PROGRAMME PROJECT REPORT (PPR)

Name of the Programme: **BACHELOR OF SCIENCE (B.Sc. In PCM & CBZ)**

Duration: Minimum 3 years
Maximum 6 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 to all students in the field of basic science enabling them to take up careers in academic, industry and government sector along with conducting significant societal based research**.** Provide an opportunity to all those who could not be able to take up formal mode education in the field of basic science and train them to enhance the knowledge and build a human resource.

MISSION:

- The Department pledges to encourage in the broadest and most liberal manner, the advancement in basic science through its education, training and service.
- Foster creativity in teaching, learning and research to build a knowledge base and promote quality initiative.
- Provides advanced study in all branches of basic science for individuals who are currently completed Pre University programme in Science and wish tojoin post graduate programme.

OBJECTIVES:

- To train the students in various quantitative and qualitative analyses to critically assess and solve problems.
- To acquire basic knowledge in the all branches of basic science.
- Demonstrate high-level of professionalism, ethical and social responsibility, independent learning, and desire for life-long learning.
- Excel in careers in the basic science and to create workforce.

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 the 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 both 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 programmes 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 the society who are willing to seeking non-formal education.
- Capacity Building using the non-formal mode platform.
- Concentrate on planning & constant upgradation 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:

Bachelor of Science, is intended for the target group of senior secondary level Classes (XI- XII) students who look for knowledge enhancement and carrier development. Candidates who are learned Science subjects in their Pre University programme are the target group. This programme mainly focuses on languages and basic science. Undergraduate programme is intended for the target group of students who wish to be future basic science teachers, can attend competitive exams, candidates who work in public as well as in private sector. Distance mode of learning is creating an opportunity to those who are not in the position to get regular mode of learning and at the same time employed persons, who are engaged in various works are also can enroll for Bachelor of Science degree programme. And candidates who are in need of skills and knowledge required for subsequent employment are our target learners. It is also intended for

- Persons who love to spent their quality time with students and want to enrich skills.
- Persons who are not able to pay higher fees in regular mode (Affordable Fee structure). Home makers who want to enhance their career.
- Young entrepreneurs who wish to acquire skills in different areas of basic science.

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 Bachelor of Science Programme provides opportunities for the in-service teachers and young learners to acquire basic knowledge and skills in the all branches of basic science to build their carrer. The existing workforce can take the advantage of DDE Bachelor of Science 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 would provide learners a wider and more comprehensive understanding of science 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	Papers	Marks		
		Term End Exams	Continuous Evaluation/IA	Total
First Year	Course :Kannada Language	80	20	100
	Course :English (L)	80	20	100
	Course :Hindi	80	20	100
	Course :Urdu	80	20	100
	Course :Sanskrit	80	20	100
	Course : Mathematics	90	30	120
	Course : Physics	85	15	100
	Course :Chemistry	85	15	100
	Course :Botany	85	15	100
	Course :Zoology	85	15	100
	Practical -I :Physics	35	*15	50
	Practical -I:Chemistry	35	*15	50
	Practical -I:Botany	35	*15	50
	Practical -I:Zoology	35	*15	50
	Course : Environmental Science	80	20	100
Second Year	Course:Kannada Language	80	20	100
	Course :English (L)	80	20	100
	Course :Hindi	80	20	100
	Course :Urdu	80	20	100
	Course :Sanskrit	80	20	100
	Course : Mathematics	90	30	120
	Course: Physics	85	15	100
	Course:Chemistry	85	15	100
	Course:Botany	85	15	100
	Course:Zoology	85	15	100
	Practical -II :Physics	35	*15	50
	Practical -II:Chemistry	35	*15	50
	Practical -II:Botany	35	*15	50
	Practical -II:Zoology	35	*15	50
	Course: Indian constitution	80	20	100

Final Year	Course: III Mathematics	90	30	120
	Course: IV Mathematics	90	30	120
	Course: V Mathematics	90	30	120
	Course: III Physics	85	15	100
	Course: IV Physics	85	15	100
	Course: III Chemistry	85	15	100
	Course: IV Chemistry	85	15	100
	Course: III Botany	85	15	100
	Course: IV Botany	85	15	100
	Course: III Zoology	85	15	100
	Course: IV Zoology	85	15	100
	Practical -III :Physics	35	*15	50
	Practical -IV :Physics	35	*15	50
	Practical -III:Chemistry	35	*15	50
	Practical -IV:Chemistry	35	*15	50
	Practical -III:Botany	35	*15	50
	Practical -IV:Botany	35	*15	50
	Practical -III:Zoology	35	*15	50
	Practical -IV:Zoology	35	*15	50

***** Out of 15 marks 05 marks allotted for viva and 10 marks for practical record.

(iii) Medium of Instruction:

The medium of instruction is 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. Learners 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 duration of 30 days normally. A minimum of 15 theory sessions (90 min each) and 10 practical sessions (4 hrs each) for instruction by experienced and scholarly faculty will be arranged for each course and practicals. 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

A candidate who has passed the examination of either pre-university or 12th standard or equivalent.

For B.Sc. candidates should have completed Science PUC or 10+2 or equivalent science course.

Candidates who have passed ITI/JOC/ vocational course at any of the recognized institutes within Karnataka are eligible for admission to B.Sc.

All the candidates who fulfill eligibility criteria are admitted to the programme. If university decides for maximum number of candidates to be admitted 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 along with 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	Final Year
Admission Orientation and Other Components				
1	Registration	1120	-	-
2	Admission	420	420	300
3	Orientation/ Tuition fee	1680	1680	1200
4	Study materials	2380	2660	1950
5	Liaison	140	140	100
6	Practical	2030	2030	1450
7	IA Books	350	350	250
8	Postage	420	420	300
9	UDF-1	250		
Examination , Certification and Other Components				
10	Examination	1030	1030	1030
11	PR EXAM	485	485	605
12	PPC	-	-	365
12	Convocation	-	-	900
13	UDF-2	140	140	140
	TOTAL	**10445**	**9355**	**8590**

Financial Assistance:

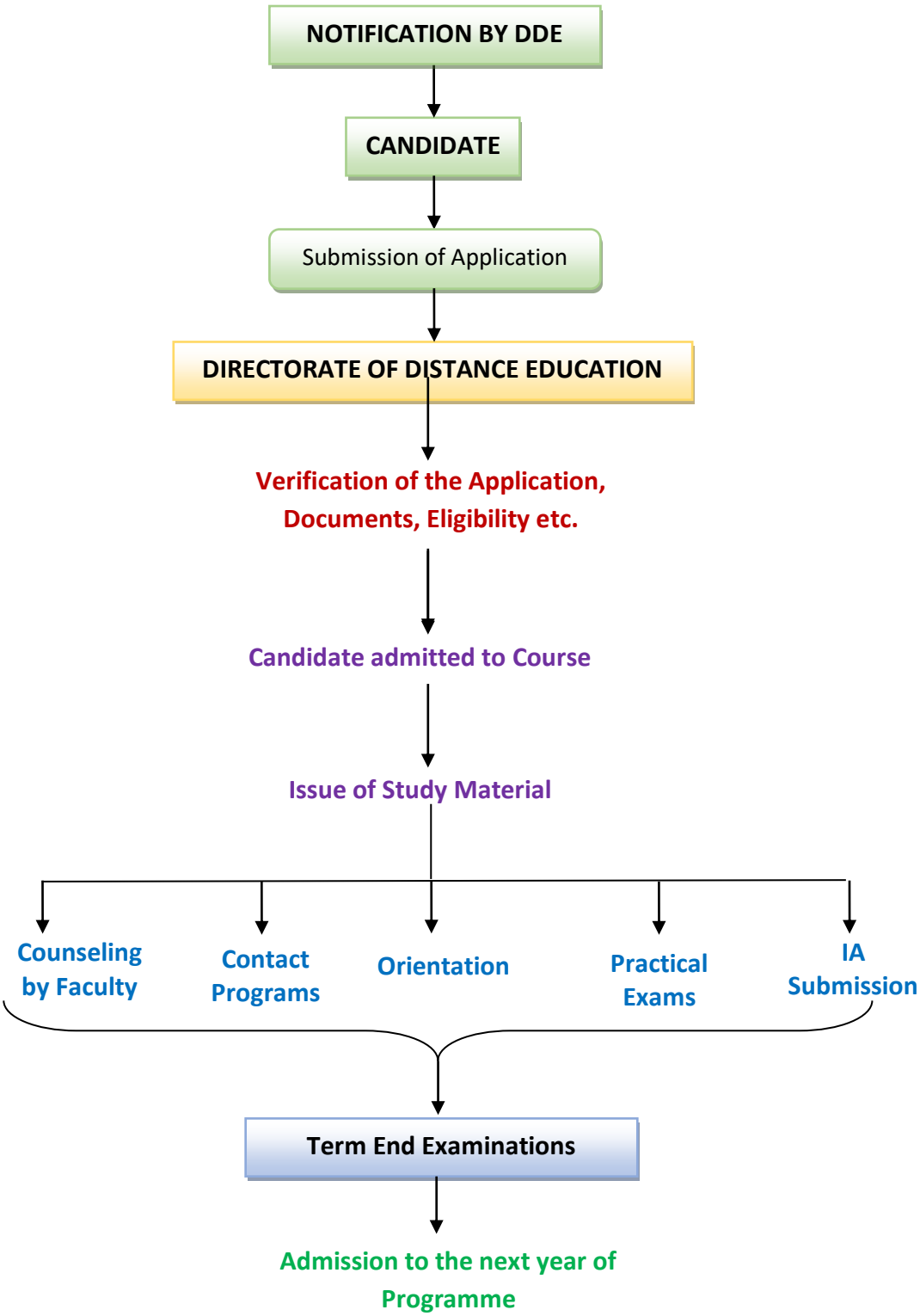
- SC/ST and OBC Students can avail scholarship/fee reimbursement from the concerned State Departments/Agencies
- Fee Concession to Physically Handicap Candidates.

- 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

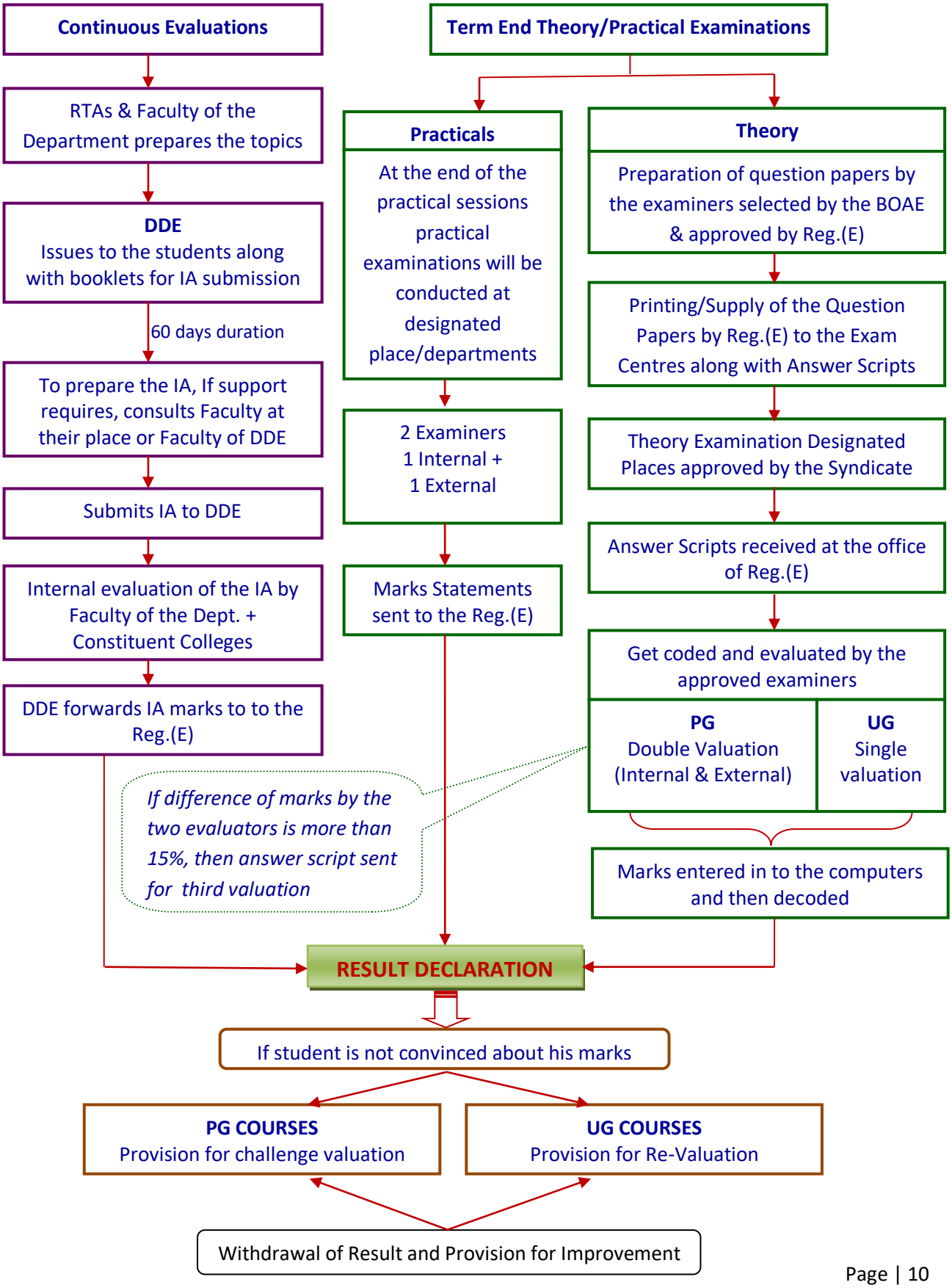
Calendar Year-I		
1	Issue of Notification	July / August
2	Commencement of Online Admissions	July / August
3	Last Date for submission of online applications by the students without Late Fee	October 31
4	Last Date for submission of online applications by the students with late fee	December 31
5	Issue of 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,

Practicals:

- For B.Sc. degree Programmee , the candidates will have to attend practical sessions for specified days at designated University Departments / Colleges/ Student Counseling Centres.
- For B.Sc. degree Programme consists of practical courses in Physics/Chemistry/Botany/Zoology each year. Each practical course will be for 50 marks, of which 35 mark for Practical work, 15 mark for viva and practical 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 papers/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 gained at the previous theory exams.

(vii) Other Policy/Provisions

Renewal of Registration: Students of II/III year who have failed to pay the II/III 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 with in the maximum permissible period ie., 6 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 it 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 (Lakh in Rupees)
1	Study Material Development – Course Writer honorarium, Review vetting, editing, SLM conversion etc	6.99
2	Printing and Distribution of SLM	4.19
3	Publicity, Awareness Information Decimation Programmes*	0.23
4	Conduction of Counselling, Orientation/Face to Face/ Practical Sessions etc.	7.55
5	Student Support Services*	0.47
6	TA/DA Meeting Expenses*	0.11
7	Continuous Evaluation / IA	0.28
8	Examination and Certification	4.15
9	Office Automation/ICT/ Communication Related Infrastructure*	0.22
10	Library*	0.34
11	Staff Salaries/ Remunerations/ Other Honorariums – Teaching, Nan-Teaching/Technical/Supporting*	0.91
12	Office Infrastructure*	0.23
13	Laboratory Development and Expenditures	0.55
14	Learner Centre Expenses*	0.26
15	Others – Office Contingence, Post/Courier, Vehicle Maintenance, Fee reimbursement and such others. *	0.91

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 the entire 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.

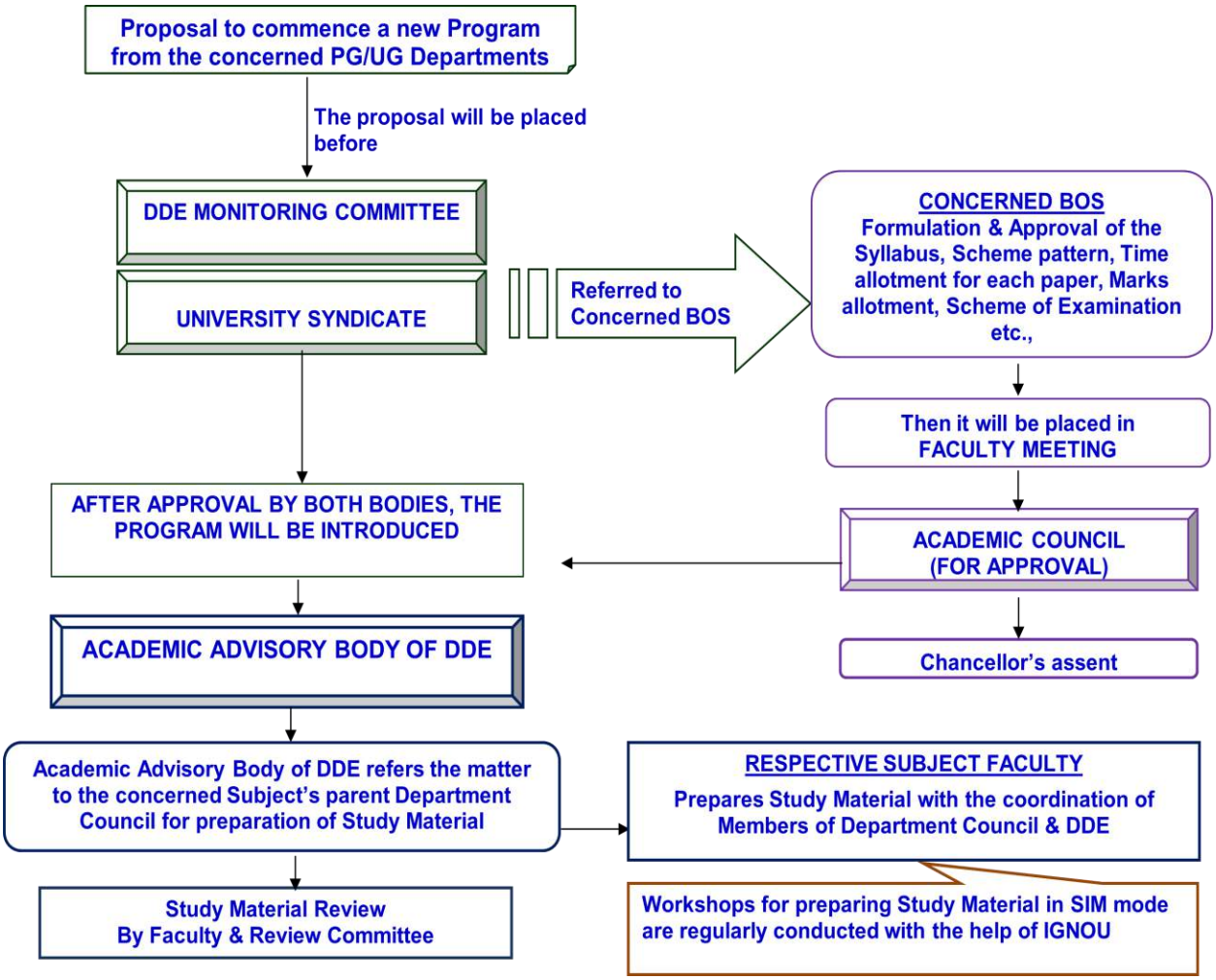
All the major decisions including financial, planning and implementation which are discussed in the MC meeting are placed before the Syndicate of the University and after its approval they will come into force.

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 an 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 Centers (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.

Appendix-01

Detailed Syllabi of B.Sc. (PCM & CBZ) Programme.

SYLLABUS FOR FIRST B.Sc.(PCM & CBZ)

ಕೋರ್ಸ್ (ಪತ್ರಿಕೆ)-1, ಕನ್ನಡ ಭಾಷಿಕ : ಸವಿಸ್ತಾರ - ಅವಿಸ್ತಾರ ಪಠ್ಯಗಳು

ಅಧ್ಯಾಯ - 1. ಹೊಸಗನ್ನಡ ಕವಿತೆಗಳು

ಘಟಕ - 1. ತೆಂಕಣಗಾಳಿಯಾಟ, ಪ್ರಾರ್ಥನೆ
ಘಟಕ - 2. ಮದಲಿಂಗನ ಕಣಿವೆ, ಕಲ್ಕಿ
ಘಟಕ - 3. ಬೆಳಗು, ಶ್ರೀರಾಮನವಮಿ ದಿವಸ
ಘಟಕ - 4 . ಮುಂಬೈ ಜಾತಕ, ದೀಪಧಾರಿ
ಘಟಕ - 5. ನನ್ನ ನಾಯಿ, ಕನ್ನಡ ಪದಗೋಳು
ಘಟಕ - 6. ಮನೆಯಿಂದ ಮನೆಗೆ
ಘಟಕ - 7. ಕುರಿಗಳು ಸಾರ್ ಕುರಿಗಳು, ನಾವಿರಾರು ನದಿಗಳು
ಘಟಕ - 8. ಅಡುಗೆ ಮನೆಯ ಹುಡುಗಿ, ಜಾಲ

ಅಧ್ಯಾಯ - 2 ನಾಟಕ : ಶೂದ್ರ ತಪಸ್ವಿ - ಕುವೆಂಪು

ಘಟಕ - 1. ನಾಟಕದ ಇತಿಹಾಸ
ಘಟಕ - 2. ನಾಟಕದ ಸ್ವರೂಪ - ಲಕ್ಷಣ
ಘಟಕ - 3. ನಾಟಕದ ಬಗೆಗಳು, ಕೃತಿ - ಕರ್ತೃ ಪರಿಚಯ
ಘಟಕ - 4. ಸನ್ನಿವೇಶ ಮತ್ತು ಪಾತ್ರಚಿತ್ರಣ
ಘಟಕ - 5. ಭಾಷೆ ಮತ್ತು ಶೈಲಿ
ಘಟಕ - 6. ಕೃತಿ ವಿಶ್ಲೇಷಣೆ

ಅಧ್ಯಾಯ - 3 . ಕಾದಂಬರಿ : ಬೆಟ್ಟದ ಜೀವ - ಶಿವರಾಮ ಕಾರಂತ

ಘಟಕ -1. ಕಾದಂಬರಿ ಇತಿಹಾಸ
ಘಟಕ - 2. ಕಾದಂಬರಿಯ ಸ್ವರೂಪ ಮತ್ತು ಲಕ್ಷಣ
ಘಟಕ - 3. ಕಾದಂಬರಿ ಬಗೆಗಳು, ಕೃತಿ, ಕರ್ತೃ ಪರಿಚಯ
ಘಟಕ - 4. ಸನ್ನಿವೇಶ ಮತ್ತು ಘಟನೆಗಳು
ಘಟಕ - 5. ಪಾತ್ರ ಚಿತ್ರಣ
ಘಟಕ - 6 ಕೃತಿ ವಿಮರ್ಶೆ : ಭಾಷೆ, ಶೈಲಿ, ಸಂವಿಧಾನ ಇತ್ಯಾದಿ

ಅಧ್ಯಾಯ - 4. ಆಡಳಿತ ಕನ್ನಡ

ಘಟಕ -1. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ : ಬೆಳೆದು ಬಂದ ದಾರಿ
ಘಟಕ -2. ಆಡಳಿತ ಭಾಷೆ ಲಕ್ಷಣ ಮತ್ತು ಸ್ವರೂಪ
ಘಟಕ - 3. ವಿವಿಧ ರೀತಿಯ ಅರ್ಜಿ ನಮೂನೆಗಳು
ಘಟಕ - 4 ಇತರ ನಮೂನೆಗಳು (ವಿಧಿ, ಜ್ಞಾಪನ, ಸುತ್ತೋಲೆ ಇತ್ಯಾದಿ)
ಘಟಕ - 5 ಸರ್ಕಾರಿ, ಅರೆಸರ್ಕಾರಿ ಪತ್ರಗಳು
ಘಟಕ - 6 .ಆಹ್ವಾನ ಪತ್ರಿಕೆ, ಜಾಹೀರಾತು, ಪತ್ರಿಕಾ ಪ್ರಕಟಣೆ ಇತ್ಯಾದಿ

COURSE: HINDI (LANGUAGE) PAPER-I

A.Kahani Sankalan:Katha Prabhas - Ed. By: Manju Jyotsna Pb. By: Rajkamal Prakashan
Unit-1.Lekak ka pirichay, Lekak ka Vyaktitva aur Krutitva
Unit-2. Kahaniyo ka sarams,kathavastu
Unit-3. Kahaniyo ka Charitra chitran
Unit-4. Kahaniyo ki Sameeksha

B. Ekanki: Sab Rang - Ed. By: Suresh Chandra Mishra, Pub. By: Lok Bharathi
Unit-5.Lekak ka pirichay, Lekak ka Vyaktitva aur Krutitva
Unit-6. Enkankiyo ka sarams,kathavastu
Unit-7. Ekankiyo ka Charitra chitran
Unit-8. Ekankiyo ki Sameeksha

C. Vyakaran:
Unit-9.Varna,Varnamala,
Unit-10.Shabda,Shabdabhed, Sandhi,Sangnya- Bedh, Sarvanam Bedh, Visheshan Bedh.

Question Pattern:

01. Kahani Pradhan Prashn 04 mein 02 likhana	2X10=20
02. Ekanki Pradhan Prashn 04 mein 02 likhana	2X10=20
Sandharbha Sahit 06 mein 04 likhana	4X05=20
03. Vyakaran 06 mein 04 likhana	4X05=20
Total	80

COURSE: SANSKRIT (LANGUAGE) PAPER-I
(POETRY,PROSE,GRAMMER & TRANSLATION)

A.Poetry: Raghuvamsa (14th Sargas)
Unit-1: Sarga ka saramsa
B.Prose: Dasakumara Charitam-Visrutacharita
Unit-2: Dasakumara Charitam-Visrutacharita ka parichay
Unit-3: Laxmasasuris Bharata Sangraha,Virata parva
C.Grammer:
Unit-4: Subantas
Unit-5: Tringantas:Lat,Lit,Lang, Lot, Lrt.Vidhirling Lankaras
Unit-6:,Sabantas
Unit-7: Change of Voice

COURSE: URDU (LANGUAGE) PAPER-I
(Poetry,Prose,Grammer & Translation)

Unit-1: Mata-e-Adab(Part-I)
Unit-2: Numaida Muktasar Afsana
Unit-3: Asnaf-f-adab ka Irthiqha

COURSE: ENGLISH (LANGUAGE) PAPER-I

BLOCK – I: Poetry

Unit – 1	Chaucer: The Wife of Bath
Unit – 2	Shakespeare: Full Many a Glorious Morning
Unit – 3	Milton: How soon Hath Time
Unit – 4	Pope: Belinda's Dressing Table

Unit – 5 Gray: Selection from the Elegy
Unit – 6 Wordsworth: Three years she Grew
Unit – 7 Tennyson: Ulysses
Unit – 8 Arnold: Dover Beach

BLOCK- II: Prose

Unit – 9 Bacon: of Studies
Unit – 10 Swift: 'Yahoo' Extract from Gulliver's Travels - Book IV Chapter II
Unit – 11 Washington Irwing : The Widow and the Son
Unit – 12 Hawthorne: Dr.Heidegger's Experiment
Unit – 13 Dickens – the Definition of a Horse
Unit – 14 Guy de Maupassant: The Necklace

BLOCK III: Fiction

Unit - 15 – 24 George Orwell: Animal Far

BLOCK IV Language Component

Unit – 25 Expansion of an Idea (Paragraph Writing on Popular Proverbs And Maxims)
Unit – 26 Comprehension Passage
Unit – 27 Uses of Idioms
Unit – 28 Active and Passive Voice
Unit – 29 Synonyms & Antonyms
Unit – 30 One word substitutes.

COURSE: PHYSICS PAPER-I
(Mechanics, Properties of Matter,Heat and Thermodynamics)

100 hours

UNIT-1 Vectors

Scalar and Vector products - Physical examples. Derivative of vectors Expressions for instantaneous velocity and acceleration. Derivative of a vector of constant magnitude.

UNIT-2 Frames of Reference

Frames of reference in uniform relative motion-inertial frames. Galilean transformation - Galilean principle of relativity. Frames of reference in accelerated motion- non-inertial frames-derivation of the equation F=F+F- Pseduo force. Measurement of a' with the help of a plumb line, apparent weight in a lift. Centre of mass-definition - motion of the center of mass-reduced mass of a binary system - Centre of mass frame and laboratory frame, conical pendulum.

UNIT-3 Motion in a Plane

Radial and transverse components of velocity and acceleration. Application to uniform circular motion. expression for centripetal force, Areal velocity.

UNIT-4 Conservation Laws

Conservation of linear momentum-motion of a rocket, expression for its instantaneous and maximum velocity taking into account the variation in its mass-multistage and its advantages. Elastic and inelastic collisions - coefficient of restitution - head on collisions of two particles, elastic oblique collision of two identical masses in a plane. Angular momentum relation between angular momentum and torque. Law of conservation of angular momentum Law of areas. Central motion-Examples of motion under central forces, simple harmonic motion. Uniform circular motion.

Newton's Law of Gravitation. Kepler's laws of Planetary motion-derivation of Kepler's laws from Newton's law of Gravitation. Simple harmonic motion, expressions for frequency and energy.

UNIT-5 Elements of Satellite Motion

Expression for orbital velocity and period of revolution, escape velocity. Condition of an earth satellite to be stationary. Uses of artificial satellites. Brief account of Indian Satellite Program.

UNIT-6 Properties of Matter

Rigid Bodies Rotational motion about an axis, moment of inertia. Radius of gyration Theorems of moment of inertia M.I. of a Rod, Plate and Cylinder. Theory of compound pendulum.

UNIT-7 Elasticity

Stress and strain-Hooke's law-Elastic limits. Modulus of elasticity for isotropic materials. Poisson's ratio. Relation between elastic constants (no derivation). Expression for elastic potential energy. Expression for bending moment Theory of light cantilever. I-Section girders, Torsion, Expression for couple per unit twist, Torsion pendulum.

UNIT-8 Surface Tension

Surface energy, Angle of contact, effect of impurities. Excess of pressure within curved surfaces (no derivation) application to spherical and cylindrical drops and bubbles. Theory of capillary rise.

UNIT-9 Viscosity

Stream line and turbulent motion. Co-efficient of viscosity. Poiseulle's formula (derivation). Stokes law from dimensional analysis.

HEAT AND THERMODYNAMICS

UNIT-10 Kinetic Theory

Distribution of molecular velocities. Maxwell's law (no derivation) Graphical representation of the law and interpretation. Expression for mean free path. Degrees of freedom. Law of equipartition of energy. Expression for ratio of specific heats.

UNIT-11 Thermodynamics

First Law of Thermodyamics-Isothermal and adiabatic changes. Work done during Isothermal and adiabatic changes. Indicator diagram. Reversible and irreversible charges. Carnot's engine, its working - derivation of expression for efficiency. Principle of refrigeration. Statement of Carnot's theorem. Second law of thermodynamics (statements).

UNIT-12 Entropy

Definition, change of entropy in reversible and irreversible processes. Temperature - entropy diagram. Change of entropy during change of state. Clausus-Clapcyron equation for variation of melting and boiling points. Principle of increase of entropy of the universe.

UNIT-13 Liquefaction of Gases

Ideal and real gasses. Porous Plug experiment and its results-expression for temperature of inversion. Principle of regenerative cooling. Measurement of low temperatures. Mention of different techniques.

UNIT-14 Radiation

Black Body Radiation - distribution of energy in the spectrum of a black body. Wien's law and Rayleigh. Jeans Law (Qualitative). Planck's law derivation using resonators. Wien's displacement law. Rayleigh-Jean's law and Stefan's law from Planck's law. Solar constant-temperature of the sun. Radiation pressure.

PHYSICS PRACTICAL –I

(Each experiment is minimum of three hours duration)

1. Bar pendulum-g (h^2-hT^2 and h-T graph)

2. Spiral spring - g and unknown mass
3. Moment of inertia of a Flywheel.
4. Torsion Pendulum.M.I. of irregular body and rigidity modulus.
5. "q" by stretching-Hooke's law verification, unknown mass.
6. Verification of parallel and perpendicular axis theorems of M.I.
7. Single Cantilever.
8. "q" by Koening's method.
9. Torsional pendulum-Rigidity modulus and M.I. of irregular body.
10. Quincke's Method.
11. Stokes Method.
12. Capillary flow.
13. Stafan's 4^{th} power law.
14. Specific heat by cooling.
15. "q" by uniform bending.
16. Coefficient of friction.
17. Platinum resultance thermometer.

*****

COURSE:MATHEMATICS PAPER- I

Part -A

Unit 1: Number Theory

Division algorithms with proof. Existence of gcd, d = (a,b) and representation d=sa+t.b, prime numbers. Fundamental theorem of arithmetic, Congruence relation, residue classes. Euler's, Fermat's and Wilson's theorems (Only statement), solution of linear congruences, solution of simultaneously linear congruences by Chinese reminder theorem.

Unit 2:Sets, Relations and Functions

De Morgan laws for arbitrary union and Intersection as well as complements of sets. Relations - Inverse relation - Equivalence relations (Examples) Functions (mappings) - Set theoretic properties of functions. Composition of function and its associativity. Inverse of compositions.

Countability of Sets - countable set, denumerable set, countable union of countable sets is countable with proof. Set of all integers, rational, NXN are countable with proof. The set of (0.1) and Real numbers are uncountable with proof.

Part - B

Unit 3: Differential Calculus

Limits of real functions of real variable problems on limits. Algebra of limits. Continuity of functions at point (Definition and problems). Differentiability of a function at a point (Definition and problems).

Unit 4: Successive Differentiation

n^{th} derivative of $(ax+b)^m$, log(ax+b), e^{ax}. (e^{ax} Sin (bx+c)), e^{ax}.cos(bx+c), sin(ax+b), cos(ax+b), Liebnit/theorem and applications.

Unit 5: Differential Calculus (Continuation)

Polar coordinates, Angle between the radius vector and Tangent. Angle of intersection of curves (Polar forms) pedal equations. Derivative of an arc in Cartesian, parametric and polar forms.

Curvature of a plane curve-formula in Cartesian, parametric, polar and pedal forms. Centre of Curvature Evolute.

Part - C

Unit 6: Analytical Geometry

Position vectors. Dividing a segment in a given ratio. Lines and planes in space. Parametric representation of line. Equation of planes-parallel planes equation of line-Mutual positions of lines and planes, spheres (Cartesian form).

Unit 7: Theory of Plane Curves

Asymptotes, Singular points, Cusp, Node and Conjugate points, Area surface and volume with illustrations.

Part - D

Unit 8: Matrices

Symmetric and skew symmetric matrices. Elementary operation on matrices. Rank of matrix (Row & Column). Inverse of a non-singular matrix by elementary row operations.

System of m-linear equations in n-unknowns. Matrices associated with linear system. Criterion for existence of non-trivial solutions of homogeneous systems.

Unit 9: Integral Calculus

Integration of algebraic-rational and irrational functions. Integration of rational function involving trigonometric functions.

Define integrals- properties standard reduction formula with applications.

*****

COURSE: CHEMISTRY PAPER - I
PART A : INORGANIC CHEMISTRY

100 Hrs.

Unit I : Elements of Quantum Mechanics

Wave nature of electron, deBroglie relationship, uncertainity principle. Schrodinger wave equation (no derivation) and the Significance shapes of orbital s. p. and d. Quantum numbers and their significance. Assigning quantum numbers to a given electron in an atom (I and II periods only). Rules governing electronic configuration with illustration-Paul's exclusion principle. Hand's rule. Aufbau principle, Energy level diagram.-8 hours

Unit II : Periodic Table and Periodicity

Classificaton of elements into s.p.d. and f-blocks. Atomic radii-Covalent, ionic and Vander Waal's radii explanation with examples. Variation of covalent radius in a group and a period. Explanation for the observed trends. Comparison of the size of the atoms with the corresponding anions and cations. Variation of atomic radii in isoelectronic systems.

Ionization Energy: Explanation, factors influencing ionization energy, Variation of ionization energy in a group and period.

Electron Affinity: Explanation variation in a group and a period, obsrved trend in the values and explanation.

Electronegativity : Explanation variation in a group and period. Observed trend in the values and explanation. Relationship between electronegativity, ionization energy and electron affinity (Mulliken relation)

Unit III : S-block Elements

Hydrogen, atomic hydrogen-production, properties and uses Ortho and Para hydrogen-definitions, Differences, physical properties.

Alkali Metals : Comparative study of properties of IA group elements physical properties-electronic configuration atomic radii, softness and density, melting and boiling points, ionization energy, electropositive character. Oxidation states, flame coloration and its cause.

Chemical properties-reactivity of metals, action of air, water, hydrogen, halogens, formation of amalgants.

Explanation for anomalous behaviours of lithium and its compounds. Diagonal relation between lithium and magnesium. Causes for such relation with a few examples (Hardness, high melting and boiling points, reaction with water. Formation of nitrides, solubility of chlories, fluorides, bicarbonates, carbonates hydroxides and thermal decomposition of nitrates)

Alkaline Earth Metals : Comparative study of properties of II A group elements (electronic configuration, melting and boiling points, softness and density, ionization energy, hydration of ions, electropositive character, reasons for the formation of dipositive ions only, flame coloration with causes)

Unit IV: Industrial Chemistry

(a) Fuels : Calorific value, advantages of gaseous fuels over solid and liquid fuels. Natural gas, water gas, biogas andliquid petroleum gas. (Production, composition and application) Propellants - Definition with two examples.

(b) Glass : Raw materials, manufacture by tank furnace method, coloring agents, annealing of glass, types of glasses-soda glass, potash glass, flint glass, Pyrex glass (their composition and uses)

(c) Cement : raw materials, manufacture by dry process, mechanism of setting.

(d) Paints : constituents and their functions.

PART B : PHYSICAL CHEMISTRY

Unit I : Gases

Expression for Maxwell distribution of molecular speeds (no derivation). Effect of temperature on the distribution of molecular speeds. Boltzmann factor. Type of molecular velocities and energy distribution as a function of temperature. Relation between the most probable, average and root mean square velocities of molecules and their calculations. Degree of freedom of motion (translatory, vibrational, and rotational).

Critical Phenomenon: Real gases, PV-isotherms for carbon dioxide Vander Waal's equation and critical state. Critical constants and their determination. Principles of corresponding states. **Liquifications** of gases intermolecular forces and inversion temperature.

Unit - II : Liquid Mixtures

Different types with examples. Binary mixtures of completely miscible liquids types with examples-Vapour pressure composition and boiling point-composition curves for the different types. Principle of fractional distillation. Azeotropic mixtures.

Partially miscible liquids. Critical solution temperature.

(i) Phenol-water, effect of impurity on miscibility temperature.

(ii) Nicotine-water and (iii) trimethyl amine-water systems.

Steam distillation-Principle its application in purification of organic compounds and determination of molar mass.

Nernst distribution law-statement, modification of the law when the solute associates and dissociates in one of the solvents. Application of the law in (i) de-silverisation of lead and (ii) solvent extraction.

Solution of gases in liquids - Henry's law and its limitation.

Unit - III : Colligative Properties

Theory of dilute solutions : Semipermeable membrances- types with examples. Osmotic pressure its determination-Berkeley and Hartley method.

Law of osmotic pressure, molecular mass from osmotic pressure measurements (equation to be derived) Isotonic solutions, plasmolysis, turgid state, haemolysis and reverse osmosis.

Vapour pressure of liquids and solutions. Raoult's law-relative lowering of vapour pressure. Relation between relative lowering of vapour pressure and molar mass. (to be derived). Ostwald and Walker method of determining the relative lowering of vapour pressure.

Elevation of boiling point and its relation to the lowering of vapour pressure and molar mass. (to be derived) Ebullioscopic constant (Kb) of solvent and its relation to the boiling point and latent heat of vaporization of the solvent. Determination of molar mass of a non-volatile solute by Walker-Lumsden method.

Depression in freezing point-its relation to lowering of vapour pressure and molar mass. (to be derived) Cryoscopic constant (Kf) of the solvent and its relation to the freezing point and latent heat of fusion of the solvent. Experimental determination of molar mass of a non-volatile solute by Beckman's method.

Unit - IV: Adsorption

Adsorption isotherms, Freundlich adsorption isotherm and its limitation Langmuir's unimolecular adsorption isotherm and its limitations. Adsorption indicators in recipitation titrations.

Unit - V : Colloids

Electrical double layer and zeta potential. Electrophoresis, electroosmosis origin of charge on colloidal particles. Hardy- Schulze rule, coagulation value, protective colloids and gold number. Applicatons of colloids. Emulsions-types with examples, Smulsifying agents.

Gels - Types and their preparation. Syneresis. Imbibition and thixotropy.

PART C : ORGANIC CHEMISTRY

Unit - I: Introduction to Organic Chemistry

Overall classification of organic compounds based on functional groups (mono functional)

Unit - II: Elemental Analysis

Detection of elements -Nitrogen, sulphur and halogen by Lassaigne's test.

Estimation of elements -Kjeldhal's method for nitrogen. Carius method for sulphur and halogens. Numerical problems to the above estimations, determination of molecular formulae.

Unit - III: Bonding in Organic Compounds

Overlapping of s and p orbitals. Hybridization of atomic orbitals of carbon in methane, ethane, Ethene and ethyne. Sigma and Pi bonds.

Unit - IV: Classification of Reaction Reagents & Reaction Intermediates

Substitution, addition, elimination and rearrangement reactions. Introduction to reaction mechanism, homolysis and heterolysis, electrophiles. nucleophiles and free radicals, carbocations and carbonions (definition and stability).

Unit - V: Hydrocarbons

(a) Alkanes: Nomenclature (Common and IUPAC). Preparation from alkyl halides by reduction and by wurtz reaction, chlorination of methane with mechanism.

(b) Cyclo alkanes : Nomenclature (common and IUPAC), two methods of synthesis (Freunds and Dieckmanns method), general reactions and relative stabilities of cycloalkanes Bayer's strain theory and Sasche-Mohr's theory.

(c) Alkenes: Nomenclature (Common and IUPAC), preparation from alcohols and alkyl halides, addition of bromine to ethene with mechanism, addition of HBr to propene with mechanism-Markonikov's rule, peroxide effect with mechanism.

(d) **Alkynes** : Nomenclature (Common and IUPAC) preparation by dehydrohalogenation of alkyl halides, dehalogenation of tetra halides, acidity of alkynes, formation of metal alkynides, mechanism of addition of water and HCI to ethyne.

Unit VI: Arenes

Benzene-Modern structure, aromaticity, Huckel's rule, electrophilic substitution reactions of benzene-nitration, sulphonation, Friedel-Crafts alkylation.

Unit VII: Necleophilic Substitution Reactions

SN_2 reaction - Explanation with mechanism taking an example of methyl bromide.

SN_1 reaction - Explanation with mechanism taking an example of tertiary butyl bromide.

*****

CHEMISTRY PRACTICAL - I

Number of Practicals:10 Each Practical : 3 Hrs.

Part - A

Systematic qualitative analysis of binary inorganic mixture by semi micro techniques.

Part - B

1. Preparation of acetanilide from aniline.
2. Preparation of parabromo acetanilide from acetanilide.
3. Preparation of benzoic acid from toluene.
4. Preparation of metadinitrobenzene from nitrobenzene.

Preparatoion, Recrystallisation, M.P. determination.

*****

COURSE: BOTANY-PAPER – I
(Protophyta, Thallophyta, Bryophyta and Pteridophyta)

UNIT 1: Viruses

Ultrastructure of TMV and Bacteriophage, common viral diseases of plant (Tobacco mosaic virus), leaf curl of tomato and common bean mosaic virus), symptoms and control methods.

UNIT 2: Bacteria

Classfication, Ultra structure of bacteria, reproduction, (cell division, conjugation, transduction and transformation). Economic importance, plant diseases (Citrus Canker).

UNIT 3: Cyanobacteria

General characters and classification. Occurrence, structure, reproduction and economic importance of Spirulina and Nostoc.

UNIT 4: Thallophyta

Classification, Occurrence, thallus construction, reproduction and life cycle of the following.

Chlorophyta : Spirogyra and Chara.

Phaeophuta : Sargassum

Rhodophyta : Batrachospermum.

UNIT 5: Mycology

Clasification of fungi; Structure, nutrition, reproduction, life-cycle and symptoms, disease caused and controlling methods of the following:

Phycomycetes : Rhyzopus

Ascomycetes : Penicillium and peziza

Basidiomycetes : puccinia graminis.

Deuteromycetes : Cercospora.

UNIT 6: Lichens

Occurrence and classification, structure, nutrition, reproduction and economic importance. Lichens as a pollution indicator.

UNIT 7: Bryophyta

Classification, Occurrence, external and internal organization of the thallus, reproduction and life cycles of the following :

Hepaticopsida : Porella.

Anthocerotopsida :Anthoceros.

Bryopsida : Funaria

UNIT 8: Pteridophyta

General characters; classification, occurrence, external and internal structure, reproduction and life cycle of the following :

Psilotopsida : psilotum

Lycopsida : Selaginella

Sphenopsida : Equisetum

Pteropsida : Pteris

Stelar evolution. heterospory and seed habit.

BOTANY PRACTICAL - I

Maximum Marks-50

Duration of each Practical-03 hours

Number of students in each batch - 10-12

Number of teachers per batch - 1 (upto 14 students)

Number of teachers per batch - 2 (above 15 students)

Number of students per batch in practical examination-10

Duration of practical examination - 3 hours

1. Study of morphological and anotomical features of vegetative and reproductive parts of types mentioned in theory parts.
2. Lichens: Crustose, fruticose and foliose.
3. Study of symptoms of diseases caused by Viruses, Bacteria and Fungi - T.M.V. Bean Mosaic viruses and Citrus canker.
4. Gram Staining Bacteria.
5. Root nodules of leguminous plants.

****

COURSE: ZOOLOGY PAPER - I

Unit 1: Principles of animal classification, Binomial nomenclature, concept of species.

Unit 2:.Systematics Salient features of phylum and classification up to classes, important characters of classes with common examples, Protozoa, Porifera, Cnidaria, Platyhelmenthes, Nematodes, Annelida, Arthropoda, Mollusca and Echimodermata.

Unit 3: **Important characters and examples of Ctenophora and Onychophora**

3.1. *Entamoeba histolytica* - Structure and life cycle.

3.2. *Plasmodium vivax* : Structure and life cycle.

3.3. *Sycon*: Structure and development.

3.4. *Obelia*: Structure and development.

3.5. Liver fluke : Externals, Reproductive system, life cycle.

3.6. Leech: External, digestive system, excretory system, nervous system and reproductive system.

3.7. *Penaeus*: Externals, appendages, nervous system, reproductive system, life history.

3.8. Freshwater Mussel : Externals, shell, digestive system, respiratory system, excretory system, circulatory system, reproductive system, *Glochidium* Larva.

3.9. Starfish: Externals, water vascular system, bipinnaria larva.

Unit 4: Chordata

4.1 Salient features and classification upto sub phyla.

4.2 Salient features of protochordata with examples.
4.3 Salient features of Agnatha with examples.
4.4 Pisces: Salient features of classes and sub classes with common examples.
4.5 Amphibia: Salient features of class and orders with common examples.
4.6 Reptilia: *Salient* features of class and living orders with common examples.
4.7 Ayes: Salient features of class and sub classes with common examples.
4.8 Mammalia: Salient features of the class and sub classes with common examples. The salient features and common examples of orders Insectivora, Chloroptera, Primates, Rodentia, Cetacea, Carnivora, Perrisodactyla and Artiodactyla.

Unit 5: Structure and functions of digestive, respiratory, excretory, circulatory. Brain and cranial nerves and reproductive systems of shark, frog and rabbit.

5.1.Zoogeography and Palaeontology
5.2.Wallace's zoogeographical realms.
5.3.Fauna of oriental region with special reference to India.
5.4.Animal distribution - methods, classification and patterns, cosmopolitan, discontinuous, bipolar and isolated distribution. Reasons for discontinuous distribution, factors affecting distribution.
5.5.Fossils and fossilization, geological time scale, fossil history of Trilobites, Archaeopteryx and Dinosaurs.

ZOOLOGY PRACTICAL - I

Number of Practicals:10 Each Practical:3 Hrs.

Study of Museum Specimens or Slides of the following

I	**Protozoa**	:	Polystomella, Noctiluca, Paramecium, Entamoeba, Vorticella.
	Porifera	:	Sycon, Spongilla, Sponge gemmule
II	**Coelenterata**	:	Obelia, physalia, Aurelia, sea anemone, fungia, madrepora
	Platyhelmenthes	:	Planaria, liver fluke, T.S. of liver fluke, tape worm, Schistosoma
	Nematodes	:	*Ascaris* male and female. *Ancylostoma duodenale*
III	**Annelida**	:	Earthworm, T.S. of earthworm through Intestine, Nereis, leech
	Arthropoda	:	Penacus, Sacculina on crab, centepede, millepede, spider, scorpion, Rhinocerous beetle, peripatus, nautilus larva.
IV	**Mollusca**	:	*Chiton, Dentalium, Mytilus, Pila, Sepia, Nautilus, Glochidium* larva
	Echinodermata	:	*Astropectin, Ophiothrix, Sea cucumber, Echinus, antedon, Bipinnaria* larva
V	**Protochordata**	:	Balanoglossus, T.S. of Balanoglossus through proboscis, Herdmania, Arriphioxus, T.S. of Amphioxus through pharynx, Agnatha: Petromyzon, Myxine, Ammocoetus larva
VI	**Pisces**	:	Shark, Zygaena, pristis, torpedo, trygon, Ophiocephalus, Eel, Hippocampus male, Echenesis, Tetradon
	Amphibia	:	Hyla, Ambystoma, axolotle larva, Necturus, lehthyopthis
VII	**Reptilia**	:	Varanus, cobra, krait, Russel's viper, Sea Snake
	Aves	:	Wood peeker, duck, owl and cattle egret.
	Mammalia	:	Bat, Rabbit, squirrel
VIII	**Palaeontology &**	:	Models of Trilobites, Tyrannosaurus, Arch. aeopteryx,

	Zoogeography		distribution of lung fishes, Bellostoma
IX	**Mounting of sponge spicules**	:	**Cockroach** : Mouth parts, digestive system, salivary apparatus, nervous system (demonstration only).
X	**Prawn**	:	Appendages and nervous system (demonstration only)
	Shark	:	Mounting of placoid scales and brain (demonstration only).

Reference Books

1. Ekambaranatha Iyer. Manual of Zoology. Vol. I & II.
2. Jordan. Invertebrate Zoology.
3. Jordan. Chordate Zoology.
4. Kotpal. Invertebrate Series.
5. Kotpal. Vertebrata.
6. Parker and Haswell. 1980. Textbook of Zoology.
7. Barrington. - Vertebrate Structure and Functions.

COURSE: ENVIRONMENTAL STUDIES (MANDATORY PAPER)

Unit 1: The multidisciplinary nature of environmental studies- Definition, scope and importance. Need for public awareness.

Unit 2: Natural Resources: Renewable and non-renewable resources: Natural resources and associated problems.

(a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.

(b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

(c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

(d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

(e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.

(f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

Unit 3: **Ecosystems**

Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: (a). Forest ecosystem (b). Grassland ecosystem (c). Desert ecosystem (d). Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries).

Unit 4: **Biodiversity and its conservation**

Introduction–Definition: genetic species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical aesthetic and option values. Biodiversity at global, national and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit 5: Environmental Pollution

Definition, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear pollution. Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an

individual in prevention of pollution. Pollution case studies, Disaster management: floods, earthquake, cyclone and landslides.

Unit 6: Social Issues and the Environment

From unsustainable to sustainable development. Urban problems and related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Case studies. Environmental ethics: Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies., wasteland reclamation. Consumerism and waste products. Environmental Protection Act, Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act, Forest Conservation Act. Issues involved in enforcement of environmental legislation, Public awareness.

Unit 7: Human Population and the Environment

Population growth, variation among nations. Population explosion – Family Welfare Programmes. Environment and human health. Human Rights. Value Education. HIV / AIDS. Women and Child Welfare. Role of Information Technology in Environment and Human Health. Case Studies.

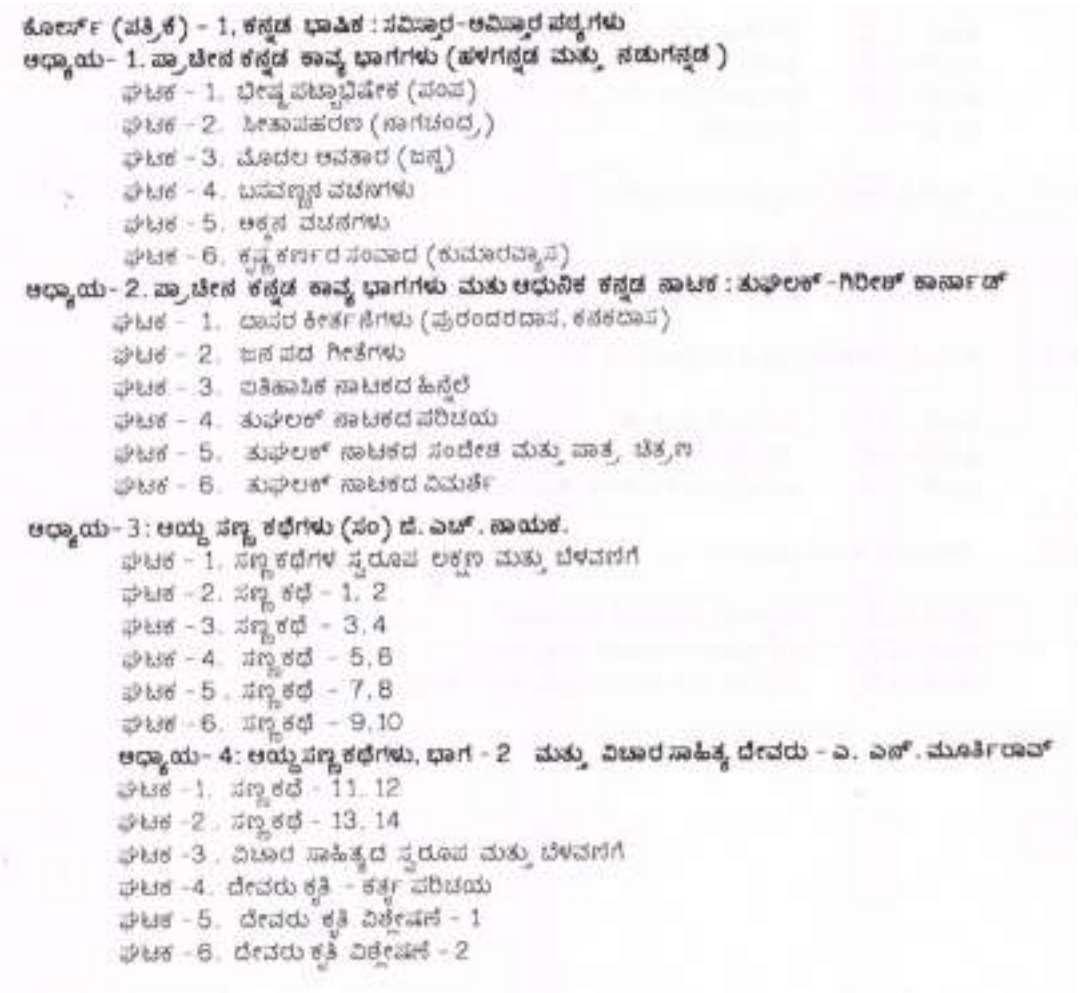
Unit 8: Field Work

Visit to a local area to document environmental assets-river/forest/grassland/hill/mountain.

Visit to a local polluted site – Urban / Rural / Industrial / Agricultural. Study of common plants, insects, birds. Study of simple ecosystems-pond, river, hill slopes, etc.

*****

SYLLABUS FOR SECOND B.Sc.(PCM & CBZ)



ಕೋರ್ಸ್ (ಪತ್ರಿಕೆ) - 1. ಕನ್ನಡ ಭಾಷಿಕ : ಸಮಿಪ್ತಾರ-ಅಮಿಪ್ತಾರ ಪಠ್ಯಗಳು

ಅಧ್ಯಾಯ- 1. ಪ್ರಾಚೀನ ಕನ್ನಡ ಕಾವ್ಯ ಭಾಗಗಳು (ಹಳಗನ್ನಡ ಮತ್ತು ನಡುಗನ್ನಡ)

ಘಟಕ - 1. ಭೀಷ್ಮಪಟ್ಟಾಭಿಷೇಕ (ಪಂಪ)
ಘಟಕ - 2. ಶೀಕಾಪಹರಣ (ನಾಗಚಂದ್ರ)
ಘಟಕ - 3. ಮೊದಲ ಅವತಾರ (ಜನ್ನ)
ಘಟಕ - 4. ಬಸವಣ್ಣನ ವಚನಗಳು
ಘಟಕ - 5. ಅಕ್ಕನ ವಚನಗಳು
ಘಟಕ - 6. ಕೃಷ್ಣ ಕರ್ಣರ ಸಂವಾದ (ಕುಮಾರವ್ಯಾಸ)

ಅಧ್ಯಾಯ- 2. ಪ್ರಾಚೀನ ಕನ್ನಡ ಕಾವ್ಯ ಭಾಗಗಳು ಮತ್ತು ಆಧುನಿಕ ಕನ್ನಡ ನಾಟಕ : ತುಘಲಕ್ - ಗಿರೀಶ್ ಕಾರ್ನಾಡ್

ಘಟಕ - 1. ದಾಸರ ಕೀರ್ತನೆಗಳು (ಪುರಂದರದಾಸ, ಕನಕದಾಸ)
ಘಟಕ - 2. ಜನಪದ ಗೀತೆಗಳು
ಘಟಕ - 3. ಐತಿಹಾಸಿಕ ನಾಟಕದ ಹಿನ್ನೆಲೆ
ಘಟಕ - 4. ತುಘಲಕ್ ನಾಟಕದ ಪರಿಚಯ
ಘಟಕ - 5. ತುಘಲಕ್ ನಾಟಕದ ಸಂದೇಶ ಮತ್ತು ಪಾತ್ರ ಚಿತ್ರಣ
ಘಟಕ - 6. ತುಘಲಕ್ ನಾಟಕದ ವಿಮರ್ಶೆ

ಅಧ್ಯಾಯ- 3 : ಆಯ್ದ ಪಣ್ಣಿ ಕಥೆಗಳು (ಸಂ) ಜಿ. ಎಚ್. ನಾಯಕ.

ಘಟಕ - 1. ಪಣ್ಣಿಕಥೆಗಳ ಸ್ವರೂಪ ಲಕ್ಷಣ ಮತ್ತು ಬೆಳವಣಿಗೆ
ಘಟಕ - 2. ಪಣ್ಣಿ ಕಥೆ - 1, 2
ಘಟಕ - 3. ಪಣ್ಣಿಕಥೆ - 3, 4
ಘಟಕ - 4. ಪಣ್ಣಿಕಥೆ - 5, 6
ಘಟಕ - 5. ಪಣ್ಣಿಕಥೆ - 7, 8
ಘಟಕ - 6. ಪಣ್ಣಿಕಥೆ - 9, 10

ಅಧ್ಯಾಯ- 4 : ಆಯ್ದ ಪಣ್ಣಿಕಥೆಗಳು, ಭಾಗ - 2 ಮತ್ತು ವಿಚಾರ ಸಾಹಿತ್ಯ ದೇವರು - ಎ. ಎಸ್. ಮೂರ್ತಿರಾವ್

ಘಟಕ - 1. ಪಣ್ಣಿಕಥೆ - 11, 12
ಘಟಕ - 2. ಪಣ್ಣಿಕಥೆ - 13, 14
ಘಟಕ - 3. ವಿಚಾರ ಸಾಹಿತ್ಯದ ಸ್ವರೂಪ ಮತ್ತು ಬೆಳವಣಿಗೆ
ಘಟಕ - 4. ದೇವರು ಕೃತಿ - ಕರ್ತೃ ಪರಿಚಯ
ಘಟಕ - 5. ದೇವರು ಕೃತಿ ವಿಶ್ಲೇಷಣೆ - 1
ಘಟಕ - 6. ದೇವರು ಕೃತಿ ವಿಶ್ಲೇಷಣೆ - 2

COURSE: HINDI (LANGUAGE)

A. Kavya Sudha: Ed. By: Prof. Ramesh Goutham(Ghananad Omitted)
Pub. By: Vani Prakashan

Unit-1.kaviyo ka parichay
Unit-2.kavitayo ka saramsa
Unit-3.kavitayo ka sayityik yogdaan

B. Shrest Lalit Nibhandhan: Ed. By. Dr. Nand G. Dube.(Omitted Lession Dhadi Aur Kaiktas) Pub: By: Jaya Bharathi Prakashana

Unit-4.Nibhandkaro ka parichay
Unit-5.Nibhando ka sahityik yogdaan

C Vyakaran:

Unit-6Kriya, Kriya Visheshan,
Unit-7Sambandh Bodhak, Samuchaya Bodhak,
Unit-8:Vismayadi Bodhak,
Unit-9:Samas,
Unit-10:Pad Parichay,

Question Pattern:

1.	Kavya Sudha Pradhan Prashn 04 mein 02 likhana	02X10=20
2.	Sandharbha Sahit 06 mein 04 likhana	04X05=20
3.	Lalit Nibandh Prashn 04 mein 02 likhana	02X10=20
4.	Vyakaran 06 mein 04 likhana	04X05=20
	Total	80

COURSE: SANSKRIT (LANGUAGE)

Paper –II: Drama and Champu

A.Drama: Nagamandala of Sriharsha

Unit-1: Sriharsha ka parichay
Unit-2: Nagamandala Natak ka saramamsa
Unit-3: Nagamandala ke Natako ka charitrachitran

B..Sundara Kanda of Champu Ramayana

Unit-4: Lekhak ka parichay
Unit-5: Sundarakhanda ka saramsa

C.Grammar:

Unit-6: Samasa
Unit-7: Kradanta and Taddhita
Unit-8: Nijanta and Sannanta forms
Unit-9: Karakas.
Unit-10: Translation from English to Sanskrit

Reference Books

1.History of Sanskrit: A.B. Keith
2.Sanskrit Drama: A.B. Keith
3.Indian Kavya Literature: A.K Warder
4.Raghuvamsa: M.R. Kale
5.Nagamandala: M.R.Kale
6.Champu Ramayana: Chowkhamba Series

COURSE: URDU (LANGUAGE)

Paper-II Prose,Poetry,Pen Portrait and Translation

Unit-1: Mata-e-Adab(Part-II) - Mammem Publisher, Bangalaore.
Unit-2: Muntakhab Khake - by S.M.Aqeel, Bombay Book House, Shivamoga.
Unit-3: Translation -Book House, Shivamoga

COURSE: ENGLISH (LANGUAGE)

BLOCK I : Poetry

Unit 1 Shakespeare :Polonius' Advice to his son
Ben Jonson : To Celia
Unit 2 Donne : A Valediction Forbidding Mourning
Unit 3 Blake : London
Unit 4 Keats : Ode On a Grecian Urn
Unit 5 Shelley :Ozymandias
Unit 6 Browning : My last Duchessm

BLOCK II: Prose

Unit – 7-10 The Power of Prose/Published by Prasaranga ,Manasagangothri, Mysore.

BLOCK III: Drama

Units 11 to 15 Shakespeare : Julius Caesar

BLOCK IV: Language Component.

Unit 16 Essay Writing
Unit 17 Précis Writing and Comprehension Passage
Unit 18 Indirect and Direct Speech
Unit 19 Use of Prepositions
Unit 20 Forms of the Verb

COURSE: PHYSICS PAPER II
(SOUND, OPTICS, ELECTRICITY AND ELECTROMAGNETISM)

100 hours

UNIT-1 SOUND

1.1 Waves and Oscillations

Simple Harmonic motion-Superposition of two S.H.M.S. of equal frequency in perpendicular directions-Lissajous figures-different cases.Theory of beats and its applications.

1.2 Forced Vibrations

Equation fordamped Oscillations and its solution-effect of damping- Equation for forced Oscillations and its solution condition for resonance. Expression for phase and amplitude at resonance, sharpness of resonance.

1.3 Progressive Waves

Equation for progressive waves in one dimension-differential equation for wave motion-relation between amplitude and intensity.Velocity of longitudinal waves in a gas-Newton's formula.Laplace Corrections-effect of temperature, pressure and humidity on velocity of sound.Longitudinal wave in a rod.Transverse vibrations of stretched strings-velocity of Transverse waves.Expression for frequency-harmonics.

UNIT-2 OPTICS

Review of wave theory-Huygen's secondary waves explanation of refraction at a plane surface wave velocity, relation between them.

2.1 Interference of Light

Principle of superposition.Interference by division of wave front and division of amplitude.Theory of Fresnel's Biprism experiment.Theory of Interference at a thin film by reflected and transmitted light-colours of thin films.Interference due to an air wedge. Theory of Newton's Rings in reflected light-determination of wavelength and refractive index of liquid. Michelson's interferometer-determination of λand refractive index of thin films, Interference filters.

2.2 Diffraction

Fresnel and Fraunhofer diffraction. Half period zones explanation of rectilinear propagation. Theory of zone plate.Presnel diffraction at a straight edge and a straight wire.Fraunhofer diffraction at a single slit with theory. Diffraction through multiples slits (qualitative). Transmission grating-normal and oblique incidence-dispersive power and resolving power of grating, Comparison between prism and grating spectra.

2.3 Optical Instruments

Defects of lenses-Achromatic combination of lenses in contact and not in contact.Spherical aberration.Huygen's and Ramsden's eyepiece.Resolving power of microscope and telescope (qualitative). Mention of modern telescopes.

2.4 Polarization

Double refraction in a uniaxial crystal-Huygen's theory positive and negative crystals-principal refractive indices Huygen's construction of 0-and E-wave fronts in a uniaxial crystal. Retarding plates production and analysis of linearly, circularly and elliptically polarized light. Optical activity-Laurent's half shade polarimeter-Fresnel's theory of rotatory polarization.Use of biquartz. Effect of electric and magnetic fields on light-Kerr and Faraday effect.

UNIT-3 ELECTRICITY

Alternating currents R.M.S. value, response of DR, CR and LCR circuits to sinusoidal voltage (discussion using 'j' parameter). Series and parallel resonance-half power frequency, band width Q-factor.Power in electrical circuits, power factor. Maximum power transfer theorem (AC &DC).

3.1 Filters

High pass and low pass R.C. filters-frequency. Band pass filter.

3.2 Rectifiers

Half wave, full wave and bridge rectifiers, with semiconductor diodes-expression for ripple factor and efficiency of rectification.Role of filters in rectifiers.

3.3 Electrical Measurements

Ballistic galvanometer theory correction for damping, charge sensitiveness determination of capacity by absolute method.Desauty' Bridge "L" by Anderson's method (Using 'j'parameter) Cathode ray oscilloscope..measurement of voltage, current and frequency.

UNIT-4 ELECTROMAGNETISM

4.1 Scalar and Vector Fields

Gradient, divergence and curl of a vector.Statement of theorems of Gauss and Stokes.

4.2 Electromagnetic Theory

Concept of dipole.Ampere's circuital law; current loop as a dipole, Torque on a dipole.Maxwell's field equations.Wave equation for field vectors.Pointing vector Equations for plane electromagnetic waves-characteristics of electromagnetic waves. Production of ELM Waves accelerated changes and oscillating dipoles. Hertz experiment.

PHYSICS PRACTICAL-II

Each experiment is of 3 hours duration. Minimum of 10 experiments to be performed.

1. Interference at a wedge-measurement of thickness.
2. Newton's rings.
3. Cauchy's constants.
4. Diffraction grating-normal incidence.
5. Diffraction grating minimum deviation.
6. Diffraction at straight wire.
7. D-B photometer - efficiency of a bulb.
8. Wavelength of sodium light using biprism.
9. Resolving power of a telescope.
10. Frequency of A.C. (Sonometer).
11. BH by Helmholtz galvanometer.
12. Desauty's bridge (AC).
13. Low and High pass filters (RC).
14. Charging and discharging of capacitors through a resistance.
15. Magnetic field on the axis of a circular coil using a magnetometer.
16. Thermo e.m.f. using mirror galvanometer.
17. Specific rotation of sugar.

COURSE: MATHEMATICS PAPER II

Part - A

Unit 1: Differential Equations

Definition of an ordinary differential equation, its orders and degree.Classification of solutions. Solutions of first degree and first order equations by :

(i) Variable separable
(ii) Homogeneous and Reducible to homogeneous form
(iii) Linear and Bernoulli's form
(iv) Exact equations and reducible to exact form with standard Integrating Factor.

Necessary and sufficient condition for the equations to be exact.

Equations of first order and higher degree solvable for P. Solvable for x (Singular solutions).Solvable for y (Singular solutions) and Clairaut's equations, orthogonal trajectories.

Part - B

Unit 2: Differential Equations (continuation)

Second and higher order linear differential equations with constant coefficients complementary functions, particular integral.

Standard types Cauchy-Euler-differential equations. Simultaneous differential equations with constant co-efficients (Two Variables).

Unit 3: Differential Calculus

Continuity of a function at a point in an interval. A function continuous on a closed interval is (i) bounded (ii) attains its bounds (iii) takes every value between the bounds.

Differentiability, Differentiability implies continuity. Converse is not true (by examples) Rolle'stheorem, Lagrange's mean value theorem. Cauchy's mean value theorem, Taylor's theorem with Lagrange's form of the remainder.Taylor's and Maclaurin's series.L' Hospital's rule and problems there on.

Part - C

Unit 4: Groups

Definition of a group with examples and simple properties. Subgroups, Generation of groups, Cyclic groups, Coset decomposition. Lagrange's theorem and its consequences.Fermat's and Euler's theorem.

Permutation Groups: Even odd permutations alternating groups and Cayley's theorem.

Unit 5: Envelopes

Working rule to determine the envelope of the family of the curves $f(x,ya)=0_2$ being a parameter, Problems there on.

Unit 6: Real Number System

Postulates and their consequences, Inequalities and absolute values Archimedean property - least upper bound and greatest lower bound property.

Part - D

Unit 7: Sequence of Real Numbers

Definition of a sequence, limit of a sequence, algebra of limits of a sequence.Convergent, divergent and oscillatory sequence, problems there on. Bounded sequence; Every convergent sequence is bounded-converse is not true-monotonic sequence and their properties, Couchy's sequence.

Unit 8: Infinite Series

Definition of convergence, divergence and oscillation of series - standard properties and results.Geometric and Hyper geometric series. Cauchy's criterion (Statement only)

Tests of convergence of series - Comparison tests – D'Almbert's ratio test – Raabe's test – Couchy's root test, The integral test -Absolute and Leibnitz test for alternating series.

Summation of Binomial - Exponential and Logarithmic series.

*****

COURSE: CHEMISTRY PAPER - II

Part A : Inorganic Chemistry

Number of lecture hours .....100 Hrs.

Unit - I : Chemical Bonding

Types of bonds-ionic bond, factors that favours formation of ionic bond. Lattice energy-calculation of lattice energy of an ionic solid like sodium chloride (Born-Haber cycle). Factors controlling lattice energy. Variation of Lattice energy with charges on the ions of Ionic crystals and with the internuclear distance between the oppositely charged ions. Ionic size and hydration Energy. Covalent bond, valence bond theory, formation of hydrogen molecule, potential energy-internuclear distance curve. Sigma and pi bonds with examples. Bond character-Polar and non-polar bonds. Electronegativity difference and variation of percentage ionic character of the bond.

Molecular orbital theory :- An elementary account of MOT-linear combination of atomic orbitals, bonding and antibonding molecular orbitals, conditions for the combination of atomic orbitals, energy levels of molecular orbitals, rules relating to filling up of electrons in molecular orbitals. Molecules orbital structures and bond orders of simple species like belium, hydrogen and oxygen. Comparision of VBT and MOT.

Co-ordinate bond:- Explanation with an example (Formation of ammonium ion).

Metallic bond:- Band theory, Semiconductors and insulators.

Hydrogen bond:- Inter and intra molecular types and their significance. Structure of ice, anomalous properties of water and ice to be accounted for.
Hybridization:- sq, sp^2, sp^3, Hybridization with respect of beryllium fluoride, born trifluoride, methane.
V S E P R theory - shapes of ammonia and water -

Unit II : P-Block Elements
Boron trifluoride : Electron acceptor character. Diborane- structure and bonding in diborane, carbon and silicon-structural features of diamond, graphite, carbon dioxide and silica -correlation of their properties with structures. Fullerene (introduction).
Halogens :- Oxidation states basic properties of iodine. pscudo halogens definition, examples, comparision with halogens.
Noble gases: Isolation of noble gases from air by Dewar's adsorption method uses of helium, neon and argon. Structures and geometries of neon difluoride xenon tetrafluoride, xenon hexafluoride.

Unit III:- Errors in Quantitative Analysis Classification and minimization - gravimetry and volumetry. Duplicate and blank. Accuracy and precision, significant figures and rules for computation.

*****

PART B : PHYSICAL CHEMISTRY

Unit - I :- Ionic Equilibria
Ionic equilibria in solutions of strong and weak electrolytes. Oswald's dilution law and its limitation. Activity and activity coefficient of electrolytes - mean activity coefficients and mean molal activity coefficients. Ionic strength, pKa value of acid and bases and strengths of acids and bases. Role of solvents in solvents in altering the strengths of acids and bases.
Buffer solutions :- Henderson's equation (to be derived), hydrolysis of salts-different types of salts undergoing hydrolysis, hydrolysis constant. Relationship between Kh, Ka, Kw and Kb for various salts hydrolysis. Effect of temperature on the degree of hydrolysis. Theory of acid base indicators :- Oswald's theory - dissociation constant of an indicator, quinonoid theory. pH range, relation between pH and pKa to be derived. Choice of indicator in acid base titrations.
Unit - II :- Reaction Kinetics
Molecularity and order of reaction, second order reactions, differential and integrated equations when a-b and a#b, methods of determining order of reaction (differential hall life and isolation methods). Parallel and consecutive reactions with examples (with derivation). Theory of reaction rates-Collision thoery a qualitative treatment. Frequency of collisum hypothesis for uni and bimolecular reactions.
Transition state theory:-Activated complex. Equilibrium constants and activated complex comparison of collision theory and transition state theory.

Unit - III :- Thermodynamics
Definition of thermodynamics, terms intensive and extensive variables. isolated and opens systems, state functions, Thermodynamic processes, isothermal adiabatic. Isobaric and isochoric. reversible and irreversible. Work, heat and internal energy. Brief resume of the first law enthalpy and molar heat capacities of gases Cp and Cv and relation between (them to be derived).

Expression for maximum work done in reversibley isothermal and adiabatic expansion of an ideal gas to be derived. Joule Thomson effect, Joule-Thomson coefficient. Inversion temperative. Variation of heat of reaction with temperature- Kirchoft's equation to be derived and its applications.

Unit IV :- Phase Equilibria

Phase rule-definition and explanation of the terms. Its application component system-water and sulphur systems. Two-component system lead silver system. K1-water system, freezing mixtures.

Unit V :- Nuclear Chemistry

Nuclear stability, n/p ratio, magic numbers, binding energy, radioactive decay series, radioactive equilibrium, artificial transmutation of elements using protons, deutrons, neutrons and their relative efficiency as projectiles. Induced radioactivity, radioactive isotopes and their use in studying reaction mechanism (any two reaction).

Unit - VI :- Polymer

Degree of polymerization, average molecular weight. Determination of molecular weight by viscosity measurement (Ostwald's method).

PART C : ORGANIC CHEMISTRY

Unit - I :- Electronic Effects

Inductive resonance and hyper conjugation effects, electronic interpretation of orienting influence of Meta directing groups:- NO_2-SO_3H-COOH and – CHO Ortho and Para directing groups :- OH_2-HN_2 and Cl and their relative reactivity on electrophilic substitution reactions of aromatic ring.

Unit - II :- Organometallic Compounds

Definition and examples, preparation of Grignard reagents and their synthetic applications (Ethyl magnesium iodide to be taken as an example). Preparation and properties of tetra ethyl lead.

Unit - III :- Hydroxy Compounds

(a) Aliphatic hydroxy compounds (alcohols)

Mohohydric alcohols: Classification with examples. Nomenclature (Common and IUPAC), reactions of primary, secondary and tertiary alcohols involving C-O bond and O-H bond cleavage.

Distinguishing tests between primary, secondary and tertiary alcohols (De-hydrogenation method and Victor Meyer's method) mechanism of esterification between acetic acid and ethyl alcohol.

Trihydric alcohols : Classification with examples, nomenclature (Common and IUPAC), manufacture of glycerol from natural sources (spent lye and molasses), synthesis from propylene, reactions of glycerol with sodium. Hl. Oxalic acid and dehydrating agents, Esterification of glycerol with higher fatty acids.

Explosives from glycerol-nitroglycerine, Cordite and Dynamite.

(b) Aromatic hydroxy compounds (phenols)

Classification with example nomenclature (Common and IUPAC), phenol manufacture from cumene, hydrogen bonding in nitrophenols and effects thereof, comparision of acidity of alcohols and phenols, reactivity of phenols towards electrophiles, effects of substituents on acidity of phenols (Nitrophenols and cresols to be taken as examples).

Unit - IV :- Carbonyl Compounds

Aldehydes and ketones-Nomenclature (Common and IUPAC). Synthesis of aldehydes and ketones. Structure, reactivity and properties of carbonyl group. Mechanism of nucleophilic addition reactions of HCN, sodium bisulphite, hydroxylamine, hydrazine, semicarbazide and

Grignard reagents, Perkins reaction. Cannizzaro's reaction. Aldol condensation. (Mechanism to be discussed.)

Unit - V :- Carboxylic Acids

Classification with examples, Nomenclature of mono and dicarboxylic acids (Common and IUPAC), synthesis of aliphatic monocarboxylic acids from

(i) Grignard reagents
(ii) Hydrolysis of cyanides
(iii) Arndt-Eistert synthesis

Action of heat on alpha, Beta and gamma hydroxy acids.

Resonance structures of carboxylic acid group and carboxylate ion-effects thereof.

Explanation of acidity of carboxylic acids-Effects of substituents on acidity of carboxylic acids, explanation taking the following examples.

(i) Acetic acid and formic acid
(ii) Acetic acid and benzoic acid
(iii) Acetic acid and propionic acid
(iv) Acetic acid and monochloracetic acid
(v) 2-chlorobutanoic acid and 3-chlorobutanoic acid.

Unit - VI :- Amines

Classification with examples, nomenclature (Common and IUPAC), methods of synthesis of aliphatic and aromatic amines (Ammonolysis of alkyl halides, reduction of nitro compounds) Distinguishing tests between primary, secondary and tertiary amines (Methylation reaction and with nitrous acid). Basic character of amines, comparative study by taking the following examples-

1. Methyl amine, dimethyl amine and Tri-methyl amine.
2. Aniline, N-methyl aniline and N_2N-dimethyl aniline.
3. Aniline and methyl amine.
4. Aniline, diphenyl amine and triphenyl amine.

*****

CHEMISTRY PRACTICAL - II

Number of Practicals:10 Each Practical : 3 Hrs.

Part - A

Systematic qualitative analysis of organic compounds.(Monofunctional compounds only).

Part – B

Organic Estimations

1. Estimation of glycine.
2. Estimation of phenol.
3. Estimation of citric acid in lemon juice.

*****

COURSE: BOTANY PAPER - II

UNIT 1: Gymnosperms :

General characters and classification, external and internal structure, reproduction and life cycle of the following

Cycadales :Cycas
Coniferales: Pinus
Gnetales :Gnetum

UNIT 2: Palaeobotany :
Process of fossilization and brief account of Lepidodendron.
UNIT 3: Histology
Cell Wall - middle lamella, primary wall and secondary wall; chemical nature of the cell wall - cellulose pectic compounds, lignin, cutin, suberin; different types of lignin thickenings.
UNIT 4: Tissues :
Definition, classification - meristematic and permanent tissues, classification of meristems based on origin, function and position: Histogen and Tunica - corpus theories. Permanent tissues, Simple and complex, structure and function of parenchyma, collenchyma, Sclerenchyma, xylem and phloem
UNIT 5: Tissue Systems :

a. Dermal Tissue System : Structure and functions of epidermis, epidermal hairs including stinging and glandular hairs.
b. Ground Tissue System: Cortex, endodermis, pericycle and pith.
c. Vascular Tissue System: Types of vascular bundles-radial, conjoint, collateral, bicollateral and concentric.

UNIT 6: Anatomy :

Internal structure of ;

I. Dicot stem - Tridax and Cucurbita ;
II. Monocot stem - grass ;
III. Dicot root - Cicer ;
IV. Monocot root - Canna
V. Dicot leaf - Tridax
VI. Monocot leaf - grass

Normal secondary growth in Dicot stem (Ex: Morus alba) in dicot root- Cicer, secondary xylem, secondary phloem, medullary rays, sap wood, heart wood, growth rings, tyloses; Periderm. Anamolous secondary growth: Stems of Boerhavia and Dracaena.

EMBRYOLOGY
UNIT 7: Contributions of Maheswari and B.G. L. Swamy.
UNIT 8: Microsporogenesis: Development of anther, development of male gametophyte, pollen embryo sac.
Megasporogenesis: Types of ovules, structure of anatropus ovule. Formation of megaspores, development of monosporic type of embryo sac (Polygonum type).Double fertilization and Triple fusion, its significance.
UNIT 9: Endosperm :
Types - Cellular.Helobial and Free Nuclear endosperm development of cellular type of endosperm, vermiform appendage; ruminate endosperm.
UNIT 10: Embryo :
Development of dicot embryo-crucifer type.
UNIT 11: Polyembroyony: Types, causes induction of polyembryony

UNIT 12: Pollination : Self and cross pollination, types and advantages.
UNIT 13: Ecology :
Aim and scope - Factors affecting plant growth edaphic, climatic and biotic factors. Mesophytes, hydrophytes xerophytes, epiphytes, halophytes parasites.
UNIT 14: Succession :Hydrosere and Xerosere.
UNIT 15: Forestery :Deforestation and afforestation, national parks and game sanctuaries
Vegetation types of Karnataka State

BOTANY PRACTICAL - II

[Max Marks - 50

Duration of each Practical - 03 hours
Number of students in each batch - 10-12
Number of teachers per batch - 1 (upto 15 students)
Number of teachers per batch - 2 (above 15 students)
Number of students per batch in practical examination - 10
Duration of practical examination - 3 hours
Gymnosperms : Morphology, Anatomy Vegetative and Reproductive parts of the types mentioned in theory.
Palaeobotany: Study of Slides/ Specimens as per theory syllabus.
Anatomy : Study of Internal structure of Dicot stem- Tridax and Cucurbita
Monocot stem - Grass
Dicot root - Cicer
Monocot root - Canna
Dicot leaf - Tridax
Monocot leaf - Grass
Anomalous secondary growth in Boerhavia and Dracaena
Embryology - Micorsporogenesis - T.S. of Anther
Megasporogenesis - Polygonum type of embryo sac. Types of Ovules.
Training in Whole mount of embryo - Brassica. Endosperm - Cucumis.
Ecology - Study of Morphological and Anatomical features of Hydrophytes, Xerophytes, Halophytes, Epiphytes and Parasites.
Ecological Instruments - Rain gauze, Anemometer and Hygrometer, Determination of Soil P^H.
Mapping of Vegetation types of Karnataka.

COURSE: ZOOLOGY PAPER - II
(Histology, Comparative Anatomy, Biochemistry, Biotechnology And Physiology)

Theory : 100 hrs

Section - A: Histology and Comparative Anatomy

Unit1. Histology of the following organs in mammals: Stomach, small intestine, liver, pancreas, spleen, kidney, ovary adrenals, thyroid and skin.

Unit 2. Circulatory System : Evolutionary trends in the structure of Heart and aortic arches of shark, frog, lizard, pigeon and rabbit.

Unit 3. Excretory System : Evolutionary trends of pronephros, mesonephros and metanephros with examples.

Unit 4. Endoskeloton: Comparative study of the skulls of shark, frog, varanus, pigeon and rabbit, Limb skeleton, girdles and vertebrae of frog, pigeon and rabbit.

Section – B : Biochemistry and Biotechnology

Biochemistry

Unit 1. Carbohydrates : Definition and classification, structure and biological importance of common mono, di and polysaccharides.

Unit 2. Proteins : Primary, secondary, tertiary and quaternary structures, simple and conjugated proteins, fibrous and globular proteins – Biological importance.

Unit 3. Lipids - Classification, structure and biological importance of Phospholipids, neutral and Glycolipids, saturated and unsaturated fatty acids with examples.

Unit 4. Vitamins : Structure and function of fat-soluble and water soluble vitamins, deficiency diseases.

Unit 5. Enzymes: Classification, properties and biological importance, mechanism of enzyme action.

Biotechnology

Unit 6. Introduction, definition, historical background and scope.

Unit 7. Recombinant DNA technology, restriction endonucleases, DNA ligase, cloning vehicles, insertion DNA into a vector, detection of recombinant molecules, selection and screening of required recombinants, genome library, DNA fingerprinting, southern blot and northern blot, transgenic animals.

Unit 8. Biotechnology for human health - Insulin synthesis, MCA gene therapy.

Section - C : Physiology

Unit 1. **Carbohydrate metabolism glycogenesis-** glycogenolysis, glycolysis, TCA cycle, terminal oxidation, EMP pathway.

Unit 2. Oxygen and carbon dioxide transport - Respiratory pigments and their function, oxygen & carbon dioxide dissociation curves. Bohr effect, carbon monoxide poisoning, deleterious effects of Tobacco smoking.

Unit 3. Body - Fluids & Circulation : Importance, closed and open circulatory systems, blood composition, buffer in blood, chloride shift, blood clotting and blood transfusion myogenic and neurogenic hearts, cardia rhythms, ECG and B.P.

Unit 4. Osmoregulation - Osmoconformers, osmoregulaters osmoregulation in shark, marine and fresh water teleosts, and terrestrial mammals (Kangaroo, rat and camel).

Unit 5. Thermoregulation - Law of Q_{10} ectotherms, endotherms and heterotherms, temp relations of poikilotherms and homeotherms, thermogenesis and its regulation, adaptive changes of animals in cold environments, a note on aestivation and hibernation.

Unit 6. Nerve physiology - Types of nerves and structure of a neutron, origin and conduction of nerve impulses, synaptic transmission, reflex action.

Unit 7. Muscle Physiology : Ultra structure of muscle fibre, physiology and energetics of muscle contraction, excitation, coupling, neuromuscular unction.

Unit 8. Endocrine Physiology: Hormones, neurohormones ands neurotransmitters hypothalamic regulation of pituitary functions, functions of pituitary, thyroid, parathyroid, islets of langerhans, adrenals, testis, ovary and placenta.

Unit 9. Bioluminescence - Definition, types extra cellular, intra cellular, Occurrence of bioluminescence animals - Noctiluca, chaetopterus, glow worms, antennarius, mechanism of light production, significance.

ZOOLOGY PRACTICAL - II

(Histology, Comparative Anatomy, Biochemistry, Biotechnology And Physiology)

10 practicals

1. Qualitative detection of glucose, starch, albumin, lipids, ammonia, uric acid and creatinine.
2. Estimation of Haemoglobin.
3. Total RBC count.
4. Total WBC count.
5. Dehydrogenase activity.
6. Comparative anatomy, skull of shark, frog & rabbit, girdles of frog and rabbit.
7. Limb skeleton - Frog and Rabbit Vertebrae - Frog and Rabbit.

8. Histology - Identification - 6 slides : Stomach, Intestine, Liver, Kidney, Ovary and Testis.
9. Histology - preparation of any two slides.
10. Vitamins - Water-soluble and fat-soluble.
    a. Vitamin A: Amaranthus, Coriander, Carrot
    b. Vitamin - B and B : Rice bran, yeast
    c. Vitamin C : Citrus, banana, orange
    d. Vitamin D : Fish liver oil.
    e. Vitamin E : Germinating seeds.

Reference Books

1. Conn *et al.* Outlines of Biochemistry.
2. Stryer, L. Biochemistry.
3. Prosser and Brown. Comparative Animal Physiology.
4. Eckert. Animal Physiology.
5. Lehninger, A. Principles of Biochemistry.
6. Dubey. Introduction of Biotechnology.
7. David Freifelder. Molecular Biology.
8. Leeson C., Ronal Lesson, *et al*. Text Book Histology.

COURSE: INDIAN CONSTITUTION

UNIT I: Spirit of the Constitution

a. Rules of Law
b. The Preamble

UNIT II: Obligation e State

Directive principles of State Policy

UNIT III: System of Governance

Nation of State Under the Constitution (Art-12)

UNIT IV: Citizen and the Constitution

a. Citizenship
b. Fundamental Rights
c. Fundamental Duties

UNIT V: Union Government

a. President and his Powers and Council of ministers
b. Parliament
c. Supreme Court

UNIT VI: State Government

a. Governor and Government Ministers
b. Legislature
c. High Court and Subordinate Courts

UNIT VII: Local Self Government

a. Urban Municipalities and Corporations
b. Rural Panchayat Raj

UNIT VIII: Special Provisions Relation to certain classes

(SC/ST's other backward classes and minorities and women and children)

UNIT IX: Constitution of the Election

Commission and its Powers and Functions .

****

SYLLABUS FOR FINAL B.Sc.(PCM & CBZ)

COURSE: PHYSICS PAPER - III

(Spectroscopy, Wave Mechanics, Statistical Mechanics, Relativity And Astrophysics)

75 hours

UNIT-1:Discovery of electron- e/m by Thomson's method Millikan's expt. (qualitative). Thomson and Rutherford atom models (qualitative).

UNIT-2:Review of Bohr's theory : Effect of finite mass of nucleus. Sommerfeld model (qualitative), space quantization. Spin of electron Stren-Gerlach expt. (qualitative). Orbital angular momentum and magnetic moment (derivation).

UNIT-3:Vector atom model-quantum numbers : Pauli's exclusion principle and its significance distribution of electrons in an atom. LS and JJ couplings Lande 'g' factor. Selection rules in spectroscopy. Zeeman effect, experimental observations-normal and anomalous-classical explanation (quantitative) for normal Zeeman effect-explanation of normal Zeeman effect from vector atom model Paschen-Back effect, Stark effect (quantitative).

UNIT-4:X-rays - continuous X rays : Duane-Hunt rule characteristics X-rays-Moseley's law, X-ray energy level diagram Diffraction of X-rays-Lane's work (qualitative) Bragg's law.

UNIT-5:Molecular spectroscopy : Origin of rotation vibration and electronic spectra and their characteristics. Qualitative discussion of different spectroscopic techniques - UV.IR. ESR. NMR.

UNIT-6:Scattering of light : Rayleigh scattering Raman effect experiment set up-quantum theory - applications Compton scattering theory.

UNIT-7: Lasers : Characteristic features of laser beam - General principles of laser-Ruby laser. He-Ne laser. Brief discussion of other types of laser Holography. Applications of lasers.

UNIT-8 :Wave Mechanics : Dual nature deBroglie hypothesis velocity of matter waves - Davission and German experiment Principle of electron microscope.

Heisenberg's uncertainty principle Illustration by y-ray microscope. Applications electron in nucleus. Bohr radius. Schrödinger's equation-derivation of time dependent and time independent equations. Born's interpretation of wave function-normalization-expectation values. Applications of Schrodinger wave equation-tunneling particle in I-D box (derivation) 3-D box, rigid rotator. SH oscillator.

H-atom (qualitative) Operators in quantum mechanics -Hermition operators eigen values and eigen functions degeneracy of states position momentum and Hamiltonian operators-Angular momentum operators brief

UNIT-9: Statistical Mechanics : Necessity of statistical approach. Distribution function. Qualitative discussion of M-B, F-D and B-E statistics. Derivation of Planck's law from B-E statistics.

UNIT-10: Theory of Relativity : Limitations of Galilean relativity. Michelson - Morley experiment (qualitative) and its significance Postulates of special theory of relativity. Length contraction-rime dilation-relativity of simultaneity. Velocity addition theorem.

Relativistic dynamics mass variation, mass-energy relation (derivation) relativistic expression for kinetic energy, energy, momentum relation.

Classical and relativistic concepts of space and time. Minkowski space, space-time co-ordinates, concept of four vectors.

General theory of relativity Inertial and gravitational mass, principle of equivalence curved space-time. Brief account of Einstein's theory of gravitation. Experiment tests of General theory of relativity.

UNIT-11:Astrophysics : Types of objects in the sky. Measurement of stellar distances, stellar

magnitudes. Mass-luminosity relation (qualitative)

Structure of Sun. Evolution of stars, H-R diagrams. Red giants, white dwarfs, neutron stars, black holes, Chandrashekar limit, quasars.

Expanding Universe-Hubble's law Big-Bang cosmology (brief account) cosmic microwave background. Nucleosynthesis Brief discussion other cosmological theories.

References

1	Modern Physics	Kenneth Krane
2	Modern Physics	A. Baiser
3	Optics and Atomic Physics	D.P. Khandelwal
4	Special Theory of Relativity	Resnik
5	Modern Physics	Ritchmeyer, Kennard and Cooper
6	Modern Physics	R. Murugeshan
7	Lasers and Non Linear Optics	B.B. Land
8	Berkeley Physics Course, Vol. III, IV and V	
9	Theory of Space, Time and Gravitation	S.G. Pimpale
10	Quantum Mechanics	Ghatak and Lokanathan
11	Atomic Physics	J.B. Rajan
12	Molecular Spectroscopy	Banwell
13	Spectra and Diatomic Molecules	G. Herrberg
14	Atomic Physics	Max Born

COURSE: PHYSICS PAPER - IV
(Nuclear Physics, Solid State Physics & Electronics)

75 hours

UNIT-1: Nuclear decay and Radioactivity: Successive disintegration radioactive equilibrium, radiocarbon dating, age of the earth. α-decay-Gamow's theory (qualitative) 2-ray spectraGeiger-Nuttal law. β-decay-neutrino hypothesis.

Nuclear reactions : Artificial radioactivity-discovery of neutron, properties andapplications of neutrons-Energetics of nuclear reactions-Q values and reaction cross sections (qualitative).

Nuclear forces : Characteristics, Yukawa theory (qualitative).

Nuclear models, liquid drop model, shell model magic numbers, Fermigas model (brief).

UNIT-2: Particle accelerators, linear accelerator, cyclotron betatron, Principles of synchro-tron accelerators.

Nuclear detectors : G.M. Counter, scintillation counters, semiconductor detectors.

Nuclear Fission: Explanation from liquid drop model, critical mass and chain reaction. Nuclear reactors classification, four factor formula, Indian nuclear programme.

UNIT-3: Nuclear fusion : Thermonuclear reactions Sources of stellar energy P-P and C-N cyder controlled nuclear fusion.

Cosmic Rays : Discovery altitude and latitude effect. East-west asymmetry - Primary and secondary cosmic rays, cosmic ray showers. Origin of cosmic rays.

Elementary particles : Classification symmetries and conservation laws. Basic interactions in nature. Quark model, unification of forces (qualitative).

SOLID STATE PHYSICS

UNIT-4:States of matter-characteristics of the solid state introductory, crystallography Bravais lathces, crystal systems, Miller Indices.

Specific heats of solids Dulong and Petit's law. Einstein explanation (qualitative), Debye

's theory (qualitative), concept of phonons.

UNIT-5: Free Electron Theory : Concept of free electron, classical expression for electrical conductivity Wiedmann Franz law-Limitations of Classical theory.

Quantum Free electron theory : Energy states of free electrons in metals-statement of density of states. Derivation of expression for Fermi energy and average energy. Application to electronic specific heat. Contact potential, paramagnetic susceptibility (qualitative).

UNIT-6: Band theory: Explanation of origin of energy bands in solids Fermi energy and conductivity of Intrinsic semiconductors, Impurity semi-conductors. Fermi energy and conductivity (qualitative). Hall effect (theory) – Photoconductivity photovoltaic effect-Solar cells.

UNIT-7 :Magnetic properties : Origin of dia, para and ferro magnetism on the basis of electronic structure of atoms and their characteristic features. Domain structure and hysterisis (qualitative).

UNIT-8: Super conductivity : Experimental observations, Meissner effect Isotope effect, type-I and type-II super conductors. B.C.S. theory (qualitative). Josephson effect and its applications. High temperature super conductors.

ELECTRONICS

UNIT-9:Network analysis : Mesh current analysis. Explanation of super position theorem. Thevenin's and Norton's theorems.

UNIT-10:Zener diode-voltage regulation, other types of diodes-brief discussion : Transistor CE characteristics (qualitative) AC and DC load lines. Biasing voltage divider method. CE amplifier single stage expressions for current voltage and power gains. Classification of amplifiers-brief discussion of each type

UNIT-11:Oscillators : Concept of feed back, Bark Hausen's criteria. Hartley and phase-shift oscillators. Brief discussion of non sinusoidal oscillators.

Digital Electronics : Basic logic gates using diodes and transistors. Truth tables of different types of gates. Boolean expressions implementation by gates. Flip-Flop R.S. and J.K and M.S. Half and Full adders (detail).

UNIT-12:Communications : Modulation, different methods. Analysis of A-M wave. A.M. transmitter and super heterodyne receiver (with block diagrams. Principles of T.V. transmission and reception (block diagrams). Colour television. Radar and applications.

References

1	Nuclear Physics	Kalpan
2	Atomic and Nuclear Physics	A.N. Ghoshal
3	Source Book of Atomic Energy	Glasstone
4	Modern Physics	R. Murugeshan
5	College Physics	Sundarajan
6	Solid State Physics	S.O. Pillai
7	Solid State Physics	C. Kittel
8	Solid State Physics	A.J. Dekkar
9	Solid State Physics	Singhal
10	Principles of Electronics	V.K. Mehta
11	Electronic Principles	Malvino
12	Handbook of Electronics	Gupta and Kumar
13	Operational Amplifiers	Gaekwad
14	Peynmann Lectures, Vol. II and III	

PHYSICS PRACTICAL - III
Minimum 08 experiments to be done

1. Capacity of a condenser using B.G by absolute method.
2. High resistance by leakage using B.G. taking into consideration the resistance of the condenser.
3. Earth inductor magnetic elements of Earth.
4. Mutual inductance by absolute method using B.G.
5. Triode characteristics determination of triode constants.
6. e/m of electron by bar magnetic method.
7. Solar spectrum Rydbeng constant.
8. Inverse square law for gamma radiation using GM. counter.
9. Absorption co-efficient using GM. counter.
10. Constructions of a full wave Rectifier Bridge type variation of ripple factor with different filters.
11. Anderson's Bridge-I.
12. Thermionic emission verification of Richardson Dushmann Equation.
13. I-H Currie.
14. Wavelength of laser light on.
15. Adsorphen Spatrum of Iodine.

PHYSICS PRACTICAL - IV
Minimum 08 experiments to be done

1. Series Resonance and Parallel Resonance.
2. Verification of Thevenin's and power transfer theorem.
3. Characteristic of PN-diode. Zener diode and LED.
4. Characteristic of transistor - Common emitter.
5. Characteristic of Field Effect Transistor.
6. Thermistor-Temperature response and energy gap measuring unknown own temperature.
7. Phase Shift Oscillator-Construction and frequency determination.
8. Phase measurement in LCR circuit using CRO resonance.
9. Common emitter amplifier-Study of frequency response and measurement of gain.
10. Wein-Bridge oscillator-construction and frequency determination.
11. Study of logic gates and realization of various logic functions using divides.
12. Photoconductor's spectral response and energy gap.
13. Astable multi-vibrator, using IC 555.
14. OP-AMP Inverting and non-inverting amplifier.
15. Voltage regulator.

*****

COURSE: MATHEMATICS PAPER - III
Part - A

Unit 1:Groups (Continuation)

Normal subgroups - definition and examples and standard theorem on Normal subgroup quotient group (Factor group). Homemorphism. Iso morphism, Fundamental theorem of homomorphism, Automorphism, Inner automorphism.

Unit 2:Rings, Integral Domains and Fields

Rings-Definition, types of rings, examples and properties of rings. Rings of integers module-n-integral domains. Fields examples subrings.

Ideals- Principle ideal, Maximal ideal in a commutative ring, examples and standard properties. Homomorphism and Isomorphism - Properties of homomorphism of rings. Quotient rings.

Unit 3:Polynomial Rings

Division algorithm - Units and Associates, irreducible polynomials-roots of a polynomial, test for rational roots, principal, prime and maximal ideals in a polynomial ring. Criterion for an ideal to be maximal polynomial rings.

Part - B

Unit 4:Linear Algebra

Vector spaces, examples, subspaces, criterion for a subset to be subspace. Concepts of linear dependence and independence. Fundamental theorem of linear dependence. Basis and dimension. Standard properties of linearly independent and dependent sets-examples, illustrations, concepts and results.

Linear transformations, matrix representation of linear maps. Change of basis and the effect of associated matrices, rank and Nullity of a linear transformation. Non Singular linear transformation. Inverse of a matrix using linear transformations.

Inner product, Euclidean vector space, examples, orthogonality of vectors, orthogonalization of a basis of a vector space by Gram-Schmidt's orthogonialisation process (Examples only).

Unit 5:Functions of Two and Three Variables

Continuity, partial derivatives, Euler's theorem for Homogeneous functions (Two variables) Maxima and Minima of functions of two variables.

*****

COURSE: MATHEMATICS PAPER - IV

Part -A

Unit 1:Line and Multiple Integrals

Definition of line integrals and basic properties. Examples on evaluation of line integrals. Definition of double integral. Evaluation of double integrals (i) Under given limits (ii) in region bounded by given curves change of variables. Surface area as double integrals.

Definition of triple integrals and evaluation. Change of variables. Volume as a triple integral.

Unit 2:Improper Integrals

Definition of Gamma and Beta functions and results following the definitions. Relation between Gamma and Beta functions. Applications to evaluations of integrals.

Unit 3:Riemann Integration

Upper and lower sums. Refinement of partitions. Upper and lower integrals. Integrability criterion for integrability. Continuous and monotonic functions are Riemann integrable. Integral as the limit of a sum, integrable of the sum and product of integrable functions, integrability of the modulus of an integrable functions, the fundamental theorem of calculus.

Part - B

Unit 4:Ordinary Linear Differential Equations

Solution of ordinary second order linear differential equations with variable coefficients by the methods: (i) When a part of complementary function is given (ii) Changing the independent variable (iii) Changing the dependent variable (iv) When a first integral is given (Exact equation) (v) Variation of parameters.

Unit 5:Total and Simultaneous Differential Equations of First Order with Two variables

Necessary condition for the equation pdx+edy+Rdz=0 be integrable. Problems thereon. Solutions of equations of the type dx/p=dy/Q=dz/R

Unit 6:Partial Differential Equations

Formation of partial differential equation – Lagrange's linear equations : Pp±Qq=R. Four standard types of first order partial differential equations Charpit's method.

Unit 7:Fourier Series

Periodic functions and properties. Fourier series of functions with period 2? and period 2L. Half range cosine and sine series.

*****

COURSE: MATHEMATICS PAPER - V

Part -A

Unit 1:Complex Analysis

Complex numbers, the complex plane-Conjugate and modulus of a complex number. The modulus arguments form - geometric representation - Euler formula, e^{ix} = cos x + isin x. Equation to circle and a line in the complex form.

Functions of a complex variable, limit of a function continuity and differentiability - Analytic function. Cauchy-Reimann equations in Cartesian form. Sufficient conditions for analytic (in Cartesian form). Real and imaginary parts of an analytic functions are harmonic - construction of analytic function given real or imaginary parts.

The complex line integral - Examples and properties. Cauchy's integral theorem (proof using Green's theorem) and its direct consequences. The Cauchy's integral formulae for the function and the derivatives. Application to the evaluation of simple integrals. Cauchy's inequalities. Liouville's theorem, fundamental theorem of Algebra.

Transformations Definition of a conformal map. An analytic function with non-vanishing derivative is confirmal. The bilinear transformation. W=az+b/cz+d Cross ratio property is preserved. Bilinear transformation, transforms circle into circle or lines, problems there on.

Unit 2:Numerical Analysis : Finite Differences

Definition and properties of Ɛ and E. and the relation between them. the nth differences of polynomial.

Newton-Gregary forward did backward interpolation formulae-Lagrange's interpolation formula for unequal intervals. Numerical differentiation based on equal intervals.

Part - B

Unit 3:Laplace Transforms

Definition and basic properties - Laplace transforms of some common functions-Laplace transforms of derivatives and integrals of functions - Inverse Laplace transforms Periodic functions -Step function Convolution theorem - Simple initial value problems - Special integral equations Solution of 1st and 2nd order equations by Laplace transform method.

Numerical Analysis (Continued)

Unit 4:Solutions of Algebraic Equations

Method of successive bisection method. Methods of Falsiposition. Newton Raphson's iteractive method.

Unit 5:General Quadrature Formula

Trapezoidal rule. Simpson's 1/3rd and 3/8th rules. Weddle's rule - problems thereon.

Solutions of initial value problem for ordinary linear first order differential equations by Picard's, Euler's. Modified and fourth order Range Kutta's method.

****

COURSE: CHEMISTRY PAPER - III

75 Hrs.

PART A : INORGANIC CHEMISTRY

Unit - I :- Industrial Chemistry

a) Electroplating - Principle and practice. Electroplating of gold and chromium.

b) Refractories - definition, classification, properties taking silicon carbide as an example.
c) Abrasives - definition, classification.

Unit - II :- Metallurgy

Thermodynamics of metallurgy. Ellingham's diagrams. Extraction of nickel from sulphide ore, extraction of manganese from its oxide ore, extraction of gold by hydrometallurgical process. Refining of gold by quartation process, recovery of silver from photographic plate. Extraction of uranium from pitchblende.

Unit - III :- Alloys

Purpose of making alloys, preparation by powder metallurgy methods. Influence of carbon, maganese, nickel, chromium, tungsten, silicon and cobalt on the properties of steel.

Unit - IV :- Solvents

Comparative account of water and liquid ammonia as solvents (striking similarities and factors which make them good polar solvents). Reactions in liquid ammonia and water solvolysis, acid base neutralization, oxidation-reduction, complex formation ionization of acetic acid in water and liquid ammonia, solubility of ionic solids and its dependence on lattice energy and solvation energy.

PART B : PHYSICAL CHEMISTRY

Unit - I : Thermodynamics

Spontaneous processes, heat engine, Carnot's cycle and its efficiency. Refrigeration and thermodynamic scale of temperature. Concept of "Entropy". Entropy as a state function. Limitations of First law and need for the second law. Statements of second law of thermodynamics, entropy changes of an ideal gas with P, V and T. Calculation of entropy changes in different processes. Molecular interpretation entropy. Physical significance of entropy.

Free energy-Helmoltz free energy (A). Gibb's free energy (G) and their relationship. Free energy and useful work, significance of free energy and useful work, significance of free energy change-criteria for equilibrium and spontaneity. Variation of free energy with P, V and T. Derivation of Gibb's Helmotz equation. Equlibrium constant and its variation with temperature van't Holff's isotherm, van't Hoff's equation. Clausius-Claypeyron equation and its appliations. -

Unit - II :- Electrochemistry

Conductance, specific conductance, molar conductance, equivalent conductance and their determination. Variation of specific and molar conductance with dilution. Anomaly of strong electrolytes. Debye Huckel theory of strong electrolytes-(a qualitative treatment). Ionic conductivity and ionic mobility. Kohlrausch's law and its applications.

Transport numbers - anomalous transport numbers. Principles of determination of tranpsort numbers by Hittorf's method-both attacable and non-attackable electrodes. Relation between ionic conductance and transport numbers. Principles involved in Conductometric titrations.

Unit - III :- Electro Motive Force

Electrochemical cell, representative of cell. Determination of EMF of a cell. Weston's standard cell reversible and irreversible cells. Energy calculation of cell. Nernst equation (to be derived) expression for single electrode potential, reference electrodes (calomel and glass electrodes). Concentration cells- E.M.F. of concentrations cells with and without transference, Liquid junction potential and salt bridge.

Applications of E.M.F. Measurements:-

1. Determination of valency of ions
2. Determination of solubility product of sparingly soluble salt

3. Determination of pH of a solution by using
(a) quinhydrone and (b) blass electrodes.
Potentiometric titration :-
(a) acid-base titrations (b) redox titrations
Fuel cells :- different types, their construction and working importance of fuel cells.
Polarization, decomposition potential, over voltage.

PART C : ORGANIC CHEMISTRY

Unit - I : Carbohydrates
Introduction, Interconversions - (a) Glucose to fructose. (b) frutose to glucose (c) Ascending sugar series - Killiani's synthesis (d) Descending sugar series-Wohl's method. Epimerization. Mutarotation.
Monosaccharides - elucidation of open and ring structures of glucose and fructose (Pyranose ring structure by Haworth's method), determination of ring size.

Unit - II :- Alkaloids
Definition, classification, isolation, elucidation of structure of nicotine and its synthesis by Spath's method.

Unit - III :- Terpenes
Definition, classification, isoprene rule, elucidation of structure of citral and its synthesis from methyl heptenone.

Unit - IV :- Vitamins
Classification, biological importance, synthesis of vitamin-C from D-glucose.
Unit - V :- Amino Acids, Peptides and Proteins
Definition and classification of amino acids, methods of synthesis of amino acids (phthalimide, malonic ester and Strecker's synthesis). Zwitter ion and isolectric point. Ninhydrin and Biuret tests.
Peptides - Peptide bond, carbobenzoxy method of synthesis of peptides.
Proteins - Classification based on composition and structure.

Unit VI :- Enzymes
Classification, active sites, specificity of enzymes, factors affecting the activity of enzymes, mechanism of enzyme action.
Unit - VII :- Lipids
Oils, fats and waxes - Definition and classification. Analysis of oil and fats-acid value, iodine value and saponification value and their importance, manufacture of soaps (hot process), cleaning action of soaps, detergents and superiority over soaps.

COURSE: CHEMISTRY PAPER - IV

75 Hrs.

Part A : Inorganic Chemistry

Unit - I :- d-Block Elements
General characteristics of transition elements (electronic configuration, variable oxidation states, atomic size, ionization potential, magnetic property, colour and complex formation) explanation taking examples from 3-d series.
Unit - II :- f-Block Elements

Lanthanide series-electronic configurations, oxidation states, colour, magnetic properties, complex formation, Lanthanide contraction, its cause and consequences. Seperation of lanthanides by ion exchange method.

Unit - III :- Inorganic Polymers

Flurocarbons-Definitions, examples, properties, manufacture of Teflon and uses.

Uses of the following organic reagents in inorganic quantitative analysis.

(a) DMG (b) EDTA (c) Oxine.

Unit - IV :- Environmental Chemistry

Air pollution - air pollutants such as oxides of carbon, nitrogen and sulphur, organic gases such as methane, chlorofluorocarbons and PAN. Particulate matters-lead and fibrous silicates. Sources of these pollutants, their effects (green house effect, acid rain and photochemical smog). Control of air pollution.

Water pollution - Sources of water of pollutants, domestic sewage. Industrial effluents, dissolved metal ions, their effects. Biochemical oxygen demand (B.O.D.) and dissolved oxygen (D.O.) level of water.

Soil Pollution - Pollutants - agricultural and animal manures, use of pesticides and radioactive wastes. Control of soil pollution.

Unit - V :- Co-ordination Compounds

Complex salts and double salts. Detection of complex ion formation (conductance method, change in pH, change in colour) Werner's theory of coordination compounds (to be illustrated taking cobalt, ammine complexes as e.g.) Definition of the terms complex ion, ligands and coordination number, types of ligands with e.g. Monodentate (cationic, anionic, neutral), polydentate, ambidentate and macrocyclic ligands Sidgwick's theory of the concept of effective atomic number.

Nomenclature of complex compounds. Isomerism in complex compounds.

a. Structural isomerism - ionization, isomerism, hydrate isomerism linkage isomerism and coordination isomerism.
b. Stereoisomerism in complex compounds with coordination numbers 4 and 6.

Stability of complex compounds - stability constant, factors influencing the stability of complexes - nature of metal ion. Nature of ligands, chelating and macrocyclic effects.

Applications of complex formation in

1. Metallurgy 2. Qualitative and quantitative analysis.

Valence bond theory as applied to complexes - inner orbital and outer orbital complexes. The structure and magnetic propertive of the following complexes to be discussed.

$[Fe(CN)_6]^{-4}$, $[Fe(CN)_6]^{-3}$, $[Fi(CN)_4]^{-2}$, $Fi(CO)_4$, $[Cu(NH_3)_4]^{-2}$

PART B : PHYSICAL CHEMISTRY

Unit - I :- Calorimetry and Spectrophotometry

Lambert's law - Absorption coefficient and extinction coefficient. Beer's law, Beer Lambert's, Molar absorption and molar extinction coefficients, transmission and optical density, their relationship, specific extinction coefficient. Photoelectric colorimeter and spectrophotometer.

Unit - II :- Photochemistry

Laws of photochemistry - Grothus and Draper's law. Einstein's law of photochemical equivalence. Quantum efficiency - low and high quantum yields. Actinometers, study of photochemical reactions.

1. Decomposition of H1.

2. Combination of hydrogen and bromine
3. Combination of hydrogen and chlorine.

Photosensitization, photoinhibition, chemiluminiscence, fluorescence and phosphorescence with examples.

Jablansky's diagrams, photosynthesis, photo electrochemistry. Radiation chemistry:- Radiation of water vapour, radiation dosimetry. Pricke and Cerrie sulphate dosimeter.

Unit-III :- Physical Properties and Molecular Structure.

Polarization - Orientation polarization - molar polarization, electronic polarization, Clausius and Mosotti equation (no derivation) and its importance.

Refractive index, specific refraction, molar refraction.

Dipole moments - Explanation, Comparision of bond polarity taking hydroacids of halogens. Application in deciding shapes of molecules - CO_2, boron trifluoride, water, ammonia and carbon tetra chloride.

Unit - IV :- Molecular Spectroscopy

Spectrum of electromagnetic radiations - interaction of electromagnetic radiations with molecules. Quantisation of different forms of energies in molecules. Condition for energy absorption by molecules. Spectroscopic terms.

Microwave spectroscopy : Diatomic molecule as a rigid rotator - moment of inertia expression to be derived. Rotational energy expression to be derived. Rotational energy expression (no derivation) energy level diagram-selection rule and rotational transitions. Expression for microwave number determination of moment of inertia and bond length of diatomic molecules.

Infra red spectroscopy

Vibrational spectra of diatomic molecules - diatomic molecules as simple harmonic oscillator (uni dimensional) Hooke's law and force constant, expression for oscillation frequency - interpretation of force constant for bond strength. Expression for vibrational energy to be assumed. Vibrational energy diagram and zero point energy. Selection rule and vibrational transitions. Calculation of force constant from observed spectral line.

Rotational - vibrational spectra of diatomic molecules. P and R branch.

Unit - V :- Crystalline State

Different types of crystals. Law of constancy of angels. Elements of symmetry - plane, axis and center of symmetry. Elements of symmetry in cubic system. Crystal lattice-space lattice and unit cell. Crystal systems Bravis lattice, Miller indices, Lattice planes in different cubic systems.

X-ray diffraction and Bragg's law (to be derived). Determination of crystal structure of rock salt by Bragg's method. Avagadro number.

PART C : ORGANIC CHEMISTRY

Unit - I :- Stereochemistry

(a) Optical isomerism : Optical activity, van't Hoff-Lebel hypothesis, chirality, D and L configurations, Fischer projection formulae, Optical isomerism in lactic acid and tartaric acid, Enantiomers and diastereomers, Racemisation and resolution, asymmetric synthesis and Walden inversion, R and S notations.

(b) Geometrical isomerism - Geometrical isomerism in Maleic acid and fumaric acid, E and Z notations.

Unit - II :- Reactive Methylene Compounds

Introduction, preparation of ethylacetoacetate by Claisen condensation (with mechanism) and synthetic applications of ethylacetoacetate, keto-enol tautomerism.

Unit - III :- Heterocyclic Compounds
Classification and nomenclature, one method of synthesis of furan, pyrrole, thiophene and pyridine.

Unit - IV :- Dyes
Classification with examples, Chromophore theory and modern theory. Synthesis of methyl orange, malachite green and indigo.

Unit - V :- Drugs
Elementary account of chemotherapy. Theory of drug action, Synthesis and uses of antipyrine, Sulphathiozole and chloroquine.

Unit - VI :- Polymers
Introduction, classification, addition and condensation polymers. Mechanism of anionic, cationic and free radical polymerization.

CHEMISTRY PRACTICAL III

Number of practical's : 10 Each Practical : 4 Hrs.

Part - A

Volumetric Analysis

1. Preparation of standard solution of sodium carbonate, standardization of HCL solution and estimation of NaOH.
2. Preparation of standard solution of oxalic acid, standardization of NaOH solution and estimation of sulphuric acid.
3. Preparation of standard solution of oxalic acid, standardization of potassium permanganate solution and estimation of Mohr's salt.
4. Preparation of standard solution of Mohr's salt. Standardization of potassium dichromate solution and estimation of ferric chloride using diphenylamine indicator.
5. Preparation of standard solution of potassium dichromate. Standardization of sodium thiosulphate and estimation of copper sulphate solution.
6. Preparation of standard solution of EDTA. Estimation of hardness of water using standard EDTA solution.
7. Estimation of available chlorine in bleachng powder.

Gravimetric Estimation

8. Estimation of barium as barium sulphate in barium chloride solution.
9. Estimation of Iron as Ferric oxide in Mohr's salt solution.
10. Estimation of Nickel as Nickel dimethyl glyoximate in Nickel ammonium sulphate solution.

CHEMISTRY PRACTICAL PRACTICAL - IV

Number of Practicals : 10 Each Practical: 4Hrs.

Part - A

Physical Experiments

1. Determination of density and viscosity of given liquid.
2. Determination of molecular weight of non volatile solute by Walker lumsden method.
3. Determination of percentage of given electrolyte in Phenol- Water system by misability temperature method.
4. Determination of rate constant of Fe(III) Catalysed decomposition of Hydrogen peroxide.

5. Determination of rate constant of Saponification of ethyl accetate.

Part - B

Instrumental Analysis

1. Determination of cell constant (0.1N Kel solution to be provided) and determination of equivalent conductance at infinite dilution for the strong electrolyte.
2. Conductometric titrations.
   (a) Sodium hydroxide >< Hydrochloric acid.
   (b) Mixture of weak acid and strong acid >< Sodium hydroxide.
3. (a) Estimation of Fe(II) in the given solution by colorimetric method.
   (b) Estimation of Cu(II) in the given solution by colorimetric method.
4. Estimation of hydrochloric acid using standard NaOH solution using pH meter.
5. Potentiometric titrations
   (a) Hydrochloric acid >< Sodium hydroxide.
   (b) Mohr's salt solution >< Potassium dichromatic solution.

References:

1. Principles of Inorganic Chemistry : Puri and Sharma.
2. Inorganic Chemistry : R.L. Dutta.
3. Selected Topics in Inorganic Chemistry : Malik W.U. Tuli.G.D. and Madan R.D.
4. Advanced Inorganic Chemistry Vol-I and II : Sathya Prakash, Tuli G.D., Basu S.K. and Madan R.D.
5. Modern Inorganic Chemistry : R.D. Madan.
6. Basic Inorganic Chemistry : Cotton and Wilkinson.
7. New Concise Inorganic Chemistry : J.D. Lee.
8. Essentials of Physical Chemistry : Bahl. B.S., Tuli G.D. and Bahl Arun.
9. Principles of Physical Chemistry : Maron and Prutton.
10. Principles of Physical Chemistry : Puri, Sharma and Pathan.
11. Texto Book of Physical Chemistry : Soni and Dharmarha.
12. Electrochemistry : A.K.N. Reddy.
13. Physical Chemistry : B.P. Varma.
14. Text Book of Organic Chemistry by Bahl and Arun Bahl.
15. Text Book of Organic Chemistry by Morryson and Boyd.
16. Text Book of Organic Chemistry by P.L. Sony.
17. Text Book of Organic Chemistry by M.K. Jain.
18. Text Book of Organic Chemistry by Tiwari & Others.

****

COURSE: BOTANY PAPER - III
Morphology and Taxonomy of Angiosperms, Economic Botany and Cytogenetics

UNIT 1: ROOT - General introduction including classification. Modifications:- For storage (fusiform, conical, napiform and fasciculated). Support (epiphytic/aerial) and Respiration (respiratory/pneumatophores) floating and haustoria.

UNIT 2 : STEM - General introduction branching types.Modifications:- Rhizome, stem tuber, bulb, corm, runner, stolon, sucker, offset, phylloclade, cladode, thorn and tendril.

UNIT 3 : LEAF - General introduction: Types (simple and compound) phyllotaxy, (alternate, opposite and whorled) stipules, shape, base, margin, apex, surface texture and ventaion. Modifications:- Phyllode, spines, tendrils, hooks, fleshy leaves.
Insectivorous Plants: Pitcher plant, Sundew plant and Bladder wort.

UNIT 4 : FLORAL MORPHOLOGY

INFLORESCENCE - General account of Racemose and Cymose including special cymes.
FLOWER - Complete account of floral morphology floral diagram and floral formula.
FRUIT - General account including classification and types of fruits.
SEED: Structure of monocot and dicot seed, germination of seeds.

UNIT 5:TAXONOMY OF ANGIOSPERMS - Principles of classification. Binomial nomenclature. Species concept, Systems of classification. Classification proposed by Bentham and Hooker. Its Merits and demerits. Field and herbarium techique and important herbaria of India and world. Study of the following families with plants of economic importance, (Bentham and Hooker's system to be followed).

UNIT 6:DICOTS - Annonaceae, Brassicaceae, Mlavaceae, Meliaceae, Anacardiaceae, Fabaceae (Caesalpinoideae, Mimosoideae and Papilionaceae), Myrtaceae, Cucurbitaceae, Apiaceae, Rubiaceae, Asteraceae, Apocynaceae, Asclepiadaceae, Solanaceae, Lamiaceae, Verbenaceae and Euphorbiaceae.

UNIT 7: MONOCOTS. Liliaceae, Arecaceae, and Poaceae.

UNIT 8: ECONOMIC BOTANY

FOOD:Cereals, Millets and Pulses : Jowar, ragi, wheat, rice, black gram and bengal gram.
OILS & FATS : Groundnut, Coconut and Sunflower.
BEVERAGES : Tea, Coffee and Cocoa.
SUGAR & STARCH : Sugarcane and Potato
TEXTILE FIBRES : Cotton and Coir.
SPICES : Cardamom, Clove and Cinnamon.
TIMER : Teak and Rosewood
COURSE & PULP : Bamboo and Eucalyptus.
NARCOTIC PLANTS : Tobacco and Opium
MEDICINAL PLANTS : Rauwolfia serpentiana, Vinca rosea, Tylophora asthmatica, Cinchona officinalis and Withunia sominifera, Tinospora cordifolia.

CYTOGENETICS

UNIT 9:THE CELL - Ultra structure of a plant cell, organization, function and its components cell wall, membranes (sandwich and fluid mosaic model). Endoplasm recticulum. Golgi apparatus, Lysosomes, Peroxisomes. Ribosomes, Mitochondri Plastids, Cytoplasm, Vac le, Cell sap. Nonliving inclusions, Nucleus, nucleoplasm, nuclear membrane, nclear pores and Nucleolus.

UNIT 10:CHROMOSOMES - Size, number, structure, chromatid, centromere, telomere, satellite. Secondary construction. nucleolar organiser. Types of chromosomes (based on position of centromere). Karyotype, super numerary chromosome. heterochromatin (facultaive and constitutive heterochromatin). Euchromatin Chromosonal models-nucleosome model.

Chromosomal aberrations- Deletions, duplications, inversions and translocations.
Variation in chromosome number : Polyploidy, Aneuploidy, Euploidy, autopolyploidy.
Allopolyploidy with reference to Raphano brassica, siginificance Polyploidy.

UNIT 11:MENDELIAN GENETICS - Biography of Mendel-Mendel's experiments. Monohybrid cross- Law of Dominance, law of segregation, purity of gametes, homozygous, heterozygous, phenotype, genotype, monohybrid test cross. Dihybrid cross- law of independent assortment, dihybrid test cross. Incomplete dominance.

UNIT 12:MODIFICATION OF MENDELIAN RATIOS - Interaction of genes Epistasis (dominant and recessive): Supplementary factors, complementary factors, Linkage and crossing over in Maize

COURSE: BOTANY PAPER - IV

Course: Physiology, Plant Breeding and Tissue Culture

UNIT 1: PLANT WATER RELATION - Significance of water for plants, solutions (molar & molal)

UNIT 2:ABSORPTION OF WATER -Mechanism-active osmotic and non-active absorption and passive absorption. Ascent of sap-path of ascent of sap, vital force theories and physical force theories.

UNIT 3:ABSORPTION OF MINERAL SALTS - Mechanism of absorption-passive absorption (diffusion, mass flow, ion exchange, Donnan equilibrium), active absorption (Lundegardh and Burstrom, Cytochrome pump theory, Lecithin cycle, carrier concept).

UNIT 4:MINERAL NUTRITION - Essential and non-essintial elements, Micro and Macro nutrients, role and deficiency symptoms.

UNIT 5:TRANSPIRATION - Types of transpiration, mechanism of stomatal transpiration- structure of Stomata, mechanism of stomatal movement.Significance of transpiration, advantages and disadvantages, factors affecting transpiration, adaptations to check the excess of transiration: Guttation and bleeding.

UNIT 6:TRANSLOCATION OF SOLUTES - Types (upward, radial and downward), path (phloem-eliminating other tissues, isotopic studies, ringing experiment), mechanism, diffusion theory, protoplasmic streaming theory, trans cellular streaming theory and mass flow theory.

UNIT 7:CONCEPT OF BIO-ENERGY - Thermodynamics (differences between non-living and living systems), laws of thermodynamics.

UNIT 8:PHOTOSYNTHESIS - Significance of mankind, structure and function of chloroplast, photosynthetic pigments, photosystem I and photosystem II. The light and dark reactions, C3 and C4 pathway. The law of limiting factors. Factors affecting photosynthesis. Photosynthesis in Bacteria, ecological significance of bacterial photosynthesis, CAM photosynthesis.

UNIT9: RESPIRATION - Introcution, significance, types, physical sites of respiration-cytosol, peroxisomes, mitochondria, biochemical pathways of respiration-glycolysis, oxidative pentose phosphate pathway. TCA cycle electron transport system and terminal oxidation. An account of photorespiration and its significance. Total energy released. An account of anaerobic respiration and fermentation.

UNIT 10:NITROGEN METABOLISM - Introduction, nitrogen fixation-physical and biological, symbiotic and asymbiotic, $NO_3$2 to $NH_3$2 incorporation into amino acids, reductive and transamination process. Utilization of protein and importance of protien.

UNIT 11: GROWTH - Definition, growth regions, phases of growth, growth curve, factors influencing growth, senescence and a general account of Vitamins.

UNIT 12:PHYTOHORMONES - Definition, types of hormones, physiological and practical application of Auxins, gibberellins, cytokinins, ethylene, ABA.

UNIT 13: PHYSIOLOGY OF FLOWERING - Photoperiodism, types, role of phytochromes, vernalization, mechanism of vernalization in India. A brief account of seed and bud dormancy.

UNIT 14:PLANT MOVEMENTS - Introduction, classification- autonomic, paratonic, tactic, tropic seismonastic (*Mimosa pudica*), movements.

UNIT 15:PLANT BREEDING - Principles and objectives: Methods of plant breeding (Mass selection single line or pure line selection, clonal selection, progeny selection, recurrent selection). Significance of plant breeding-increase in yield, resistance to discase and insect pests. Plant breeding in producing new and improved varieties of medicinal plants and other plants of industrial importance.

UNIT 16:HYBRIDIZATION - Objectives, techniques of esmasculation, artificial pollination. Intraspecific and intergeneric crosses. Propagation-Cutting, Gooty (air layering). grafting, wedge grafting, approach grafting and bud grafting.

UNIT 17:TISSUE CULTURE - Aim and scope, application, somatic hybridization, somatic embryogenesis, organogenesis and embryo culture.

BOTANY PRACTICAL - III

MORPHOLOGY AND TAXONOMY OF ANGIOSPERMS, ECONOMIC BOTANY AND MENDELIAN GENETICS

1. Study of specimens of morphological interest based on theory.
2. Taxonomy description of representative species with floral diagram and floral formula from each of the families mentioned in theory.
3. Study of economically important plants and their products based on theory.
4. Every candidate must record the observations directly in the laboratory journal. The practical journals duly certified by head of the department of Botany for having completed the practical work satisfactorily, must be submitted at the time of practical examination. Candidates who fail to submit the record should not be allowed to take the practical examination.

Genetics Problems

1. In Pea tallness (T) is dominant over dwarfness (t), a tall plant crossed with dwarf. Produces off springs of which about 50% are tall and 50% are dwarf. What are the genotypes of the progeny?
2. In Tomatoes red fruit colour (R) is dominant over yellow (r). A pure red fruited plant is crossed to a yellow fruited one, what will be the appearance of F_1? The F_1 are interbred and produce 320 off springs in the F_2. How many of them will be rad? and how many yellow? What will be the genotypes of F_2 and in what number?

3. In Tomato many of them will be red? and now many yellow? to recessive alleles of genes which produce the more common red fruited, tall plant, if pollen from a pure dwarf plant bearings red fruit is placed on the pistil of a pure tall plant bearing yellow fruit, what type of off springs are expected in the F_1? If these are crossed among themselves, what off springs would be expected in the F_2?

4. A tall red plant when crossed with dwarf red plant produces a dwarf white plant; give the genotypes of parents.

5. A round seeded dwarf Pea plant was crossed with a wrinkled seeded tall one. In the F_2 328 round tall and 115 round dwarf 120 wrinkled tall and 36 wrinkled dwarf were produced. Decide whether these characters are showing independent assortment.

BOTANY PRACTICAL - IV

PHYSIOLOGY : Major experiments to be conducted by the candidate (list enclosed).

MINOR EXPERIMENTS : Demonstration experiments as per the list enclosed. Chemical investigation of starch, glucose, protein and fat.

Every candidate must record the observations directly in the Record book. The same must be produced at Practical Examination, after being certified by the head of the department for having completed the practical work in a satisfactory manner. Submission of class record at the time of practical examination is compulsory.

LIST OF MAJOR EXPERIMENTS :

1. Measurement of D.P.D. in plants by gravimetric (Potato) method.
2. Ganong's potometer. Rate of transpiration under different condition of light and wind.
3. Relation between absorption and transpiration.
4. Suction force due to transpiration
5. Evolution of oxygen during photosynthesis by bubble counting method under different wavelengths of light using colour transparencies red, blue, yellow (or green) (during examination different conditions need not be asked.)
6. Comparison of rate of respiration in starchy and fatty seeds using Mc. Daugala's respirometer.
7. Separation of chlorophyll pigments by Course chromatographic method.
8. Ganong's respirometer experiment to measure the volume of CO_2 liberated during respiration.

LIST OF MINOR EXPERIMENTS :

1. Light screen experiment
2. Mohl's half leaf experiment
3. Dewar's flask experiment
4. Kuhne's fermentation vessel.

5. Phototropism
6. Geotropism
7. Hydrotropism
8. Arc indicator
9. Beljar experiment
10. Experiment to demonstrate root pressure using high-pressure mercury experiment
11. Performing exosmosis and endosmosis by using potato osmoscopes.
12. Passage of air through stomata using Colocasia leaf.

CELL BIOLOGY:

Preparation of squash of Onion root tip and Smear of Onion flower buds. Study of Mitosis and Meiosis stages using permanent slides.

REFERENCES

1. Alexopoulos, C.J. and Mims, C.W. (1979) – Introductory Mycology.
2. Baruah, H.K et al (1980) - Textbook of Plant Pathology.
3. Bharrucha, F.R. (1983) - Text book of Plant Geography in India.
4. Bhojwani, S.S. and Bhathnagar S.F. The Embryology of Angiosperms.
5. Dawn, S.B. (1987) General Microbiology Vol I and II 6. Dube, H.C. (1983) - An introduction of Fungi.
7. Dube, R.C. and Chand S. Text book of Biotechnology 8. Dutta, A.C. College Botany
9. Gangulee, H.C. and Kar, A.K.(1986) College Botany, Vol. II.
10. Gangulee, H.C., Das and Datta - College Botany, Vol-I,
11. Jain, V.K. and Chand, S Fundamentals of Plant Physiology
12. Johri, B.M. Embryology of Angiosperms.
13. Kochaar, K.L. and Krishnamurthy, H.N.- Plant Physiology.
14. Koromondy, F.J. (1978) - Concept of Ecology.
15. Lawerence, G.H.M. (1951) - Taxonomy of Vascular Plants
16. Maheshwari, P. (1950) -An introduction to the Embryology of Angiosperms.
17. Maheshwari, P. (1963)- Recent Advances in the Embryology of Aniosperms.
18. Mehrothra, R.S. (1976) Plant Physiology, Ed. II.
19. Odum, E.P. (1971) Fundamentals of Ecology.
20. Pandey, B.P. - College Botany.
21. Pandey, S.N. and Sinha, B.K. -Plant Physiology.
22. Peizar, J. Reid, R.D. and Chand E.C.S. - Microbiology.
23. Powar, C.B. - Cell Biology.
24. Sharma, P.D. (1988) - Elements of Ecology.
25. Shukla, R.S. and Shukla, R.S. - Cytogenetics Evolution and Plant Breeding.
26. Sinha and Sinha - Cytogenetics. Plant breeding and Evolution
27. Smith, G.M. (1955) - Cryptogamic Botany, Vol- I and II
28. Sunder Rajan, S. - College Botany, Vol-I, Vol-II, Vol-III & Vol-IV.
29. Vasishta, B.R. (1988) - Algae.

COURSE: ZOOLOGY PAPER - III

Cell Biology, Genetics, Evolution, Apiculture & Sericulture

Section- A

Cell Biology Theory : 100 hrs

Unit 1:Light,fluorescent and electron microscope, centrifugation, autoradiography and cell fractionation.

Unit 2: Cancer - Definition, structure of cancer cells, carcinogens.

Unit 3:Immunology - Primary lymphoid organs, antigen, antibody, antigen-antibody reaction, immunization, T and B cells.

Unit 4:Spermatogenesis and oogenesis, structure of sperm.

Unit 5:Fertilization-External and internal, capacitation, acrosome reaction, penetration, cortical changes, amphimixis, monospermy, polyspenny, significance.

Unit 6:Parthenogenesis - Natural and artificial, significance.

Section - B

Genetics

Unit 7:Interaction of Genes (a) Lethal genes in mice (b) Multiple alleles - coat colour in Rabbit.

Unit8 :Nature and Nurture - Norm of reaction in Himalayan Rabbit and Human twins, Homeostasis, phenocopy, pleiotropism, penetrace and expressivity with examples.

Unit 9:Sex Determination - Chromosomal mechanism, genic balance theory, gynandromorphys, sex determination in Bonelia. Klinefelter's and Turner's syndrome.

Unit 10:Gene - Definition, gene action, Lac-operon.

Unit 11:Mutation - Spontaneous and induced, CLB technique.

Section - C

Evolution

Unit 12:Lamarkism, Darwinism, Neo - Darwinism.

Unit 13:Evidence for organic evolution from morphology and anatomy, embryology, Biochemistry, genetics and palacontology.

Unit 14: Modern concept - Gene pool, variation, mutation, genetic drift, isolation, natural selection, Hardy - Weinberg law, Bottle neck phenomenon.

Unit 15:Types of speciation - Role of isolating mechanism in specification.

Unit 16:Evolution of Horse.

Section - D

Apiculture

Unit 17: Honey Bee - Morphology, mouthparts, honey sac, wax glands, and stinging apparatus. Social life, different species and races. Bee keeping, economic importance, production of Honey, Chemical composition.

Section - E

Sericulture

Unit 18:Components of sericulture, life cycle and morphology of *Bombyx mori*, non - mulberry silkworms, Modern rearing house, rearing equipments, Rearing methods, Silkworms pests and predators, Brief note on silkworm diseases.

References

1. De Roberties. Cell Biology.
2. Lodish, H., *et al.* Molecular Cell Biology.
3. A.G Gardner. Principles of Genetics.
4. Strickberger. Genetics.
5. Moody. Introduction to Evolution.
6. Dobzhansky. Genetics and Origin of Species.
7. Rogen A. Morse. Bee Culture.
8. Kvaleve. Silkworm Breeding Stocks.
9. Ullal and Narasimhanna. Hand book of Sericulture.

ZOOLOGY PRACTICAL – III

10 practicals

1. Study of Mitosis in onion root tip.
2. Study of Mitosis in gross hopper testis.
3. Stages of Mitosis and Meiosis with the help of slides.

4. Problems in Monohybrid and Dihybrid crosses.
5. Problems in sex linked inheritance.
6. Construction of linkage map.
7. Homologous organs, analogous organs and vestigeal organs.
8. Honey bee - Morphology - Mouthparts of honey bee.
9. Life cycle of *Bombyx mori*.
10. Non-mulberry silk worms and rearing equipments.

COURSE: ZOOLOGY PAPER - IV

Developmental Biology, Environmental Biology, Ethology, Inland Fisheries & Wild life Management

Section - A: Developmental Biology

Theory : 100 hrs

Unit 1:Classification of eggs - based on quantity and distribution of yolk. Egg membranes, cleavage pattern - types and planes of cleavage.

Unit 2:Blastula Cocloblastula, stereoblastula, discoblastula, blastocyst.

Unit 3:Development of *Aniphioxus* up to gastrula stage.

Unit 4:Development of frog up to neorula stage.

Unit5: Development of chick up to primitive streak stage.

Unit 6:Foetal membranes in chick development, structure and function.

Unit 7:Placenta in mammals, deciduate and non deciduete placent. Classification of placenta based on distribution of villi and histology.

Unit 8:Organizer phenomenon - concepts of primary and secondary organizers. Chemical nature of inducer.

Section- B : Environmental Biology

Unit 9: Concept of Ecosystem, pond, food chain, food web, ecological pyramids and energy flow.

Unit 10:Fresh water environment - features and zonation, lentic and lotic biota, adaptations.

Unit 11:Marine environment - Zonation of sea, estuaries, littoral pelagic and deep sea adaptations.

Unit 12:Terrestrial environment - types of biomes, biota, desert and grassland biomes.

Unit 13:Definition of examples of following - Habitat ecological niche, population, community, ecotone, edge effect, climatic climax, natality, mortality, population density, Leibig's law of minimum and Shelford's law of tolerance.

Unit 14:Air pollution, water pollution, noise pollution, causes, effects, control and remedial measures.

Section – C : Ethology

Unit 15:Innate behaviour and learned behavior.

Unit 16:Fish migration-definition types, causes, Migration in Anguilla and Salmon.

Unit 17:Bird Migration definition, types, causes, factors, advantages and disadvantages.

Unit 18:Courtship and parental care definition significance. Courtship in Betta splenders, sea horse, Anus, care to horse, Anus, Bower bird, parental care lehthyophis, rhacophorms, *Hyla geoldii, Pipa amencana.*

Section – D : Inland Fisheries

Unit 19:Principles, scope, techniques, Brief account of culturing of carps Induced breeding of major carps, A note on fish byproducts.

Section – E : Wildlife Management

Unit 20:Importance of wild life studies, Wild life depletion, importance and methods of wild conservation, National parks, sanctuaries, wild life reserves, endangered species, Wild life conservation projects.

ZOOLOGY PRACTICAL -IV

10 practical's

1. Blastula, Gastrula and Neurula of Frog.
2. Whole mount of 24 hrs, 36 hrs and 48 hrs of chick embryo.
3. Estimation of dissolved chlorine in pond water.
4. Estimation of dissolved oxygen in pond water.
5. Estimation of dissolved CO_2 in pond water.
6. Parental care in *Arius lehthyophis, Pipa americana* and Sea horse.
7. Endangered species - *Loris, Pangolin americana* and Sea horse.
8. Study of fishes *Catla catla*, Anabas, Rohu, Shark Mrigala, sardine.
9. Determination of pH in water and soil.
10. Study of pond ecosystem.

References

1. Balansky. An Introduction of Embryology.
2. Gilbert. Developmental Biology.
3. Odum. Ecology.
4. Turk and Turk. Environmental Science.
5. Manning. An Introduction of Animal Behaviour.
6. Jhingran, V.G. Fish and Fisheries of India.
7. Seshadri, B. India's Wild Life Reserves.
8. Teague, R.D. A Manual of Wild Life Conservation.