

PROGRAMME PROJECT REPORT (PPR)

Name of the Programme: **MASTER OF SCIENCE IN BOTANY
(M.Sc. BOTANY)**

Duration: Minimum 2 years
 Maximum 4 years

Recognition: This Programme was recognized by the DEC-IGNOU, and now by the UGC-DEB

A. PROGRAMME'S MISSION & VISION

Vision:

To provide comprehensive, relevant curriculum and train the Learner/students in the field of Botany. Enabling the Learner to take up careers in academic (teaching and research), industry and government sector, along with conducting significant societal based research.

To provide an opportunity to all those who could not be able to take up formal mode education in the field of Botany and train them to enhance their skill and knowledge, and build a human resource in the field of Botany.

Mission

Through offering this programme to the interested Learners the following mission objective are intended

- Explain the importance of plant life, biodiversity and ecosystems and their importance in applied sciences such as medicine and agriculture.
- Interpret phylogenetic trees.
- Explain how form and function of cells, tissues, or plant organ systems are related in the context of biodiversity.
- Demonstrate the ability to identify all forms of plants and to taxonomic grouping.
- To emphasize the unity and integration of human life with plants, celebrate the fundamental significance of the natural world, and enriches communities through agriculture, forestry, horticultural excellence in education and innovative outreach initiatives.

Objectives

- The major objective of present course has been prepared keeping in view of the course requirements for those candidates seeking Post –Graduate Distance Education in Botany.
- Specific purpose of the course is to create awareness to students of Distance Education Council about status of diversity of angiosperms and plant taxonomy.

- The Botany Department is a community of learners and teacher-scholars, which has as its mission to help all its students gain an appreciation of plants, both as a science and as a humanistic study

B. RELEVANCE OF THE PROGRAM WITH HEI'S MISSION AND GOALS

Kuvempu University is an affiliating State University in Karnataka. Established in 1987, it is a University with a distinctive academic profile, blending in itself commitment to rural ethos and a modern spirit. It has 37 Post-Graduate departments of studies in the faculties of Arts, Science, Commerce, Education and Law. It also has 4 constituent colleges at Shankaraghatta and Shimoga, and two outlying regional Post-Graduate Centres at Kadur and Chikkamagalur.

The Vision and Mission of the University are:

Vision:

Kuvempu University shall strive to become an international centre of excellence in teaching and research to provide high quality value based education to all through various modes to meet the global challenges.

Mission:

Foster creativity in teaching, learning and research to build a knowledge base and promote quality initiative.

Provide access to education to all.

Develop human resources to meet the societal needs.

The Distance Education Programmes are a part of the University's outreach programmes for the rural masses and also to foster University-Society relationship with the motto of "**Education for All**", to provide quality education at the doorsteps of desirous individuals who want to take up higher education, for the discontinued who could not take up formal education, housewives and employees who want to improve and enhance their knowledge. The University firmly believes that education and seeking knowledge is a **Lifelong Learning** concept.

Offering higher education through Distance Mode is an important step taken by Kuvempu University so as to help the student community in their zeal to pursue higher education at UG and PG Level. The University felt the necessity of this when when a large number of students, who wanted seats for PG. Studies, could not be accommodated in our regular P.G. Programmes. The University believes that Distance Education Mode is an equally good avenue to be made available to interested students. With these view, Kuvempu University started offering courses through distance mode since 2002-2003. At present it is offering 31 Programmes (earlier called Courses) in various faculties at the U.G., P.G. and PG Diploma levels. These courses were approved by the erstwhile DEC-IGNOU, and now by the UGC-DEB.

Goals & Objectives of Distance Mode Programmes

- Reach out to larger sections of society seeking non-formal education.
- Capacity Building using the non-formal mode platform.

- Concentrate on planning & constant upgrading of facilities to meet new challenges in education through Distance Mode.
- Provide counseling & consultancy to students.
- Offer area/ region wise educational requirements.
- Skill Development and Enhancement.
- To impart quality training through interactive learning module.
- Interactive Pedagogy of teaching-learning and flexible learning environment.
- Provide supportive academic environment and effective teaching.

C. NATURE OF PROSPECTIVE TARGET GROUP OF LEARNERS:

The study of Botany helps provide students with a foundation for lifelong learning, critical thinking, and collaborative, technical problem solving in professional and business contexts. We achieve this through an innovative curriculum, which has students explore plants not only for its own sake but also for the myriad ways it is used in the modern world.

The production and distribution of plants and their products have profound influence on the economic and social life of the country. The maintenance of an adequate supply of food and raw materials for the use of industries is essential to the existence and prosperity of a nation. Importance of plants and their products obtained from them are Food, Shelter, Clothing, Medicines, Essential oils, Fatty oils, waxes, Tanins, dyes, Beverages, Rubber and Latex products.

D. APPROPRIATENESS OF PROGRAMME TO BE CONDUCTED IN OPEN AND DISTANCE LEARNING MODE TO ACQUIRE SPECIFIC SKILLS AND COMPETENCE

Education through Distance Mode has become as an important and widely accepted strategy to counteract the inadequacy of the traditional system of education to keep abreast of the new demands. Distance Education is seen as a means of passing on the benefits of recent advances in communication technology to the masses and thereby actualising the concept of a learned society. Master of Science in Botany Programme provides opportunities for the in-service teachers, analytical chemist assayer, chemical instrument technician, environmental control analysis and lab assistants to understand the latest trends in teaching learning process and advancements in analytical techniques. The existing workforce can take the advantage of DDE Botany Programme to increase their skills and competence in this particular field without disturbing their work schedule. It should also endeavour to develop in the future practitioners a deep and critical awareness of professional ethics and an ability to critically engage in and reflect on practice.

Further, the Programme develops ability to apply acquired knowledge and solve problems in new or unfamiliar surroundings within broader (or multi-disciplinary) contexts related to the area of study. The Programme will expose students to the diversity and variety of educational practices, policies, settings, and contexts in India. The Programme aims to build among our graduates capabilities for ongoing self motivated professional development. The Programme will strive to develop capabilities to plan independent educational interventions in various roles such as those of curriculum developers, textbook/ material developers, teacher educators, analytical scientists and researchers. The programme would provide learners a wider and more comprehensive understanding of

Botany as field of knowledge and would accommodate a wide variety of learning needs of learners.

E. INSTRUCTIONAL DESIGN

(i) Programme Formulation:

Proposal from the concerned PG department to commence the programme was placed before Monitoring Committee of the DDE/Syndicate. Then it will be referred to the BOS concerned for formulation and approval of the syllabus scheme pattern, time allotment for each paper, marks allotment, scheme of examination etc., then it was placed in the Faculty meeting and then Academic Council (the highest body) of the University for its approval. After approval by both the bodies, the programme was introduced. The academic advisory body of DDE refers the matter to the concerned subject/parent department council for preparation of study material. The concern subject faculty will coordinate with the DDE and the department council, as he/she is on the member in it. Workshops for preparing study material in SLM mode are regularly conducted (with the help of IGNOU experts).

- (ii) **Curriculum Design:** The Programme is of 2 years duration with annual examinations. The maximum period allowed is 4 years (double the duration).

The Programme structure is as below.

Year	Course	Marks		
		Term End Exams	Continuous Evaluation/I A	Total
First Year	Course 1: Biology and Diversity of Algae, Fungi, Bryophyte, Pteridophytes and Gymnosperms	85	15	100
	Course 2: Diversity of angiosperms and Plant Taxonomy	85	15	100
	Course 3: Plant Ecology and Plant Geography	85	15	100
	Course 4: Microbiology	85	15	100
	Practical-1: Based on Course 1 & 2	55	20	75
	Practical-2: Based on Course 3 & 4	55	20	75
	Total marks	450	100	550
Second Year	Course 6: Plant Physiology	85	15	100
	Course 7: Medicinal Plants and Economic Botany	85	15	100
	Course 8: Angiosperm Embryology	85	15	100
	Course 9: Plant Breeding & Biotechnology	85	15	100
	Practical-3: Based on Course 5 & 6	55	20	75
	Practical-4: Based on Course 7 & 8	55	20	75
	Total marks	450	100	550
Total Marks - I Year & II Year		900	200	1100

(iii) Medium of Instruction:

The medium of instruction shall be English.

(iv) Detailed syllabi: Given as Appendix-01

(v) Faculty and Supporting Staff Requirement:

Full time faculty in regular department will be involved in orientation counseling, and face to face programmes. Such programmes are scheduled during the vacation time of the regular department, which will meet the faculty availability and infrastructure need of ODL Programme. Coordinator of the programme, who is a regular faculty member and the Research and Teaching Assistant (RTA) will be in-charge of the Programme, who will address the day to day academic and learner/student support aspects of the Programme.

Regarding supporting staff, DDE has a separate and well equipped wing/office to take care of all the administration and delivery aspects of ODL Programmes.

There is a separate DDE wing in the Office of the Registrar (Evaluation) for all the evaluation and certification aspects headed by a Deputy/Assistant Registrar.

The DDE and Evaluation wings are fully computerized and technical staff assist in all the activities.

(vi) Instructional Delivery Mechanism:

Instructional delivery mechanism is through study materials prepared by the experts in the subjects concerned. Study materials (SLM) are prepared in-house by the faculty of the department and the faculty from sister universities.

The study material provided is the general guide and covers the course content in order the learner understand core content of the course concerned. Learner are advised to make use of the reference books in the list of books provided along with the syllabus.

Contact Programme: There will be a contact programme for a minimum duration of 15 days normally. A minimum of 15 days for instruction by experienced and scholarly faculty will be arranged for each paper. There shall be interaction built around lectures, discussions, individual and group activities. A test will be conducted for the candidates in each paper at the end of the contact programme.

Student Support Service: Students can interact with the Office/Faculty through e-mails and personal visits. SMS alert facility for the students regarding dissemination of information relating to conduct of PCPs/Orientation Programme and Production file submission deadlines etc. Student Support Service is provided through online mode and grievance handling mechanism is adopted with the help of supporting technical staff. All necessary and relevant information are uploaded in the dedicated website: www.kuvempuuniversitydde.org. Internal Assignments with Guidelines, previous years question papers, notifications timetables and results are available from the website.

F. PROCEDURE FOR ADMISSIONS, CURRICULAM TRANSACTION AND EVALUATION

As outlined in Section-B, Kuvempu University has a policy to provide opportunity to maximum number of eligible and desirous candidate from all sections of the Society including a class having of low-level of disposable income, rural dwellers, women unskilled men minorities etc.

(i) Eligibility for the Programme:

Any candidate who has passed the three year B.Sc degree examination with Botany as an major/optional or B.Sc. Agriculture ,B.Sc Horticulture or any other degree, from this University or any other University having Botany as an optional is eligible for admission to the M.Sc Botany.

All the candidates who fulfill eligibility criteria are admitted to the programme. If university decides for maximum number of candidates for Programme, admissions are made first come first basis.

(ii) Admission Process:

- Notification issued by the Directorate of Distance Education (DDE) in Regional and National News papers and in the official website.
- Uploading of the Application by the candidate through Online only.
- Payment of fee through online (various options like net banking etc.) or through banks/post offices using printout of the challan.
- Submission of the printout of the application by the candidate to DDE alongwith original documents for eligibility, date of birth etc., and along with fee paid receipt.
- Verification of applications- for fulfillment of eligibility criteria (marks cards) documents, fee paid details.
- Approval of the admission and issue of self learning material (Study Materials) to the students.

(iii) Fee Structure:

Figures in rupees as prescribed for the academic year 2017-18

SN	Fee Component	First Year	Second Year
Admission Orientation and Other Components			
1	Registration	2520	-
2	Admission	980	980
3	Orientation/ Tuition fee	3080	3080
4	Practicals	3080	3080
5	Study materials	4480	4480
6	Liaison	140	140
7	IA Books	490	490
8	Postage	420	420
9	UDF (DDE)	140	-

Examination , Certification and Other Components			
10	Examination	1450	1450
11	Practical exam	485	485
12	PPC	-	365
13	Convocation	-	900
14	UDF (Exams)	250	140
TOTAL		17515	16010

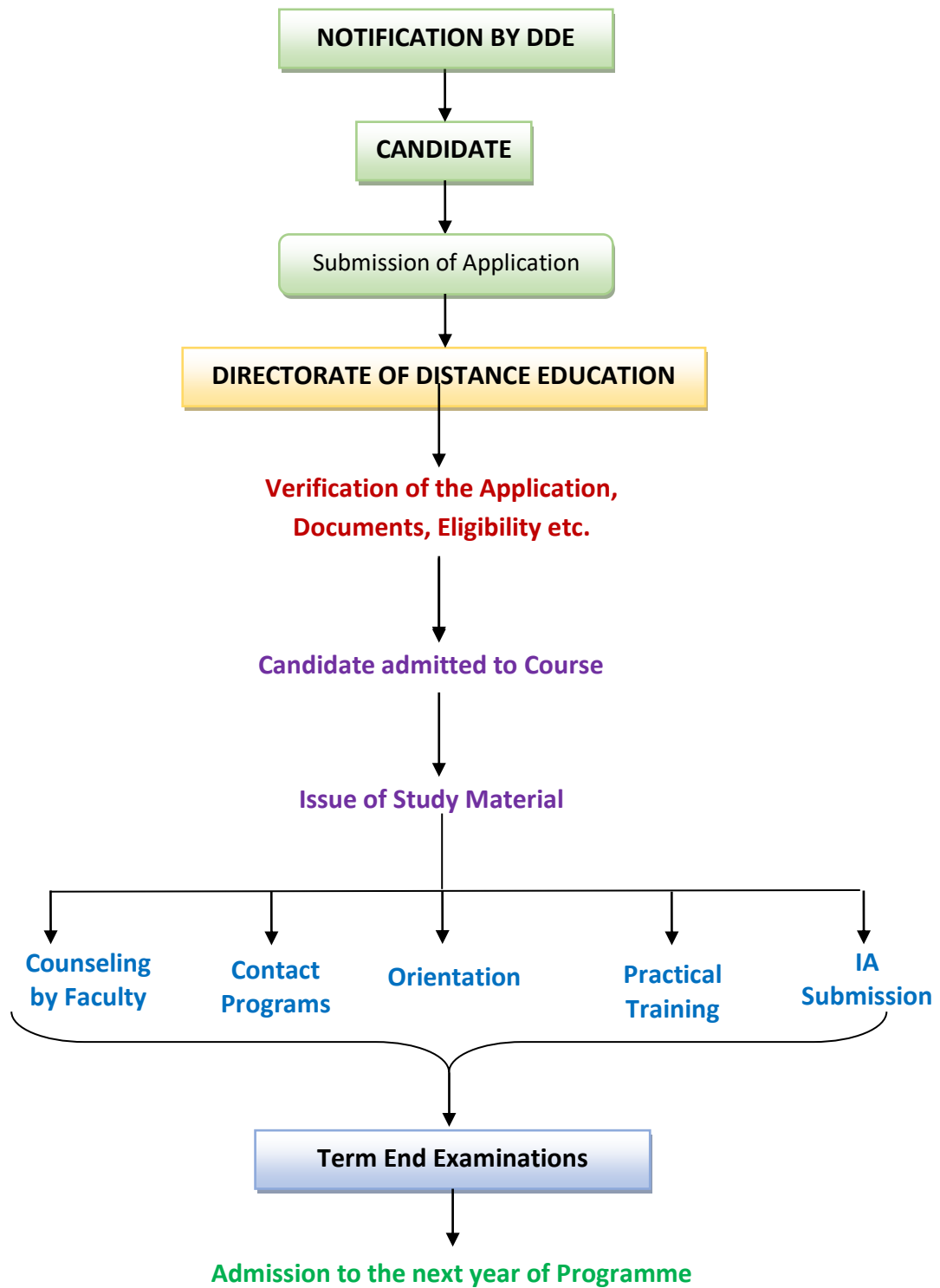
Financial Assistance:

- SC/ST and OBC Students can avail scholarship/fee reimbursement from the concerned State Departments/Agencies
- Fee Concession to Physically Handicap Candidates.
- Fee concession to Employees of the University and their dependents.
- Fee concession to Ex- servicemen.
- Scholarships and education supports extended by various Governmental and Non-Governmental agencies.

(iv) Academic and Activity Planner:

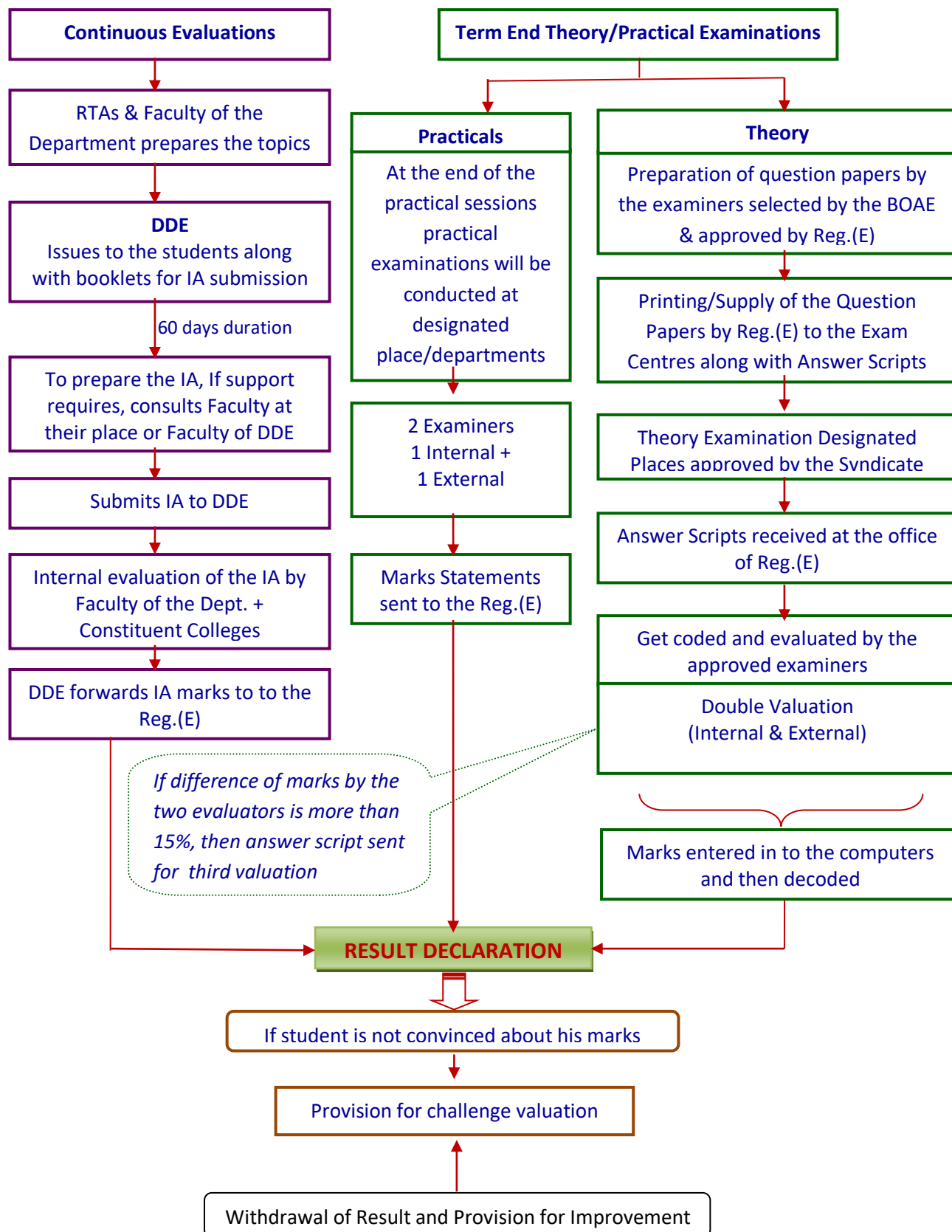
Calendar Year-I		
1	Issue of Notification	July / August
2	Commencement of Online Admissions	July / August
3	Last Date for submission of online applications by the students without Late Fee	October 31
4	Last Date for submission of online applications by the students with late fee	December 31
5	Issue of Study Material and Assignment Books (immediately after verification of the applications)	July to December
Calendar Year-II		
6	Issue of assignment topics Commencement of Counseling sessions	December - January
7	Commencement of Face-to-Face (Orientation) Sessions	February –March
8	Completion of all Orientation Sessions	April 30
9	Last date for Submission of Internal Assignments/ Project Reports	April 30
10	Tentative date for commencement of Examination.	May / June
11	Declaration of Examination Results	August / September

Generalised Academic Flow Chart for the Distance Mode Learners



(v) Evaluation of Learner Progress:

Evaluation Process is given here in the form of Flowchart. This Flowchart is common to all Programme at UG, PG and PG Diploma level offered by the University.



Internal Assessments:

- As a part of continuous assessment the candidates will have to complete assignments in the booklets provided by DDE and submit them to the Directorate of Distance Education within the specified date. The Topics & Instructions for I.A. will be notified in the Students Corner section of the website and also issued to the students directly or through Student Counseling Centres.
- It is mandatory to submit the I.A. in the same year of registration. However, if the candidate failed to take up the theory examination, for any reason, such candidate can submit the I.A. in the next year with prior permission from the DDE.
- All students are expected to complete the above assessments before taking the Term end Examination.
- There is no provision for resubmission of I.A.

Provision for class tests and workout exercises: during Counseling and Face-to-Face (Orientation/Contact) programmes.

(vi) Term End (written) Examination:

Duration: Duration: 3 hours, **Maximum marks:** 80

Questions pattern - Theory

Time: 3 Hours. Marks: 85
Short answer questions 7 x 3marks each – Total 21marks
Medium answer questions 3 x 8 marks each – Total 24
Long answer questions with multiple choice 2 x15 Marks each – total 30 marks
Long answer questions with multiple choice 1 x10 Marks – total 10 marks

Questions pattern – Practical

- For M.Sc. Botany Programme, the candidates will have to attend practical sessions for specified days (25 days) at designated University Departments / Colleges
- Programme consists of two practical courses in each year. Each practicals course will be for 75 marks of which 55 for Practical work, 10 mark for viva and 10 marks for Record.
- The practical examination can be repeated if the candidate has failed to take up the practicals and practical examination in the concerned year. If a candidate fails to attend the regular practical course and exam, he/ she may take up the theory exam and take practicals later.

Declaration of class: At the completion of course evaluation (the Programme) the class will be awarded on the basis of the aggregate of marks at both previous and final examinations taken together.

Pass Class : 40% of marks or above but below 50% of marks.
Second class : 50% of marks or above but below 60% of marks.
First Class : 60% of marks or above.

Separate Ranks and Medals are awarded to ODL Learners. Policy for awarding ranks and medals are same as the one followed for the Regular Programme.

Reappearing for Exams: The unsuccessful candidates at the P.G. Examinations of a particular year are required to reappear for those courses/examinations only as per the syllabus of that year. The repeaters are therefore advised to preserve the syllabus and study material until they pass the final year of the course.

Candidates will have to complete all the exams within double the durations of the course (and not the number of attempts). The double the duration is reckoned from the year of registration.

A candidate is permitted to register for the final year examination irrespective of the number of courses failed at the previous theory exams.

(vii) Other Policy/Provisions:

Renewal of Registration: Students of II year who have failed to pay the II year programme fee in the respective year are permitted to renew their registration by paying the specified course fee along with registration renewal fee and continue their programme. However they should complete the programme within the maximum permissible period i.e., 4 years.

Bonafide student certificate: Those candidates who require Bonafide Certificate/ Study Certificate can obtain by submitting a written request or a filled in prescribed application form (available from the KUDDE website) along with a fee of Rs. 100/- paid either through Bank Challan or Demand Draft.

Change of Address: Any change in the address of the students should be intimated to the Directorate with a fee of Rs. 100/- paid through a challan of Electronic Transfer. No change of address will be entertained once the students receive their examination hall ticket. The Directorate of Distance Education is not responsible for missing correspondence due to change of address without getting address changed at DDE.

Name Correction: Change of Name, if any required, candidate has to make a written request along with relevant documents as proof of change of name, and by paying specified fee.

Duplicate Registration Card: For issue of duplicate Admission/Registration/ Enrollment card- Rs. 200/- will be charged.

Transfer Certificate: A Transfer Certificate is not required for admission to any of the KUDDE courses. The Directorate will also not issue Transfer Certificate at the time of completion of the course. However, for Lateral Entry admissions a migration and transfer certificate will be required from such students.

Change of Examination Centre: DDE will not entertain any change of exam centre unless there is a proof of change of address and it is permissible.

Discrepancies in Marks cards and certificates: In case of any discrepancies observed in the marks card/ certificates etc., candidates have to bring it to the notice of the Director, DDE

through a written request within a period of 3 months from the date of issue of the document.

Miscellaneous: All the original certificates submitted by the candidates in connection with their admission, registration will be returned to them from the Office of the DDE along with the registration certificate. In case any of their certificates are not received back, they must bring the same to the notice of The Director, DDE, Kuvempu University, immediately. The original records will be maintained for a minimum period of three months. If the candidates ask for the originals before three months, their requests will not be entertained.

Preservation of Answer Scripts / IA Scripts: The answer scripts of Theory Exams will be preserved for a maximum duration of 6 months from the date of announcement of results/ revaluation / challenge valuation results. Any query or request for verifications may be submitted, through a written request, within the notified period only.

Similarly, written IA Scripts of the students will be preserved for a period of six months from the date of announcement of the results (First announcement of results). Any discrepancy observed regarding IA marks may be informed to DDE through a written request within three months from the date of issue of results. Later request may not be accepted.

Students are advised to refer the website for notifications regarding preservation of various documents, issued from time to time.

Notwithstanding any conditions mentioned above the University reserves the right to change, alter, and amend any of the above clauses/conditions. In matters of fees for unforeseen issues / certificates/ endorsements the University may fix the amount subject to the existing fee structure or change it from time to time.

Post-Examination Related Issues: For all matters regarding post-examination Certifications - such as, issue of Convocation (Degree) Certificates, Duplicate Marks Cards, Provisional Pass Certificate (PPC), Name Correction, Consolidated Marks Cards, removal of NCL, Academic Transcript, verification of genuineness of Marks Cards and Certificates, and Processing Certificates - enquiries can be made directly at the Office of Registrar (Evaluation). Candidates are informed to contact, for any related information/clarifications, the Helpdesk at the O/o Registrar (Evaluation) by telephone and e-mail ID given the website.

G. LIBRARY RESOURCES

A well established library facility shall be made available with the support of the university library. In the campus we have modern and well equipped building of library in Kuvempu University offers excellent infrastructure facilities in reading, browsing and reference to the students, teachers and research scholars. The library has kept pace with modernisation by introducing CD ROM data base, internet and e-mail facilities. It is also a nodal centre for INFLIBNET, access is available to 10,000 + e-journals online under the UGC- infonet Consortia. There is a well developed digital library and campus network interconnecting all the Post-Graduate departments and offices in the campus.

Further, the DDE will made special effort to upgrade the existing DDE Library exclusively for distance learners with an emphasis on distribution of information and course material online by making use of the state-of-art information and communication technologies.

Library Card: Candidates who are desirous to avail themselves the facilities of Kuvempu University Main Library on the campus will be permitted. They have to obtain a separate Library / ID Card on payment of Rs. 100/- (through Challan of Electronic Transfer). However, no books will be issued to them.

H. COST ESTIMATE OF THE PROGRAMME AND THE PROVISIONS

Cost Estimated of the Programme is based on following components

– calculated for an admission of 100 Students:

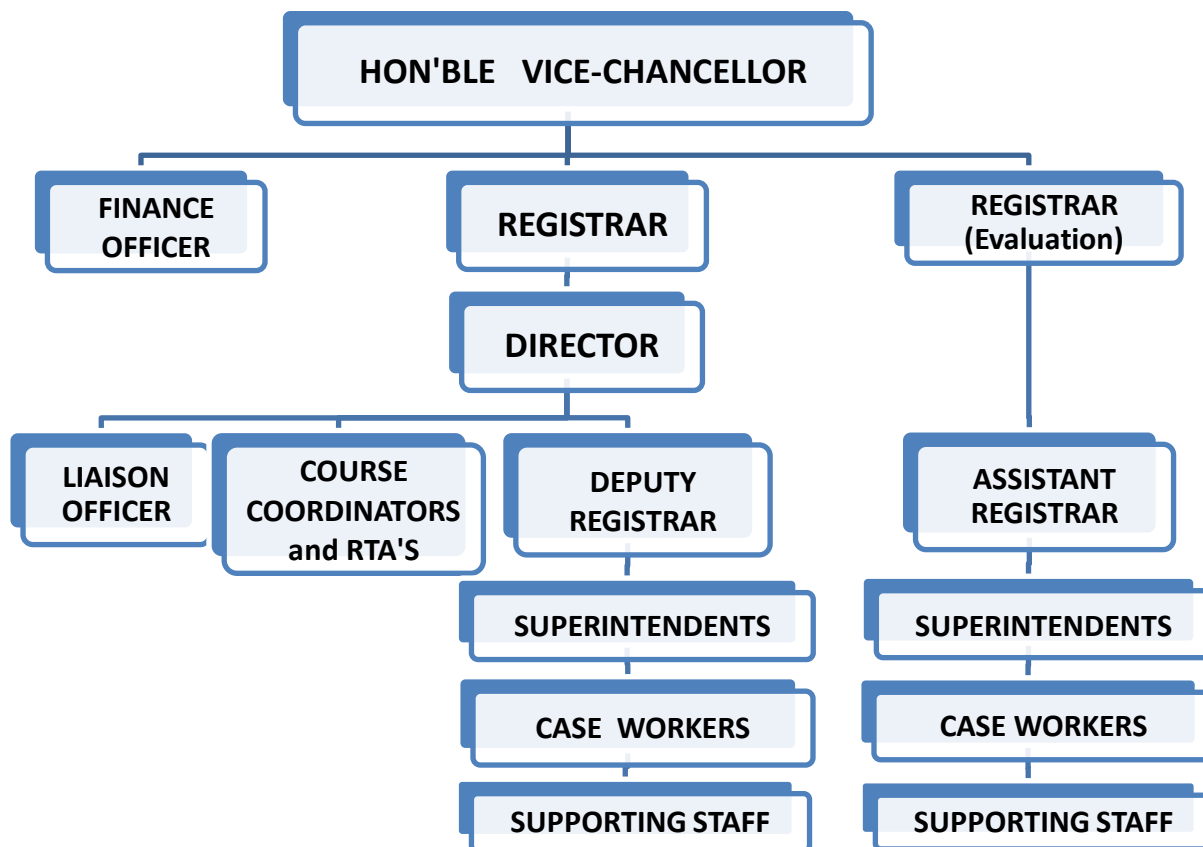
SN	Component	Estimate in Lakh Rupees
1	Study Material Development – Course Writer honorarium, Review vetting, editing, SLM conversion etc	4.48
2	Printing and Distribution of SLM	2.69
3	Publicity, Awareness Information Decimation Programmes *	0.07
4	Conduction of Counselling, Orientation/Face to Face/ Practical Sessions etc.	5.78
5	Student Support Services *	0.25
6	TA/DA Meeting Expenses *	0.13
7	Continuous Evaluation / IA	0.15
8	Examination and Certification	1.63
9	Office Automation/ICT/ Communication Related Infrastructure *	0.25
10	Library *	0.22
11	Staff Salaries/ Remunerations/ Other Honorariums – Teaching, Nan-Teaching/Technical/Supporting *	0.78
12	Office Infrastructure *	0.20
13	Laboratory Development and Expenditures	0.46
14	Learner Centre Expenses *	0.17
15	Others – Office Contingence, Post/Courier, Vehicle Maintenance, Fee reimbursement and such others. *	0.34

Note: * costs that will be incurred collectively for all the Programmes, but given here are the fractions of the total, considering 100 students admission to the Programme.

I. QUALITY ASSURANCE MECHANISM AND EXPECTED PROGRAMME OUTCOMES

(a) Organizational Structure, Management and Monitoring Mechanism:

The Organizational Structure of the Kuvempu University Directorate of Distance Education (KUDDE) is given below in the form of flowchart.



For the administrative and policy decisions, and reviewing and monitoring of the ODL activities, Kuvempu University has a Monitoring Committee (MC) Chaired by the Honorable Vice-Chancellor. The Registrar, Registrar (Evaluation), Finance Officer, Deans of all the Faculties, Chief Librarian, One Syndicate Member, One Academic Council Member and the Regional Director of the IGNOU, are its members. The Director, DDE is the Organising Member. The operational plans, goals and policies are decided by the MC, and all the decisions and policy matters are placed before the Monitoring Committee before implementation. The Committee normally meets twice a year to review the ODL Programmes and activities.

Academic Advisory Committee (AAC) of the DDE will review the academic programme performance, content delivery mechanism. Issues regarding course content and syllabi revision of all the Programme offered in ODL mode are discussed and decided in AAC. The Registrar will be the Chairman of the AAC, and Registrar (Evaluation), Chairpersons of all BOSs of the concerned Departments will be the members. The Director/ Deputy Director of the DDE is the Organising Member.

All the major decisions including financial, planning and implementation which are discussed in the MC meeting are placed before the Syndicate of the University and after its approval they will come into force.

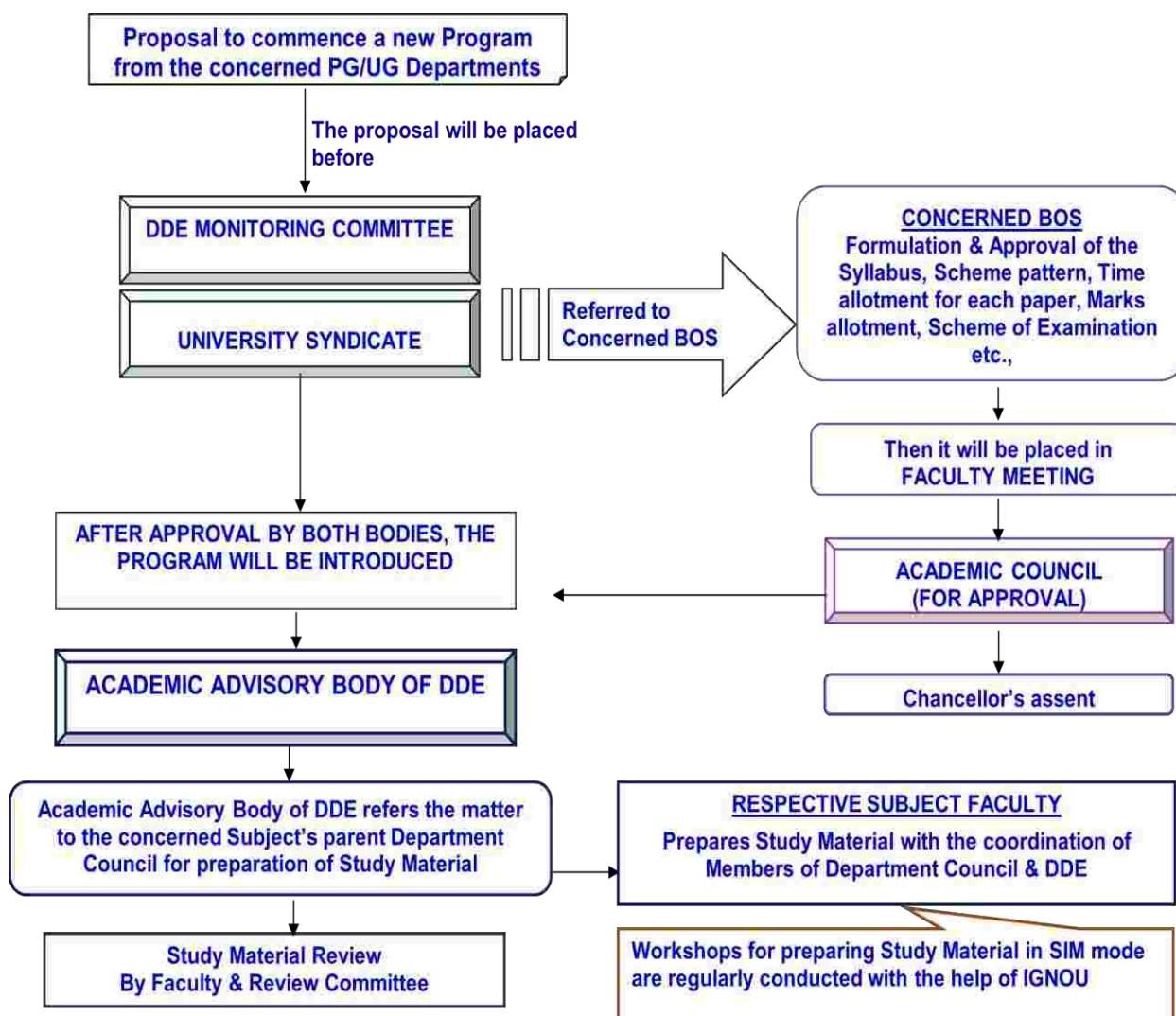
The decisions taken by the AAC are placed through the concerned bodies like, BOS/ Examination wing (for evaluation and certification issues) and finally placed before the Academic Council of the University for its approval.

For the internal quality assurance mechanism there is a Internal Quality Assurance Cell of the University.

(b) Programme Development and Approval Processes:

Proposal from the concerned PG/ UG department to commence a new Programme will be placed before Monitoring Committee of the DDE/ Syndicate. Then it will be referred to the BOS concerned for formulation and approval of the syllabus, programme structure, time allotment for each paper, marks allotment, scheme of examination etc., then it will be placed in the Faculty meeting and then Academic Council for its approval. After approval by both the bodies, the programme will be introduced. The Academic Advisory Body of DDE refers the matter to the concerned Subject's/ parent Department Council for preparation of Study Material. The concern subject Faculty will coordinate with the DDE and the Department Council, as he/ she is one of the member in it. Workshops for preparing Study Material in SLM mode are regularly conducted (with the help of IGNOU experts) and preparation of course material in SLM mode is in progress.

The various steps involved in programme development, approval and implementation are depicted in the flowchart given below.



(c) Programme Monitoring and Review:

As a part of the regular monitoring mechanism, feedback from the Learners is obtained at the end of each of the face-to-face programmes - both through discussion and through written feedback form. Feedback form includes mainly three aspects – about appropriateness/ usefulness of learning (study) materials, effectiveness of orientation/ face-to-face programmes and internal assessments/continuous assessment process. Learner can give their opinion, suggestions and complaints, if any, through the feedback form. Issues raised in feedback are addressed at appropriate level.

There is also Student Support Service and Grievance Cell in DDE in order to address the day-to-day issues faced by the Learners. The Research and Teaching Assistants at DDE and the Coordinator in the concerned the subjects are available for the learner support services. These apart, regular meetings of concerned faculty are conducted in order to plan the orientation and practical session's activity.

It is the policy of the KUDDE to make available the expert faculty of the PG Departments/ Colleges (for UG) and experts from the sister universities in the state who are regular faculty in the respective subjects for the ODL programmes. The same is followed for the Learner Support Centres (LSC). Programme delivery/academic activities at the LSC are also monitored from the Headquarter.

DDE is organizing Coordinators Meet every year wherein all the issues related to ODL programmes – academic, examination, learners related and administration are discussed and remedial measures are considered under the ODL framework of the university. During the Meet academic activities/learners' issues at the LSC are also reviewed.

Detailed Syllabi of M.Sc, in Botany

FIRST YEAR

Course 1: Biology and Diversity of Algae, Fungi, Bryophyte, Pteridophyte and Gymnosperms. (100

hours)

- UNIT 1:** Plant Kingdom: Introduction, classification of plant kingdom (Based on Mayr, seven kingdom of living organisms), diversity habitat, ecological status, origin, evolution of land plants. - 15 hours
- UNIT 2:** Algae: Introduction, general characters classification, economic importance, characteristic features and life cycle of Chlorophyceae, Volvox, Ulothrix, Ulva; Xanthophyceae – Vaucheria, Phaeophyceae – Ectocarpus, Sargassum. Rhodophyceae – Polysiphonia. -16 hours
- UNIT 3:** Fungi: Introduction, General characters, classification (Alexopoulos system) Life history of Mastigomycotina -Pythium, Phytophthora Zyzomycotina-ucor, Ascomycotina- Saccharomyces, Chaetomium, Peziza, Bidiomycotina-Puccinia, Agaricus, Dueteromycotina-Cercospora, Colletotrichum. - 17 hours
- UNIT 4:** General accounts of Lichens, Classification and economic significance. - 10 hours
- UNIT 5:** Bryophytes: Introduction, salient features, Classification, Morphology, Reproduction, Life cycle of Marchantia, Anthoceros and Funaria. -12 hours
- UNIT 6:** Pteridophytes: Introduction, Salient features, Economic importance, classification, Morphological and Anatomy, reproduction, steelar evolution. A general account of evolution and significance of Psilopsida, Lycopsida, Sphenopsida, and Pteropsida, heterospory and seed habit. - 15 hours
- UNIT 7:** Gymnosperms: Introduction, Classification, Salient characteristics features, evolutionary significance, morphology, anatomy and reproduction of Cycadales, Coniferales and Gnetales. -15 hours

Practicals:

1. Study of Blue green algae, Anabaena, Volvox, Ulothrix, Ulva, Sargassum, Polysiphonia.
2. Study of Rhizopus, Yeast, Aspergillus Penicillium, Choctomium, Peziza, and Agaricus.
3. Morphological and reproductive structures in Riccia, Marchantia and Anthoceros,
4. Morphological and reproductive structures in Lycopodium, Selaginella, equisetum, marsilea, Pteris.
5. Morphological, anatomical and reproductive structures in Cycas, Pinus, Ephedra or Gnetam.

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7. Pandey, S.N., Misra, S.P. and Trivedi,P.S. 1977. Text book of Botany, Bryophyta, Pteridophyta, Gymnosperms and Paleobotany. 2nd edition. Vikas publishing house. New Delhi.
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9. Sundarlingam,V.S., 1989. Marine algae; Morphology, Reproduction and Biology. Dehradun;Bishan Singh. Mahendrapal shingh.
10. Pandey,S.M., Trivedi,P.S. 1995. Text book of Algae. Vikas publishing house, New Delhi.
11. Carter Nellie, 1926. Fresh algae from India. Government of India. Calicutt.
12. Garbary., David, J. and South G. Robin. 1990. Evolution bio geography of the marine algae of the North Atlantic, Published by London Springer verlag.
13. Trivedi and Pravin chandra. 2001. Algal bio technology. Jaipur pointer publishers.
14. Pandey, S.M., Mishra,S.P., and Trivedi,P.S. 1977. Text Book of Botany, Bryophyta, Pteridophyta, Gymnosperms and paleo botany. Vikas publishing house, New Delhi.

Course 2: Diversity of Angiosperms and Plant Taxonomy. -100
hours

- UNIT 1:** Systems of Angiosperms classification- Merits and demerits of following classification. Bentham and Hooker, Engler and Prantle, Hutchinson, Cronquist, Relevance of Taxonomy to conservation, sustainable utilization of bio-resources and ecosystem research. -
20 hours
- UNIT 2:** Taxonomic evidence:- Morphology, Cytology, Palynology, Embryology and phytochemistry. -15
hours
- UNIT 3:** Botanical Nomenclature: ICBN Principles, Nomenclature of taxa according to their ranks. - 15
hours
- UNIT 4:** Concept of Phytogeography: Endemism, hotspots and hottest hotspots, importance of plant diversity in socio-economic development. - 15
hours
- UNIT 5:** Study of the following families with their phylogeny (a/c B.H. System). -15 hours
- UNIT 6:** Magnoliaceae, Nymphaeaceae, Capparidaceae, Caryophyllaceae, Malvaceae, Meliaceae, Anacardiaceae, Combretaceae, Lythraceae, Passifloraceae, Casuriaceae, Rubiaceae, Apocyanaceae, Boraginaceae, Nyctaginaceae, Scrophulariaceae, Bignoniaceae Verbenaceae, Asteraceae, Hydrocharitaceae, Alismataceae, Zingiberaceae, Liliaceae, Orchidaceae, Poaceae. - 20
hours

Practicals: Study of the representatives of the above families available locally.

References:

1. Lawrence, H. M. 1967. Taxonomy of Vascular plants.Oxford and IBH. New Delhi-1.
2. Mathur, R. C. 1968. Systematic Botany [Angiosperms]. Agro Book Store. Educational Publishers,Agra 2.
3. Vasishta, P.C. 1974. Taxonomy of Angiosperms. R.Chand and Co., New Delhi.

4. Priti Shukla and S.P. Mishra. 1985. An introduction to Taxonomy of angiosperms. Vani Educational Publishers.
5. Vasudevan Nair. 1997. Taxonomy of angiosperms. APH. Publishing House. New Delhi.
6. Pullaiah, T. 1998. Taxonomy of angiosperms. Regency Publications. New Delhi.

Course 3: Ecology and Plant Geography -100
hours

- UNIT 1:** Introduction:- Scope and Concepts of Ecology relationship of ecology with other fields of Biological science and its Applications. -8
hours
- UNIT 2:** Ecosystem:- Nature and types of Ecosystems, producers, Consumer's Decomposers, energy flow and Mineral cycling. - 5 hours
- UNIT 3:** Autecology and Synecology. -5
hours
- UNIT 4:** Climatic factors:- Light, temperature, precipitation, humidity, role of climatic factors in the distribution of plants. Macro & Micro climate, positive and negative interaction of climatic factors. -10
hours
- UNIT 5:** Stability and change in plant communities:- Concepts of Ecological Succession. Basic types, general process in succession and climax community. -10
hours
- UNIT 6:** Biogeochemicals:- Types of Bio-geo chemicals cycles, nutrient budget, biomagnification. -10
hours
- UNIT 7:** Energetics:- Electromagnetic spectrum, energy flow in ecosystem, Primary and secondary production. -8 hours
- UNIT 8:** Ecosystem efficiency, utilization of resources diversity, stability, classification and ecosystem models, Green house effect. - 8
hours
- UNIT 9:** Major ecosystem of the world:- Their structure and productivity. - 6 hours
- UNIT 10:** Genecological units and ecological amplitudes. -5
hours
- UNIT 11:** Principles of phytogeography:- Centre of Origin, dispersal mechanisms, barriers distribution in space time and ecesis. -10
hours
- UNIT 12:** Pollution:- Definition, Air, Noise and Water Pollution. -5
hours
- UNIT 13:** Continental drift:- Theories, Origin and distribution of Coffee, Cardamum, Wheat, Rice, Cotton, Sugar cane, Sorghum, Cocoa, Banana, Coconut. - 10 hours

Practicals:

1. Studying of woodland and grassland Vegetation by quadrat method.
2. Transect Method of studying vegetation.
3. To determine diversity indices (Shanon Veiner and Simpson, richness) In disturbed and protected areas.
4. Methods of collecting soil samples, determination of soil colour, texture, Purity analysis of PH, temperature.
5. Estimation of microbes in water samples.

6. Estimation of free CO₂ in water.
7. Estimation of total hardness and
8. Temporary hardness.
9. Estimation of phosphates, sulphates, Carbonates in water

Reference:

1. Mohan P. Arora., Ecology, Himalaya Publishing House, Bombay. 1995.
2. Eug. Warming. Ecology of plants. Ambey Publications New Delhi, 1998.
3. Verma. P. S. and Agarwal V. K. Principle of Ecology. published by S. Chand and company ltd. New Delhi. 1992.
4. Ambasht K.S. Plant Ecology. Published by student's friends and co. lanka varansi, India. 1969.
5. Eugene p. odum.. Ecology. Sinauer Associates Inc publishers, Sunderland, USA. 1996.
6. Charan and Anil, K. 1992. Plant Geo-graphy. Rawat publications. Jaipur

Course 4: Microbiology

- 100

Hours

- | | | |
|-----------------|---|------|
| UNIT 1: | Introduction to microbiology : Scope, History and Recent advancements in the field of Microbiology. | -8 |
| | hours | |
| UNIT 2: | Tools used for Microbial examination: Hostory ,development of Microscopy, Dark field, Bright field, Phase contrast and Electron Microscope (Scanning and Transmission). | -10 |
| | hours | |
| UNIT 3: | Microorganisms:- Nature, identification Isolation and Classification of Micro organisms. | -10 |
| | hours | |
| UNIT 4: | Sterilization Methods by Physical and Chemical methods. | - 10 |
| | hours | |
| UNIT 5: | Ultra structure and Reproduction in Bacteria, fungi, viruses Mycoplasma and Blue green algae. | -12 |
| | hours | |
| UNIT 6: | Microbiology of dairy and dairy products. | -10 |
| | hours | |
| UNIT 7: | Agricultural Microbiology:- Microflora of soil, rhizoplane, rhizosphere, mycoflora nitrogen fixation, Role of Biofertilizers in Agriculture. | -10 |
| | hours | |
| UNIT 8: | Industrial Microbiology:- Industrial application of microbes, microbes as a source of protein organic acids, enzymes, production of Antibiotics, Steroid and Vaccines. | -10 |
| | hours | |
| UNIT 9: | Water and Food Microbiology:- Water pollution, Bacteriological Examination of water, control of water borne diseases, Microbiology of food, Food spoilage,, Methods of food preservation and Control of food poisoning. | - 10 |
| | hours | |
| UNIT 10: | Microbiology of Air:- Analysis of Air Mycoflora, by gravity slide, vertical cylinders spore trap, rodtorod , anderson air sampler, and liquid Impigners methods and Aeroallergens. | -10 |
| | hours | |

Practicals:

1. Calibration of Microscope:- Determination of dimensions of microbes (Bacteria yeast and fungal spores)
2. Determination of total count of microorganisms kusing haemocytometer.
3. Isolation and culturing of microorganisms; serial dilution of soil or water or milk; streaking on agarplates/plates.
4. Staining technique: Direct staining , Negative staining and Grams staining.
5. Isolation and culturing of Rhizobium from root nodules of higher plants.
6. Demonstration of Bacterial motility by hanging drop method.
7. Test for presence of coliform bacteria in contaminated water.
8. Identification of fungi from slides:
 - a) Aspergillus b) Penicillium c) Yeast
 - d) Fusarium e) Colletotriclum f) Phoma
 - g) Dreschelera h) Alternaria i) Curvularia
 - j) Rust spores k) Cercosporos.

References:

1. Pelczar, Jr., Chan, B.C.S. and Krejz, N.R. 1993. Microbiology. Mc Graw- Hill Inc. New Delhi.
2. Sullia, S. B. and Shantharam, S. 1998. General Microbiology. Croford and IBH Publishing Co., Pvt. Ltd. New Delhi.
3. Prescott. L.M., Harley, J.P. and Klein. D.A. 1996. Microbiology. WMC Brown Publishers. New Delhi.
4. Sharma, P.D. 1995. Microbiology and Plant Pathology. Rastogi and Co., Subash Bazar, Meerut.
5. Michael J. Pelczar, J. R., E.C.S. 1993. Chan and Noel R. Krieg. Microbiology.
6. Tata McGraw- Hill Publishing Company limited, New Delhi.
7. Jerome J. Perry And James T. Staley. Microbiology: Dynamics and Diversity, Saunders college publishing, USA, 1997.
8. Larry Mckane and Judy Kandel. Microbiology: Essential and Applications, Mc GrawHill Book Company Publication, New York, 1986.
9. Edward Alcame,. Fundamentals of Microbiology. Benjamin/ Cumming publishing company, Canada, 1997.
10. Yanka Gupta., Selected Reading in Microbiology and Genetics, published by prabhat Kumar kumar sharma, for sarup and sons New Delhi, 1998.

SECOND YEAR

Course 5: Plant Physiology

(100

HOURS)

UNIT 1:	Plant cells: Basic postulates, Prokaryotic cells and Eukaryotic cells.	-5 hours
UNIT 2:	Water relation: Diffusion and water potential, osmosis.	- 5 hours
UNIT 3:	Transpiration: Measurement of transpiration, stomatal Mechanics and mechanisms, role transpiration –water stress and energy extinct.	-10 hours
UNIT 4:	Ascent of sap: Problem behind ascent of sap, Cohesion mechanism of the ascent of sap, Pathways, Water potential.	-5 hours
UNIT 5:	Mineral nutrition: Essential elements and their functions chelating agents, Nutrient deficiency symptoms, and methods of studying plant nutrition.	-5 hours
UNIT 6:	Absorption of mineral salts: Roots as absorbing surfaces, soils and their mineral elements, ion traffic in to the root, Principles of solute absorption and characteristics.	-10 hours

- UNIT 7:** Photosynthesis: history, structure of chloroplast, Photosynthetic pigments, principles of light absorption by plants, Emerson enhancement effect, photosystem-I &II- composition and functions, transport of electrons from water to NADP⁺, photophosphorylation, Reduction potentials, CO₂ fixation, Calvin cycle (C₃), C₄ cycle, Photorespiration, Crassulacean Acid Metabolism (CAM), Factors affecting photosynthesis. -10 hours
- UNIT 8:** Respiration: Respiration quotient, Glycolysis, Fermentation, Krebs cycle, Mitochondria, electron transport system, oxidative phosphorylation, pentose phosphate pathway. -10 hours
- UNIT 9:** Growth and development: Patterns of growth and development, growth kinetics, -5 hours
- UNIT 10:** Hormones and growth regulators: Auxins, Gibberelins, ethylene, abscisic acid, and other components. -5 hours
- UNIT 11:** Biological clock: Circadian and other rhythms, basic concepts and terminology. Rhythm characteristics – light, temperature, applied chemicals, clock mechanisms, biological clock in nature. -10 hours
- UNIT 12:** Photoperiodism: Early studies, burning hypothesis, and existence of rhythmic component in photoperiodic behavior. Principles of photoperiodism, photoperiod during plants life cycle, response type, phytochrome and role of the dark period time measurement in photoperiodism, florigen concept. -10 hours
- UNIT 13:** Growth responses to temperature: Vernalization, dormancy, seed longevity and germination, seed dormancy, bud dormancy, thermoperiodism, mechanism of the low temperature response, Nature of photoperiodic signal. -10 hours

Practicals :

1. Determination of TAN value in CAM plant.
2. Effect of Kinetin on postponing senescence.
3. Effect of temperature on cell permeability.
4. Determination of stomatal index in leaves of mesophytic and xerophytic plants.
5. Determination of isoelectric point of protein.
6. Determination of Lypase activity.
7. Determination enzyme activity as a function of its concentration.
8. Determination enzyme activity as a function of its p^H.
9. Determination of protein concentration by Biuret method.
10. Determination of Diffusion Pressure Deficit in Potato tubers.
11. Separation of Chlorophyll pigments by Paper chromatography of thin layer chromatography.
12. Determination of seed viability by TTC method.
13. Estimation of DNA content in plant cells.
14. Estimation of carbohydrates in plant tissues.

References:

1. Water stiles (1994) Principles of Plant Physiology Discovery publishing House, New Delhi.. India.
2. Edwards and Hassall (1980) Biochemistry and Physiology of the cell. Mc-Graw-Hill Book Company (UK) limited. Maidenhead. Berkshire, England.
3. Arora, D.K., Gupta and Seema, (1996). Physiology of Plant cells. Anmol publications New Delhi.
4. Taiz, Lincoln Zeiged and Ekdurado california .
5. Wilkins and Malcem, B (1969). Physiology of Plant growth and development Tata Mc Graw Hill publishing co., Bombay.
6. Pandey and Sinha (1990) Plant Physiology Vikas publishing House, New Delhi.

7. Devlin, Robert M. Witham, Francies, H. (1983). Plant Physiology, CBS Publishers- New Delhi.
8. Salis Bury, Frant B Ross, Cleon W (1980), Plant Physiology CBS Publishers, New Delhi.
9. Bidwell,RGS (1986). Plant Physiology, Macmillan publishing co., Newyark.
10. Meyer, Bernard, Anderson., Donald B (1952), Plant Physiology, Affiliated East-West Press Moore and Themar,C. (1989). Biochemistry and Physiology of Plant Hormones.
11. Naggle, Pay G Fritz, Gearge J. (1983) Introductory Plant Physiology prentice Hall of India, New Delhi.
- 12.Datta, Subhash Chandra (1998), Plant Physiology, Age Isdnternational Publishers. New Delhi.

Course 6:. Medicinal plants and Economic Botany

100

hours

- UNIT 1:** Introduction:- Importance of medicinal and aromatic plants to human welfare: present status of research and scope. Literature on Medicinal and Aromatic plants. -10 hours
- UNIT 2:** Concepts of Ethnobotany with special reference to its Historical development in India contributions of tribal and other communities; Organizations Institutions. Literature and archeological records to Ethonobotany. -12 hours
- UNIT 3:** Classification of Medicinal Plants. Phanerogamic and Crytogamic Medicinal Plants species of India with special reference to Karnataka. -10 hours
- UNIT 4:** Methods of Surveying, Collection, Preservation of medicinal plants and their products. Herbal drugs in India; Adultration and Detection; Marketing facilities and problems. -10 hours
- UNIT 5:** Drugs of Biological origin, Extraction, Processing; testing of antimicrobial properties and mode of action of the following plants. *Rauwuolfia serpentina*, *Vinca rosea*, *Aloe vera*, *Centella asiatica* and *Emblica officinales*. -10 hours
- UNIT 6:** Characteristics of Essential oil yielding plants; Extraction, Purification and Importance. -8 hours
- UNIT 7:** A short account of spices, Timber yielding, rubber yielding, beverages, fibers and floss plants. -10 hours
- UNIT 8:** Distribution and Taxonomy of plants with pesticidal properties, their extraction and processing and Marketing value. -10 hours
- UNIT 9:** Poisonous plants of India, Chemistry of plant toxins and their therapeutic uses. -10 hours
- UNIT 10:** Conservation of Endangered Medicinal and Aromatic plants with special reference to Karnataka. -10 hours
- Practicals:** Medicinal plants and Economic Botany
1. Study of any twenty medicinal plants (Covered in theory) and their uses.
 2. Preparation of Churnas,. Thaila and dry powder (Ayurveda Drugs) used in ayurveda.
 3. Study of spices and condiments, oil yielding plants, Timber yielding plants, Bevarages and Essential oils.

References:

1. Acharya Y.T. 1941. Charaka samhita, Commentary by Chakrapani, niranya Sagar Press Bombay.
2. Ambasta, S.P. 1986. The useful plants of India,
3. Anonymous, 1992, Five hundred Indian plants; their use in medicine and in the arts (in Karnataka), 3rd ed. (Ist ed. 19881) Kanarese Mission press, Mangalore.

4. Sengupta, N. 1959. Sushrutha Samhitha Commentary by Dalharna C.K. Sen and Co., Calcutta.
5. Bodey, B.P. 1984. Economic Botany, Chord Co. New Delhi.
6. Grewal R. C. 2002. Medicinal plants. Published by campus books international, New Delhi,
7. Irfan A Khan and Atiya Khanum. 2002. Role of biotechnology in Medicinal and Aromatic plants, Ukaza publications, Hyderabad.
8. Agarwal, V.S. 1986. Economic plants of India, Published by Kailash, 46. Brahma Samaja Road. Calcutta -34, (India).
9. Pandey, S.N and Ajanta chandha, 1993. Text book of Botany (Plant Anatomy and Economic Botany). Vikas publishing house. Pvt.Ltd., New –Delhi.
10. Kirtikar, K.R. and Basu, B.D. 1987. Indian medicinal plants. International book distributors booksellers and publishers, dehra dun- 245001.
11. Robert Bentley. 1998. Medicinal plants. Published by prashant Guhlot for allied book center, Dehradun..
12. Sinha and Rajiv, K. 1996. Ethnobotany. the renaissance of traditional herbal medicine. INA. Shree publications. Jaipur
13. Singh V., Pandey, R..P. 1998. Ethnobotany of Rajasthan. Jodhpur scientific publications. India.

Course 7: Angiosperm Embryology

100

hours

- UNIT 1:** Introduction – History and development of Angiosperms Embryology. -10 hours
- UNIT 2:** Microsporogenesis- Structure and development of the Microsporangium wall and male gametophyte. Role of tapetum in pollen development. Scope of Palynology. -15 hours
- UNIT 3:** Mega Sporangium and female gametophyte: Morphological types and structure of ovules. Special structures; Nucellus pallasuodrum, Perisperm, carinacle, Operculum and aril. -15 hours
- UNIT 4:** Fertilization: Role of Synergids, filiform apparatus, heterospermy, behaviour of male gametes, Syngamy and triple fusion, metabolic and structural changes before fertilization. -15 hours
- UNIT 5:** Endosperm:- Classification and types, Ultra structure, Endosperm haustoria. -10 hours
- UNIT 6:** Embryo: development and types poly embryony – classification and types. -15 hours
- UNIT 7:** Apomixis:- diplospory, apospory, parthenogenesis of embryos. -10 hours
- UNIT 8:** Fruit and Seed-parthenocarpy –induction of seedless fruits. -10 hours

Practicals:

1. Pollen grain diversity studies, of few families of angiosperms with respect to size, exine sculpturing, germ pore number etc.,
2. Pollen grain germination by hanging drop technique in *Catharanthus roseus* or any other suitable material.
3. Slides- Microsporangium wall and microsporogenesis
4. Slides- Megasporangium and female gametophyte
5. Slides- Endosperm
6. Slides- Embryo of dicots and monocots
7. Microdissection of endosperm in *Cucumis sativus* with haustoria.

Course 8: Plant Biotechnology and Plant Breeding

100 Hours

Plant Biotechnology

- UNIT 1:** Scope, importance and centers of biotechnology in India and abroad. -5 hours
- UNIT 2:** Basic aspects of plant tissue culture, tissue culture media, media components, growth regulators, growth retardant, vitamins, aminoacids, undefined supplements, explants, totipotency, sterilization, inoculation, sub-culturing. -8 hours
- UNIT 3:** Different types of cultures, callus formation, different types, suspension cultures, single cell culture ,testing of viability of cells, organogenesis different types, factors affection, micropropagation, different stages of micropropagation, rooting and establishments in herbs and woody plants ,somoclonal variation and its importance,somatic embryogenesis ,different methods, factors affecting embryo maturation ,applications, synthetic seeds and its significance. -10 hours
- UNIT 4:** Haploids - Production of haploids, different methods, anther culture, pollen culture, significance in crop improvement, ovule, endosperm and embryo culture, importance, *invitro* fertilization and its significance. -5 hours
- UNIT 5:** Protoplast culture, regeneration and somatic hybrids; Isolation and purification of protoplast, viability and planting density of protoplast. Protoplast culture and regeneration of plants, protoplast fusion and somatic hybridization, uses of somatic hybrids, cybrids- genetic modification of protoplasts. - 8 hours
- UNIT 6:** Recombinant DNA and gene cloning; Cloning vectors for recombinant DNA (plasmids, phases, cosmids, viruses, transpones etc.), binary and shuttle vectors, restriction enzymes for cloning, techniques of restriction mapping, construction of chionaeic DNA, molecular probes, southern, northern and western blotting, construction and screening of genomic and c DNA libraries. -10 hours
- UNIT 7:** Polymerase chain reaction (PCR) and amplification; Basic PCR and its modification, Application of PCR in biotechnology and genetic engineering, DNA-finger printing. -8 hours
- UNIT 8:** Hybridoma and monoclonal antibodies- Hybridoma technology and production of monoclonal antibodies, alternatives to hybridoma technology, uses of monoclonal antibodies. -5 hours
- UNIT 9:** Germplasm conservation; *invitro* methods, long term and short term, cryopreservation and significance, cryopreservation centers in India. -5 hours

Plant-Breeding

- UNIT 1:** History and scope of plant breeding, breeding systems in crop plants, techniques and methods of plant breeding. -3 hours
- UNIT 2:** Breeding self-pollinated and cross-pollinated crops by introduction, selection, and hybridization.
- UNIT 3:** Introduction, selection, principles of selection, types of selection, hybridization-pedigree method, bulk method, back cross, procedures, advantages. -5 hours
- UNIT 4:** Method of breeding- mode reproduction, incompatibility, male sterility, barriers to cross ability. -5 hours
- UNIT 5:** Breeding for disease and insect resistance, definition and history, loss of resistance, race and its identification, classification of resistance, genetics of host parasite interaction, breeding for disease resistance, explanation of resistance genes, advantages and limitations of resistance breeding. - 8 hours
- UNIT 6:** Mutation breeding- Definition and history, classification of mutation and mutagens, procedure for mutation breeding, self-pollinated crop, cross-pollinated crop, asexually propagated crop, applications and achievements. -5 hours

UNIT 7: Heterosis or hybrid vigour-Types of Heterosis, causes of Heterosis, breeding methods to exploit Heterosis, technique of producing hybrid seed. - 5 hours

Practicals:

1. Selfing and hybridization techniques in Bajra and Sorghum.
2. Floral biology of Bajra and Maize.
3. Estimation of pollen viability and pollen size.
4. To study stigmatal receptivity and pollination period in self-pollinated crops.
5. To determine LD 50 value for certain chemical mutagens.
6. To test seed viability by TTC method.
7. Preparation of tissue culture media.
8. Preparation of Explants and tissue culture.
9. Synthetic seeds.
10. B-chromosomes and polytene chromosomes.
11. Mitotic and meiotic studies.
12. Determination of nodulation in cultivated and uncultivated legume crops.
13. Determination of protoplasm viability.
14. Estimation of citric acid produced by fungi.
15. Protoplast fusion by PEG treatment.
16. Techniques in plant biotechnology and study of tools / instruments.

References:

1. Bajaj YPS (Ed 1986. Biotechnology in agriculture and forestry Springer verlag).
2. Bonga J.M. and K.J. Durzan(Eds1987. Cell and tissue culture in forestry, Vol.I & II general principles of Biotechnology. Martinus Jijhoff pub. Lancaster.).
3. T.H. Dodds and W. Robertyes. 1985. Expt in plant tissue culture. 2nd Ed.
4. J. Reinert and Bajaj YPS (1977). Applied and fundamental aspects of plant cell, tissue and organ culture.
5. Bajaj. Y.P.S (Ed1985) Biotechnology and Agriculture and Forestry, I and II Crops .
6. Chopra.V.(Ed. 1988) Forest and Crop Biotechnology, progress and prospects.
7. Gupt. P.K. 1986. Elements of Biotechnology. Rastogi and company educational pub. New-Delhi
8. R.C.Dubey 1996. A text book of Biotechnology, HR company limited , New Delhi.
9. Lyndon.R.F. 1990. Plant development the cellulr basis Unwin Hyman Ltd. UK
10. Zimmerman.R.H. 1986 Tissue culture as a plant production system for Horticulture crops. Elmer Academy pub.
11. King.S.D. and Arntzen .D. 1989 Plant Biotechnology .
12. Bajaj. Y.P.S. 1990 Somaclonal variation in Crop improvement.
13. Suzuki.D. and Knudson.P. 1989 Genetics the ethics of engineering life. Unwin Hyman . London
14. Crespi, R. S. 1981. Biotechnology and intellectual property part –II patenting in biotechnology Tibtech –9; 117 to 121
15. Allard R.W.1996. Principles of Plant breeding. John wiley and Sons.
16. Bajaj. Y.P.S.1990. Haploids in crop improvement, Springer Verlag.
17. Chopra. V.L. 1989. Plant breeding , Theory and practice, Oxford IBH.
18. Chopra .V.L. and Anwar nasim Genetic engineering and Biotechnology ; concepts and Applications, Oxford IBH.
19. Frankal.OH and E.benett, 1970,Genetic resources in plants Blackwell.
20. ICAR,1989.Fourty years of agricultural research and education in India.
