing, types of sliding contact bearings, rolling contact bearings – Introduction, advantages and disadvantages of rolling contact bearing over sliding contact bearings. Types of rolling contact bearings, types of radial ball bearings, Standard dimensions and designations of ball bearings, types of roller bearings, basic static load rating of rolling contact bearings, life of a bearing. Basic dynamic load rating of rolling contact bearings, dynamic load rating for rolling contact bearings under variable loads, reliability of bearing, lubrication of ball and roller bearings.

Unit-V:

Design of Machinery : Design of Tillage equipment – cultivator, Rotovator, sowing machinery – Tractor Operated seed com Fertilize drill. Design of harvesting & threshing equipment – reaper, power thresher, Design of spraying equipment – Tractor mounted Boom sprayer.

TEXT BOOK:

1.   Machine Design – Khurmi R.S. and Gupta J.K. 1996, Eurasia Publishing House Pvt. Ltd., New Delhi.

REFERENCE:

1.   Machine Design – Jain R.K. 1991. Khanna Publishers, New Delhi.

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IV Year B.Tech. Ag. Engg.-II Sem	L	T/P/D	C
	4	-/-/-	4

(A83026) GIS AND REMOTE SENSING
(Elective-III)

Objective: To equip the students with the knowledge on techniques of Remote Sensing and GIS applications for land and water resources management with projections on yield response to irrigation water, mapping of salt affected and waterlogged lands and techniques of image processing for various applications in efficient natural resources management.

Unit-I:

Introduction to Remote Sensing, stages I remote sensing, Sensors- Remote sensing types and applications, important features of Indian Remote Sensing Satellites, Data acquisition and analysis – from satellites-interpretation, Electromagnetic spectrum- different bands- Resolution, Spectral response Pattern-multi spectral data use, modern remote sensing technology versus conventional aerial photography.

Unit - II

Visual image interpretation, image interpretation, Basic principles of image interpretation, Factors governing the quality of an image, Factors governing interpretability, visibility of objects, Elements of image interpretation, Techniques of image interpretation, Digital image processing-Radiometric correction-DN (Digital Number value) – Noise removal and correction-image enhancement, Digital image processing-Contrast manipulation-gray level thresholding-level slicing-contrast stretching, Digital image processing-spatial Feature Manipulation-spatial filtering-convolution edge enhancement.

Unit – III:

Digital image processing-Fourier Analysis-Multi Spectral scanners-MSS operation and design considerations-Imaging spectrometry –Multi image manipulation, Digital image processing vegetation components image classification supervised image classification unsupervised classification output stage data merging, Remote sensing in agriculture progress and prospects Yield assessment, Remote sensing in water resources development, Remote sensing in soil conservation, Remote sensing in geology and soil mapping.

Unit-IV:

Microwave radiometry for monitoring agriculture crops and hydrologic forecasting, Aerial photo interpretation for water resources development and soil conservation survey, definition- Geographical Information Systems GIS:

History of development of GIS definition, Basic components and standard GIS packages.

Unit – V

Date entry, storage and maintenance, Data types spatial non spatial (attribute-date), Data structure, data format, point line vector-raster polygon, Object structural model, files, files organization, Data base management, systems (DBMS), Entering data in computer-digitizer-scanner data compression.

TEXT BOOKS:

1.   Remote sensing and Geographical information system, BS publications, sultan Bazaar, Hyderabad – 3

2.   Introduction to Remote sensing, James B and Compell, Published by Taylor & Francis Limited.

REFERENCES:

1.   Basics of remote Sensing and GIS, University Science Persons.

2.   Remote Sensing and GIS by Basudeb Bhatta, Oxford University Persons, New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. Ag. Engg.-II Sem	L	T/P/D	C
	4	-/-/-	4

(A83027) HUMAN ENGINEERING AND SAFETY
(Elective-III)

Objective: To enable the students to study of human relation with environmental factors, study of anthropometry study of safety gadgets for spraying, chaff cutting and tractor & trailer operator.

Unit-I:

Introduction to human engineering & safety different working systems-human factors, Machine factors-environmental factors – relationship between the three, study of human machine model, Human performance –effectors and senses, Importance of FMJ (Fitting Man Job) & FJM (Fitting Job man). Study of anthropometrics in designs, Workspace design for standing and seated workers, Tasks requirements –visual requirements and postural requirements.

Unit-II:

Functions of the skeletal and muscular systems, The conditions for the static equilibrium for the human body, The muscle function and types of muscle fatigue & discomfort, Factors influencing the work posture, Design of hard tools, Biometrics and energy for muscle contraction oxygen dependent & oxygen independent system & CO_2 consumption, Importance of cardio Vascular system and respiratory system in physical work handling, Difference between static and dynamic works.

Unit – III:

Physical work capacity- Factors effecting the work capacity – Introduction, Work capacity- Factors effecting the work capacity- Personal factors- Age, Sex, Environmental Factors- Light, climate, Indirect measures of energy expenditure, Calculation of rest periods in manual work.

Unit-IV:

Safety using the difference machines and measures taken for the protection, Vision- Importance of vision- measures taken for the protection of the vision- Guidelines for using colour combinations. Sound- measurement of sound- the nature of sound and the damages due to noise and preventive measures taken, Displacer- types of displace-Visual displace, Audio signals, Communication, Noise communication, Audio warning cues.

Unit – V:

Advance affects of air pollution- safety regulation acts for the safety measures to be taken in forming operated, Rehabilitation and compensation to accident victims, Human information processing, skill and performance – General

model of human information processing, Memory storage- Short term and long term storages, Feedback information, Design of hand tools for Agricultural operation.

TEXT BOOK:

1. Work study and Ergonomics, Dalela S and Saurabh 1995, Standard Publishers and Distributors, New Delhi

REFERENCES:

1. Introduction to Ergonomics, Bridger R S

2. New Horizons I Human Factor Design, Huckingson 1992. McGraw-Hill Book Co., New Delhi.

3. Human Factors Engineering, McCormick E J 1992. McGraw-Hill Book Co., New Delhi.

4. Human Factors in Engineering and Design, Sanders M S and McCormick E J 1992. McGraw-Hill Book Co., New Delhi

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. Ag. Engg.-II Sem   **L**   **T/P/D**   **C**

                                   4   **-/-/-**   **4**

(A83025) DESIGN OF TRACTORS
(Elective-III)

Objective: To enable the students to know the development of agricultural tractors and different operations performed by the tractors to know the different trouble shootings and remedies, design of different parts. To get knowledge on different tests performed on tractors.

Unit – I:

Introduction – Development of agricultural tractor- Classification and selection of tractors, different operations performed by the tractors, Tractor components, Procedure for design, Parameters to be considered for design of tractors, parameters for balanced design of tractor for stability. Weight distribution, weight transfer in tractors, Adding extra weights to front and rear wheels, Location of centre of gravity, different methods, Turning ability of a tractor.

Unit-II:

Design of mechanical power transmission in agricultural tractors Drive trains – types of Transmissions, Gears – Gear design Bearings and seals, Rolling contact bearings, V-belt drivers, Applications- mechanics-tension ratios, Drive trains, Over load safety devices, clutches and brakes, universal joints, Power take off drives, load limits.

Unit – III:

Steering system-Qualities of steering system, Main parts, Types of Steering boxes, worm and roller type, sector type, worm and nut type, cam and lever type etc., Steering system-Qualities of steering system, Main parts, Types of Steering boxes, worm and roller type, sector type, worm and nut type, cam and lever type etc., Working of hydraulic or power steering – maintenance, steering and front end trouble shooting, Front axle- functions-types, axle beams, adjusting front wheel spacing, Repair of front axle.

Unit – IV:

Tractor Hydraulic systems- Principle of hydraulics, working of hydraulic system, Components of hydraulic circuits, different valves in hydraulic system. Hydraulic controls- Position control system, Draft control system, Maintenance and repair of hydraulic system, Tractor seat and controls of an agricultural tractor, operator exposure to vibration, operator seating.

Unit – V:

Traction mechanism, Tractive efficiency, Traction testing, Tractive

performance, chasis mechanics- Static equilibrium analysis, stability, longitudinal stability, centre of gravity determination. Tests related to Tractor-Power Test, PTO test, draw bar test, Hydraulic power and lifting capacity test.

REFERENCES:

1. Machine Design, Jain R K, 1991, Khanna Publishers, New Delhi.

2. Testing and Evaluation of Agricultural, Mehta M.L, Verma S R, Misra S K and Sharma,VK, 2005, daya Publishing House, Delhi. Machinery

3. Farm Machines and their Equipment, Nakra C P, 1986, Dhanpet Rai and Sons, 1682, Nai sarak, New delhi.

4. Text book on Off Road Vehicle, Carrol E Goering, Marvin L Stone, David W Smith, Paul K Turnquist, 2003, ASAE Publishers, Engineering Principles

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IV Year B.Tech. Ag. Engg.-II Sem	L	T/P/D	C
	4	-/-/-	4

(A83023) AGRICULTURAL AND FARM STRUCTURES
(Elective-IV)

Objective: To enable the student to understand the principles and acquire the knowledge on various aspects in farmstead design and construction and also design and construction of farm structures like dairy barns, barn for poultry, compost pit, fodder silos, farm fencing, implement sheds, rural grain storage structures, silos, rural roads and septic tank.

Unit –I:

Planning and layout of farmstead-location-definition and arrangement, location of various buildings, Farm service buildings: Site selection, planning farm service buildings, factors effecting planning of farmstead. Physiological reactions of livestock to solar radiation (dairy cattle, poultry, beef cattle and sheep). Influence of climate and thermoregulation: temperature, relative humidity, direct effect of temperature, direct effect of solar radiation. Environmental factors effecting design of farm residence or animal shelter: temperature, Relative humidity, air purity, air movement, light, heat and moisture production.

Unit-II:

Livestock production facilities: water and electricity, sanitary requirements, etc. BIS. Standards for dairy, piggery, poultry and other farm structures. Design, construction and cost estimation of farm structures; Animal shelters: Dairy barn compost pit, fodder silo cost estimation of different farm buildings, method of building estimates, actual cost, detailed estimates of main items of work. Fencing: -design and construction of farm fences, planning of farm fences, type of farm fences: wooden, fencing, woven wire fencing, barbed wire fencing, plain wire fencing, and electrical fencing. Cost estimation.

Unit –III:

Implement shed: requirements of farm machinery and implement shed, requirements of farm work shop, planning and construction of shed and pump houses. Problems and layout. Threshing and drying yards: design and construction of drying and threshing floors, type of floors: barbed floor, concrete floor, natural floor etc. Barn for cows, buffalo-planning and design of different barns, types of dairy barns based on construction-housing systems: stable barns, free stalls and milking parlor barn layout.

Unit-IV:

Barn for poultry: planning and requirements, environmental requirements, modern poultry houses: deep litter housing, building of poultry houses,

classification of poultry houses depending up on materials used: wired floor houses, deep litter, cage houses.

Unit-V:

Design and construction of rural grain storage structures such as Bhukari, Morai, Kothari: - requirements of good storage structures, types of grain storage structures. Construction of Bhukari, Morai, Kothari type storage structures. Silo: design and construction in respect of farm uses. Types of silos: pit silo, tower silo, trench silo, bunkers.

Unit –VI:

Development, rural roads: design and construction of farm road types of farm roads: characteristics of some important early roads, earth roads, gravel roads, kankar roads, etc. Construction cost of different roads, repair and maintenance. Road estimation and casting. Design of septic tank for small family-location-capacity of tank-cleaning-disposal field-soakage pit-water closet.

REFERENCES:

1.   Principles and practices of Agricultural, Structures and Environmental Control, Pandey P H 2004, Kalyani Publishers, Ludhiana.

2.   Principal of Agricultural Engineering Vol. 1, Michael A M and Ojha T P 2004 Jain Brothers, New Delhi.

3.   Farm Buildings Design, Newbaver L W and Walker H B 2003 Prentice – Hall Inc., New Jersey.

4.   Agricultural Buildings and Structures, Whitaker J 2002. Reston Publishing Home, Reston, Virgenia.

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IV Year B.Tech. Ag. Engg.-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A83028) HYDRAULIC DEVICES AND CONTROLS
(Elective-IV)

Objective The students will be trained to highlight the usage and operation of hydraulic and pneumatic controls required for operation of automated farm machinery with hydraulic and pneumatic systems.

Unit –I:

Hydraulic basics – Pascal's law applications, fluid flow, fluid energy, fluid work, Fluid power –advantages, draw backs, applications, components. Hydraulic system, color coding. Reservoirs – Hydraulic reservoirs, design and construction features, sizing of reservoirs. Strainers and filters – Hydraulic filters, positions, types, disfilters, water traps, air dryers, different air dryers. Filtering material and elements – introduction strainers, filters, filtering methods, location of filters in hydraulic circuits, beta ratio of filters.

Unit- II:

Accumulators – Definition, types, weight – loaded, spring loaded, gas – loaded (non-separator, separator), piston, diaphragm, bladder. Accumulators – As a auxiliary power source, leakage compensator, emergency power source, hydraulic shock absorber. Pressure gauges and volume meters – Bourdon gauge, Schrader gauge, rotameter, sight flow indicator, disc piston, turbine flow meter, electronic digital readout. Hydraulic circuits-control of single acting and double acting hydraulic cylinder, regenerative cylinder circuit, pump unloading circuit, double pump hydraulic system, Counter balance valve application; hydraulic cylinder sequencing circuits. Hydraulic circuits-Automatic cylinder reciprocating system, locked cylinder using pilot check valves, cylinder synchronizing circuits, fail-safe circuits, speed control of hydraulic cylinder, speed control of hydraulic motor. Hydraulic circuits-Hydraulic motor braking system, hydrostatic transmission system, air-over-oil circuit, analysis of hydraulic system with frictional losses considered mechanical hydraulic system. Hydraulic conductors and fittings –conductor sizing for flow rate requirements, pressure rating of conductors, steel pipes, steel tubing, plastic tubing, flexible houses, quick disconnect couplings, metric steel tubing.

Unit-III:

Pumps, pump theory, pump classification, performance, displacement, designs, gear pumps, vane pumps, piston pumps, pump operation. Hydraulic actuators- Linear actuators, cylinders, construction, seals, rotary actuators. applications (speed control, actuator synchronization, regeneration, counter

balance and dynamic braking, pilot operated check valves, pre-fill and compression relief), maintenance. Hydraulic cylinders operating features, cylinder mountings and mechanical linkages, cylinder force, velocity and power, cylinder loadings through mechanical linkages, hydraulic cylinder cushions, hydraulic shock absorbers. Hydraulic motors limited rotation hydraulic motors, gear motors, vane motors, piston motors, hydraulic motor theoretical torque, power and flow rate, performance, hydraulic transmissions. Hydraulic valves- directional control valves, flow control valves, Servo valves, proportional control valves, cartridge valves, hydraulic fuses, valve installation, valve failures, remedies, valve assembly, trouble shooting of valves. Hydraulic circuit diagrams and trouble shooting, USASI graphical symbols –Symbols, description, Tractor hydraulics – Power steering (hydraulic power steering, surface and soil conditions, sizing of components, actuator, control valves, lines hoses and internal passages, orifices, power steering pumps, Tractor hydraulics-noise in hydraulic systems, hi-tech tractor kinetic energy, problems, integral hi-tech systems, three point hitches quick attaching coupler for three point hitches.

Unit-IV:

Pneumatics: Air services – Compressors (Introduction, piston compressors, compressor starting un loader controls, screw compressor, vane compressor, capacity rating sizing of air receiver, power. Fluid conditioners (air filters, air pressure regulators, air lubricators pneumatic pressure indicators), pneumatic silencers, after coolers, air dryers) analysis of moisture removal from air, air-flow rate control with orifices and sizing of valves), Air services-Air control valves (regulators, check valves, shuttle valves, directional control two-way valves, three way and four way control valves, flow control valves, sizing of valves) pneumatic actuators (pneumatic cylinders, pneumatic rotary actuator, rotary air motors, air requirement, problems), pneumatic circuits and applications-Introduction, pneumatic circuit design considerations, air pressure loses in pipe lines, economic cost of energy losses, basic pneumatic circuit analysis using metric systems, Basic electrical controls –Electrical components, control of a cylinder using a singly limit switch, reciprocation of a cylinder using pressure or limit switches, dual cylinder sequence circuits, box-sorting system, electrical control of regenerative circuit, counting timing, reciprocation of hydraulic cylinder.

Unit – V:

Logic units-Moving part logic (MPL) control systems, MPL control of fluid power circuits, Boolean algebra, illustrative examples using Boolean algebra, Fail, safe and safety systems, Safety, cleanliness, fault finding instruments, fault finding, preventive maintenance, Robotics, use of hydraulic and pneumatic drives in agricultural systems, Advanced electrical controls-Components of an electro hydraulic servo system, analysis, programmable

logic controllers.

REFERENCES:

1.   Robotics Control, Sensing Vision, and Intelligence, Gonzalezr K S and Lee S G 1987 Mc Graw – Hill Book Company, New Delhi.

2.   Tractors and their Power Units, Lijedahl J B, Carleton WM, Turnquist P K and Smith D W 1984. AVI Publishing Co. Inc., Westport, Connecticut.

3.   Mechanical Measurements, Thomas GB and Buck N L 1969 Oxford and IBH Publishing Co. Ltd., 66 Janpath, New Delhi.

4.   Robot Engineering – An Integrated approach, Klafter R D, Cmielewski T A and Negin M. Prentice – Hall of India, New Delhi.

5.   Fluid Power with Applications, Esposoto A. 2003. Pearson Education, Inc., Delhi.

6.   Hydraulics and Pneumatics, Parr A. 2005. Jaico Publishing House, Mumbai.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. Ag. Engg.-II Sem	L	T/P/D	C
	4	-/-/-	4

(A80129) PRINCIPLES OF ENTREPRENEURSHIP
(Elective-IV)

Unit I:

Introduction to Entrepreneurship: Definition of Entrepreneur Entrepreneurial Traits. Entrepreneur vs. Manager, Creating and Starting the venture: Sources of new ideas, methods of generating ideas, creative problem solving - Writing Business Plan, Evaluating Business Plans. Launching formalities.

Unit II:

Financing and Managing the new venture: Sources of capital, Record keeping, recruitment, motivating and leading teams, financial controls. Marketing and sales controls. E-commerce and entrepreneurship, Internet advertising- New venture Expansion Strategies and Issues.

Unit III:

Institutional/financial support: Schemes and functions of Directorate of Industries, District Industries Centres (DICs), Industrial Development Corporation (IDC), State Financial Corporation (SFCs), Small Scale Industries Development Corporations (SSIDCs), Khadi and Village Industries Commission (KVIC), Technical Consultancy Organisation (TCO), Small Industries Service Institute (SISI), National Small Industries Corporation (NSIC), Small Industries Development Bank of India (SIDBI).

Unit IV:

Production and Marketing Management: Thrust areas of production management, Selection of production Techniques, Plant utilization and maintenance, Designing the work place, Inventory control , material handling and quality control. Marketing functions, market segmentation, market research and channels of distribution, Sales promotion and product pricing.

Unit V :

Labour legislation, Salient Provisions of Health, Safety, and Welfare under Indian Factories Act, Industrial Disputes Act, Employees State Insurance Act, Workmen's Compensation Act and Payment of Bonus Act.

TEXT BOOKS:

1.   Robert Hisrich, & Michael Peters: Entrepreneurship, TMH,2009.

2.   Dollinger: Entrepreneurship, Pearson,2009.

REFERENCE BOOKS:

1.   Vasant Desai, Dynamics of Entrepreneurial Development and

Management, Himalaya Publishing House, 2009.

2.   Harvard Business Review on Entrepreneurship, HBR Paper Back.

3.   Robert J.Calvin: Entrepreneurial Management, TMH, 2009.

4.   Gurmeet Naroola: The entrepreneurial Connection, TMH,2009

5.   Bolton & Thompson: Entrepreneurs—Talent, Temperament and Techniques, Butterworth Heinemann, 2009.

6.   Agarwal: Indian Economy, Wishwa Prakashan 2009.

7.   Dutt & Sundaram: Indian Economy,S.Chand, 2009

8.   B D Singh,:Industrial Relations & Labour Laws, Excel, 2009.

9.   Aruna Kaulgud: Entrepreneurship Management by, Vikas publishing house, 2009.

10.   Essential of entrepreneurship and small business management by Thomas W.Zimmerer & Norman M.Searborough, PHI-2009

11.   ND Kapoor: Industrial Law, Sultan Chand & Sons, 2009.

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IV Year B.Tech. Ag. Engg.-II Sem	L	T/P/D	C
	-	-/-/-	2

(A80087) INDUSTRY ORIENTED MINI PROJECT

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. Ag. Engg.-II Sem	L	T/P/D	C
	-	-/6/-	2

(A80089) SEMINAR

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. Ag. Engg.-II Sem	L	T/P/D	C
	-	-/15/-	10

(A80088) PROJECT WORK

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. Ag. Engg.-II Sem	L	T/P/D	C
	-	-/-/-	2

(A80090) COMPREHENSIVE VIVA