



वन जैव विविधता संस्थान  
INSTITUTE OF FOREST BIODIVERSITY  
भारतीय वानिकी अनुसंधान एवं शिक्षा परिषद



Indian Council of Forestry Research and Education

(An autonomous body under Ministry of Environment, Forest & Climate Change, Government of India)

Dulapally, Kompally S.O., Hyderabad – 500 100

Phone: 040-66309500, Fax: 040-66309521, e-mail: director\_ifb@icfre.org, website: <http://ifb.icfre.gov.in>

No.1-156/IFB/TA/2019-20/1157

Dated: 20<sup>th</sup> February, 2020

**RECRUITMENT NOTIFICATION**

Applications are invited from the citizens of India who fulfill the requisite qualifications mentioned below in the prescribed format for the following posts. These posts carry all India transfer liability in ICFRE institutes/Centre:

Sl. No.	Name of the Post	7 <sup>th</sup> CPC pay level	No. of Vacancies	Eligibility Qualification			Age limit as on 20.04.2020 (i.e the last date of receipt of applications)
				UR	OBC	SC	
1	Technical Assistant ( Field/Lab Research)	Pay Matrix Level-5 ( 29200-92300) of 7 <sup>th</sup> CPC	1 No.	1	-	-	Not below 21 years or exceeding 30 years
2	Technical Assistant ( Field/Lab Research)		3 Nos.	1	1	1	
3	Technical Assistant ( Field/Lab Research)		1 No.	-	1	-	
4	Technical Assistant ( Field/Lab Research)		1 No.	1	-	-	

**Important Note:**

**Age Limit:** Not below 21 years or exceeding 30 years. The upper age limit is relaxed by 5 years for SC/ST, 3 years for OBC. **No age relaxation will be allowed to SC/ST/OBC candidates applying against the unreserved posts.**

## **General Instructions:**

1. Mere fulfilling of the minimum qualification and experience requirements shall not vest any right in the candidate for being called for written examination.
2. All the applications received within due date in response to this advertisement shall be considered for short-listing by a Screening Committee and only the candidate recommended by the screening committee will be called for, for appearing in the written examination. The decision of the Director, IFB on short-listing will be final and no correspondence will be entertained in this regard.
3. If a candidate applies for more than one post, his/her application will be rejected. Applicant must choose only one subject where he/she is most suited.
4. For each post specific qualification is required. Therefore, your candidature is considered for only one post for which you are most eligible and in which you have appeared for the exam. Therefore, specify the subject in which you would like to appear for the exam.
5. The envelope containing the application should be superscripted as "**Application for the Post of \_\_\_\_\_ and S. No. of the post \_\_\_\_\_**". The envelope without superscription of the post applied for will not be entertained for further scrutiny.
6. Govt. servants applying for the above posts should forward their applications "**Through Proper Channel**" and should enclose "**No objection Certificate**" obtained from their appointing authority. They may send an advance copy of the application by the due date, if they so desire. The forwarding authority should ensure that in the event of selection of the official, he/she should be in a position to relieve/spare the official within the time specified in the offer of appointment.
7. **Application fee: Non-refundable** Demand Draft of Rs.300/- (Rupees Three Hundred only) drawn from any nationalized Bank in favour of the "**Director, Institute of Forest Biodiversity**" payable at **Hyderabad** should be enclosed along with application. No other mode of payment of application fee is acceptable. However, **SC/ST/Women candidates are exempted from payment of application fee as per Govt. of India guidelines.**
8. The application duly completed in all respects shall be submitted along with the **self-attested photocopies of certificates of educational and technical qualification, age proof, claim of belonging to SC/ST/OBC & experience** etc.
9. The candidates are required to send **TWO additional and identical photograph separately** along with application form, with their name written in capital letters, name of the post on the reverse of the photographs.

**10. Application will be liable for rejection due to reasons such as:**

- i. Incomplete or not submitted in prescribed format.
  - ii. Unsigned/undated/without photograph (including additional photos)
  - iii. Without proper certificate (prescribed by DoPT) in respect of SC/ST/OBC.
  - iv. Under aged/over aged candidates.
  - v. Not possessing the requisite educational qualification at the time of submitting applications
  - vi. Educational qualification from non-recognized institutions.
  - vii. Application received after due date.
  - viii. Application without prescribed fee.
  - ix. Any other like mutilated or damaged applications/documents, etc.
  - x. Certified copies of testimonial not enclosed.
  - xi. Application for more than one post in single application.
11. Short-listed candidates for the all the posts will be informed the Date, Time and venue for written examination separately. It will also be hosted in the Institutes website.
12. The crucial date for determining the age limit shall be the last date for receipt of applications i.e. **20<sup>th</sup> April ,2020**
13. Interested/eligible candidates may submit their applications to "**The Director, Institute of Forest Biodiversity, Dulapally, Kompally S.O., Hyderabad – 500 100' THROUGH POST ONLY** so as to reach on or before **20<sup>th</sup> April, 2020**, which would also be the crucial date for determining the age limit.
14. This institute shall not be responsible for **any postal delay** or loss during the postal transit.
15. The candidates selected on direct recruitment will be governed by the provisions of the New Pension Scheme introduced by the Govt. of India w.e.f. 01-01-2004.
16. Relaxation in upper age limit is applicable as per the norms of Govt. of India to the employees already working in central government departments. No upper age limit for the officials already working in ICFRE and its Institutes/Centres.
17. No correspondence and interim enquiries will be entertained in any manner.
18. Canvassing in any form by the applicant will disqualify his/her candidature.
- 19. The Director, IFB, Hyderabad reserves the right to increase or decrease the posts or not to fill up any or all the advertised posts without assigning any reason.**
20. Legal disputes if any shall be subject to the jurisdiction of the Competent Court at Hyderabad.

## **Syllabus for Examination:**

**1. Technical Assistant:** There will be an objective questions paper comprising 100 multiple choice questions in total from different subjects or recruitment of Technical Assistant. Duration of examination will be 03 hours. The details of each subject and carrying MCQ are as follows:

General awareness & Reasoning	-	20 Marks
General English & General Science	-	20 Marks
Arithmetic's	-	20 Marks
Technical (Optional Subjects)	-	40 Marks
<b>Total No. of Questions</b>	<b>-</b>	<b>100 Marks</b>

### **Note:**

1. Each correct answer will carry one mark. 1/4<sup>th</sup> mark will be deducted for each incorrect/wrong answer.
2. In case of equal marks/ tie up marks in the written examination, general rules will be followed to finalize the merit list.

Sd/-  
Director  
Institute of Forest Biodiversity  
Hyderabad



वन जैव विविधता संस्थान  
INSTITUTE OF FOREST BIODIVERSITY  
भारतीय वानिकी अनुसंधान एवं शिक्षा परिषद

Indian Council of Forestry Research and Education

(An autonomous body under Ministry of Environment, Forest & Climate Change, Government of India)

Dulapally, Kompally S.O., Hyderabad – 500 100

**FORMAT OF THE APPLICATION FORM**

Application for the post of \_\_\_\_\_

Advertisement No. \_\_\_\_\_

1. Amount of Application Fee : Rs. \_\_\_\_\_ DD No. \_\_\_\_\_ Date: \_\_\_\_\_

Name of the Bank \_\_\_\_\_

2. Name of the Applicant (in Block Letters): \_\_\_\_\_

3. Fathers/Husband Name : \_\_\_\_\_

4. Date of Birth : \_\_\_\_\_

5. Age as on **20.04.2020** : Years \_\_\_\_\_ Months \_\_\_\_\_ Days \_\_\_\_\_

6. Nationality : \_\_\_\_\_

7. Whether SC/ST/OBC/PWD (Specify) : \_\_\_\_\_

8. Sex (Male/Female) : \_\_\_\_\_

9. Address for correspondence : \_\_\_\_\_  
\_\_\_\_\_

10. Mobile No./e-mail address : \_\_\_\_\_

11. Aadhar No. : \_\_\_\_\_

12. Educational Qualifications :

Exam Passed	Year	Board/University

13. Experience if any : \_\_\_\_\_

14. I hereby declare that the above information is correct to the best of knowledge and belief that nothing has been concealed or distorted. If any time, I am found to have concealed/distorted any material information, my appointment shall be liable for termination.

Affix self-attested passport size photograph

Place:  
Date:

Signature of the Candidate  
Name:

**(in the case of Govt. employees)**

Certificate to be furnished by the Employer/Forwarding Authority certified that:

- i. The particulars furnished by Shri/Kum./Smt. \_\_\_\_\_ are correct.
- ii. There is no vigilance/ disciplinary case either pending or contemplated against him/her.
- iii. Integrity of the applicant is certified.
- iv. Photocopies of the up-to-date ACRs, attested by an officer or below the rank an Under Secretary to the Govt. of India are enclosed.

Date: \_\_\_\_\_ (Signature of the Head of Department/Forwarding Authority)

Department/Office with seal

Telephone No.

**OBC CERTIFICATE FORMAT FORM OF CERTIFICATE TO BE PRODUCED BY OTHER  
BACKWARD CLASSES APPLYING FOR APPOINTMENT TO POSTS / ADMISSION TO  
CENTRAL EDUCATIONAL INSTITUTES (CEIs), UNDER THE GOVERNMENT OF INDIA**

“This certificate MUST have been issued on or after 1<sup>st</sup> April 2018.”

This is to certify that Shri/Smt./Kum. \_\_\_\_\_ Son/Daughter of  
Shri/Smt. \_\_\_\_\_ of Village/Town \_\_\_\_\_  
District/Division \_\_\_\_\_ in the \_\_\_\_\_ State belongs to  
the \_\_\_\_\_ Community which is recognized as a backward class under:

- (i) Resolution No. 12011/68/93-BCC(C) dated 10/09/93 published in the Gazette of India Extraordinary Part I Section I No. 186 dated 13/09/93.
- (ii) Resolution No. 12011/9/94-BCC dated 19/10/94 published in the Gazette of India Extraordinary Part I Section I No. 163 dated 20/10/94.
- (iii) Resolution No. 12011/7/95-BCC dated 24/05/95 published in the Gazette of India Extraordinary Part I Section I No. 88 dated 25/05/95.
- (iv) Resolution No. 12011/96/94-BCC dated 9/03/96.
- (v) Resolution No. 12011/44/96-BCC dated 6/12/96 published in the Gazette of India Extraordinary Part I Section I No. 210 dated 11/12/96.
- (vi) Resolution No. 12011/13/97-BCC dated 03/12/97.
- (vii) Resolution No. 12011/99/94-BCC dated 11/12/97.
- (viii) Resolution No. 12011/68/98-BCC dated 27/10/99.
- (ix) Resolution No. 12011/88/98-BCC dated 6/12/99 published in the Gazette of India Extraordinary Part I Section I No. 270 dated 06/12/99.
- (x) Resolution No. 12011/36/99-BCC dated 04/04/2000 published in the Gazette of India Extraordinary Part I Section I No. 71 dated 04/04/2000.
- (xi) Resolution No. 12011/44/99-BCC dated 21/09/2000 published in the Gazette of India Extraordinary Part I Section I No. 210 dated 21/09/2000.
- (xii) Resolution No. 12016/9/2000-BCC dated 06/09/2001.
- (xiii) Resolution No. 12011/1/2001-BCC dated 19/06/2003.
- (xiv) Resolution No. 12011/4/2002-BCC dated 13/01/2004.
- (xv) Resolution No. 12011/9/2004-BCC dated 16/01/2006 published in the Gazette of India Extraordinary Part I Section I No. 210 dated 16/01/2006.
- (xvi) Resolution No. 12015/2/2007-BCC dated 18/08/2010.
- (xvii) Resolution No. 12015/2/2007-BCC dated 11/10/2010.
- (xviii) Resolution No. 12015/13/2010-BC-II dated 08/12/2011.
- (xix) Resolution No. 12015/05/2011-BC-II dated 17/02/2014.
- (xx) Resolution No. 12011/6/2014-BC-II dated 07/12/2016.

Shri/Smt./Kum. \_\_\_\_\_ and/or his family ordinarily reside(s) in the  
\_\_\_\_\_ District/Division of \_\_\_\_\_ State. This is also to  
certify that he/she does not belong to the persons/sections (Creamy Layer) mentioned in Column 3 of the  
Schedule to the Government of India, Department of Personnel & Training O.M. No. 36 012/22/93-  
Estt.(SCT) dated 08/09/93 which is modified vide OM No. 36033/3/2004 Estt.(Res.) dated 09/03/2004.

Dated:

District Magistrate/ Deputy Commissioner, etc.

Seal

NOTE: (a) The term ‘Ordinarily’ used here will have the same meaning as in Section 20 of the  
Representation of the People Act, 1950.

(b) The authorities competent to issue Caste Certificates are indicated below:

(i) District Magistrate / Additional Magistrate / Collector / Deputy Commissioner / Additional  
Deputy Commissioner / Deputy Collector / First Class Stipendiary Magistrate / Sub-Divisional

magistrate / Taluka Magistrate / Executive Magistrate / Ex tra Assistant Commissioner (not below the rank of Ist Class Stipendiary Magistrate).

(ii) Chief Presidency Magistrate / Additional Chief Presidency Magistrate / Presidency Magistrate.

(iii) Revenue Officer not below the rank of Tehsildar and

(iv) Sub-Divisional Officer of the area where the candidate and / or his family resides.

**SC/ST CERTIFICATE FORMAT FORM OF CERTIFICATE TO BE PRODUCED BY A  
CANDIDATE BELONGING TO SCHEDULED CASTE OR SCHEDULED TRIBE**

This is to certify that Shri/Smt./Kum. \_\_\_\_\_  
Son/Daughter of Shri \_\_\_\_\_ of village/Town \_\_\_\_\_ in  
District/ Division \_\_\_\_\_ of the State/Union Territory  
\_\_\_\_\_ belongs to the \_\_\_\_\_ caste/Tribe, which is  
recognized as a Schedule Caste/Scheduled Tribe under.

\* The Constitution (Scheduled Castes) order, 1950. \* The Constitution (Scheduled Tribes) order, 1950.

\* The Constitution (Scheduled Tribes) (Union Territory) order, 1951.

\* The Constitution (Scheduled Castes)(Union Territory ) order, 1951. (As amended by the Scheduled Castes and Scheduled Tribes (Modification) Order 1956, the Bombay Reorganization Act, 1960, the Punjab Reorganization Act, 1966, The State of Himachal Pradesh Act, 1970, the North Eastern Areas (Reorganization Act, 1971) and the Scheduled Castes and Scheduled Tribes orders (Amendment) Act, 1976.), the state of Mizoram Act, 1986, the state of Arunachal Pradesh Act, 1986 and the Goa, Daman and Diu (Reorganization) Act, 1987.)

\* The constitution (Jammu & Kashmir) Scheduled Caste Order, 1956;

\* The Constitution (Andaman and Nicobar Islands) Scheduled Tribes, 1959, as amended by the Scheduled Castes and Scheduled Tribes orders (Amendment) Act. 1976;

\* The Constitution (Dadra and Nagar Haveli) Scheduled Castes Order 1962;

\* The Constitution (Dadra & Nagar Haveli) Scheduled Tribes Order, 1962;

\* The Constitution (Pondichery) Scheduled Castes Order, 1964;

\* The Constitution (Uttar Pradesh) Scheduled Tribes Order, 1967;

\* The Constitution (Goa, Daman &Dieu) Scheduled Castes Order, 1968;

\* The Constitution (Goa, Daman &Dieu) Scheduled Tribes Order,1968;

\* The Constitution (Nagaland) Scheduled Tribes Order, 1970;

\* The Constitution (Sikkim) Scheduled Castes Order, 1978;

\* The Constitution (Sikkim) Scheduled Tribes Order, 1978;

\* The constitution (Jammu & Kashmir) Scheduled Tribes Order, 1989;

\* The Constitution (Scheduled Castes) Orders (Amendment) Act, 1990;

\* The Constitution (Scheduled Tribes) Order, (Amendment) Ordinance, 1991;

\* The Constitution (Scheduled Tribes) Order, (Second Amendment) Act, 1991;

\* The Constitution (Scheduled Tribes) Ordinance, 1996;

\* The Constitution (Scheduled Castes) order (Amendment) Act 2002;

\* The Constitution (Scheduled Castes) order (Second Amendment) Act 2002;

\* The Scheduled Castes and Scheduled Tribes orders (Amendment) Act 2002;

2. Applicable in the case of Scheduled Castes, Scheduled Tribes persons who have migrated from one State/Union Territory Administration. This certificate is issued on the basis of the Scheduled Castes/ Scheduled tribes certificate issued to Shri/Shrimati \_\_\_\_\_ Father/mother \_\_\_\_\_ of Shri/Srimati/Kumari\* \_\_\_\_\_ of village/town\* \_\_\_\_\_ in District/Division\* \_\_\_\_\_ of the State/Union Territory\* \_\_\_\_\_ who belong to the \_\_\_\_\_ Caste/Tribe which is recognized as a Scheduled Caste/Scheduled Tribe in the State/Union Territory\* issued by the \_\_\_\_\_ dated \_\_\_\_\_.

3. Shri/Shrimati/Kumari and /or \* his/her family ordinarily reside(s) in village/town\* \_\_\_\_\_ of \_\_\_\_\_ District/ Division\* \_\_\_\_\_ of the State/Union Territory of \_\_\_\_\_

Place \_\_\_\_\_

Date \_\_\_\_\_

Signature \_\_\_\_\_

Designation \_\_\_\_\_

(With seal of Office)

NOTE: - The terms ordinarily reside(s) used here will have the same meaning as in Section 20 of the Representation of the People Act, 1950. SC Certificate issued from Maharashtra State must be validated by Social Welfare Department and ST Caste certificate must be validated by Tribal Development Department of Maharashtra Government.

**LIST OF AUTHORITIES EMPOWERED TO ISSUE CASTE/TRIBE CERTIFICATE:**

1. District Magistrate/Additional District Magistrate/Collector/Deputy Commissioner /Additional Deputy Commissioner/Dy. Collector/ 1st Class Stipendiary Magistrate/Sub Divisional Magistrate/Extra Assistant Commissioner/Taluka Magistrate/Executive Magistrate.
2. Chief Presidency Magistrate/Additional Chief Presidency Magistrate/Presidency Magistrate.
3. Revenue Officers not below the rank of Tahsildar.
4. Sub-Divisional Officers of the area where the candidate and/or his family normally resides.

General Syllabus for Entry-Level post of  
Category-II Technical Assistant pay level 5 of 7th CPC Pay Matrix

To be used against General Awareness & Reasoning, General English & General Science and Arithmetic of framework elaborated at Para 2.2 of Appendix - XI of ICFRE TSR - 2013 for all functional Groups viz. Field/Lab Research, Maintenance, Workshop, General Service and Para Medical)

A. General Awareness & Reasoning (20 MCQ):

i) General Awareness:-

Questions in this component will be aimed at testing the candidate's general awareness of the environment around him and its application to society. Questions will also be designed to test knowledge of current events and of such matters of everyday observation and experience in their scientific aspects as may be expected from an educated person. The test will also include questions relating to India and its neighbouring countries especially pertaining to history, culture, geography, economic scene, general policy and scientific research etc. These questions will be such that they do not require a special study of any discipline.

ii) Reasoning:-

Questions of reasoning would include questions of both verbal and non-verbal type. This component will include questions of analogies, similarities and differences, spatial visualization, spatial orientation, problem solving, analysis, judgment, decision making, visual memory, discrimination, observation, relationship concepts, arithmetic reasoning, verbal and figure classification, arithmetical number series, non-verbal series, coding and decoding statement, conclusion, syllogistic reasoning etc.

B. General English & General Science (20 MCQ)

i) General English:-

Questions in this component will be designed to test the candidate's understanding and knowledge of english language and will be based on spot the error, fill in the blanks, synonyms, antonyms, spelling/detecting misspelled words, idioms & phrases, One word substitution, improvement of sentences, Active/Passive Voice of Verbs, conversion into direct/indirect narration, comprehension Passage etc.

ii) General Science:-

Basic understanding of science expected of a high school student

C. Arithmetic (20 MCQ)

The questions will be designed to test the ability of appropriate use of numbers and number sense of the candidate. The part will include questions on problems relating to number system, computation of whole numbers, decimals and fractions, relationships between numbers, fundamental arithmetical operations, percentage, ratio and proportion, average, interest, profit and loss, discount, use of tables and graphs, mensuration time and distance ratio and time etc.

## Syllabus of Agriculture

### AGROMETEOROLOGY

Elements of Weather-rainfall, temperature, precipitation, humidity, wind velocity, Sunshine weather forecasting, climate change in relation to crop production.

### AGRONOMY

Agronomy as a science and its scope, plant growth and development, environmental effects on crop growth, ideal plant type, tillage seed quality, sowing, crop density and spatial arrangement, crop nutrition, organic manures and fertilizers, irrigation and drainage, weed management, distribution of crops, cropping system, selection of crops and varieties for multiple cropping, crop yield contributing character; Organic farming concept, practices and scope in India; Crop production in dry lands, salt affected, acidic, flood affected, waterlogged and eroded areas.

### CROP PHYSIOLOGY

Plant cell-an introduction, laws of thermodynamics, diffusion and osmosis, the concept of water potential, cell water relations, absorption of water, transpiration, stomatal physiology, ascent of sap, ion uptake and metabolic utilization of mineral ions, deficiencies of mineral ions in plants, photosynthesis, respiration, fat metabolism, physiology of growth and development, growth regulators, physiological parameter influencing the productivity of major cereal, pulse and oilseed crops.

### ELEMENTARY BIOCHEMISTRY, GENETICS AND PLANT BREEDING

Cell, Biomolecules, water, pH and buffer; cellular constituents: Structure and function- amino acids and protein, carbohydrates, lipids and biomembrances and nucleic acids; Enzymes- function, properties and mechanism, metabolism of cellular constituents; Central Metabolic Pathways: Derivative path ways- glycolysis, hexose mono phosphate pathways, degradation of starch, sucrose, other sugars, fatty acids and acylglycerols, proteins and amino acids; Biosynthetic path ways, photosynthesis, formation of sucrose and starch, Kreb's cycle and electron transport chain; Nitrogen and sulphur cycles; Nitrogen fixation, assimilation of ammonia; synthesis of DNA, RNA and proteins; Secondary metabolites-structure, function and metabolism. Pre-mendelian and post-mendelian concepts of heredity, mendelian principles of heredity, probability and chi-square, Cell and animal cell, chromosome structure. Cell division mitosis, meiosis, variation in chromosomes polytene chromosome, Lampbrush chromosomes.

*[Handwritten signatures and initials]*

Dominance relationship, gene interaction. Multiple alleles, pleiotropism and pseudoalles. Sex determination, sex linkage, sex limited and sex influenced traits. Linkage, crossing over mechanism, chromosomes mapping, structural change in chromosomes: Deletion and Duplication, Translocation and inversion, "Numerical change in chromosomes, chemical basis of heredity" Gene concept, mode of replication of genetic material, transcript and translation genetic material. Gene regulation and operon concept. Mutation- Chemical and physical mutagens, mode of action of mutagens. Extra nuclear inheritance. Polygene and quantitative inheritance. Plant tissue culture, principal and application.

## MICROBIOLOGY

Microbial cell structure, Micro-organisms- Algae, Bacteria, Fungi, Actinomycetes, Protozoa and Viruses. Role of micro-organisms in respiration, fermentation organic matter decomposition

## ENTOMOLOGY

Introduction and scope of Entomology, brief history of entomology in India, Insects as Arthropods and its relationship with phylum Annelida and other classes of Arthropoda, origin of insects, major points related to dominance of insects in Animal Kingdom. External morphology and anatomy of grasshopper; body segmentation, integument, thorax and abdomen, antennae, legs and wings and their modifications, generalized mouth parts and their modification, Alimentary, Circulatory, Excretory, Respiratory, Reproductive and nervous system, major sensory organs like simple and compound eyes, chemoreceptors, endocrine glands; basic embryology and post embryonic development basic groups of present day insects with special emphasis to order and families of agricultural importance

## PLANT PATHOLOGY

Importance of plant disease, scope and objectives of plant pathology. Concept of plant diseases inanimate cause and plant virus. Classification of plant disease. Definition and terms, parasites, pathogens, biotrophs and hemibiotrophs, necrotrophs, pathogenicity, pathogenesis, virulence, infection, primary infection, inoculum, invasion and colonisation, inoculum potential, symptoms, incubation period, disease cycle, disease syndrome, single cycle disease, multiple cycle disease, alternate host, collateral host, predisposition, biotype, symbiosis, mutualism, antagonism. Pathogenesis & parasitism, Koch's postulate. Effect of pathogenesis on the plants, morphological changes, physiological changes. Development of epidemics. Principles

and methods of plant disease management. Basic concepts; avoidance, eradication, protection, disease resistance and therapy. General Morphology, characteristics of fungi and somatic structure, reproduction of various structure. Basic and different methods of classification of fungi, taxonomy and nomenclature. General morphological and cultural characters of prokaryotes (Bacteria, basic methods of classification, taxonomy and nomenclature. Nutrition and effects of physiochemical factors on growth. Reproduction and life cycle. Genetics and variability, importance and general characters of mycoplasma, spiroplasma & Fastidious bacteria, reproduction, nomenclature and classification. Physical architecture and chemical composition of virus & virioids. Nomenclature and criteria of identification, multiplication, transmission and infective nature. General morphological characters, life cycle, reproduction of nematodes behaviour in soil and nematodes as vectors for other plant pathogens. Classification and general identifying characters of phanerogames plant parasites, reproduction and life cycle.

### LIVESTOCK PRODUCTION SCOPE AND IMPORTANCE

(a) Importance of live stock in agriculture and industry, White revolution in India.  
(b) Important breeds Indian and exotic, distribution of cows, buffaloes and poultry in India. Care and management: (a) Systems of cattle and poultry housing (b) Principles of feeding, feeding practices. (c) Balanced ration-definition and ingredients. (d) Management of calves, bullocks, pregnant and milch animals as well as chicks crockrels and layers, poultry. (e) Signs of sick animals, symptoms of common diseases in cattle and poultry, Rinderpest, black quarter, foot and mouth, mastitis and haemorrhagic septicaemia coccidiosis, Fowl pox and Ranikhet disease, their prevention and control. Artificial Insemination: Reproductive organs, collection, dilution and preservation of semen and artificial insemination, role of artificial insemination in cattle improvement. Livestock Products: Processing and marketing of milk and Milk products.

### CROP PRODUCTION

(a) Targets and achievements in food grain production in India since independence and its future projections, sustainable crop production, commercialization of agriculture and its scope in India. (b) Classification of field crops based on their utility-cereals, pulses, oils seeds, fibre, sugar and forage crops.



## SOIL, SOIL FERTILITY AND WATER MANAGEMENT

Soil as a natural body and medium for plant growth; soil component and soil plant relationship; soil farming rocks and minerals; weathering and process of soil formation; physical properties of soils-texture, structure, density and porosity, soil colour consistence and plasticity, soil reaction pH and its measurement, soil acidity and alkalinity, buffering, effect of pH on nutrient availability, soil colloids-inorganic and organic; silicate clays: constitution and properties; humic substances nature and properties; ion exchange, cation exchange capacity, base saturation; soil organic matter: composition, properties and influence on soil properties, transformation of organic and inorganic wastes in soil- Urban and Industrial wastes. Soil water retention, dynamics and availability; soil air composition and dynamic; source, amount and flow of heat in soils; soil temperature and plant growth; soil survey and classification, soil of India; soil pollution behavior of pesticides and inorganic contaminants, prevention and mitigation of soil pollution, methods of irrigation and drainage.

## WEED CONTROL

Introduction: definition, costs to society from weeds, classification of weed, Ecology of weeds: Reproduction (Seed production, seed dissemination, seed germination, vegetative reproduction), geographical distribution, factor influencing weed distribution, weed succession on uncultivated sites, competition between crops and weeds. Concepts of prevention, eradication and control of weeds. Weed control methods: Physical, cultural, biological, chemical and integrated weed management, Introduction to herbicides: basic concepts, polar vs. Non polar, Esters, Salts, acids etc, surfactant Chemistry. Factors affecting foliage active herbicides: reaching the target plants, spray retention, absorption into leaf, translocation, and factors influencing soil applied herbicides: microbiological effect, soil absorption, photo decomposition and volatilization, spray of herbicides.

## HORTICULTURE

Definition and its branches; importance and scope; horticultural and botanical classification; climate, soil and distribution of fruit crops; propagation and nursery raising; principles of orchard establishment and management; flower bud differentiation and propagation; causes of unfruitfulness; pollinizers and pollinators; environmental and soil factors affecting vegetable production, kitchen gardening; types of gardens and their parts; care and maintenance of ornamental plants; lawn making; knowledge of landscaping of rural and urban area; exposure to important medicinal &

aromatic plants, spices and condiments, use of plant bioregulator in Horticulture, post Harvest Technology-Principles and Practices.

## FUNDAMENTALS OF EXTENSION EDUCATION

Meaning, concept and process of extension education. Objective, principles and philosophy of extension. Education - formal and non-formal. Components of behaviour-knowledge, attitude, skill and motivation. Principles and steps in teaching-learning process, learning situation. Implication of teaching. Concept, need and steps in programme planning. Principle of programme planning, Programme planning process.

## AGRICULTURAL ECONOMICS

Nature and tools of Economic analysis, micro & macro economics, consumer behavior, demand and supply, production, costs, firm, price determination, markets, welfare economics, consumption, saving & investment, business cycle, inflation, income and interest, agriculture in economic development, agricultural policies, role of infrastructure and technological change, land reforms, agricultural finance, rural credit, financial and economic appraisal measures, fundamental accounting and book keeping, financial statements, agricultural marketing, market functions, marketing institutions, trade, role of economics in natural resource accounting, allocation of renewable and non-renewable resources, farm records, farm planning and budgeting, production functions, decision making under risk and uncertainties, farm efficiency measures, resource use efficiency, returns to scale, diversification and insurance.

## AGRICULTURAL ENGINEERING

Farm structures, farm house, dairy and poultry housing, farm site, food grain storage, elementary knowledge on engines/motors, common troubles and remedies, tractors and common farm equipments.

or/

*[Handwritten signature]*

42

*[Handwritten signature]*

## BOTANY

### BIODIVERSITY

Microbes, Algae, Fungi and introduction to Archegoniate, Bryophytes, pteridophytes, Gymnosperms

### PLANT ECOLOGY AND TAXONOMY

Introduction, Ecological factors, Plant communities, Ecosystem, Phyto geography, Introduction to plant taxonomy, Identification, Taxonomic evidences from palynology, cytology, phytochemistry and molecular data, Taxonomic hierarchy, Botanical nomenclature, Classification, Biometrics, numerical taxonomy and cladistics

### PLANT ANATOMY AND EMBRYOLOGY

Meristematic and permanent tissues, Organs, Secondary Growth, Adaptive and protective systems, Structural organization of flower, Pollination and fertilization, Embryo and endosperm, Apomixis and polyembryony

### PLANT PHYSIOLOGY AND METABOLISM

Plant-water relations, Mineral nutrition, Translocation in phloem, Photosynthesis, Respiration, Enzymes, Nitrogen metabolism, Plant growth regulators, Plant response to light and temperature

### CELL AND MOLECULAR BIOLOGY

Techniques in Biology (Principles of microscopy, Light Microscopy etc.), Cell as a unit of Life, Cell Organelles (Mitochondria, Chloroplast, ER, Golgi body & Lysosomes, Peroxisomes and Glyoxisomes, Nucleus), Cell Membrane and Cell Wall, Cell Cycle, Genetic Material (DNA, DNA replication (Prokaryotes and Eukaryotes), Transcription (Prokaryotes and Eukaryotes), Regulation of gene expression

### ECONOMIC BOTANY AND BIOTECHNOLOGY

Origin of Cultivated Plants, Cereals, Legumes, Spices, Beverages, Oils and Fats, Fibre Yielding Plants, Introduction to Biotechnology, Plant tissue culture, Recombinant DNA Techniques

### GENETICS AND PLANT BREEDING

Heredity (Brief life history of Mendel, terminologies, laws of inheritance etc.), Sex-determination and Sex-Linked Inheritance Linkage and Crossing over, Mutations and Chromosomal Aberrations, Plant Breeding, Methods of crop improvement, Quantitative inheritance, Inbreeding depression and heterosis, Crop improvement and breeding

### ANALYTICAL TECHNIQUES IN PLANT SCIENCES

Imaging and related techniques (principles of microscopy, light microscopy, fluorescence microscopy etc.), Cell fractionation, Radioisotopes,

Spectrophotometry, Chromatography, Characterization of proteins and nucleic acids, Biostatistics

#### **BIOINFORMATICS**

Introduction to Bioinformatics, Databases in Bioinformatics, Biological Sequence Databases, Sequence Alignments, Molecular Phylogeny, Applications of Bioinformatics

#### **RESEARCH METHODOLOGY**

Basic concepts of research, General laboratory practices, Data collection and documentation of observations, Overview of biological problems, methods to study plant cell/tissue structure, plant microtechniques, the art of scientific writing and its presentation

## SYLLABUS FOR BIOTECHNOLOGY

**Biodiversity and Taxonomy:** Principles of taxonomy and classification of plant kingdom; structural, biochemical and molecular systematic; biodiversity and plant genetic resources; germplasm exploration, collection, regeneration and evaluation; principles and methods of germplasm conservation; conservation of plant biodiversity; tools to assess molecular diversity, germplasm exchange and plant quarantine; ecology and biodiversity.

**Cell structure and Function:** Basics of Cell Biology in prokaryotes and eukaryotes; cell wall and cell membranes; structural organization and functions of cell organelles; intracellular transport; biosynthesis and degradation of cellular components; cell division and cell cycle; intracellular and extra-cellular control of cell division; programmed cell death.

**Biomolecules and Metabolism:** Classification, structure and function of carbohydrates, lipids, proteins, nucleic acids, hormones and vitamins; metabolism of carbohydrates (glycolysis, citric acid cycle, glycogenesis, glycogenolysis, pentose-phosphate pathway); metabolism of lipids (oxidation of saturated and unsaturated fatty acids, oxidation of odd chain fatty acids, energy yield, ketone bodies); metabolism of amino acids (biosynthesis and breakdown of amino acids) and metabolism of nucleic acids (biosynthesis and degradation of purine & pyrimidine); photosynthesis (oxidative phosphorylation and photophosphorylation); respiration (photorespiration).

**Genetics and molecular Biology:** Mendelism & chromosome theory, basic principles of inheritance; linkage & crossing over; allelic variation & gene function, co-dominance, incomplete dominance, gene interactions, pleiotropy, genomic imprinting; linkage disequilibrium; sex-linked inheritance; quantitative genetics and polygenic inheritance; population genetics and hardy-weinberg equilibrium; extra chromosomal inheritance; gene concept; mutations; transposable genetic elements; structural and numerical alterations of chromosomes; basics of cyto-genetics, karyotyping, chromosome banding and mapping; formulation and testing of genetic hypothesis; DNA as the genetic material; DNA and the molecular structure of chromosomes; Organization and structure of prokaryotic and eukaryotic of genomes; DNA replication in prokaryotes and eukaryotes; transcription and RNA processing in prokaryotes and eukaryotes; translation and the genetic code; regulation of gene expression in prokaryotes and eukaryotes; mutation, DNA repair, and recombination.

**Microbiology:** History and development of microbiology; classification of microbes; concepts and methods of sterilization; microscopy and staining; microbial culture techniques; concepts of microbial species and strains; growth curves, various forms of microbes; pathogenic microorganisms (bacteria, fungal, viral and protozoan); microbes in extreme environment (photosynthetic bacteria; Cyanobacteria; thermophilic, methanogenic and halophilic archaea); basic concepts of virology.

**Tissue culture:** Basic principles of plant tissue culture, totipotency, establishment of aseptic culture, callusing, regeneration and organogenesis, hardening; micro-propagation; somaclonal variations; endosperm and anther culture; embryo culture; somatic hybrids; synthesis of artificial seed; single cell and protoplast culture and

regeneration; cryopreservation and conservation of plant genetic resources; production of secondary metabolites, hairy roots and bioreactor technology.

**Recombinant DNA Technology:** Basic principles of cloning, tools for cutting and joining DNA molecules, types of vectors and their properties, bacterial transformation and selection strategies; gene transfer to plants; transgenic technology; Intellectual Property Rights (IPR).

**Molecular tools and techniques:** Nucleic acids and protein isolation; molecular markers and their applications; polymerase chain reaction (PCR), RT-PCR; techniques for separation of nucleic acids and proteins; nucleic acid blotting; restriction digestion and ligation; restriction mapping; genetic mapping; preparation of genomic and cDNA libraries; molecular cloning; transformation and screening strategies; techniques for differential gene expression; transcriptomics; proteomics; metabolomics; synthesis and sequencing of oligo-nucleotides; genome sequencing; analysis and management of sequence data; bioinformatics; techniques for targeted mutagenesis; genome editing; techniques for gene transfer in plants.

**General Instrumentation:** Principles and applications of chromatography, agarose gel electrophoresis, PAGE, SDS PAGE, centrifugation, microscopy, X-ray crystallography, spectroscopy, spectrophotometer, autoradiography, preparation of microbial and tissue culture media, sterilization.

## Syllabus for Marine Biology

**Principles of Oceanography:** Geologic history of the oceans - Early history of Oceanography and World exploration - Modern Technology in Oceanography - Seas - Oceans - Ocean floor - Continental shelf - Continental slope - Abyssal basin - Introduction to hydrographic surveying. Marine instrumentation - Structure and motion of the ocean and its environs - properties, populations and energy budget - Oceanic currents. Ocean resources and exploration - Bioresources of the sea - Food production from the sea - Energy production from the sea - Mineral resources of the sea.

**Biology Oceanography:** Life process in the marine environment - Ocean's Food web - Classification of planktons, methods of collection, interrelations. Adaptations of planktons. Organic production, methods of estimation and factors affecting primary production., red tide phenomenon.

Sea weeds - occurrence and distribution in India, economic importance. Sea grasses - morphological and anatomical adaptations, ecological role. Mangroves and salt marshes - distribution - adaptations, ecological role, uses, need for conservation. Marine biodiversity - biodiversity assessment techniques - Marine resources, Fisheries - Pelagic - Benthic and non biological - Threats to marine biodiversity, overexploitation, physical alteration, alien species.

**Marine Flora, Ecology and Zoogeography:** Classification of marine flora - Factors affecting marine life. Marine flora - Bacteria, Fungi, Diatoms, Flowering Plants - Blue green and Red algae. Ecology and Geographic distribution of marine flora - Mangrove associations: Distribution of mangrove plants - Nutrient cycling, ecological significance of mangroves. Marine Environment: zonation, stratification, geographic distributions - ecological factors - light, temperature, salinity, pressure - Classification of marine environment - pelagic environment, planktonic and nektonic adaptations, benthic environment - intertidal, interstitial and adaptation - Coastal environments - coral reefs, estuaries, mangroves, sea grass beds, forests, polar seas and hydrothermal vent - Marine zoogeography. Marine ecosystem structure and function, food chain, food-web, ecological pyramid, energy flow - Systems ecology and modeling. Population ecology - group attributes, population growth, population density variation, carrying capacity, dispersal, prey-predator relationship, density dependent and independent factors. Community ecology - structure and composition, diversity and stability, concept of niche, succession, community wise adaptation - fouling and boring community, animal association in the sea.

**Applied Marine Botany:** Marine Algal Physiology- Marine algae as food, fodder, fertiliser and source of medicine and industrial raw material. Cultivation of Unicellular organisms, sea weeds. Marine Products: Agar-agar, Carragenin, Kiesulguhr, Algin, Laminarin, Phycocolloids.

**Marine Biotechnology:** Marine natural products - Marine organisms: - Pharmaceuticals. Marine Microbiology - Microbial biofilms; Marine polysaccharaides - Molecular pathogenicity; Biochemistry, gene regulation and molecular biology of marine hyperthermophils. Biofouling and Control technology - Genetic engineering and ploidy

manipulation to enhance growth - reproduction and development of disease resistance in aquacultural species.

**Marine Paleobiology:** Principles of fundamental Stratigraphy - Standard Geological time scale - Order of Superposition - Principles of stratigraphic correlation - Various zones of marine realm and their characteristic fauna and flora - Marine habit and habitat. Marine fossils

**Marine Geology:** Structure of the Earth - Origin and structure of Oceans, Plate tectonics, transform faults, ocean trenches, mid-ocean ridges, geothermal vents - Continental shelf, Slope and Rise.

Deep ocean basins, Coastlines and Coastal system beaches - rocky and sandy beaches, bays, inlets, and fjords; physical processes and Classification of coasts - formation of beaches - loss of headlands - formation of barrier islands and lagoons - coastal development. Characteristics of coastal waters - Estuaries - Temperate and tropical wetlands and Lagoons - Marginal seas of the world.

#### **Physical Oceanography**

Characteristics of Ocean Water - major wind systems - Air-Sea Interaction - ocean-atmosphere coupling - marine weather and climate - El Nino/La Nina - global change - storms and hurricanes - methods and measurements - contributors - Ocean currents including wind driven systems - eddies - rings - geostrophic currents - upwelling and down welling processes - tidal waves (Tsunami). Waves and their properties - impact on beaches - marine structures to mitigate wave effects - surfing.

Physical properties of seawater - vertical and horizontal distributions of salinity and temperature - Identification and significance of water masses.

**Chemical Oceanography:** Chemical properties of water and seawater - Chemical processes in oceans - pH and buffering capacity of seawater. Basic properties and processes in estuarine chemistry.

**Marine Mineral Resources:** Marginal marine, Subsurface, Beach placer, Deep sea deposits - Ocean boundaries and Petroleum resources - Petroleum prospects beneath oceans - Relation of boundary to petroleum - Contribution of sea for world's petroleum production - Future prospects of petroleum resources of sea - Contribution of marine petroleum resources in Indian petroleum production.

**Marine Pollution:** Kinds and quantities of ocean pollution. Oil spills, plastics, trace metals, sewage and nutrients, Factors influencing the toxicity of trace metals to marine organisms. Effects on marine organisms. Time scale of global changes in the ecosystem and climate - impact of circulation in atmosphere and ocean on climate, rainfall and agriculture.