

**REGULATIONS GOVERNING  
UNDER GRADUATE PROGRAMMES OF THE FOREST COLLEGE  
AND RESEARCH INSTITUTE, MULUGU  
(From 2016-2017 onwards)**

**FCRI - UG Regulations**

**1.0 SHORT TITLE**

These regulations shall be called 'The FCRI Regulations, 2016 governing the under graduate courses of study leading to the award of the B.Sc.Forestry 4 year degree program. These regulations shall apply to the students admitted from the academic year 2016-17 and onwards.

**2.0. Definitions**

**2.1 Academic Year**

The academic year of the FCRI shall ordinarily be from June to April (except in the case of year of admission) and shall consist of two semesters.

**2.2 Semester**

A minimum duration of 110 working days, consisting of 95 instructional days and 15 examination days except during the year of admission.

For a short semester in the year of admission the number of classes should be increased proportionately.

**2.3 Credit Hour**

Each credit hour represents one hour lecture or two to three hours of laboratory or field practical's each week in a semester. It is also known as semester credit or credit.

**2.4 Course**

A course is a unit of instruction or segment of subject matter (as specified in the course catalogue) to be covered in a semester. It has a specific number, title and credits.

**2.5 Grade Point of course**

It is the value obtained by dividing the percentage of marks secured in a course by 10. The grade point is expressed on a 10 point scale up to 1 decimal place.

## **2.6 Credit point of a course**

It is the product of credit hours and grade point obtained by a student in a course.

## **2.7 Grade Point Average (GPA)**

It is the quotient of the total credit points obtained by a student in various courses at the end of each semester divided by the total credit hours taken by him/her in that semester. The grading is done on a 10 point scale. The GPA is to be corrected up to first decimal place.

## **2.8 Overall Grade Point Average (OGPA):**

It is the quotient of cumulative credit points obtained by a student in all the courses taken by him/her from the beginning of the first semester of the degree course divided by the total credit hours of all the courses which he/she had completed up to the end of a specified semester from the first semester. It determines overall performance of a student in all the courses taken during a period covering more than a semester. The OGPA is to be corrected up to second decimal place.

## **2.9 Semester final examinations**

Semester final examinations for each course are conducted by the University at the end of each semester in the theory portion of the course.

2.10 Dean of FCRI: Dean of FCRI means person Incharge/Principal/ Director of FCRI

## **3.0 Admissions**

3.1 Admission including selections to the under graduate courses, ordinarily made in the beginning of the first semester of the academic year, shall be in accordance with the regulations laid down from time to time by the FCRI.

## **3.2 Fee**

The fee for application, semester fee, special fee, examination fee and other fee shall be as prescribed by the FCRI from time to time.

## **4.0 Courses, credits and syllabi**

The details of the courses, credits and syllabi of the under graduate courses shall be as prescribed by the Academic Council from time to time.

## **5.0 Advisory System**

The students on their admission shall be divided into convenient batches by the Dean of the college, and each batch is assigned to one of the teachers who are designated as 'Advisor'. Each student immediately after enrolment fills up all the registration cards with the guidance

of his/her advisor. Among other things, the advisor shall help the students in planning the programmes of their studies.

The advisor will establish and foster close personal relationship with students assigned to him/her during their entire stay in the college by having periodical meetings either with the entire batch of students or with each individual student as often as is considered necessary in an effort to know their problems, review their study programmes and take such remedial actions as may be necessary in consultation with the teachers concerned and the Dean.

The advisor will maintain a record containing particulars of previous history of the student, courses registered and examinations appeared and grades obtained in each course in each semester as per the format prescribed by the FCRI (Format - 1).

## **6.0 Registration**

### **6.1 Registration for the first time in the FCRI**

Students who have received notification of admission from the FCRI will receive, on arrival, guidelines for registration from the Dean of the respective colleges.

The registration and orientation programme will be conducted by the Dean of the FCRI for the benefit of the students joining for the first time.

Attendance in respect of fresh students for the first semester shall be reckoned from the date of registration of the student concerned.

### **6.2 Registration in the subsequent semesters**

The following are the steps in registration of students for different courses.

6.2

(a) The student in each batch shall have to register for the set of courses offered in to for that batch and fill in the registration cards in person producing the identity card at the registration centre on the day of registration. The students having backlog courses can register the total backlog courses and few fresh courses offered in that semester for that batch and fill in the cards. The Advisor in turn will countersign and send them to the Dean's office. The Dean's office should prepare a list of students who have registered for each course and send them course-wise to the concerned teacher within a week.

(b) The payment of fee and other arrears due to the college, department, hostel, library etc., shall precede registration.

(c) Late fee for U.G. students shall be Rs. 10/- for the first three working days starting from the next day of the scheduled date of registration and thereafter Rs. 100/- per day for a further period of seven (7) days.

(d) The attendance will however be reckoned from the day the instruction commences as per the academic calendar. However, in respect of Intern ship / Experiential Learning Programmes (ELP)/ Project Work, the rules as shall be followed.

### **6.3 Study load for semester**

For the purpose of calculation of study load, number of credits registered in a semester includes fresh courses and courses to be repeated due to shortage of attendance in the previous semester(s). The total study load for a student shall not be more than 23 credit hours per semester.

### **7.0 Attendance**

**7.1** Every student shall ordinarily attend all classes in a course. However, the minimum attendance prescribed in a course is 75%. The attendance shall be reckoned for theory and practical's separately. A student who fails to put in the minimum attendance either in theory or practical examination his/her registration, for that course shall be treated as cancelled.

#### **7.1**

**(a)** The minimum attendance requirements can be relaxed upto 10% on medical grounds (i.e., up to 65% for theory and practical separately) only in case of indoor Hospitalization.

#### **7.2**

**(a)** If a student admitted to the first year U.G. courses does not register the courses of first semester of that year or having registered does not put in at least 75% of attendance in all the courses, his/her admission shall stand cancelled, provided that the admission of a student may not be cancelled in exceptional and deserving cases having regard to the facts and merits of the case as provided in clause (b) of this regulation

**(b)** A student who wishes to seek relaxation of provision in clause (a) of this regulation for good and exceptional reasons may make an application within 7 calendar days from the last day of instruction of first semester to the giving the grounds and the proof thereof due to which to which he/ she could not fulfil the minimum attendance requirement, provided he/she puts in at least 60% attendance during the first semester of admission. Such application shall be considered by a committee consisting of Dean, a senior Professor or a senior Associate Professor or a Assistant Professor as nominated by the Dean, the Academic advisor of the college, Advisor of the student concerned and the FCRI Medical Officer. If the committee is satisfied that there were exceptional circumstances warranting exercise of discretion to relax the provision in clause (a) of this regulation, the Dean may pass an order allowing the student to continue the studies in relaxation of the provision in clause (a). The student so permitted to continue the studies shall re-register the courses, in which he/she had shortage of attendance, when offered next.

**7.3** When a student has to leave the college after completion of first semester of study, for reasons beyond his/her control, he/ she shall obtain prior permission of the Dean for discontinuation within one month from the date of discontinuation. If a student fails to take

such permission, he/ she shall not be eligible for readmission. The maximum period of break shall not exceed 4 (four) semesters under any circumstances including the semester during which he/she discontinued. A student, permitted to discontinue by the Dean, shall apply to the Dean for readmission, at least one month before the commencement of the semester in which readmission is sought.

Where a student leaves the colleges taking a T.C. he/she shall not be eligible for readmission.

## **8.0 Evaluation of students, examinations and grades**

**8.1 (a)** The evaluation of the student in a course shall be based on his/ her performance in various kinds of examinations, records, class work and other types of exercises

**(b)** The detailed course outlines in each course shall be prepared by the concerned teacher(s) in consultation with the Head of the Department/Head of the Department, which will be made available to the students during the first week of the semester. A schedule of the mid-semester examinations of the academic programme shall be prepared by the Dean and notified to the students at the beginning of each semester

**(c)** Answer scripts of mid-semester examinations are evaluated by the teacher shall be shown to the students. The students shall have the option to request the teacher for clarification of any doubts in scoring, provided that such clarification is requested for when the answer scripts are made available to them. This, shall not apply for final both theory and practical examinations.

## **8.2 Mid-semester examinations**

There shall be one mid-semester examination to be conducted by the teacher offering the course after 50% of the working days are over in a semester. The duration for mid-semester examination shall be for one and half hours. Ordinarily no condonation for absence of mid-semester

Examination shall be given. However, if a student is genuinely prevented from taking examination as in the case of serious illness or accident or any other case, a special re-examination may be arranged by the concerned teacher in consultation with the Head of the department. This repeat examination shall be held within two weeks from the date of examinations so missed, and shall be a common examination for all such students.

Unless a student appears for the mid-semester examination he/she shall not be permitted to appear for the semester final theory and practical examinations in the course concerned.

The regular mid-semester examination and the special re-examination shall be conducted as per the time to be fixed by the Dean.

### **8.3 Semester final examinations**

(a) The semester final examinations shall be held at the end of each semester in each course. The semester final examination in the theory portion shall be of two and half hours duration. It shall be the responsibility of the University to conduct the theory portion of semester final examination. Practical examinations shall be conducted by FCRI internally. The students shall be given minimum two preparation holidays (inclusive of the public holiday) before the commencement of semester final theory examinations.

(b) Answer scripts of semester final theory examination are evaluated internally by the faculty of FCRI other than the concerned course instructor. The Controller of Examinations of affiliating University/Dean of FCRI shall send all the sealed answer scripts to the concerned evaluators after coding.

Teachers shall be nominated by the Controller of Examinations of affiliating university/Dean of FCRI for valuation. The nominated teachers shall report to the Controller of Examinations of affiliating University/Dean and shall submit award list of marks after completion of correction of answer scripts allocated to her/him.

### **8.4 Scheme of examination & Evaluation**

As approved by the Board of Studies in Forestry of Affiliating University and approved by academic council of FCRI.

### **8.5 Mass absence of students from a class or examination**

Absence of students 'enmasse' from a class or examination shall not be condoned. The Dean, in addition, may order suspension of the course, if deemed necessary.

### **8.6 Unfair means during tests and examinations**

The Dean of the FCRI shall be responsible for dealing with all cases of use of unfair means in various examinations. The phrase, 'Use of Unfair Means' include possession of any information or material by the student, talking to other students, copying from other students or from printed or written material may include 'use of mobiles or any other electronic gadgets', impersonation etc. The invigilator concerned, on finding the use of unfair means by any student may take the answer scripts of the student and the material evidence, if any, and the explanation from the student. The student may also be sent out of the examination hall immediately. The invigilator concerned shall report each case of unfair means direct to the Dean immediately with full details of the incident, answer scripts, the available evidence and explanation of the concerned students, if any. The Dean, on receipt of the report, may give an opportunity to the concerned student to represent his/her case considering all the available evidence, the Dean shall take appropriate action immediately. The penalty shall be as indicated below:

(a) A student found using unfair means during mid-semester examination shall be deemed to have failed in that course.

(b) A student found using unfair means during semester final examination shall be deemed to have failed in all the courses, he/she has registered in that semester and/or in such of those courses in which he/she appeared for semester final examination in that semester. In such cases, the student shall not be permitted to take the remaining examinations, if any, in that semester

(c) The Dean shall pass an order regarding the cases falling under (a) and (b) above immediately.

(d) For using unfair means of a serious nature such as ignoring the repeated instructions of invigilator, or abusing or threatening or assaulting the invigilator, warranting higher penalties than those indicated in clauses (a) and (b) above, the Dean, besides treating the student as failed in all the courses he/she registered in that semester, may further debar the student for the succeeding semester permanently. The decision of the Dean is final. The parent or the guardian of the concerned student shall be informed of any punishment awarded to the student and the reason therefore.

### **8.7 Scrutiny of grades**

The student may apply to the Dean within one week after the announcement of the grades for scrutiny of the totalling of marks of the semester final examination or calculation of grade points obtained by him advancing sufficient reasons for such a request. The fee for such scrutiny shall be as prescribed from time to time.

### **9.0 Academic status and scholastic deficiencies**

9.1 (a) A student shall get minimum of 50% marks in both final theory and final practical examinations separately for a pass in the final examination of a course. If a student does not achieve this he/she has to reappear for the final examination in theory/practical or both as the case may be, when next conducted for such course(s).

(b) A student obtaining a grade point of 5.0 shall be considered to have passed the course. A student getting less than 5.0 shall be deemed to have failed in the course and 'F' shall be indicated in the grade report. A student who secured grade point below 5.0 or who secures above 5.0 but secures less than 50% marks in semester final theory/practical examination of the course (or) was marked absent has to appear for either final theory or practical examination or both (as the case may be). A student may also have the option to write the mid-semester examination of the course in the same semester when he/she next takes again the final examination of that particular course.

In the case of final year B.Sc. (forestry), re-examination shall be conducted within one month from the date of reopening the colleges after the semester vacation i.e. first semester of the succeeding academic year, in not more than three failed courses, provided the student would complete his/her graduation requirements by passing said three courses.

(a) Whenever a student wants to take re-examination in any course(s) he/she should fill in the particulars in a prescribed application form duly paying the re-exam fee of Rs. 50/-

(Rupees fifty only) for each course subject to a maximum of Rs. 100/- (Rupees hundred only) within 40 days from the date of commencement of the subsequent semester.

9.2 Promotion to second year A candidate is automatically promoted to second year irrespective of the number of courses as absent/failed courses in the first year.

Promotion to third year A candidate should have passed all the courses of first year and should not have more than 6 courses of second year as backlog courses (failed).

Promotion to fourth year A candidate should have passed all the courses of second year and should not have more than 6 courses of third year as backlog courses (failed).

NO CONDITIONAL PROMOTIONS SHALL BE ALLOWED TO ANY  
STUDENT TO REGISTER THE COURSE (S).

### 9.3 Year of standing

The year of standing of a student shall be determined solely on the basis of his completion of certain number of credit hours as prescribed by the Academic Council.

### 10.0 Graduation requirements

10.1 The student shall satisfy minimum residential requirements and maximum duration as below. The minimum residential requirement is eight Semesters for U.G. Degree Programmes at FCRI. The maximum duration of degree programmes is fourteen semesters (7 academic years).

### 10.2 Requirements for Bachelor's Degree

A student undergoing B.Sc. Forestry 4 year degree at FCRI shall pass courses and complete the minimum number of credit hours prescribed there by the Academic Council from time to time by obtaining minimum OGPA of 5.00 in the 10 point scale.

A student undergoing instructions in U.G. courses of study leading to the award of Bachelor in Forestry, shall have to complete satisfactorily the internship/Experiential Learning Programme/Project Work etc., as prescribed from time to time.

### 10.3 Classification of successful candidates

**The successful candidates after completion of graduation requirements who secured an OGPA of 5.00 or more in the 10 point scale shall be classified as under:**

OGPA	DIVISION
5.000-5.999	Pass
6.000-6.999	II division
7.000-7.999	I division
8.000 and above	I division with distinction

NOTE: Class/division shall not be mentioned in the degree certificate but, Classification may be given in the transcript as footnote.

### **11.0 Students responsibility**

All under graduate students studying in FCRI, Mulugu are expected to know the requirements for the award of Bachelor's Degree and general academic requirements and assume full responsibility for meeting them. They are expected to keep constantly in touch with their advisors so that the latter may watch their progress and guide them along right lines. In no case a regulation be waived or exception made simply because a student pleads ignorance of it.

### **12.0 Transfers**

Transfer of students from other Universities/ Institutes/ Colleges to FCRI is not permitted.

### **13.0 Record of courses**

To ensure that requirements for the award of degree have been completed by a student, the Dean office, FCRI shall keep a record of courses completed by the students.

### **14.0 Authorities to approve results and issue pass certificates, transcripts etc.**

The Vice-Chancellor of affiliating University shall approve the results on the recommendation of the Controller of Examinations of the affiliating University/Dean of the FCRI and Registrar of the affiliating University shall issue the Provisional Pass Certificates, transcripts etc. to the candidates.

### **15.0 Award of Degree**

A degree under the seal of the affiliating University and duly signed by the officers authorized in this behalf shall be presented at a convocation to each candidate who has successfully completed the graduation requirements for the award of degree. Degrees of the candidates who have successfully completed the graduation requirements for the award of degree and are admitted 'IN ABSENTIA' to a degree at a convocation shall be sent by post. The degree shall set for the name of the candidate, father's name, mother's name, degree, month and year of successful completion of the graduation requirements etc.

**16.0 Amending or cancellation of result**

If the result of a candidate is discovered to be vitiated by error, malpractice, fraud, improper conduct or any other reasons, the Vice-Chancellor of affiliating University shall have the power to amend the result in such a manner as to accord with the true position, and to make such declaration as the Vice-Chancellor of affiliating University may deem necessary in that behalf.

If it is found that the result of a candidate has been vitiated by malpractices, fraud or other improper conduct whereby he has been benefited and that he has in the opinion of the Vice-Chancellor of affiliating University, been a party to or connived at the malpractice, fraud or improper conduct, the Vice-Chancellor of affiliating University shall have the power at any time, notwithstanding the award of the Diploma or a Certificate or Prize or a Scholarship, to amend the result of such candidate and to make such declaration as the Vice-Chancellor of affiliating University may deem necessary in, that behalf, including debarring of the candidate from the University for such a period as may be specified and the cancellation of the result of the candidate in such manner as the Vice-Chancellor of affiliating University may decide.

**17.0 Transitory provision**

These regulations shall apply to the students who shall be admitted from the academic year 2016 -17 and onwards.

**18.0** No Regulation made by the Academic Council, governing the under graduate courses of study shall be constructed to limit or abridge the powers of the Academic Council to deal with any case or cases of any student or students of the under graduate courses in such manner as it may appear to it to be just and equitable.

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**FORMAT – 1**  
**(REGULATION 5.0)**

**FOREST COLLEGE AND RESEARCH INSTITUTE, MULUGU**

**REGISTRATION & AWARD BOOK.**

- 1) Name of the College :
- 2) Course of Student :
- 3) Name of the Student :
- 4) I.D. No :
- 5) Aadhar Card Number of the student :
- Inner front page :
- Name of the College :
- Name of the Student in Full :
- Blood Group** :
- Mobile No. of Student and Father/Guardian:**
- E- Mail ID of the Student & Father/ Guardian** :
- Health Status** :
- (Are you suffering from Chronic Illness if any):*
- Father's Name & Occupation :
- Mother's Name :
- Permanent Address :
- Present Address :
- Local Address, if residing outside the Hostel :
- Name & Address of guardian, if any :
- Name of the institute last studied :

**Particulars of the Advisor**

Name:

Designation:

Department:

**Signature of the Advisor**

**Signature of the Student**



Sl.	Advisory meeting during the semester (dates on which student attended)	
No		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Sl.	Discipline & Conduct, Punishment awarded, prizes won, if any	Other remarks
No		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

**Forest College and Research Institute, Mulugu**  
**(Affiliated to Osmania University)**  
Scheme of Instruction, Examination and Evaluation  
B.Sc. Forestry 4 year degree course  
Proposed for the Academic year 2016-17

**Semester - I**

<b>Courses with both Theory and Practical's</b>															
S.No.	Course Code	Course title	Scheme of examination				L	P	Hours per Week	Credit hours	Scheme of Exam Duration Hours		Scheme of examination Maximum marks		
			Internals			University Exam					Sessional	University Exam	Sessional	University Exam	
			Mid Sem	Practical	Assignment	SEE									
1	BFC101	Fundamentals of Biochemistry	30	15	5	50	2	1	4.5	2+1	1.5	3	50	50	
2	BFC102	Principles of Analytical chemistry	30	15	5	50	1	1	3.5	1+1	1.5	3	50	50	
3	BFC103	Dendrology	30	15	5	50	1	1	3.5	1+1	1.5	3	50	50	
4	BFC104	Basic and applied Mathematics	30	15	5	50	1	1	3.5	1+1	1.5	3	50	50	
5	BFC105	English for Effective Communication	60 for Practical Exam 40 for continuous system of Evaluation			0	0	1	2.5	0+1	3	0	100	0	
6	BFC106	Principles of Silviculture	30	15	5	50	2	1	4.5	2+1	1.5	3	50	50	
7	BFC107	Principles of Environmental Sciences	30	15	5	50	1	1	3.5	1+1	1.5	3	50	50	
8	BFC108	Fundamentals of ICT	30	15	5	50	1	1	3.5	1+1	1.5	3	50	50	
9	BFC109	Production Technology of Field Crops	30	15	5	50	1	1	3.5	1+1	1.5	3	50	50	
<b>Total</b>		<b>9</b>						<b>10</b>	<b>9</b>	<b>36</b>	<b>19</b>			<b>500</b>	<b>400</b>

**B.Sc. (Forestry) 4year degree programme at Mulugu,  
Medak District, Telangana State.**

Sl No	Semester I	Credit Hours	No. Of hours Theory Class	No. Of hours Practical class
1.	Fundamentals of Biochemistry	2+1	2	2.5
2.	Principles of analytical chemistry	1+1	1	2.5
3.	Dendrology	1+1	1	2.5
4.	Basic and applied mathematics	1+1	1	2.5
5.	English for effective communication	0+1	0	2.5
6.	Principles of Silviculture	2+1	2	2.5
7.	Principles of Environmental Sciences	1+1	1	2.5
8.	Fundamentals of ICT	1+1	1	2.5
9.	Production Technology of Field Crops	1+1	1	2.5
10.	Physical education	0+1	0	2.5
11.	National service scheme	0+1	0	2.5
<b>Total Credit Hours</b>		<b>10+11= 21</b>	<b>10</b>	<b>26</b>

**Semester – I**

**1. Fundamentals of Biochemistry (2+1)**

**Aim**

- To gain basic knowledge of the biomolecules viz., Carbohydrates, Proteins and Lipids - properties, structure and metabolism.
- To learn basics of enzymes

**Theory**

**UNIT I - Carbohydrates**

Carbohydrates - occurrence and classification. Structure of monosaccharides, oligosaccharides and polysaccharides. Physical and chemical properties of carbohydrates – optical isomerism, optical activity, mutarotation, reducing property, reaction with acids and alkalis. Glycoconjugates - Glycoproteins and Lectin - structure and significance.

**UNIT II - Lipids**

Lipids - occurrence and classification. Storage lipids - fatty acids, triacyl glycerol, essential fatty acids, waxes. Structural lipids - role of lipids in biological membrane –

**glycolipids and phospholipids - types and importance; Sterols - basic structure and their importance. Physical and chemical constants of oils. Rancidity of oils.**

### **UNIT III - Proteins and Enzymes**

**Amino acids - classification and structure. Essential amino acids. Properties of amino acids - amphoteric nature and isomerism. Classification of proteins based on functions and solubility. Structure of proteins: primary structure, secondary structure, tertiary structure and quaternary structure - protein folding and denaturation. Properties and reactions of proteins. Enzymes - Properties, classification and nomenclature. Mechanism of enzyme action. Factors affecting enzyme activity. Enzyme inhibition - Competitive, Non-competitive and Uncompetitive inhibition; Allosteric enzymes. Coenzymes, cofactors and isoenzyme.**

### **UNIT IV – Metabolism & Secondary metabolites**

**Carbohydrate metabolism - breakdown of starch by amylases, glycolysis, TCA cycle and pentose phosphate pathway. Respiration - electron transport chain and oxidative phosphorylation. Bioenergetics of glucose. Lipid metabolism - lipases and phospholipases. Beta-oxidation of fatty acids and bioenergetics. Biosynthesis of fatty acids and triacyl glycerol. General catabolic pathway for amino acids - transamination, deamination and decarboxylation. Ammonia assimilating enzymes. Metabolic inter-relationship. -- Secondary metabolites - occurrence, classification and functions of phenolics, terpenes and alkaloids.**

#### **Practical**

**Qualitative analysis of carbohydrates – Estimation of starch – Estimation of amylase – Determination of reducing sugars – Qualitative analysis of amino acids - Sorenson's formal**

titration of amino acids – Estimation of amino acids by Ninhydrin method – Estimation of protein by Biuret method – Determination of free fatty acid of an oil – Determination of iodine number of an oil – Estimation of ascorbic acid by dye method – Assay of amylase – Estimation of total phenols – Extraction and estimation of lycopene and carotenoids – Separation of amino acids by paper chromatography – Separation of phenols by thin layer chromatography.

Text books

1. Berg JM, Tymoczko JL and Stryer L, (2007), Biochemistry, 7th Ed. Wiley Eastern Ltd. ISBN:0-7167-8724-5.
2. Thayumanavan, B, Krishnaveni, S and Parvathi, K, (2004), Biochemistry for Agricultural Sciences, Galgotia Publications Pvt Ltd., New Delhi. ISBN :81-7515-459-4.

References

3. Cox, MM and Nelson, DL. (2011), Principles of Biochemistry, Fourth (Indian edition) Macmillian, Worth Publishers. <http://bcs.whfreeman.com/lehninger6e> - Web links/ Tutorials/ Lecture companion Art
4. Harper's illustrated Biochemistry -<https://freemedebooks.files.wordpress.com/2014/01/harpers-illustrated-biochemistry-28th-edition.pdf>
5. J M Berg, J L Tymoczko and L Stryer , Biochemistry, Sixth Edition - <http://www.irb.hr/users/precali/Znanost.o.Moru/Biokemija/Literatura/Lubert%20Stryer%20-%20Biochemistry.pdf>
6. Sadasivam, S and Manickam, A. (2009), Biochemical Methods, 3rd Edn, New Age International.
7. Wilson, K. and Walker, J.M. (2000), Principles and techniques of Practical Biochemistry, 5th Edn. – Cambridge University Press.

E references

- [www.ncbi.nlm.nih.gov](http://www.ncbi.nlm.nih.gov)

Outcome

- The students will acquire the basic knowledge of the biomolecules, their properties, structure and metabolism.

## 2. Principles of analytical chemistry (1+1)

### Aim

To impart knowledge on concepts and principles of analytical techniques among under graduate students.

It also provides opportunity to develop skill among students in various analytical techniques.

## Theory

### UNIT I - General principles

General principles of analytical chemistry - common analytical methods - qualitative and quantitative analysis - accuracy and precision of analytical results- Preparation of laboratory reagents

### UNIT II - Volumetric analysis

Volumetric analysis - Calibration of apparatus- preparation of primary and secondary standards - standardization. Theory of indicators and buffers - acidimetry, alkalimetry, oxidometry, complexometry and precipitometry.

### UNIT III - Gravimetric analysis

Gravimetric analysis - principles of precipitation reactions- solubility product - common ion effect -conditions of precipitation - Choice of filters - washing solutions.

### UNIT IV - Instrumental methods and Nuclear Techniques

Instrumental analysis - principles and practices of potentiometry, conductometry, colorimetry, spectrophotometry, absorption and emission spectrometry - chromatography - Choice of analytical methods. -- Nuclear Techniques- Radioactivity - radio tracer techniques in agriculture - Stable isotopes - tracing carbon and nitrogen -mass spectroscopy - use of stable isotopes in agriculture

## Practical

Analytical techniques and concepts - Volumetry - Gravimetry - Acidimetry - Alkalimetry - Permanganometry - Dichrometry - Iodometry, Complexometry - Potentiometry - Conductometry -Colorimetry - Spectro-photometry -Turbidimetry - Flame Photometry - Atomic absorption spectrophotometry- Radioactivity-Measurement.

## Text books

1. Jeffery, G.H, J.Basset, J.Mendham, R.C. Denney (1988, ) Vogel's e-book on Text book of Quantitative Chemical Analysis V<sup>th</sup> edition Longman Scientific &Technical and John Wiley &Sons Inc., NewYork
2. Pradyot Patnaik. (2004) e-book on Dean's Analytical Chemistry Handbook, Second edition. McGraw – Hill Handbooks

## References

1. Chopra, S.L. and J.S.Kanwar. 1976. Analytical Agricultural Chemistry. Kalyani Publishers, Ludhiana, New Delhi.
2. Hesse, P.R. 2002. A Text book of Soil Chemical Analysis. CBS Publishers and Distributors Pvt. Ltd., New Delhi.
3. Jackson, ML. 2014. Soil Chemical Analysis. Scientific Publishers, Jodhpur, India.
4. Khandpur, R.S. 2012. Hand Book of Analytical Instrumentation. Tata McGraw Hill Education Pvt. Ltd..
5. Piper, C.S 2014. Soil and plant analysis: Scientific Publishers, Jodhpur, India.

## E - references

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<http://www.scribd.com/doc/30296831/Instant-Notes-in-Analytical-Chemistry> <http://nzic.org.nz/ChemProcesses/analysis/15B.pdf>  
[www.aoac.org](http://www.aoac.org) <http://www.tutornext.com/ws/rock-type-chart> <http://www.chem.uoa.gr>  
<http://www.chemguide.co.uk/analysis/paper.html>.  
<http://www.ias.ac.in/initiat/scied/resources/chemistry>  
[Portal.acs.org/portal/career/CTP-003375](http://Portal.acs.org/portal/career/CTP-003375)

### **Out come**

The students will gain knowledge on concepts and principles of analytical techniques. They will also acquire skills in various analytical techniques. Further, the knowledge gained will form as building block to pursue many research works.

### **3. Dendrology (1+1)**

#### **Aim**

- To inculcate the fundamentals of botany and taxonomy of gymnosperms and angiosperms.

#### **Theory**

##### **UNIT I - Introduction**

Dendrology - Definition - scope - importance in taxonomy, physiology and ecological Interpretations - plant Kingdom and classification – prokaryotes and eukaryotes – cryptogams and phanerogams – different taxa of plant kingdom.

##### **Unit II - The Cell**

Plant cell- structure and organelles - cell wall - fine structure of primary and secondary wall- cell wall thickening - pits - simple, bordered, half bordered - plasmodesmata- structure and function -growth of cell wall - apposition, intussusception -cell wall properties.

##### **Unit III - The Tissue**

Tissues - definition and types -meristmatic tissues - characters, types and functions based on origin, position and plane of division -vascular tissues - components of xylem and phloem - types of vascular bundles and their functions -epidermal tissues - epidermis, structure of stomata, trichomes, motor cells and their functions.

##### **Unit IV - Morphology & Taxonomy of Vegetative Parts**

Morphology - introduction, definition and scope - descriptive and interpretative - morphology of vegetative parts - roots - types and modifications of roots - stem – functions and modifications - leaf - parts of leaf - functions and types of leaves. -- Taxonomy of Reproductive Parts - Morphology of reproductive parts - inflorescence - types as well as special types and significance - flower - parts of flower - types of flower - floral whorls - types of placentations - fruit - types of fruits - simple and dry – fleshy – aggregate and multiple fruits -seed - parts, types and structural modifications for seed dispersal.

## Practical

Microscopic observations and characterization of Algae - Lichens - Bryophytes - Pteridophytes - Gymnosperms - Angiosperms – Study of Inflorescence - racemose, cymose and special type - Study of floral parts - calyx, corolla, perianth, androecium and gynoecium - Floral formula and floral diagrams of various types of flowers - Study of fruits and seed with suitable examples - Arboretum design and layout - Visit to Botanical Garden Botanical Survey of India.

## Text Books

- Pandey, B.P. 2014. College Botany. S Chand & Company Pvt Ltd, New Delhi
- Dasgupta, S.1998. Systematic Botany for Foresters. Khana Bandhu Publications, New Delhi, India.

## References

- Vidyarthi, R. D and S. C Tripathi. 1982. A Text Book of Botany. S Chand & Company Pvt Ltd, New Delhi
- Bor, N.L. 1953. Manual of Indian Forest Botany. Oxford University Press, U.K.
- Esau, K . 1953. Plant Anatomy. McGraw Hill Publication, New York, U.S.A.

## E- References

<http://www.cnr.vt.edu/DENDRO/DENDROLOGY/main.html>

<http://www.botit.botany.wisc.edu/courses/dendrology>

<http://www.metla.fi/info/vlib/Forestry/Topic/Dendrology>

<http://www.hcs.osu.edu/hcs300/gymno.htm>

<http://www.tolweb.org/angiosperms> <http://delta-intkey.com>

## Outcome

Students will gain knowledge on fundamental structures of plant life and their significance in taxonomical classification and growth.

Skill in identification of families and tree species using morphological

identification keys and knowledge in economical values of tree species.

## 4. Basic and applied mathematics

### (1+1) AIM

- To understand and apply fundamental concepts of mathematics applicable in biology and to acquire about theoretical concepts of Algebra, Calculus and Mathematical Modeling.

### Theory

#### UNIT I - Algebra

Permutation and Combination -meaning of  $nPr$  and  $nCr$  and simple problems. Progressions -

Arithmetic, Geometric and Harmonic progressions. Matrices: Types - Algebra of matrices -

**Determinants – expansion– inverse of a matrix by adjoint method-solving system of equations by Cramer’s rule and matrix inverse method.**

#### **UNIT II - Differential Calculus I**

**Definition – methods of differentiation. Geometrical and physical meaning of the derivative - Higher order derivatives - Applications of differentiation. Partial differentiation – Homogeneous functions and Euler’s Theorem - Applications**

#### **UNIT III - Differential Calculus II**

**Increasing and decreasing function-Maxima and minima of single and several variables with and without constraints- Physical and Economic optimum- Applications in agriculture.**

#### **UNIT IV - Integral Calculus & Mathematical Models**

**Definition of integration-indefinite and definite integrals-Formulae-methods of integration - substitution, method of partial fractions -Integration by parts -Simple applications in finding the area and volume by integration. -- Mathematical Models - Agricultural systems - Mathematical models - classification of mathematical models-Linear, quadratic, exponential and logistic models.**

#### **Practical**

**Problems in Permutation and Combination. Problems in A.P, G.P, and H.P. in biology. Problems in forming price and quantity matrix and estimation of revenue matrix. Formation and solution (using matrix inverse and Cramer’s rule) of simultaneous equations from problems in agriculture. Problems in differentiation- maxima and minima of single and several variables with and without constraints - physical and economic optimum-finding the fertilizer dosage for maximum yield and maximum profit. Simple problems in methods of integration computation of area, volume using definite integrals. Problems in fitting linear, quadratic, exponential and logistic models to data from agricultural experiments.**

#### **Text Books**

- 1. Manickavasagam Pillai, T. K and Natarajan, T. 2003. Calculus, Viswanathan Publications, Madras.**
- 2. Suyambulingom, C and Kailasam, C. 1990. Mathematics for Plant Sciences, Sakthi Publications, Coimbatore.**

#### **References**

- 1. Duraipandian, 2007, Calculus and Analytical Geometry, Emerald Publishers, Chennai.**
- 2. James Stewart and Barhara Frank, Calculus, 2008, International Thomson Publishers, Singapore**
- 3. Mehta, B. C. and G. M. K. Madnani.2006, Mathematics for Economists, Latest edition, Sultan Chand & Sons, New Delhi.**

4. Veerarajan, T, 2004. Engineering Mathematics, Tata McGraw-Hill Publishing Company Limited, New Delhi.
5. Ranganathan.C.R. 2006, A First Course in Mathematical Models of Population Growth (with MATLAB programs), Associated publishing company, New Delhi

**E - Reference**

[www.mathworld.com](http://www.mathworld.com)  
<http://en.wikipedia.org/wiki/Portal:Mathematics>  
<http://www.sosmath.com/>

**E – Journals**

<http://www.math.neu.edu/~Suciu/journals.html>

**Outcome**

Students will acquire knowledge in basic techniques that are applicable to agricultural sciences. Further the course will provide them good introduction to various mathematical models used in Biological sciences.

**5. English for effective communication**

**(0+1) Aim**

- To make the students competent in English language skills viz., listening, speaking, reading and writing.

**UNIT I - LISTENING**

Introduction to communication skills - listening vs. hearing -basic listening modes - types of listening -intensive and extensive listening - process of listening - methods of enhancing listening- barriers of listening.

**UNIT II - SPEAKING**

Introduction to English phonology – English phonemes – stress & intonation - influence of language 1 on language 2 - oral discourse skills - principles of speech preparation - presentation skills - techniques of speaking.

**UNIT III - READING**

Introduction to reading - types of reading - skimming and scanning - idea reading (reading for information) - exploratory reading - study reading (text reading) - critical reading - analytical reading - note-making – précis writing.

**UNIT IV – WRITING & INTEGRATED SKILLS**

Word formation (prefix , suffix & word coining) - word expansion ( root word & etymology) - compound words - single word substitutes -abbreviations & acronyms – sentence agreement - sentence completion - sentence correction - writing definitions - coherence and cohesion in writing - mind mapping in writing - paragraph writing techniques - thesis sentence writing -

inferential sentence writing - logical arrangement of sentences - letter writing - text conversion- interpreting charts , graphs, diagrams into text - poster making - essay writing ( types of essays). -- Integrated skills - Group Discussion - Presentation (Seminar) - Forum discussion - Brain Storming – Debate – Writing Fan-mail – e-mail.

#### **Text Books**

1. Hariharan,S. et al., English for Effective Communication. Coimbatore, Thannambikkai publications, 2014. Third edition.
2. Kepmer et al., Writer1, Wadsworth, Boston, USA.2012.

#### **E - Books**

1. <http://www.nature.com/scitable/ebooks/english-communication-for-scientists-14053993/contents>
2. <https://archive.org/details/businessenglishp00buhlrich>
3. <http://www.e-booksdirectory.com/details.php?ebook=3153>

#### **References**

1. Bernhardt, E.B., Reading Development in a Second Language, Norwood, N.J., Ablex Publishing,1991.
2. Gerald, J. Alfred et. al, The Professional Writer, New York: St. Martin's Press, 1992.
3. Goodale, Malcolm, Professional Presentations, Cambridge University, 2005.
4. Greenbaum Sidney, Oxford English Grammar, New Delhi, Oxford University Press. Peregoy, 2009.
5. Greenbaum Sidney, Oxford English Grammar, New Delhi, Oxford University Press, 2009.
6. Hariharan, S., Authentic English for Agriculture and Allied Sciences, Hyderabad, Orient Longman,2003.
7. Helgesen, Mark et al., Active listening, Cambridge University,1997.
8. Jones Daniel, English Pronouncing Dictionary, Cambridge University Press,2006.
9. Lynch, Tony and Kenneth Anderson, Study Speaking, Cambridge University, 1992.
10. Martin Cutts, Oxford Guide to Plain English, Oxford University Press, 2004.
11. Robert, A. Day, How to Publish a Scientific Article, Oxford University, 2001.
12. S.F. and Boyle, O.F. Reading, Writing and Learning in ESL, New York. Longman,1997.

Sahaneya Wandy, et.al., IELTS, Preparation and Practice, Oxford University, 2005.

13. Sundararajan, N, Attentive Listening: How it Matters, University News, March 19-25, 2005.
14. Swan, M. & Smith, B, Learner English, Cambridge, 1987.
15. Sweeney, Simon, English for Business Communication, Cambridge University, 2003.

E- References [www.esl-lab.com](http://www.esl-lab.com)

[www.webenglishteacher.com](http://www.webenglishteacher.com)

[www.eflweb.com](http://www.eflweb.com)

[www.softskills.com](http://www.softskills.com)

[www.teachingenglish.org.uk](http://www.teachingenglish.org.uk)

[www.reportingskills.com](http://www.reportingskills.com)

[www.essays.com](http://www.essays.com) [www.writing-skills.com](http://www.writing-skills.com)

[www.onestopenglish.com](http://www.onestopenglish.com)

[www.negotiation.com](http://www.negotiation.com)

[www.tealite.com](http://www.tealite.com)

[www.businessballs.com](http://www.businessballs.com)

[www.eltweb.com](http://www.eltweb.com) [www.study-habits.com](http://www.study-habits.com)

[www.angelfire.com](http://www.angelfire.com)

[www.timethoughts.com](http://www.timethoughts.com)

[www.primesl.com](http://www.primesl.com)

[www.applyesl.com](http://www.applyesl.com)

[www.learnbusinessEnglish.com](http://www.learnbusinessEnglish.com)

[www.teachersdesk.com](http://www.teachersdesk.com)

[www.bogglesworld.com](http://www.bogglesworld.com)

[www.flexiblelearning.net.au](http://www.flexiblelearning.net.au)

## **Outcome**

The students will gain competence in skills viz.,

**Listening:** Understanding the kinds of listening and acquire the techniques of active listening followed by note-taking and the art of asking questions

**Speaking:** Acquire the correct pronunciation and the art of speaking in a forum.

**Reading:** Know the types of reading, the techniques of reading, reading for comprehension and note-making.

**Writing:** Understand the genre of writing, mechanics of writing, article writing (essay), abstract writing (précis) and letter writing.

## **6. Principles of Silviculture**

### **(2+1) Aim**

- To study the distribution pattern and functions of forests
- To impart knowledge on locality factors and its influence on forest types

### **Theory**

#### **UNIT I – Introduction to Forest and Forestry**

**Forest – Forestry – Definition, classification and historical perspectives of forests in India. Role of forests – tangible and intangible benefits. Major vegetation forms of world and India - distribution. Forest and Tree cover - Global and Indian scenario . Recent trends in forestry development in the world and India - challenges and constraints. Forestry organizations - National - International.**

#### **UNIT II – Tree and Forest**

**Distinguishing features of tree – parts of tree –Growth of trees - diameter, height and volume growth in trees - crops – growth stages - differentiation of stands based on age, composition and density – pure and mixed stands – ecological and economic advantages of mixed stands - Crown classification - development of stands**

#### **UNIT III – Silviculture and Locality Factors**

**Silvics and Silviculture - Definition - objectives – its relation with other branches of forestry. Factors of locality – Climatic, Edaphic, Physiographic and Biotic factors. Bioclimate and microclimate of forests. Site quality – classification of sites.**

#### **UNIT IV – Site Factor Interactions & Forest Types**

**Interaction of site factors - Leibig's law of minimum – Shelford's law of tolerance – principles of dynamism and thermodynamics. Compensation factors – combined concept and vegetation – site factors and vegetation in India – modification of site factors through silvicultural practices. -- Forest Types - Plant succession concept – kinds and causes of succession. Climax- concept - theories in climax - significance in silviculture. Forest types - definition – Object, basis and systems of classification - Major groups – Revised**

**classification of forest types of India– Tropical, Montane sub-tropical, Montane temperate, Sub-alpine and Alpine – sub groups – types – species composition and distribution. Forest types of Telangana.**

### **Practical**

**Visit to a forests to study its site factors – productive and protective role of forests – study of tree structure and form – study of tree components above ground and below ground – Visit and study of locality factors, species composition in a dry deciduous forests – moist deciduous forests – thorn forest – tropical dry evergreen forests – littoral and swamp forests – Fire affected areas and understory vegetation – Visit to a man made forests – Visit to ICFRE/State Forest Institute – Visit to a forest range.**

### **Text Books**

- 1. Khanna, L.S. 2000. Principles and practice of Silviculture. Milton Book Company, Dehra Dun. 473 p.**
- 2. Dwivedi, A. P. 2006. A Text book of Silviculture. International Book Distributors, Dehra Dun. 505 p.**

### **References**

- 1. Haig, I.T., M.A. Huberman and U. Aung Din. 1986. Tropical Silviculture. Periodical Experts Book Agency, New Delhi. Vol. 1, p. 190.**
- 2. Rawat, A.S. 1991. History of Forestry in India. Indus Publishing Co., New Delhi. 337 p.**
- 3. Champion, H.G. and S.K. Seth. 1968. A revised survey of the forest types of India. Manager of Publication, Delhi.**

### **E - References**

**[www.wvu.edu](http://www.wvu.edu)  
[www.fri.icfre.gov.in](http://www.fri.icfre.gov.in)  
[www.fsi.org.in](http://www.fsi.org.in)  
[www.iufro.org](http://www.iufro.org)  
[www.itto.int](http://www.itto.int)  
[www.forestry.about.com](http://www.forestry.about.com)**

### **Outcome**

**• The students will be able to understand the various forest types of world and India.**

**They will be able to know the locality factors and its influence on forest vegetation.**

## **7. Principles of Environmental Sciences**

### **(1+1) Aim**

- To impart students on the importance of ecosystems, biodiversity and their conservation

### **UNIT I - Introduction to Environmental Science**

**Environmental Science – Interrelationship with other sciences - Scope – Concepts - Segments - Global Environmental initiatives and perspectives – Environmental Sustainability – Ecological footprint.**

### **UNIT II - Ecology and Ecosystems**

**Ecology – Relevance to man - Ecosystem - Components – Terrestrial - Biomes – Forest – Desert - Aquatic – Pond – River – Estuaries – Ocean - Matter cycling - Energy flow – Food Chain, Food Web and Ecological pyramids —Species interactions – Succession.**

### **UNIT III- Biodiversity and conservation**

**Biodiversity – Types – National and Global Status – Significance – Hotspots - Threats – Conservation – In-situ – Ex-situ - Biosphere Reserve - National parks and Wildlife Sanctuaries – Botanical Garden**

### **UNIT IV- Natural Resources & Environmental problems and Protection**

**Natural resources – Land – Water – Air – Forest – Minerals – Energy Resources – Renewable - Non-renewable - Status – Degradation – Sustainable Management and Conservations- Resource Extraction. -- Environmental problems and Protection - Green House Gases-Global warming- Climate change- Impact on agriculture and other natural resources-Environmental pollution-Introduction to soil, water and air pollution -impact on agriculture and environment. Environmental protection-Global treaties - Conventions – National and state level organizations: TNPCB, CPCB — Environmental Laws and Acts – Environmental Education**

#### **Practical**

**Environmental sampling and preservation - Biodiversity assessment in organic and conventional farming - Floral and faunal diversity assessment in forest ecosystem - Water quality analysis: Colour, temperature and turbidity - Water quality analysis: pH, EC and TDS - Estimation of Acidity, Alkalinity - Estimation of water hardness - Estimation of DO and BOD in water samples - Estimation of COD in water samples - Effect of wastewater on plants: Germination test - Enumeration of E.coli in water sample - Energy: Biogas production from organic wastes - Assessment of Suspended Particulate Matter (SPM) - Visit to wind mill / hydro power / solar power generation units - Visit to Contaminated site and Common Effluent Treatment system - Visit to Pollution Control Board.**

## **Text Books**

1. Tyler Miller and Scot Spoolman. 2009. Living in the Environment (Concepts, Connections, and Solutions). Brooks/cole, Cengage learning publication, Belmont, USA
2. P.D. Sharma, 2009, Ecology and Environment, Rastogi Publications, Meerat, India

## **References**

1. Chiras, D.D. 2015. Environmental Science, Tenth Edition, Jones&Bartlett Learning, Burlington, MA. ISBN: 978-1-284-05705-8, 708 pages.

## **Outcome**

The students will gain expertise on the importance of ecosystems, biodiversity and its conservation.

## **8. Fundamentals of ICT**

### **(1+1) Theory**

#### **UNIT I - Computer Basics**

Introduction to Computer – Evolution and Generation of Computers - Classification of Computers – Computer Organization and Architecture - Data Representation - Memory and Storage - Input Output Media – Current Trends in Computer.

#### **UNIT II - Operating System and Software**

Introduction to Software - Categories – System Software - Evolution and Types of Operating System - Functions of Operating System - Application Software - Installation and Un-installation – Office Automation Software - Word Processing – Spread sheet - Presentation – Multimedia and its Building Blocks - Multimedia Applications – Virtual Reality – Current Trends in System and Application software's.

#### **UNIT III - Computer Networks and Internet**

Introduction to Computer Networks – Topologies – Communication Protocol – Network Devices - Introduction to Internet – Internet Applications – Internet Tools - Web Browser – Email client – Search Engines – Instant Messaging – Computer Security - Current Trends in Computer Networks and Internet.

#### **UNIT IV - Computer Programming and Languages & Database Management Systems**

Introduction to Computer Programming – Algorithm – Flowchart – Decision Tables – Pseudo code – Program Control Structures – Programming paradigms – Introduction to Programming Languages – Generation of Programming Languages - Current Trends in Computer Programming and Languages. -- Database Management Systems - Introduction to Database - Logical and Physical Data Concepts – Data Base Management System - DBMS Architecture - Database Models – Normalization Techniques – Types of Databases – Introduction to Structured Query Language – SQL Commands - Current Trends in Database Management Syst

## **Practical**

**Working with basic Computer Hardware - Number System conversion : Decimal, Binary, Octal, Hexa Decimal, Binary addition and subtraction - Conversion between bits, bytes, kilobits, kilobytes, megabits, megabytes, gigabits, gigabytes - Working with MS DOS commands - Working with Windows Operating system - Working with Linux Operating System - Working with Word Processing Software - Working with Presentation Software - Working with Spreadsheet Software - Working with Image Editing Software - Working with basic networking commands - Working with Web Browsers and Search Engines - Working with Emails - Working with Programming basics : Algorithm, Flowchart, Pseudo Code and Coding - Working with DBMS software's - Working with SQL commands.**

## **Text Books**

- 1. Pearson, Introduction to Information Technology, 2013 Second Edition, ITL Education Solutions Limited.**
- 2. Pearson, Express Learning: Introduction to Information Technology, 2012 Edition, ITL Education Solutions Limited.**

## **E- Reference**

**<http://pearsoned.co.in/ITLEducationSolutionsLimited/>**

## **Outcome**

**After completing this course the student must demonstrate the knowledge and ability to:**

**Understand and identify the integral components of a computer system.**

**Familiarize the working environment and applied knowledge of Windows Operating System 7.**

**Understand the basic computer security and gain applied knowledge of troubleshooting computer viruses.**

**Understand the basics of computer networks and gain applied knowledge of working with wired and wireless network environments.**

**Gain applied knowledge of internet, email and web access utilization.**

**Familiarize the working environment of office automation softwares and gain applied knowledge of working with Microsoft Office 2010.**

**Familiarize the fundamental programming constructs and gain applied knowledge of coding using C programming language.**

## **9. Production Technology of Field Crops (1+1)**

### **Aim**

- To acquire the basic and fundamental knowledge on the production technology of field crops**

## **THEORY**

### **Unit I - Principles of Agronomy**

**Definition of agriculture and agronomy - Factors affecting crop growth - climatic factors - tillage and tith - objective and principles - different kinds of tillage - seeds - sowing - and planting - methods - crop geometry.**

### **Unit II - Agricultural Inputs**

**Manures and fertilizers - methods of application - bio fertilizers - irrigation - principles and methods of irrigation - Weeds - principles and methods of weed management - cropping systems - monoculture and multiple cropping - inter, mixed, relay, strip and multitier cropping.**

### **Unit III - Field crops - I**

**Package of practices for important field crops - rice, maize, sorghum, finger millet and small millets. Pulses - red gram, black gram, green gram, soybean.**

### **Unit IV - Field crops – II & III**

**Package of practices for groundnut, gingelly and sunflower. -- Field crops – III - Package of practices for sugarcane and cotton.**

### **Practical**

**Study of dry land environment and identification of field crops - Study of Irrigated environment and identification of field crops - Identification of seeds, manures and fertilizers - Practicing nursery seed bed preparation in irrigated dry land - Study of primary, secondary tillage implements - Study of tools and implements special operations - Weeds - study and identification - Study of irrigation methods - Practicing intercultural operations - Working out seed rate for major field crops -Working out fertilizer requirements for major field crops - Study and identification of Agro meteorological instruments -Practicing different methods of sowing and planting - Study of growth and yield parameters and estimation of yield in major cereals and millets - Study of growth and yield parameters and estimation of yield in major pulses and oilseeds - Study of growth and yield parameters and estimation of yield in sugarcane and cotton crop.**

### **Text Books**

- 1. Rajendra Prasad. 2004. Text Book on Field Crop Production, Indian Council of Agrl. Research, New Delhi.**
- 2. Yellamanda Reddy. T and G.H Sankara Reddi. 2005. "Principles of Agronomy", Kalyani publishers, Ludhiana.**

## **E-References**

<http://icar.res.in>

[www.tnau.ac.in](http://www.tnau.ac.in)

<http://www.uasd.edu/>

<http://www.fao.org/home/en/>

<http://www.pjtsau.ac.in/>

## **Outcome**

After completing this course the student must demonstrate the knowledge in production technology of Field crops.

## **10. Physical education (0+1)**

### **Semester I & II**

Posture - exercises for good posture - Physical fitness - exercises for ability, strength co-ordination, endurance and speed - Skill development in any one of the games - Foot ball, Volley ball, Hockey, Basket ball, Cricket, Tennis, Kabaddi, Handball and Kho- Kho. Participation in one of the indoor games – Shuttle, Badminton, Chess and Table Tennis. Basic gymnastic exercises. Participation in any one of the athletic events - long Jump - High jump - Triple jump - Javelin throw - Discus throw - shot put - Hurdles - sprints and long distance running.

### **Semester III & IV**

Skill Development in major games and indoor games (continued), safety education - Movement education - Effective way of doing day-to-day activities – basic concept in Developing Camp Sites, Swimming Pools and Trekking.

### **Semester V & VI**

Coaching for major games and indoor games. Asanas and indigenous ways for physical fitness - Curative exercises - exercises and games for leisure time use and experience.

### **EVALUATION (100 Marks)**

**Attendance (60 Marks)**

**Performance in games & sports (20 Marks)**

**Behaviour (10 Marks)**

**Viva-voce (10 Marks)**

## **11. National service scheme (0+1)**

### **I Year**

Orientation – NSS origin – Motto – Symbol – NSS administration at different levels – Programme planning – Rural projects – Urban projects – Government schemes – Career guidance – Self help groups – Environment protection – Use of natural energy – Conventional energy resources – Soil and water conservation – Community health programmes – Women and child welfare – Education for all.

## **II Year**

**Popularization of agro techniques – Self employment opportunities – Animal health, dairy and poultry farming – Road safety – Training on first aid and emergency cell – Popularization of small savings – Communal harmony and national integration – Care of senior citizens – Personality development – Meditation – Yoga art of living – Activities on the preservation of national monuments, cultural heritage and folk lore – Special camp activities.**

### **Evaluation**

#### **1. Regular Activities (60 marks) I**

**Semester (15 marks)**

**II Semester (15 marks)**

**III Semester (15 marks)**

**IV Semester (15 marks)**

**Written test 10 marks and attendance 5**

**marks 80% attendance compulsory**

#### **2. Special Camping Activities (40 marks)**

**Attendance in daily activities during special camp (30 marks) Special camp activity report (5 marks)**

**Viva-voce on the 10th day of the special camp (5 marks)**

**B.Sc. (Forestry) 4year degree programme at Mulugu,  
Medak District, Telangana State.**

Sl No	Semester II	Credit Hours	No. Of hours Theory Class	No. Of hours Practical class
1.	Forest Botany	2+1	2	2.5
2.	Principles of Economics	1+1	1	2.5
3.	Agrometerology	1+1	1	2.5
4.	Practices of Silviculture	2+1	2	2.5
5.	Principles of Cytology and Genetics	2+1a	2	2.5
6.	Fundamentals of Geology and Soil Science	1+1	1	2.5
7.	Production Technology of Horticultural Crops	1+1	1	2.5
8.	Tree Seed Technology	2+1	2	2.5
9.	Study Tour – Telangana (10 days)	0+1	0	2.5

11. National Service Scheme (NSS) 0+1 Contd. Semester – II

1. Forest botany (2+1)

Aim

• To impart botanical and taxonomical skills for identification of plants particularly the tree species

Theory

**UNIT I - Botany and Systematic Classification**

Botany - introduction, definition and application in forestry. Taxonomy - Detailed study of systems of classification - Bentham and Hooker natural system, its advantages and disadvantages. Plant Nomenclature – Objectives, principles and International code of Botanical Nomenclature.

**UNIT II – GYMNOSPERMS**

Origin, geographical distribution, phylogenetic position, taxonomic description and economic importance of the flora of families of Gymnosperms viz., Taxaceae, Podocarpaceae, Pinaceae, and Cupressaceae.

**UNIT III – ANGIOSPERMS I**

Origin, geographical distribution, phylogenetic position, taxonomic description and economic importance of the flora of families of Angiosperms viz., Ranunculaceae, Magnoliaceae, Annonaceae, Sterculiaceae, Bombacaceae, Malvaceae, Bixaceae, Dipterocarpaceae, Meliaceae and Simaroubaceae

#### **UNIT IV – ANGIOSPERMS II & ANGIOSPERMS III**

Origin, geographical distribution, phylogenetic position, taxonomic description and economic importance of the flora of families of Angiosperms viz., Sapindaceae, Rhizophoraceae, Fabaceae, Combretaceae, Myrtaceae, Sapotaceae and Ebenaceae. --  
**ANGIOSPERMS III** - Origin, geographical distribution, phylogenetic position, taxonomic description and economic importance of the flora of families of Angiosperms viz., Apocynaceae, Bignoniaceae, Verbanaceae, Santalaceae, Euphorbiaceae, Moraceae, Casuarinaceae, Poaceae, Orchidaceae.

#### **Practicals**

Laboratory and field identification of important forestry species using vegetative and reproductive characteristics for the families Magnoliaceae, Annonaceae, Sterculiaceae, Bombacaceae, Bixaceae, Dipterocarpaceae, Meliaceae, Simarubaceae, Fabaceae, Combretaceae, Myrtaceae, Sapotaceae, Apocynaceae, Bignoniaceae, Verbanaceae, Santalaceae, Euphorbiaceae, Moraceae, Casuarinaceae and Poaceae – Field Visit to Tropical moist deciduous forest and Tropical dry deciduous forest for study of Angiosperms and Gene Pool Garden for identification. Field Visit to Littoral Swamp Forests, Tropical Thorn Forest and Dry Evergreen forests for study of Angiosperms.

#### **Text books**

1. Mishra, S.R. (2010). Textbook of Dendrology. Discovery Publishing House Pvt. Ltd.
2. Bhatnagar, S.P. and Alok Moitra. 2000. Gymnosperms. New age International (P) Ltd.

#### **References**

1. Datta, S.C. 1999. Systematic Botany. New Age International (p) Ltd. Publ. New Delhi, India.
2. Dasgupta, S. 1998. Systematic Botany for Foresters. Khana Bandhu Publ., New Delhi, India.

#### **E-References**

<http://www.cnr.vt.edu/DENDRO/DENDROLOGY/main.html>

<http://www.botit.botany.wisc.edu/courses/dendrology>

<http://www.metla.fi/info/vlib/Forestry/Topic/Dendrology>

<http://www.hcs.osu.edu/hcs300/gymno.htm>

<http://www.tolweb.org/angiosperms> <http://delta-intkey.com>

## **Outcome**

- Skill in identification of tree species using morphological identification keys and knowledge in economical values of tree species.

## **2. Principles of economics**

### **(1+1) Aim**

- This course aims to introduce the basic principles of economics including the problem of economic decision-making, laws of economics and macroeconomic concepts.

### **THEORY**

#### **UNIT I - Nature and Scope of Economics**

**Nature and Scope of economics: Importance, Subject matter: Science Vs. art, Positive science Vs. normative science, Deductive method Vs. inductive method -Definitions of Economics: Wealth, Welfare, Scarcity and Growth - Different economic systems: merits and demerits - Divisions of Economics - Microeconomics and Macroeconomics - Agricultural Economics: Definition and scope- Basic concepts: Goods, Service, Value, Cost, Price, Wealth and Welfare-Wants: Characteristics and classification**

#### **UNIT II -Theory of Consumption**

**Utility: Definition, Measurement: Cardinal and ordinal utility, Marginal utility- Law of Diminishing Marginal Utility and Law of Equi- marginal Utility: Definition, Assumptions, Limitations and Applications - Indifference curve analysis: Definition and properties of indifference curves and budget line - Demand: Definition, Kinds of demand, Demand schedule, Demand curve, Law of Demand, Determinants of demand, Extension and Contraction of demand Vs increase and decrease in demand-Elasticity of Demand: Types, Degrees of price elasticity of demand, Factors influencing elasticity of demand, Importance of elasticity of demand-Standard of Living: Definition, Engel's Law of Family Expenditure - Consumer surplus: Definition and Importance.**

#### **UNIT III-Theory of Production**

**Concept of production- Factors of production- Land: Characteristics of land - Labour: Characteristics of labour, Division of labour, Malthusian and Modern theories of population - Capital: Characteristics of capital, Capital formation- Entrepreneur: Characteristics and functions of entrepreneur. Supply: definition, Law of Supply, Factors influencing supply - Elasticity of Supply-Producer surplus.**

#### **UNIT IV - Exchange and Theory of Distribution & Macroeconomic Concepts**

**Exchange and Distribution: Definition -Pricing of factors of production - Marginal productivity theory of distribution - Rent and Quasi rent - Wages: Real wage and money wage - Interest: Pure interest and gross interest - Profit: Meaning of economic profit. -- Macroeconomic Concepts - Macroeconomics: Definition and Subject matter- National Income: Concepts- GNP, GDP, NNP, Disposable income and Per capita income- Money: Definition, Types and**

**functions of money - Inflation: Meaning, types of inflation - Public Finance: Meaning, Principles - Public Revenue: Meaning, Classification of taxes- Canons of Taxation - Public expenditure: Principles–Welfare Economics: Meaning, Pareto’s optimality. Practical**

**Ten principles of economics - Law of Diminishing Marginal Utility-Law of Equi-Marginal Utility - Indifference Curve analysis and consumer equilibrium - Individual and market demand-Measurement of Arc and Point elasticities of demand - own price, income and cross price elasticities of demand – Estimation of Consumer surplus– Law of Diminishing Marginal Returns: Relationship among TPP, APP and MPP - Cost concepts and graphical derivation of cost curves - Estimation of total revenue and profit - Producer surplus - Supply elasticity – Exchange: Market Structure and Price determination– Theories of Distribution –Computation of National Income –Study of structural changes in the economy - Estimation of Growth Rate -Money: Quantity theory of money - Inflation: Causes and control measures – Estimation of price index - Measures of standard of living – Indices of human development.**

#### **Text books**

- 1. Dewett, K.K. 2002. Modern Economic Theory, Syamlal Charitable Trust, New Delhi.**
- 2. Delhi.**
- 3. Samuelson, P. 2004. Economics, (18/e), Tata Mcgraw-Hill, New Delhi**
- 4. Koutsoyiannis,A. 1983.Modern Microeconomics, The Macmillan Press Ltd., Hongkong**
- 5. Varian, H. R. 1987. Intermediate Microeconomics, WW Norton & Company, New Delhi**
- 6. Seth, M.L. 2000. Principles of Economics, Lakshmi Narain Agarwal Co., Agra.**
- 7. New Delhi**

#### **References**

- 1. Dewett, K. K. 2004. Modern Economic Theory, SyamlalCharitable Trust, New Delhi.**
- 2. Mankiw, G.N., Principles of Microeconomics, Cengage Learning. Chapter 1.**
- 3. Samuelson, P. 2004. Economics, (18/e), TataMc-graw-Hill, New Delhi**
- 4. Seth, M. L. 2005.Principles of Economics, Lakshmi NarainAgarwalCo., Agra. New Delhi.**

#### **Out come**

- The student will acquire knowledge on basic principles of economics, economic decision-making, laws of economics and macroeconomic concepts.**

### **3. Agrometeorology (1+1)**

#### **Aim**

- **To gain basic knowledge on Meteorology and its scope and importance**

#### **Theory**

##### **UNIT I- Meteorology- Importance and scope**

**Meteorology - Agricultural Meteorology - Importance and scope in crop production - Co-ordinates of India and Telangana - Atmosphere - Composition and vertical layers of atmosphere (stratification) - Climate - Weather - Factors affecting climate and weather - Climatic types - Different agricultural seasons of India and Telangana – Agro- climatic regions of India and Telangana.**

##### **UNIT II - Weather parameters**

**Solar radiation - Light intensity, quality, direction and duration - Air and Soil temperature - Diurnal variation - importance in crop production. Heat unit and its importance in agriculture. Relative Humidity and its importance – vapor pressure deficit and its importance - Wind and its effect on crops.**

##### **UNIT III - Pressure systems**

**Atmospheric pressure - Pressure systems - cyclones, anticyclones, tornado, hurricane and storms - Wind systems of the world - Inter Tropical Convergence Zone. Clouds - types and their classification. Precipitation - forms - monsoon - - Seasons of India- rainfall variability drought, flood and their effect - Cloud seeding – Evapotranspiration – transpiration - PET**

##### **UNIT IV - Forecasting and impacts & Climate change**

**Agroclimatic Zones - Agroclimatic normals - Weather forecasting - synoptic chart - crop weather calendar - Remote sensing and crop weather modeling - Impact of climate and weather on crop production and pest and diseases. -- Climate change - Climate change- climate variability – definition and causes of climate change - Impact of climate change on Agriculture, Forestry, Hydrology, marine and coastal ecosystem**

#### **Practical**

**Agromet Observatory - Site selection and layout. Acquiring skill in use of Pyranometers - Sunshine recorder - Maximum, Minimum, Gross minimum and Soil thermometers – Thermograph, Dry and wet bulb thermometers - Hygrograph - Psychrometers – Fortein’s barometer - Barograph - Altimeter; Wind vane, Anemometer - Raingauge - Ordinary and self-recording; Automatic weather station - Evaporimeters - Lysimeters, Dew gauge. Preparation of synoptic charts and crop weather calendars. Rainfall probability analysis. Mapping of Agroclimatic Zones.**

### **Text books**

1. **Gopaldaswamy, N. 1994. Agricultural Meteorology, Rawat publications, Jaipur.**
2. **Kakde, J.R., 1985. Agricultural climatology, Metropolitan Book Co. Pvt. Ltd., New Delhi.**

### **References**

1. **Lenka, D. 2000. Climate, Weather and Crops in India, Kalyani Publishers, Ludhiana.**
2. **Mavi, H.S., 1996. Introduction to Agrometeorology, oxford and IBH Publishing Co., New Delhi.**
3. **Murthy, V.R.K. 1995. Practical manual on Agricultural Meteorology, Kalyani Publishers, Ludhiana.**
4. **Prasad, Rao, G.S.L.H.V. 2005. Agricultural Meteorology. Kerala Agricultural University, Press, Thrissur.**
5. **IPPC Fourth Assessment report, 2007 (<http://www.ipcc.ch>)**
6. **Radhakrishna Murthy, V. 2002. Basic Principles of Agricultural Meteorology. BS Publications Hyderabad.**
7. **Venkataraman, S., Krishnan, A. 1992. Crops and Weather. Indian Council of Agricultural Research, Pusa, New Delhi.**
8. **Yellamanda Reddy, T. and G.H. SankaraReddi, 2004. Principles of Agronomy, Kalyani Publishers, Ludhiana.**

### **Outcome**

- **The student will learn the scope and importance of meteorology as well as gain expertise on the various meteorological instruments.**

### **4. Practices of Silviculture (2+1)**

#### **Aim**

- **To impart knowledge on the techniques of regeneration, planting and tending operations**
- **To acquire knowledge on silvicultural practices for mangrove, shola forest and cold desert forests.**

#### **Theory**

#### **UNIT I -Natural regeneration**

**Forest regeneration- types-natural regeneration-definition- seeds, root suckers and coppice-ecological requirements- techniques-natural regeneration techniques for important species and forest types-regeneration survey-regeneration maps**

## **UNIT II -Artificial regeneration**

**Artificial regeneration-definition- objectives- afforestation- reforestation- reasons for artificial regeneration- choice between artificial and natural regeneration- techniques- artificial regeneration from seeds- vegetative parts- mechanization in artificial regeneration- recent trends in artificial regeneration**

## **UNIT III - Planting and maintenance**

**Site selection- pre planting survey- site preparation – spacing- staking- methods of direct sowing- aerial seeding – pitting and planting- method of planting- rules of planting – planting pattern- casualty replacement. In situ techniques of Soil and water conservation measures in planting site, mulching-protection against adverse weather conditions- grazing by domestic, protection against wild animals and fire.**

## **UNIT IV - Tending operations & Silvicultural practices**

**Tending- importance- weeding–cleaning- thinning- objectives- methods- factors-thinning cycle, intensity and regime- improvement felling- girdling- pollarding, pruning- methods- green and dry pruning- climber cutting. Practices for Management of invasive species in forests- slash disposal -- Silvicultural practices - Silvicultural practices for mangrove, shola and cold desert-Mangrove- habitat and characteristics- plantation establishment and rehabilitation of degraded mangrove formation- silvicultural systems for mangroves. Shola forest distribution. Cold desert - characteristics- species composition – management of species. Assisted regeneration. Silvicultural practices for shola regeneration - fire induced regeneration - regeneration in mangroves - degraded lands - practices for plantation trees**

### **Practical**

**Regeneration survey-regeneration stock map – techniques of obtaining natural regeneration of important species in various types of forests – estimation of plant percent for a few tree species – time schedule, preparation of plantation journal– demonstration of different mixtures – different kinds of sowing – line, strip, patch sowing and dibbling – spacing for different tree species – estimation of seed and plantation material requirement – different kinds of fence – different kinds of pit – kinds of trenches – trenches with vertical sides – trenches with slanting sides – shelved trench and double trench – trench ridges – exercise in patterns of planting – line, square, triangular and quincunx planting –estimating planting material required per unit area under different methods of planting. Demonstration of different thinning – standard tree classification adopted in Indian forestry – formulae used in mechanical thinning – grades of ordinary thinning-demonstration of different grades of thinning – light and heavy crown thinning – calculation of stand density index by different methods. Establishment and rehabilitation of degraded mangrove formations - Silvicultural systems for Tropical Dry Deciduous Forests– study about Tropical Moist Deciduous Forests.**

### **Text Books**

1. **Champion and Seth, 1968. General silviculture of India. Government of India publication.**
2. **Dwivedi, A.P.1992.Principles and practice of Indian Silviculture, Surya publication, 420p**

#### **References**

1. **Luna, R.K. 1989. Plantation Forestry in India. International Book distributors, Dehra Dun. P. 476.**
2. **Champman, G.W. and Allan, T.G. 1978. Establishment Techniques for Forest Plantation F.A.O. Forestry Paper No.8. F.A.O.Rome**
3. **Khanna, L.S. 1984. Principles and practices of silviculture Khanna Bhandu, Dehradun. P.476.**

#### **E-References**

- [www.forestryimages.org/silviculture.cfm](http://www.forestryimages.org/silviculture.cfm)
- [www.springerlink.com/index](http://www.springerlink.com/index)
- [www.ces.iisc.ernet.in](http://www.ces.iisc.ernet.in)

#### **Outcome**

**Students undergoing the course would acquire knowledge on regeneration, planting and tending operations for forest trees.**

#### **5. Principles of cytology and genetics**

##### **(2+1) Aim**

**The fundamental concepts of and Genetics Cytogenetics will be exposed to the students quoting classical examples**

##### **Theory**

##### **Unit I: Cytology**

**Brief history of developments in genetics and cytogenetics; Physical basis of heredity: Structure and function of cell and cell organelles – Differences between Prokaryotes and Eukaryotes. Cell division – mitosis, meiosis and their significance, cell cycle - zygote formation and embryo development - identical and fraternal twins. Chromosome structure, chemical composition, nucleosome, centromere, telomere, euchromatin, heterochromatin, NOR, satellite chromosome, karyotype, ideogram – chromosome banding; Types of chromosomes based on position of centromere, based on structure and function: based on the role in sex determination, normal and special chromosomes - polytene, lampbrush, Other types of chromosomes - B, ring and isochromosomes; Chromosomal aberration: Variation in chromosome structure – deletion, duplication, inversion and translocation – genetic and cytological implications; Chromosomal aberration: Variation in chromosome number – euploid, aneuploid, types of aneuploids and their origin; Nondisjunction - Klinefelter**

syndrome and Turner syndrome; Definition of eugenics and euthenics; Polyploid - auto and allopolyploids, their characters; evolution of wheat, Triticale, cotton, tobacco, Brassicas.

## **Unit II: Mendelian laws and modifications of Mendelian laws**

Pre-Mendelian ideas about heredity – Vapour and fluid theory, Magnetic power theory, Preformation theory, Lamarck's theory, Darwin's theory, Germplasm theory and Mutation theory. Mendel's experiments and laws of inheritance. Rediscovery of Mendel's work. Terminologies: gene, allele, locus, homozygous, heterozygous, hemizygous, genotype, phenotype, monohybrid, dihybrid, trihybrid, polyhybrid. Chromosomal theory of inheritance. Allelic interactions – Dominance vs. recessive, complete dominance, codominance, incomplete dominance, over dominance. Deviation from Mendelian inheritance – Non allelic interaction without modification in Mendelian ratio – Bateson and Punnett's experiment on fowl comb shape. Non allelic interaction with modification in Mendelian ratio – i.) Dominant epistasis (12:3:1) ii.) Recessive epistasis (9:3:4) iii.) Duplicate and additive epistasis (9:6:1) iv.) Duplicate dominant epistasis (15:1) v) Duplicate recessive epistasis (9:7) vi.) Dominant and recessive epistasis (13:3); Summary of epistatic ratios (i) to (vi). Lethal genes, Pleiotrophy, penetrance and expressivity, phenocopy: Multiple alleles, blood group in humans, coat colour in rabbits, self incompatibility in plants; pseudo alleles, isoalleles.

## **Unit III: Quantitative inheritance, Linkage and Crossing over**

Quantitative inheritance – Multiple factor hypothesis – Nilsson Ehle experiment on wheat kernel colour. Polygenes – transgressive segregation, comparison of quantitatively and qualitatively inherited characters; modifiers; Types of gene action controlling quantitative traits. Linkage - coupling and repulsion; Experiment on Bateson and Punnett – Chromosomal theory of linkage of Morgan – Complete and incomplete linkage, Linkage group. Crossing over – significance of crossing over; cytological proof for crossing over - Stern's experiment; Factors controlling crossing over. Strength of linkage and recombination; Two point and three point test cross. Double cross over, interference and coincidence; genetic map, physical map.

## **Unit IV: Sex determination, sex linkage and cytoplasmic inheritance & Modern concept of genetics and mutation**

Sex determination: Autosomes and sex chromosomes - chromosomal theory of sex determination - different types – sex determination in human, fowl, butterfly, grasshopper, honey bee, fumea; Sex determination in plants – Melandrium, papaya, maize. Genic balance theory of Bridges, quantitative theory, hormonal theory, barr bodies, metabolic differentiation theory; Gynandromorphs – sex reversal in chicken. Sex linked inheritance – criss cross inheritance – reciprocal difference; holandric genes; sex influenced and sex limited inheritance. Cytoplasmic inheritance and maternal effects – features of cytoplasmic inheritance, chloroplast, mitochondrial - plastid colour in *Mirabilis jalapa* - iojap gene of maize, cytoplasmic male sterility in rice, kappa particles of paramecium - plasmid and episomic inheritance. -- Modern concept of genetics and mutation - DNA, the genetic material – Griffith's experiment, experiment of Avery, McCleod and McCarthy – confirmation by Hershey and Chase; RNA as genetic material – Frankel, Conrat and Singer experiment. Structure of DNA – Watson and Crick model – Central dogma of life. Proof for semi

conservative method of DNA replication; Models of DNA replication; RNA types - mRNA, tRNA, rRNA; Genetic code, protein synthesis; Regulation of gene expression – operon model of Jacob and Monad; Structural genes and regulator genes. Cistron, muton and recon; Complementation test; exons, introns – split genes –Transposable genetic elements-Ac - Ds system in maize. Functional genomics, Metagenomics, Transcriptomics, Proteomics, Metabolomics and Phenomics. Mutation – characteristics of mutation – micro and macro mutation – CIB technique - molecular basis of mutation-Transition and transversion; major physical and chemical mutagens.

#### **Practical**

Study of microscopes – Preparation of fixatives and stains – pre treatment of materials for mitosis and meiosis – study of mitosis and meiosis. Study of genetic ratios of – monohybrid, dihybrid – incomplete dominance. Gene interaction - multiple alleles and multiple factors. Study of linkage, estimation of strength of linkage and recombination frequency in two point and three point test cross data and F2 data – Drawing of genetic map – interference and coincidence

#### **Text Books**

Daniel Sundararaj, G. Thulasidas and M.StephenDorairaj, 1997. Introduction to Cytogenetics and Plant Breeding. Popular Book Depot, Chennai –15.

Strickberger. M.W. 1996. Genetics. Prentice-Hall of India Pvt. Ltd. New Delhi.

#### **Reference**

#### **e-Books**

Heidi Chial, et al. 2009- Essentials of GeneticsNPG Education

NPG Education 2010-A Brief History of Genetics: Defining Experiments in Genetics

#### **E-Books**

Gupta P.K., 1997. Cytogenetics. Rastogi Publications, Meerut.

Pundhansingh. 2014. Elements of Genetics. Kalyani Publishers

#### **Web resources**

[www.nmsu.edu](http://www.nmsu.edu),

[www.biology200.gsu.edu](http://www.biology200.gsu.edu)

#### **Outcome**

Basic principles of inheritance and modern concepts of genetics will be exposed to students.

## **6. Fundamentals of geology and soil science**

### **(1+1) Aim**

- To impart knowledge on the geological make up and mineralogical compositions of rocks and formation of rocks and genesis of soil as well as the fundamental of soil sciences to the students

#### **Unit I – Geology and weathering**

**Geology- Origin of earth- Theories - planetesimal and nebular hypothesis - Composition of Earth's crust - Rocks - definition, formation, classification - igneous, sedimentary and metamorphic rocks- Minerals - definition, occurrence, classification of important soil forming primary minerals - silicate and non silicate minerals, ferro and non-ferro magnesium minerals- Geological classification of rocks and minerals- weathering of rocks and minerals-Physical, chemical and biological weathering .**

#### **Unit II – Soil formation**

**Soil formation –soil forming factors-active and passive-soil forming process- Fundamental soil forming process - Simenson's fourfold soil forming process - eluviation, illuviation, translocation and humification- Specific Soil forming processes - podzolization, laterization, salinization, alkalization, calcification, decalcification and pedoturbation- soil profile - Master horizons - pedon and poly pedon**

#### **Unit III – Soil physical properties**

**Soil Physical Properties and their significance- Soil texture - Soil texture - particle size distribution - textural classes - textural triangular diagram - -Soil structure - classification - significance of soil structure - Soil consistency - cohesion, adhesion, plasticity, Atterberg's constants - upper and lower plastic limits, plasticity number- significance of soil consistence - Soil bulk density, particle density and porosity - Soil Colour - Munsell notations - Soil air - composition - Soil temperature - Soil water-measurement.**

#### **Unit IV – Soil chemical properties & Soil Biological properties**

**Soil colloids-properties- inorganic colloids and organic colloids - Layer silicate clays - genesis and classification - 1:1, 2:1 expanding and non expanding - 2:2 clay minerals, amorphous minerals -Ion exchange –CEC-AEC-Base saturation-soil pH- definition, pH scale, buffering capacity - Significance -EC- definition-measurement. -- Soil Biological properties - Soil organic matter-composition-decomposition-mineralization- immobilization humus formation- Carbon cycle, C : N ratio, biomass carbon and nitrogen -soil organism - soil flora and fauna -- earth worms - micro- organisms and their influence on soil properties beneficial and harmful effects-soil enzymes- Dehydrogenase, catalase and phosphatase.**

#### **Practical**

**Identification of rocks and minerals - Study of soil profile - collection and processing of soil samples -Determination of bulk density, particle density and porosity - Particle size analysis - Feel method -International pipette method - Soil colour - Munsell colour chart- Soil moisture determination -Gravimetric method, gypsum block, tensiometer, TDR and neutron**

probe moisture meter. Determination of infiltration rate and hydraulic conductivity - Soil temperature. Soil pH and EC - Organic carbon -Chemical constituents of soil - Field study of different soil types.

#### **Text Books**

1. Biswas, T.D and S.K.Mukherjee, 1994. Textbook of Soil Science, second edition, Tata McGraw-Hill Publishing Company Ltd, New Delhi.
2. Brady, N.C. and R.R.Weil. 2002. Nature and Properties of Soil. 13<sup>th</sup> edition. The Mac Millan Company, New York. Indian Publisher-Pearson Education, (Singapore) Pte.Ltd., Indian Branch, New Delhi.
3. Negi,S.S. 1993. Forest Geology and Soils. Periodical Expert Book Agency, New Delhi. 4.

Dilip Kumar Das, 2001. Introductory Soil Science. Kalyani Publishers, New Delhi.

#### **Further Readings**

1. Sehgal, J. 1996. Pedology – Concepts and applications, Kalyani Publishers, Ludhiana.
2. Sekhon, G.S., P.K.Chhonkar, D.K.Das, N.N.Goswami, G. Narayanasamy, S.R.Poonia, R.K.Rattan and J.L.Sekhal, 2002. Fundamentals of Soil Science, Indian Society of Soil Science, New Delhi.
3. Shivanand tolanur, 2004. Fundamentals of Soil Science. First edition. Army Printing Press, Lucknow.

#### **Web Sites**

<http://geology.com/>

Rocks and minerals

<http://jersey.uoregon.edu/>

[www.opleidingen.ugent.be/](http://www.opleidingen.ugent.be/)

#### **Outcome**

Students gain experience in identifying the type of rocks and their mineralogical composition and its economical importance. They also gain knowledge on principles of soil science, soil formation and physical and chemical properties of soil.

#### **7. Production technology of horticultural crops**

##### **(1+1) Aim**

- To familiarize the production aspects of horticultural crops of commercial importance.

#### **Theory**

##### **UNIT I - Production Technology of Vegetable Crops**

Introduction to Horticulture- Divisions, scope and importance- classification of horticultural crops - Nutritive value - Soil, climate, seeds, sowing, transplanting, intercultural operations, role of growth regulators, plant protection and harvesting of solanaceous vegetables (tomato, brinjal and chillies); vegetable cowpea, cluster beans and bhendi .

##### **UNIT II - Production Technology of Fruit Crops**

**Production technology of fruit crops- soil, climate, propagation, varieties, planting, training and pruning, aftercare, plant growth regulators, plant protection and harvesting of mango, amla, custard apple, ber, jamun and tamarind.**

### **UNIT III - Production Technology of Spices**

**Production technology of major spices - climate, soil, propagation, varieties, planting, intercultural operations, plant protection, harvesting and processing of black pepper, cardamom, cinnamon, clove, nutmeg and allspice.**

### **Unit IV - Production Technology of Plantation Crops and Medicinal and Aromatic Plants**

**Production technology of major plantation crops - climate, soil, propagation, varieties, planting, intercultural operations, plant protection, harvesting and processing of tea, coffee, rubber and cashew. -- Production Technology of Medicinal and Aromatic Plants - Production technology of major medicinal and aromatic plants - climate, soil, propagation, varieties, planting, intercultural operations, harvesting and uses of senna, periwinkle, glory lilly, medicinal coleus, palmarosa and citronella grass.**

#### **Practical**

**Layout of fruit orchard and kitchen garden - Visit to orchard and medicinal plants unit, for identification of crops- Nursery management - fertilizer application and irrigation to horticultural crops - Use of plant growth regulators in horticultural crops – Special horticultural techniques - training, pruning, mulching, staking etc. - Description of varieties/hybrids -maturity indices in vegetable and fruit crops - Study of post harvest techniques to enhance shelf-life of horticultural crops – Identification of varieties and special horticultural techniques in production of major spices and plantation crops - Extraction of medicinal products and quality standards-Distillation of essential oil from aromatic plants-Visit to State Horticultural Farm to the study different tree spices.**

#### **Text Books**

- 1. Kumar, N., M.D. Abdul Khader, P.Rangaswami and I. rulappan.1997 Introduction to Spices, Plantation Crops, Medicinal and Aromatic Plants \_ Oxford & IBH, New Delhi.**
- 2. Veerarghavathatham, D., M.Jawaharlal, S.Jeeva and S.Rabindran. 1996. Scientific fruit Culture. Suri Associates, Coimbatore.**

#### **References**

- 1. Bose,T.K., M.K.Som and J.Kabir. 1993. Vegetable crops. Naya Prakash, Calcutta.**
- 2. Preece,J.E. and P.E Read. 2005.The Biology of Horticulture : An Introductory Text book,second edition. John Wiley and Sons, New York,NY**

3. Singh, N.P. 2004. Basic concepts of vegetable science. IBDC publishes, Lucknow.
4. Bose. T.K, S.K.Mitra and D.Sanyal (Editors) 2002. Fruits: Tropical and Subtropical Vol.2 Nayaudyog, publications Calcutta.
5. Kumar, N.1997. Introduction to Horticulture. Rajhalakshmi Publications, Nagercoil.

#### E-References

<http://www.horticulture.com.au/export/hmac.asp>

[http://www.horticultureworld.net/hort\\_india.htm](http://www.horticultureworld.net/hort_india.htm)

<http://www.floriculture.com>

<http://www.herbs.org>

#### Outcome

The student will gain knowledge in production technology of horticultural crops.

#### 8. Tree seed technology

##### (2+1) Aim

- To impart knowledge on production, collection, processing, quality control and storage of tree seeds and its application in production and conservation of forests.

#### Theory

##### UNIT I – Concept and methods in seed production

Seed and its importance - characteristics of good quality seed and its significance in propagation and establishment of plantations- seed formation in gymnosperm and angiosperm - Generation system of seed multiplication - and their quality control-Influence of agro-climatic factors viz., environment, edaphic, biotic and physiographic factors - provenance and seed source on tree seed production and quality-Effect of pollution on seed quality - air, industrial wastes, acid rain and water effluents on tree seed production-Selection of seed production areas and establishment of seed orchard - merits and demerits - identification of candidate, check, plus and elite trees -Management of seed production area and seed orchard - special treatments to enhance tree seed production - pollen dilution zone- Pollen management and handling – viability testing

##### UNIT II – Seed Collection, processing and treatment

Events of Seed development and maturation - Physiological and Harvestable maturity – significance - maturity indices and its types-methods of seed harvesting - - merits and demerits - harvesting appliances and their uses- seed extraction – extraction techniques for

different tree species – precautions- seed drying- principles and methods - factors influencing drying - mechanical injury - causes and assessment -seed processing - objectives - principles and sequence -processing equipments –their operating principles-seed dormancy - -methods for breaking seed dormancy in tree species -pre sowing seed treatment - principle and methods - seed fortification with seed hardening - seed priming. IDS and Prevac -seed pelleting and coating - applications in tree seeds

### **UNIT III – Seed legislations and regulatory framework**

Certification procedure for tree seeds - classes of seed stand - standards - seed certification programme in forestry (OECD) –The Seeds Act and Rules - composition and role of Central Seed Committee and its Sub- Committee i.e. Central Sub - Committee on Crop Standards, Release and Notification of varieties - State Seed Sub – Committee-Seeds (Control) Order, 1983 - Labelling standards - New Policy on seed development, 1988 - salient features of Seed Bill 2004-Central Seed Testing Laboratory cum Referral Laboratory and Notified Seed Testing Laboratories - Seed Inspector - duties and responsibilities - offences and penalties

### **UNIT IV – Seed Testing & Seed Storage -**

Seed sampling methods and types of samples - dividing and mixing and obtaining working samples-purity analysis in tree seeds - procedure for separating purity fractions, weighing and reporting results - purity work board, blower-seed moisture estimation - principle and methods - equipments - reporting results-Germination test – media - methods – requirements -equipments - seedling evaluation – categories - - essential parameters-tolerance and reporting results- seed viability – TZ- Hydrogen peroxide and embryo excised test -Seed viability vs vigour - Seed vigour concepts and its importance - principles and methods of seed vigour testing in tree crops-X-ray - radiographic analysis - principle and procedure – application in tree seeds - Seed health testing in different tree seeds - seed-borne diseases-International organizations in seed quality regulation- trading - pre and post entry Quarantine measures – phytosanitary certificate -- Seed storage – behaviour of orthodox and recalcitrant seeds - principles - purpose and types of storage-factors affecting seed storage - Role of seed moisture - temperature and relative humidity on seed storage - controlled seed storage –types of storage container and structures - godown sanitation – fumigation-mid-storage correction treatments for tree seeds

### **Practical**

Identification and study of external and internal structures of tree seeds - seed maturity indices to assess the harvestable maturity - Visit to Seed production area and Seed orchard -planning seed collection in tree crops -Methods of seed collection and equipments-Practicing seed extraction in economically important tree species-practicing the methods of breaking dormancy in tree seeds- practicing seed fortification, hardening and seed priming - practicing seed pelleting technology - seed sampling , mixing and dividing- conducting physical purity analysis - determination of seed moisture content -conducting seed - germination tests and seedling evaluation - conducting Tetrazolium test for seed viability assessment - conducting seed vigour tests and vigour evaluation - visit to Seed certification department and Seed testing laboratory

## **Text Books**

1. Agarwal, P.K. and Dadlani, M. 1988. Techniques in Seed Science and Technology South Asia Publishers, New Delhi, India.
2. Copeland, L.O and N.B.McDonald.1995. Principles of Seed Science and Technology. Chapman and Hall, New York, USA.

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1. FRI, Dehradun .2003. A handbook for testing Indian tree seeds. ICFRE publication
2. Ram Prasad and Kandya, R.K. 1992. Handling of Forestry Seeds in India. Associated Publishing Co., New Delhi, India
3. Schmidt, L. 2000. Guide to Handling of Tropical and Sub Tropical Forest Seeds. Danida Forest Seed Centre, Denmark.
4. Umarani, R and Vanangamudi, K. 2004. An Introduction to Tree Seed Technology. International Book Distributers, Dehradun, India.
5. Faulkner, R. 1975. Seed Orchards. Her Majesty's Stationary Office. London.
6. Gordon, A.G., Gosling, P. and Wang, B.P.S. 1991. ISTA handbook on tree and shrub seed testing . ISTA publication
7. Khullar P. 2003. Forest Seed. ICFRE Publication, Dehradun, India.
8. Mittal, R.K., Anderson, R.L. and Mathur, S.B.1990. Micro-organisms associated with tree seed. World checklist. ISTA publication
9. Napier, I. and Robbins, M. 1986. Forest Seed and Nursery Practices in Nepal,. U.K Forestry Research Project, Katmandu.
10. Neergard, P. 1977. Seed Pathology. The MacMillan Private Limited.
11. Nema, N.P. 1989. Principles of Seed Certification and Testing. Allied Publishers Private Ltd., New Dehili.
12. Poulsen, K., Parratt, M. and Gosling, P. 1998. Handbook on tropical and sub-tropical tree seed testing. ISTA publication
13. Tunwar, N.S and Singh, S.V. 1988. Indian Minimum Seed Certification Standards. Central Seed Certification Board, New Delhi.
14. Willan, R.L. 1985. A Guide to Forest Seed Handling, FAO, Forestry Paper 20/2, FAO Rome.

## **E-References**

- <http://www.fao.org/>
- <http://www.for.gov.ac.ca>
- <http://www.forestry.gov.uk>
- <http://www.ias.ac.in>
- <http://web.icppgr.fao.org/>

- <http://www.sciencedirect.com>
- <http://www.seedbiology.de>

#### **Out Come**

- **Acquirement of technical skills on quality seed production, processing and quality control of tree seeds.**

#### **9. Study tour to Telangana (0+1)**

**Visit to Godavari Basin Forest areas- Forest types- Afforestation activities- Visit to Kawal Tiger Reserve – Wildlife habit management works – Visit to SCCL afforestation activities – Visit to ITDA Utnoor – Visit to Eturu Nagaram – Visit to Krishna Basin Forest Areas – Forest Types – Afforestation- activates- APFDC woks, ITC – paper mills works – Amrabad Tiger Reserve – NZP. Composite wood industry – Urban Forestry Works.**

#### **10. Physical Education 0+1 Contd.**

#### **11. National Service Scheme (NSS) 0+1 Contd.**