



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



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

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No.1-156/IFB/TA/2021-22/1916

Dated: 11th February, 2022

RECRUITMENT NOTIFICATION

Applications are invited from the eligible individuals for filling up of vacancies in the following posts by DIRECT RECRUITMENT at IFB, Hyderabad .The detailed notification is available in the websites www.icfre.gov.in or www.ifb.icfre.gov.in.

Sl. No.	Name of the Post	7 th CPC pay level	No. of Vacancies	Eligibility Qualification			Exam will be held on the subject	Age limit as on 29.03.2022 (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 th CPC	3 Nos.	1	1	1	Bachelor Degree in Science with Botany as one of the subjects from a recognized University	Not below 21 years or exceeding 30 years
2	Technical Assistant (Field/Lab Research)		1 No.	-	1	-	Bachelor Degree in Science with Biotechnology as one of the subjects from a recognized University	
3	Technical Assistant (Field/Lab Research)		1 No.	1	-	-	Bachelor Degree in Science with Marine Biology and/or Zoology as one of the subjects from a recognized University	

Important Note:

1. The number of vacancies are subject to change.
2. Eligibility/Essential qualification is mandatory for the posts.

Abbreviation: UR=UNRESERVED, OBC=OTHER BACKWARD CLASS (NON-CREAMY LAYER), SC=SCHEDULED CASTE

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

OBC candidates whose caste is not listed in Central List (as available on National Commission for Backward Classes website www.ncbc.nic.in) and who are not covered under the provisions as applicable to OBC-Non Creamy Layer (NCL) candidates shall be treated as General Category candidates for all purposes. Accordingly, OBC Candidates not belonging to OBC Non-Creamy Layer shall indicate their category as 'General'.

Candidates must submit the OBC (NCL), SC & ST certificates in prescribed format and the certificate must be issued on or after 01st April 2021 otherwise candidature will not be considered.

Candidates must mention their category in the application form. Accordingly as per availability of suitable documents for that, reservation will be considered.

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.

1. Relaxation of fees is not applicable to SC/ST/OBC candidates applying against unreserved posts.
2. **No TA/DA** will be admissible to the candidates for appearing in **written Examination.**
Fees once paid by the candidates will not be refunded in any circumstances.

PLAN Written Examination:- The written examination will be conducted for all the posts either on the same date or on different dates. It will have a total of 100 multiple choice questions (MCQ) and 1/3rd mark will be deducted for each incorrect/wrong answer.

Minimum qualifying marks required in written examination: -

Category of candidate	Minimum qualifying marks
General (UR)	50%
OBC-NCL/SC /ST	40%

Date and Time of written examination:

To be intimated later on the website www.ifb.icfre.gov.in

SELECTION PROCEDURE

- (i) The candidates will be shortlisted on the basis of merit of written examination subject to minimum qualifying marks. The decision of the Institute on short-listing will be final and the Institute will not entertain any correspondence in this regard.
- (ii) The shortlisted candidates will have to produce original as well as self attested photocopies of their certificates related to age proof, caste, educational qualifications etc. at the time of document verification which will be done on certain dates to be specified later. If any further latest certificates are required for claim of OBC(NCL)/SC/ST etc., the candidates are liable to produce them.
- (iii) In case of equal marks/tie up marks in the written examination general rules followed to finalise the merit list
- (iv) **Other instructions**
 - a) Under no circumstances candidates will be allowed the help of a scribe for the examination.
 - b) There is no provision of re-evaluation of the answer script and therefore, no request for reevaluation of the answer script will be entertained. The Institute will not enter into any correspondence in this regard.
 - c) Posts are temporary but likely to continue. Number of posts mentioned in the advertisement may decrease or increase.
 - d) A candidate must be in good mental and bodily health and free from any physical defects likely to interfere with the discharge of his duties. IFB may prescribe necessary medical tests, if required.

PLACE OF POSTING: The candidates selected against the posts will be posted at IFB, Hyderabad or its centre FRCCE, Visakhapatnam. However, all posts carry liability to serve at any of the Institute/Centre under ICFRE within India.

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. Candidates must attach photocopies of necessary certificates/documents (self-attested) with the application form regarding the necessary educational qualifications, age proof, claim of belonging to SC/ST/OBC etc. In absence of such documents the application shall be rejected straightaway.
3. 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.

4. **If a candidate applies for more than one post, his/her application will be rejected. Applicant must choose only one exam subject where he/she is most suited.**
5. 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 chosen to appear for the exam. Therefore, specify the exam subject in which you would like to appear for the exam.
6. **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. Without proper age proof certificate.
 - v. Under aged/over aged candidates.
 - vi. Not possessing the requisite educational qualification at the time of submitting applications
 - vii. Educational qualification from non-recognized institutions.
 - viii. Application received after due date.
 - ix. Application without prescribed fee.
 - x. Any other like mutilated or damaged applications/documents, etc.
 - xi. Self-attested copies of necessary certificates not enclosed.
 - xii. Application for more than one post in single application.
7. The envelope containing the application should be superscripted as "**Application for the Post of _____**" **(with exam subject)**. The envelope without superscription of the post applied for will not be entertained for further scrutiny.
8. The candidates are required to send **TWO additional and identical photographs separately** along with application form, with their name written in capital letters, name of the post applied for on the reverse of the photographs.
9. The crucial date for determining the age limit shall be the last date for receipt of applications i.e.29.03.2022
10. 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 29.03.2022
11. This institute shall not be responsible for **any postal delay** or loss during the postal transit.
12. 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.
13. 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 employees of ICFRE and its Institutes/Centre's.
14. No correspondence and interim enquiries will be entertained in any manner.

15. Canvassing in any form by the applicant will disqualify his/her candidature.
16. **The Director, IFB, Hyderabad reserves the right to increase or decrease the posts at any stage or not to fill up any or all the advertised posts without assigning any reason.**
17. Legal disputes if any shall be subject to the jurisdiction of the Competent Court at Hyderabad.
18. Decision of the Director, Institute of Forest Biodiversity, Hyderabad in all matters relating to recruitment eligibility, acceptance, rejection of applications, mode of selection, conduct of written examination and selection etc. and not to fill up all or any posts will be final and binding on all the candidates.. The Director, IFB reserves the right to cancel the recruitment process any time due to any administrative exigency. Director, IFB reserves right to add or modify any conditions as per suitability.
19. 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. 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.
20. In case of Departmental candidate, it is mandatory to attach relevant service experience certificate (mentioning name, present designation, post, present pay level as per 7th CPC, present location/office address, etc) on official letter head from the competent Authority in the application form.
21. No interview will be conducted for advertised posts. Merit list will be prepared on the basis of marks secured by the candidate in the written examination. In case of tie, general rules will be followed to finalize merit list.
22. For availing reservation, SC/ST/OBC-NCL candidates should furnish original valid Caste/Category Certificate from Competent Authorities at the time of document verification.
23. Further, in case of OBC-NCL candidates, the certificates should specifically indicate that the candidate does not belong to the Persons/Sections (Creamy Layer) mentioned in Column 3 of the Schedule of the Government of India, Department of Personnel and Training O.M.No.36012/22/93- Estt. (SCT) dated 08.09.93 & its subsequent revision through O.M.No.36033/3/2004-Estt. (Res) dated 09.03.2004, 27.05.2013, 13.09.2017 and further revision if any received till the closing date for application. The candidate should ensure that he/she belongs to the OBC- Non Creamy Layer category while applying for the posts against this notification. Further, in addition to the Category Certificate (OBC-NCL), a declaration if required has to be furnished by the candidate during Document Verification, that he/she does not belong to the creamy layer, otherwise, their claim for reserved status (OBC-NCL) will not be entertained and the candidature/application of such candidates, if fulfilling all the eligibility conditions prescribed for General (Un- reserved) category, will be considered against General (UR) vacancy only.
24. The mere fact that a candidate has been called for the written examination and/or skill/proficiency test does not imply that his/her candidature has been finally cleared by IFB. The candidate must note that if ineligibility is detected at any stage before or after the written examination and/or skill/proficiency test or if the items prescribed in the Rules and instructions given in the advertisement or any other additional information/document called for at any stage are not complied with within the time specified therein, his/her candidature will be liable for cancellation. The IFB will not be responsible for cancellation of candidature on this account.

25. If at any time, at the time of appointment or during the tenure of services the claim of candidate regarding Age, Educational Qualifications, Scheduled Caste (SC)/Scheduled tribe (ST)/Other Backward Class (OBC) etc. is found to be incorrect, the candidature will be cancelled /the services of the candidate shall be terminated forthwith. In addition, legal action may be initiated against such candidates/ employees as per law.

26. Director, IFB has right to ask candidate for the further details related to any certificate or any other information/validation by any/other suitable authority as he/she deems fit at any time. If it is asked, the candidate must abide by it & provide the information within asked time for his/her case to be considered further.

27. No person:-

a) Who has entered into or contracted a marriage with a person having a spouse living

Or

b) Who, having a spouse living, has entered into or contracted a marriage with any person shall be eligible for appointment to the service, provided that the IFB may, if satisfied that such a marriage is permissible under the personal law applicable to such person and the other party to the marriage and there are other grounds for so doing, exempt any person from the operation of this rule.

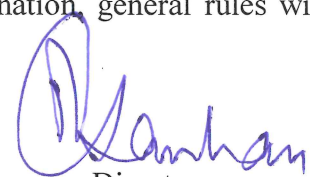
SYLLABUS FOR EXAMINATION:

1. Technical Assistant: There will be an objective questions paper comprising 100 multiple choice questions in total from different subjects for recruitment of Technical Assistant, Questions of relevant subject will be according to graduation level. 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
Relevant Subject	-	40 Marks
Total No. of Questions	-	100 Marks

Note:

1. Each correct answer will carry one mark. 1/3rd 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.



Director

Institute of Forest Biodiversity
Hyderabad



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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 : _____

Exam Subject: _____

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 **29.03.2022** : Years _____ Months _____ Days _____

6. Nationality : _____

7. Category which General/SC/ST/OBC(NCL) (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.

Place:

Date:

Signature of the Candidate

Name:

Affix self-
attested
passport size
photograph

(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 not below the rank of an Under Secretary to the Govt. of India are enclosed.
- v. In the event of his/her selection, there is no objection to relieve/ spare him/her within the time specified in the offer of appointment.

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 1st April 2021.”

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 / Extra 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 certificate MUST have been issued on or after 1st April 2021.”

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.

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.
5. Certificates issued by Gazetted Officers of the central or of a State Government countersigned by the District Magistrate concerned

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.