

**ORDINANCES AND OUTLINES OF TESTS,  
SYLLABI AND COURSES OF READING  
FOR  
MASTER OF AGRICULTURE (AGRONOMY)  
PART-I  
(SEMESTER I & II)  
FOR  
SESSIONS 2016-17 & 2017-18  
UNDER CREDIT BASED SEMESTER SYSTEM  
OF  
UNIVERSITY GRANTS COMMISSION**



**DEPARTMENT OF AGRICULTURE  
GENERAL SHIVDEV SINGH DIWAN GURBACHAN SINGH  
KHALSA COLLEGE PATIALA**

**An Autonomous College  
NAAC Accredited 'A' Grade  
College with Potential for Excellence Status by UGC  
E-mail: [Khalsacollegepatiala@gmail.com](mailto:Khalsacollegepatiala@gmail.com)  
Website: [www.khalsacollegepatiala.org](http://www.khalsacollegepatiala.org)**

## **Preamble:**

General Shivdev Singh Diwan Gurbachan Singh Khalsa College Patiala, accredited 'A' grade by NAAC (2015), recognized as "College with Potential for Excellence" status by UGC, New Delhi (2016) and an Autonomous College (2016), is a premier institute of higher education in the state of Punjab since 1960. Being concordant with the need to the creation of a self-sustaining, global knowledge society, the college has undertaken several measures initiated by UGC to bring equity, efficiency and excellence in the Higher Education System of the country.

The important measures taken to enhance academic standards and quality in higher education include innovation and improvements in curriculum, teaching-learning process, examination and evaluation systems, besides governance and other matters.

The UGC has formulated various regulations and guidelines from time to time to improve the higher education system and maintain minimum standards and quality across the Higher Educational Institutions (HEIs) in India. The academic reforms recommended by the UGC in the recent past have led to overall improvement in the higher education system. However, due to lot of diversity in the system of higher education, there are multiple approaches followed by Higher Educational Institutions towards examination, evaluation and grading system. While the HEIs must have the flexibility and freedom in designing the examination and evaluation methods that best fits the curriculum, syllabi and teaching-learning methods, there is a need to devise a sensible system for awarding the grades based on the performance of students. Presently, the performance of the students is reported using the conventional system of marks secured in the examinations or grades or both. The conversion from marks to letter grades and the letter grades used vary widely across the HEIs in the country. This creates difficulty for the academia and the employers to understand and infer the performance of the students graduating from different universities and colleges based on grades.

The grading system is considered to be better than the conventional marks system and hence it has been followed in the top institutions in India and abroad. So, it is desirable to introduce uniform grading system. This will facilitate student mobility across institutions within and across countries and also enable potential employers to assess the performance of students. To bring in the desired uniformity in grading system and method for computing the cumulative grade point average (CGPA) based on the performance of students in the examinations, the UGC has formulated CBSS guidelines.

## **DEFINITIONS**

- a. Academic Year:** Two consecutive (one odd + one even) semesters constitute one academic year.
- b. Course:** Usually referred to, as 'papers' is a component of a programme. All courses need not carry the same weight. The courses should define learning objectives and learning outcomes. A course may be designed to comprise lectures/tutorials/laboratory work/field work/outreach

activities/ project work/vocational training/viva/seminars/term papers /assignments/ presentations/self study etc. or a combination of some of these.

- c. **Credit Based Semester System ( ):** Under the CBSS, the requirement for awarding a degree or diploma or certificate is prescribed in terms of number of credits to be completed by the students.
- d. **Credit Point (CP):** The numerical value obtained by multiplying the grade point (GP) by the no. of credit(C) of the respective course i.e.  $CP = GP \times C$ .
- e. **Credit(C):** A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week, i.e. a course with assigned L-T-P: 3-0-2 or 3-1-0 will be equivalent to 4 credits weight-age course.
- f. **Cumulative Grade Point Average (CGPA):** It is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.
- g. **Grade Point (GP):** It is a numerical weight allotted to each letter grade on a 10 point scale.
- h. **Letter Grade:** It is an index of the performance of students in a said course. Grades are denoted by letters O, A+, A, B+, B, C, P and F.
- i. **Programme:** An educational programme leading to award of a degree, diploma or certificate.
- j. **Semester Grade point Average (SGPA):** It is a measure of performance of work done in a semester. It is ratio of total credit points (CPs) secured by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed upto two decimal places.
- k. **Semester:** Each semester will consist of 15-18 weeks of academic work equivalent to 90 actual teaching days. The odd semester may be scheduled from July to December and even semester from January to June.
- l. **Transcript or Grade Card (GC) or Certificate:** Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester. The grade certificate will display the course details (code, title, no. of credits, grades secured) along with SGPA of that semester and CGPA earned till date semester.
- m. **Semester Examinations:** The comprehensive examinations conducted for summative evaluation of course. The duration of these examinations shall be 3 and 4 hours for theory and practical courses respectively; and the weight shall be as per the ordinance of relevant programme.

- n. **L-P:** The prescribed hours/week during a semester for Lecture-Practical to a particular course, in accordance with curriculum prescriptions based on respective nature.

### **ORDINANCES M. Sc. AGRICULTURE (AGRONOMY)**

#### *Applicability of Ordinances for the time being in force.*

Notwithstanding the integrated nature of a course spread over more than one academic year, the Ordinances in force at the time a student joins a course shall hold good only for the examination held during or at the end of the academic year. Nothing in these Ordinances shall be deemed to debar the College from amending the ordinances subsequently and the amended ordinances, if any, shall apply to all the students whether old or new.

1. M.Sc. Agriculture (Agronomy) is course comprising two parts spread over two years. Each part will consist of two semesters. The course of study of M.Sc. Agriculture (Agronomy) shall be divided in four semesters and the final examination will be held at the end of every semester in the months of November/December (for semester I & III) and April/May (for semester II & IV) or as fixed by the College.
2. The examination in M.Sc. Agriculture (Agronomy) Part-I shall be open to a student who produces the following certificates to the Principal of the college.

- 2.1 The admission to Master of Science Agriculture (Agronomy) Part-I the candidate should have passed the Four years Bachelor's degree [B.Sc. (Agriculture)/ B.Sc. Agriculture (Hons.)] with at least 50% marks in the aggregate from any University or any other examination recognized as equivalent thereto. The admission of the candidate will be subject to the eligibility conditions in force at the time of admissions.

**Note:** Candidate placed under reappear in one or more subjects with Bachelor's degree [B.Sc. (Agriculture)/ B.Sc. Agriculture (Hons.)] from any recognized university or any other examination, recognized as equivalent there to shall not be eligible for admission to M.Sc. Agriculture (Agronomy) Part-I Course.

- 2.2 The candidate should have good character.
3. To qualify for admission to 3<sup>rd</sup> semester of the course, the candidate must have passed 50% of total papers of the two semesters of the 1<sup>st</sup> year. In case, the result of 2<sup>nd</sup> semester is not declared at the time of admission to 3<sup>rd</sup> semester, the student may be admitted provisionally and will be allowed to take examination if 3<sup>rd</sup> semester if he/she has passed in 50% of the total papers of first year (i.e. 1<sup>st</sup> and 2<sup>nd</sup> semester).
4. A candidate must complete and pass the whole course of two years within a maximum of four years from the date of admission in M.Sc. Agriculture (Agronomy) First semester. If the candidate does not clear the lower examination within stipulated period the higher result of the candidate will stand automatically cancelled.

5. Semester examinations will be open to regular candidates who have been on the rolls of the college and meet the attendance and other requirements as prescribed in the ordinances of the course.
- 6. Examination Rules**
- 6.1** Paper Setting/Evaluation will be done by an External Examiner or as decided by the Examination Cell.
- 6.2** The supplementary examination will be held along with the routine End Semester Tests. The supplementary paper would be from the syllabi prescribed for that session in which the candidate is appearing. The student can appear only in the theory paper on the payment of the required fee. The candidate will have consecutive two attempts to clear the Supplementary Examination, marks of practical and internal assessment will be carry forward as original.
- 6.3** Re-evaluation of answer sheet in two subjects is allowed after paying the requisite fee. The application for Re-evaluation should be submitted within 15 days of the declaration of the results. In case there is a difference of more than 10 % between the marking of the First evaluator and the Second evaluator, then the paper would be sent to a Third Evaluator. The mean of the marks of the Second and Third evaluators is then considered as the final marks. The re-evaluated marks will be considered final irrespective of the increase or decrease in marks.
- 6.4** The students who have reappear in the IIIrd semester only of Two Year Degree Course at the Postgraduate Level will be allowed to appear in their Reappear examination along with the Final Semester Examinations of their respective courses.
- 6.5** The Principal can provide Golden Chance (with special chance fee) to students who have been unable to clear their exams even after two attempts.
- 6.6** Improvement Examinations:
- (i) A student who has been declared 'pass' in the Postgraduate course he/she was obtain less than 50% marks than may apply for improvement within a year from the declaration of the result of the final semester and he/she can take maximum of 50% of the total papers for that course for improvement.
  - (ii) A student shall have to appear in End semester examination of the paper chosen for improvement along with the regular students. No special exam shall be held for him/her.
  - (iii) If a student fails to improve upon the original marks obtained in the paper chosen for improvement, his/her original marks shall be retained and he/she shall not get a second chance for improvement.
  - (iv) Improvement examination in practical paper shall not be allowed.
  - (v) A student taking improvement examination shall have to pay a fee decided by the college.

## 6.7 Evaluation and Grading System:

The grades and their description, along with equivalent numerical grade points are listed in the Grading Assignment Table as follows

Grade Assignment Table

Range of Marks	Description	Grade	Grade Point
85-100	Outstanding	O	10
75-84	Excellent	A+	9
65-74	Very Good	A	8
55-64	Good	B+	7
50-54	Above Average	B	6
45-49	Average	C	5
35-44	Pass	P	4
0-34	Fail	F	0
Otherwise	Absent/Detained	Ab/D	0

a. A student obtaining Grade F shall be considered failed and will be required to reappear in the examination.

b. For non credit courses 'Satisfactory' or 'Unsatisfactory' shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

## 6.8 Computation of SGPA and CGPA

The UGC recommends the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

- a. The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

$$\text{SGPA (Si)} = \frac{\sum(\text{Earned Credits } C_i \times \text{Grade Point } G_i)}{\sum \text{Earned Credits } C_i};$$

Where  $C_i$  is the number of credits of the  $i$ th course and  $G_i$  is the Grade Point Scored by the student in the  $i$ th course.

- b. The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e.

$$\text{CGPA (Ci)} = \frac{\sum(\text{Earned Credits } C_i \times \text{SGPA } S_i)}{\sum C_i};$$

Where  $S_i$  is the SGPA of the  $i$ th semesters and  $C_i$  is the total number of credits in that semester.

- c. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

### Illustration of the computation of SGPA and CGPA and Format for Transcripts

#### i. Computation of SGPA and CGPA

Illustration for SGPA

Course	Credits	Grade Letter	Grade Point	Credit Point (Credit x Grade)
Course 1	3	A	8	$3 \times 8 = 24$
Course 2	4	B+	7	$4 \times 7 = 28$
Course 3	3	B	6	$3 \times 6 = 18$
Course 4	3	O	10	$3 \times 10 = 30$
	13			100

Thus, **SGPA** =  $100/13 = 7.69$

Illustration for CGPA

Semester 1	Semester 2	Semester 3	Semester 4
Credit : 20 SGPA : 6.9	Credit : 22 SGPA : 7.8	Credit : 25 SGPA : 5.6	Credit : 26 SGPA : 6.0

Thus, **CGPA** =  $\frac{20 \times 6.9 + 22 \times 7.8 + 25 \times 5.6 + 26 \times 6.0}{93} = 6.51$

#### ii. Transcripts (Format):

Based on the above recommendations on Letter grades, grade points, SGPA and CGPA, the College may issue the transcript for each semester and a consolidated transcript indicating the performance in all semesters.

### 6.9 Division and Position:

Division shall be awarded in the following manner, to the candidates on the basis of their respective CGPA:

CGPA 7.5 or more	1 <sup>st</sup> Division with Distinction
CGPA 6.0 to 7.5	1 <sup>st</sup> Division
CGPA 5.5 or more but less than 5.99	2 <sup>nd</sup> Division
CGPA 5.0 or more but less than 5.49	3 <sup>rd</sup> Division
Otherwise	Fail

However, First, Second or Third position shall be awarded to the candidates, provided they meet the following conditions:

- a. Rank shall be solely decided on the final CGPA, on completion of degree credit requirement.
- b. The candidate has completed all the prescribed requirements, in the prescribed programme duration.
- c. The candidate has passed / secured valid grades in all the prescribed courses, in the first attempt.
- d. No disciplinary action is pending or has ever been lodged against him/her.
- e. In case of an exceptional tie, both candidates shall be awarded the same rank.

**(i) Grade Card:**

At the end of each semester, a student will be given a 'Grade Card' which will contain Course Code, Title, Credits, Grades Awarded, Earned Credits and Earned Point secured by him/her in each course, together with his/her SGPA in that semester. On the completion of the programme, a Final Grade Card will be issued to the student, giving full semester-wise details about the absolute marks and grades obtained by him/her in each course together with his/her SGPA and also the CGPA and Division awarded to him/her.

**6.11 Equivalence:**

Percentage (P) equivalent to CGPA earned by a candidate may be calculated using the following formula:

$$P = \text{CGPA} \times 10$$

**6.12 MALPRACTICES/UNFAIR MEANS**

6.12.1 The following shall be deemed to be unfair means:

- i. Leaving the Examination Hall without submitting the answer book to the invigilator or taking away, tearing off or otherwise disposing off the same or any part thereof.
- ii. Using abusive language in the examination hall or writing the same in the answer sheet.
- iii. Making an appeal to the evaluator through answer sheet.
- iv. Possession by examinee or having access to books, notes, papers, mobile or any other electronic material which can prove to be helpful in the exam.
- v. Any action on the part of candidate at an examination trying to get undue advantage in the performance at examinations or trying to help another, or derive the same.
- vi. Impersonating for a candidate in the examination.



- vii. Intimidating, threatening, manhandling, using violence, show of force in any form against any invigilator or any person on duty, creating disturbance to the smooth conduct of the examination.
- viii. Any other action which the Controller Examination / Chief Controller deem fit to be a case of UMC.

**6.12.2** In case the student is found to have used any of the above Unfair means:

- i. His/her answer book shall be seized and He/She will be given a new answer sheet.
- ii. Invigilator shall submit a detailed report along with the answer book of the student and the related material, if any, to the Centre Superintendent who will subsequently hand it over to Controller Examination.
- iii. Written statement to this effect shall be obtained from the student by the Centre Superintendent. In case the student refuses to do the same, the fact of refusal must be recorded.
- iv. The student reported to have used unfair means shall be allowed to appear in the subsequent papers. However, no marks would be awarded for the paper in which unfair means were used.
- v. The Principal shall refer the cases of malpractices in Mid Semester tests, House Tests and End Semester Examinations, to an Unfair Means Committee, constituted by him/her for the purpose. Such committee shall follow the approved scales of punishment. The Principal shall take necessary action, against the erring students based on the recommendations of the committee.

**6.12.3** The involvement of the Staff, who are in charge of conducting examinations, evaluating examination papers and preparing/keeping records of documents relating to the examinations if involved in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned at the examination shall be viewed seriously and recommended for award of appropriate punishment after enquiry.

## **7. Attendance Regulations & Condonation:**

- I. A student shall be eligible to appear for end semester examinations, if he/she acquires a minimum of 75% of attendance in each subject.
- II. Request to the Principal for Condonation of shortage of attendance after the recommendation of the Head of the Department will be forwarded to Lecture Shortage Condonation Committee. The committee can finally condone the shortage in aggregate up to 15% on medical grounds in each semester.
- III. Any student representing the Institute/ University/ State/ Nation in any Academic/ Sports/ Cultural/Extra Co curricular/ NSS/NCC or any other event shall be considered on duty. His/ Her shortage of lectures shall be condoned, provided that the student is permitted in writing by the Principal/Head of the department concerned and a

certificate to this effect signed by the competent authority where the student attended the event is taken.

- IV. A Student will not be promoted to the next semester unless he/she satisfies the attendance requirement of the present semester as applicable.
- V. Students whose shortage of attendance is not condoned in any semester are not eligible to take their end semester examination of that particular semester and their registration for examination shall stand cancelled and no fee shall be refunded.
8. Late college students: A candidate, who has completed the prescribed course of instructions for a semester but has not appeared in the examination or having appeared, has failed in the examination, may appear as a late college student within the prescribed period.
9. Applications for admission to the examination shall be made on the prescribed form attested by the competent authority as per the college rules.
10. Amount of examination fee to be paid by a candidate for each semester shall be as fixed by the College from time to time.
11. The last date by which examination forms and fees must reach the college office shall be as follows.

Semester	Without late fee	With late fee of Rs. 800/-	With late fee of Rs.1200/-	With late fee of Rs.5000/-	With late Fee of Rs. 10,000
Nov./Dec. (Odd)	Sept. 30	Oct.15	Oct. 21	Oct. 31	Nov. 10*
April/May(Even)	Feb. 28	March 15	March 21	March 31	April 15*

**\*Note:** No Examination Form will be accepted after the prescribed date.

12. College medal will be awarded to a candidate who secures first position in the College on the basis of the marks of all the eight semesters taken together. The general rules and conditions of the College/University for the Award of medal/prizes etc. will be applicable in the award of College medal to the topper of this examination.
13. Practical examination shall be conducted by a committee consisting of the following
  - (i) One external examiner
  - (ii) One internal examiner
14. All the question papers will be set in English and the candidate can answer the questions in English only.

## 15. Internal Assessment:

**15.1** M.Sc. Agriculture (Agronomy) Course will be run on Credit based semester System (CBSS) as described in the Introduction.

**15.2** The Assessment in each semester of M.Sc. Agriculture (Agronomy) Course will be 30% internal and 70% external for each Theory paper. The result of the Internal Assessment shall be conveyed to the students/examination branch by the Head of the Department.

**15.3** There shall be Two Mid Semester tests in each Semester.

**15.4** Internal Assesment of 30% will be based on Continuos Comprehensive Assessment (CCA) pattern and the break up of 30% will be as under:

- |       |  |   |     |
|-------|--|---|-----|
| (i)   | Average of Two Mid Semester Tests                | : | 40% |
| (ii)  | Assignment/Seminar/Class Test/Tutorial/Quiz etc. | : | 40% |
| (iii) | Attendace  | : | 20% |

Papers having practical/viva, the marks of theory and practical/viva will be reduced equally percentage wise to make room for 30% internal assessment.

Note: If a case comes to notice of Controller of Examinations where the marks awarded by the Teacher are on a very Higher/Lower side, the award will be got moderated by the following committee.

- I. Paper Evaluator
- II. Head of the Department
- III. Dean of Faculty concerned
- IV. Controller of Examination

**15.5** The marks for attendance in internal assessment would be awarded according to the student's attendance percentage as follows:

91-100% attendance	100% marks of the allotted Internal Assessment marks for attendance
81-90% attendance	80% marks of the allotted Internal Assessment marks for attendance
75-80% attendance	70% marks of the allotted Internal Assessment marks for attendance
Below 75%	Zero marks

**15.6** A candidate is required to secure at least 35% marks both in external examination (Theory and Practical/ Project work) and in internal assessment separately in each paper in order to qualify in an examination.

**15.7** Students should be shown the internal assessment before submission. In case the student is dissatisfied with the marks awarded to him/her in internal assessment; he/she can

approach the concerned teacher. If the student is still not satisfied he/she may approach the head of department and the Principal subsequently.

**16.** The minimum number of marks required to pass each semester examination will be 35% in each paper and 50% in the aggregate of the semester examination. Provided, that in papers with practical's, the percentage shall be required separately in written and practical/lab work. The candidate shall also be entitled to grace marks as admissible under the general ordinance relating to the Award of Grace Marks'. These ordinances will apply to all examinations:

**16.1** Grace marks to be given shall be calculated on the basis of 1% of total aggregate marks of all the written and practical papers of the examination concerned. Marks for viva-voce/internal assessment/sessional work/skill in teaching/any additional /optional subject shall not be taken into account for this purpose. If a fraction works out to half or more, it shall count as one mark and fractional less than half shall be ignored

**16.2** To pass in one or more written papers or subjects, and/or to make up the aggregate to pass the examination but not in sessional work, internal assessment, viva-voice and skill in teaching.

**17. End-Semester Examination:**

End-semester examination(s) of each theory course shall be of three hours duration and will be conducted as per norms and schedule notified by the Controller of Examination. The end semester examinations of laboratory/practical courses and other courses such as seminar, field work, project, master research thesis etc. shall be conducted as notified by the Head of the Department.

**18. Terminology for M.Sc. Agriculture (Agronomy):** For M.Sc. Agriculture (Agronomy) major subject is Discipline in which a student takes admission i.e Agronomy; Minor Subject will be from Soil science and supporting subject will be from Statistics.

Minimum credit Requirements for course work is

- I. Major discipline i.e. Agronomy is 20
- II. Minor Discipline i.e. Soil Science is 09
- III. Supporting subject i.e. Statistics is 05
- IV. For 06 Compulsory courses is 06
- V. Master Seminar is 01
- VI. Mater Research is 20
- VII. Two years of M.Sc. Agriculture (Agronomy) course is 61.

**18.1** Master Seminar- A student shall be required to deliver a seminar. The seminar will be assessed internally by a committee comprising the Head of the Department, one senior most teacher other than the Head of the Department and the Seminar In-charge for 100 Marks, to which all the faculty members of the Department shall be invited. In case the seminar is unsatisfactory (i.e. students gets less than 60 marks out of 100) the student will deliver the Seminar again in the same semester.

## **18.2 Constitution of Student Advisory Committee**

Minimum 5 members (Head of the Department (Chairman), 2 members from Major discipline including (Supervisor), and one from Minor/Allied discipline, and one from supporting subject) to be constituted within three months of the start of 1<sup>st</sup> semester.

## **19. Master Research: Approval of Area of Work and Title of Master research thesis**

**19.1** Every candidate admitted to the course M. Sc. Agriculture shall be required to pursue studies in an area to be decided by the Student Advisory Committee. The name of the Supervisors will be supplied by the Head of the Department during the First Semester of M.Sc. Course. Topic for the Master Research Thesis is to be selected by the Supervisor/student in consultation with the Student advisory committee [Reference: Ordinance 18.2].

**19.2** In case of complaint of harassment of the candidate by the Supervisor and loose of conduct between the candidate and the supervisor, the Head of the Department, Dean Research and Dean of the Faculty of Science under the Chairmanship of the Principal may take an appropriate decision.

**19.3** A panel of three subject experts as examiners for Master Research Thesis evaluation will be recommended by the Master Research Thesis Panel Committee [Reference ordinance 22.1] before the end of the third semester or on the submission of master research thesis whichever is earlier.

**19.4** Any change in the title/topic will be approved by the College Principal on the recommendation of the Student Advisory Committee.

## **20. Master Research Thesis: Submission and Evaluation**

- I. The Research Thesis to be submitted by a candidate must comply with the following conditions:
- II. It should normally be written in English (as per College rules except as allowed otherwise).
- III. It must indicate evidence of candidate's knowledge of the main research and techniques prevalent in his chosen field of study.
- IV. It must be satisfactory as regards literary presentation.

## **21 Submission of Master Research Thesis**

**21.1** A candidate will submit his Master Research Thesis during the fourth semester but on or before 30<sup>th</sup> June to the Head of the Department through the Supervisor who would certify that the candidate has worked under his/her supervision.

**21.2** A candidate will submit five copies of Master Research Thesis together with a neatly type written abstract through the Supervisor to Head of the Department.

**21.3** Before one month of submission of M.Sc. Research Thesis, a candidate will give an application through the supervisor to the Head of the Department that he will be in a

position to submit the Master Research Thesis and request for a pre-submission Master research seminar. The pre-submission Master research seminar will be assessed internally by a committee comprising the Head of the Department, one senior most teacher other than the Head of the Department and the Supervisor for 50 Marks, to which all the faculty members of the Department shall be invited.

- a) In case the pre-submission Master research seminar is unsatisfactory (i.e. students gets less than 30 marks out of 50) the student will deliver the Seminar again in the same semester.
- b) If the candidate fails to present the pre-submission Master research seminar within the stipulated period (i.e. one month from the date of submission of application by the candidate for conduct of pre-submission seminar as per clause 21.3) or his/ her seminar is stated unsatisfactory as per clause 21.3 (a) he/she would be allowed to present the pre-submission Master research seminar on paying a late fee of Rs. 2000/- per month.

**21.4** The Master Research Thesis along with prescribed Thesis Evaluation fee (Rs. 2000/- only) to be submitted by the candidate would be sent to the external examiner as nominated by Principal, for evaluation within fifteen days from the date of its receipt in the College office. One month's time would be given for the evaluation of Master Research Thesis. The College office would remind the examiner if the report is not received within the stipulated period.

Provided further that in case a candidate who fails to earn qualifying percentage i.e 65% (130 out of 200) marks in Master Research Thesis he shall be allowed only one chance to resubmit his Master Research Thesis within a period of one year of the declaration of the result.

## **22. Evaluation of Master Research Thesis**

**22.1** The Master Research Thesis shall be examined by one External Examiner. The External Examiner shall be appointed by the College Principal out of a panel of at least three experts recommended by the Master Research Thesis Panel Committee consisting of the following:

- i. Head of the Department (Chairperson)
- ii. Supervisor
- iii. Co-Supervisor and all faculty members of related/allied subject.

**22.2** The viva-voce shall be compulsory and shall be conducted by the External Examiner for 50 marks in presence of Head of the Department, Supervisor and Dean of the Faculty (in this Viva-voce, quorum will be a minimum of three members) to which all the faculty members of the Department shall be invited. In case the viva-voce is unsatisfactory (i.e. students gets less than 30 marks out of 50) the student will deliver the viva-voce again within one month.

**23. Extension in the Period of Master Research thesis.**

- 23.1** Candidates should ordinarily, complete their Master Research Thesis work within the normal period as provided in Rule 21.1 but in genuine and hardship cases, the College Principal, on the recommendations of the Head of the Department and Supervisor may allow extension by paying a fee of Rs. 5000/- per month up to a maximum of six months.
- 23.2** If a candidate fails to submit his Master Research Thesis within the stipulated period as provided in ordinance rule 23.1 given above, he could seek registration afresh after paying a fee of Rs. 10000/- and could submit master research thesis within a period of six months after paying a fee of Rs. 5000/- per month.
- 24** The Master Research Thesis shall be evaluated an external examiner as nominated by the Principal of the College. [Reference: Ordinance 22.1]. The result(s) would be communicated by the external examiner to the Controller Examination, GSSDGS Khalsa College, Patiala.
- 25.** If any student gets admission after concealing any fact or his/her certificates are found fake after verification or he/she misleads the institution as any front or because of any other reason, his/her admission will stand cancelled/ his/her result cancelled though he/she may have been declared pass.
- 26.** In case the ordinance is silent about any issue, it will be decided by the College Principal in consultation with the Academic Advisory Committee of the college in the anticipation of approval of the same by Academic Council of the College.

**M. SC. AGRICULTURE (AGRONOMY)**  
**PART-I**  
**COURSE SEMESTER SYSTEM**  
**SCHEME OF STUDIES & EXAMINATION**  
**2016-17 & 2017-18 Session**  
**SEMESTER-I**

Sr. No.	Course Code	Subject	Theory			Practical	Grand Total	Credits L+P
			Internal Assessment <sup>#</sup>	External Assessment	Total			
1	AGRON 501*	MODERN CONCEPTS IN CROP PRODUCTION	30	70	100	-	100	3+0
2	AGRON 502*	PRINCIPLES AND PRACTICES OF SOIL FERTILITY AND NUTRIENT MANAGEMENT	30	70	100	50	150	2+1
3	<b>MINOR</b> SOILS – 506	SOIL BIOLOGY AND BIO CHEMISTRY	30	70	100	50	150	2+1
4	<b>SUPPORTING:</b> STAT 501	STATISTICAL METHODS FOR RESEARCH WORKERS	30	70	100	50	150	2+1
5	PGS 501	LIBRARY AND INFORMATION SERVICES		--	--	50	50	0+1
6	PGS 504	BASIC CONCEPT IN LABORATORY TECHNIQUES		--	--	50	50	0+1
Total:			120	280	400	250	650	9+5=14

\*Core Course

<sup>#</sup>The breakup of marks for the internal assessment for theory will be as under:

Average of Two Mid Semester Tests / Internal Examinations	12 Marks
Written Assignment/Project Work	12 Marks
Attendance	6 Marks





**SEMESTER I****AGRON 501 MODERN CONCEPTS IN CROP PRODUCTION (L+P = 3+0)***Max. Marks: 70**Pass Marks: 25**Time Allowed: 3 Hours***INSTRUCTION TO THE CANDIDATE**

The question paper will be divided into three Sections A, B and C. Section A and B will consist of four descriptive questions each of 10 marks each from Unit I and Unit II of syllabus, respectively. Candidates will be required to attempt any two questions from Section A and Section B. Section C will be compulsory consisting 15 short answer type questions from whole of the syllabus carrying 2 marks each.

**UNIT I**

Crop growth analysis in relation to environment; geo-ecological zones of India; Quantitative agro-biological principles and inverse yield nitrogen law; Mitscherlich yield equation, its interpretation and applicability; Baule unit; Effect of lodging in cereals; physiology of grain yield in cereals; optimization of plant population and planting geometry in relation to different resources, concept of ideal plant type and crop modelling for desired crop yield.

**UNIT II**

Scientific principles of crop production; crop response production functions; concept of soil plant relations; yield and environmental stress; Integrated farming systems, organic farming, and resource conservation technology including modern concept of tillage; dry farming; determining the nutrient needs for yield potentiality of crop plants, concept of balance nutrition and integrated nutrient management; precision agriculture.

**SUGGESTED READINGS**

- ) Alvin, P.T. and Kozlowski, T.T. 1976. *Ecophysiology of Tropical Crops*. Academic Publications, New York
- ) Balasubramaniyan, P. and Palaniappan, S.P. 2001. *Principles and Practices of Agronomy*. Agrobios, Jodhpur.
- ) Fageria, N.K. 1992. *Maximizing Crop Yields*. Marcel Dekker, New York.
- ) Gardner, P.P., Pearce, G.R. and Mitchell, R.L. 1985. *Physiology of Crop Plants*. Scientific Pub., Jodhpur.
- ) Havlin, J.L, Beaton, J.D., Tisdale, S.L. and Nelson, W.L. 2006. *Soil Fertility and Fertilizers* (7<sup>th</sup> Ed). Prentice Hall, New Delhi.
- ) Lal, R. 1989. Conservation tillage for sustainable agriculture: Tropics versus temperate environments. *Advances in Agronomy* 42: .85-197
- ) Paroda, R.S. 2003. *Sustaining our Food Security*. Konark Publishers, Ludhiana.
- ) Reddy, S.R. 2000. *Principles of Crop Production*. Kalyani Publishers, Ludhiana.
- ) Sankaran S. and Mudaliar T.V.S. 1997. *Principles of Agronomy*. The Bangalore Printing & Publishers, Bangalore.

**AGRON 502: PRINCIPLES AND PRACTICES OF SOIL FERTILITY AND NUTRIENT MANAGEMENT (L+P =2+1)**

Max. Marks: 70

Pass Marks: 25

Time Allowed: 3 Hours

**INSTRUCTION TO THE CANDIDATE**

The question paper will be divided into three Sections A, B and C. Section A and B will consist of four descriptive questions each of 10 marks each from Unit I and Unit II of syllabus, respectively. Candidates will be required to attempt any two questions from Section A and Section B. Section C will be compulsory consisting 15 short answer type questions from whole of the syllabus carrying 2 marks each.

**Practical** – Question Paper will be set with the mutual consent of Internal and External Examiners on the spot.

**UNIT I**

Soil fertility and productivity - factors affecting; features of good soil management; problems of supply and availability of nutrients; relation between nutrient supply and crop growth; organic farming - basic concepts and definitions; Criteria of essentiality of nutrients; Essential plant nutrients - their functions, nutrient deficiency symptoms; transformation and dynamics of major plant nutrients; Preparation and use of farmyard manure, compost, green manures, vermicompost, biofertilizers and other organic concentrates their composition, availability and crop responses; recycling of organic wastes and residue management.

**UNIT II**

Commercial fertilizers; composition, relative fertilizer value and cost; crop response to different nutrients, residual effects and fertilizer use efficiency, fertilizer mixtures and grades; agronomic, chemical and physiological methods of increasing fertilizer use efficiency; nutrient interactions; Time and methods of manures and fertilizers application; foliar application and its concept; relative performance of organic and inorganic manures; economics of fertilizer use; integrated nutrient management; use of vermin-compost and residue wastes in crops.

**AGRON 502: PRACTICAL**

Max. Marks: 50

Pass Marks: 18 Marks

Time Allowed: 3 Hours

- ) Determination of soil pH, E<sub>Ce</sub>, organic C, total N, available N, P and K in soils
- ) Determination of total N, P and K in plants
- ) Interpretation of interaction effects and computation of economic and yield optima

**SUGGESTED READINGS**

- ) Brady, N. C and Weil, R.R 2002. *The Nature and Properties of Soils* (13th Ed.). Pearson Prentice Hall, New York
- ) Fageria, N.K., Baligar, V.C. and Jones, C.A. 1991. *Growth and Mineral Nutrition of Field Crops*, Marcel Dekker, New York.
- ) Havlin, J.L, Beaton, J.D., Tisdale, S.L. and Nelson, W.L. 2006. *Soil Fertility and Fertilizers* (7th Ed.) Prentice Hall of India, New Delhi.

**(Minor) SOILS - 506: SOIL BIOLOGY AND BIO CHEMISTRY (L+P = 2+1)**

Max. Marks: 70

Pass Marks: 25

Time Allowed: 3 Hours

**INSTRUCTION TO THE CANDIDATE**

The question paper will be divided into three Sections A, B and C. Section A and B will consist of four descriptive questions each of 10 marks each from Unit I and Unit II of syllabus, respectively. Candidates will be required to attempt any two questions from Section A and Section B. Section C will be compulsory consisting 15 short answer type questions from whole of the syllabus carrying 2 marks each.

**Practical** – Question Paper will be set with the mutual consent of Internal and External Examiners on the spot.

**UNIT I**

Soil biota, soil microbial ecology, types of organisms in different soils; soil microbial biomass; microbial interactions; un-culturable soil biota. Microbiology and biochemistry of root-soil interface; phyllosphere; soil enzymes, origin, activities and importance; soil characteristics influencing growth and activity of microflora. Microbial transformations of nitrogen, phosphorus, sulphur, iron and manganese in soil; biochemical composition and biodegradation of soil organic matter and crop residues, humus formation; cycles of important organic nutrients.

**UNIT II**

Biodegradation of pesticides, organic wastes and their use for production of biogas and manures; biotic factors in soil development; microbial toxins in the soil. Preparation and preservation of farmyard manure, animal manures, rural and urban composts and vermicompost. Biofertilizer – definition, classification, specifications, method of production and role in crop production.

**SS 501: PRACTICAL**

Max. Marks: 50

Pass Marks: 18 Marks

Time Allowed: 3 Hours

- ) Determination of soil microbial population (Viable bacterial, fungi, Actinomycete counts in soil by serial dilution pour plate method)
- ) Soil microbial biomass (Total count of soil microorganisms by direct microscopic examination of soils)
- ) Elemental composition, fractionation of organic matter and functional groups decomposition of organic matter in soil (Decomposition of organic matter in soil by CO<sub>2</sub> evolution method)
- ) Soil enzymes
- ) Measurement of important soil microbial processes such as ammonification, nitrification, N<sub>2</sub> fixation, S oxidation, P solubilization and mineralization of other micro nutrients.
- ) Study of rhizosphere effect

**SUGGESTED READINGS**

- ) Alexander M. 1977. *Introduction to Soil Microbiology*. John Wiley & Sons, New York.
- ) Burges A and Raw F. 1967. *Soil Biology*. Academic Press, New York.
- ) McLaren AD and Peterson GH. 1967. *Soil Biochemistry*. Vol. XI. Marcel Dekker Inc., New York.
- ) Metting FB. 1993. *Soil Microbial Ecology – Applications in Agricultural and Environmental Management*. Marcel Dekker Inc., New York.
- ) Paul E.A. and Ladd J.N. 1981. *Soil Biochemistry*. Marcel Dekker Inc., New York.
- ) Reddy M.V. (Ed.). *Soil Organisms and Litter in the Tropics*. Oxford & IBH, New Delhi.

**STAT 501: STATISTICAL METHODS FOR RESEARCH WORKERS (L+P = 2+1)**

Max. Marks: 70

Pass Marks: 25

Time Allowed: 3 Hours

**INSTRUCTION TO THE CANDIDATE**

The question paper will be divided into three Sections A, B and C. Section A and B will consist of four descriptive questions each of 10 marks each from Unit I and Unit II of syllabus, respectively. Candidates will be required to attempt any two questions from Section A and Section B. Section C will be compulsory consisting 15 short answer type questions from whole of the syllabus carrying 2 marks each.

**Practical** – Question Paper will be set with the mutual consent of Internal and External Examiners on the spot.

**UNIT-I**

Probability and fitting of standard frequency distribution, sampling techniques, sampling distributions, mean and standard error, simple partial, multiple and intra- class correlation and multiple regressions.

**UNIT-II**

Tests of significance, students' -t, chi-square and large sample tests, confidence intervals, analysis of variance for one way and two way classification with equal cell frequencies, transformation of data.

**STAT 501: PRACTICAL**

Max. Marks: 50

Pass Marks: 18 Marks

Time Allowed: 3 Hours

Fitting of distributions, samples and sampling distributions, correlation and regression, tests of significance and analysis of variance.

**Note:** Students shall be trained to use computer to analysis the data, using available softwares. However, during university examination students will use scientific calculators to analyse the data.

**SUGGESTED READINGS**

- ) Black T.R. 1993. *Evaluating Social Science Research - An Introduction*. SAGE Publication, New Delhi.
- ) Creswell J.W. 1999. *Research Design - Qualitative and Quantitative Approaches*. SAGE Publication, New Delhi.
- ) Dhondyal S.P. 1997. *Research Methodology in Social Sciences and Essentials of Thesis Writing*. Amman Publication House, New Delhi.
- ) Kothari C.R. 2004. *Research Methodology - Methods and Techniques*. Wishwa Prakashan, Chennai.
- ) Rao K.V. 1993. *Research Methodology in Commerce and Management*. Sterling Publ., New Delhi.

**PGS - 501 LIBRARY AND INFORMATION SERVICES (L+P = 0+1)****PGS 501: PRACTICAL**

**Practical** – Question Paper will be set with the mutual consent of Internal and External Examiners on the spot.

*Max. Marks: 50*

*Pass Marks: 18 Marks*

Time Allowed: 3 Hours

Introduction to library and its services; Role of libraries in education, research and technology transfer; Classification systems and organization of library; Sources of information- Primary Sources, Secondary Sources and Tertiary Sources; Intricacies of abstracting and indexing services (Science Citation Index, Biological Abstracts, Chemical Abstracts, CABI Abstracts, etc.); Tracing information from reference sources; Literature survey; Citation techniques/Preparation of bibliography; Use of CD-ROM Databases, Online Public Access Catalogue and other computerized library services; Use of Internet including search engines and its resources; e-resources access methods.

**Suggested Readings**

- ) Furr AK. 2000. *CRC Hand Book of Laboratory Safety*. CRC Press. Gabb MH & Latchem
- ) WE.1968. *A Handbook of Laboratory Solutions*. Chemical Publ. Co.

**PGS - 504: Basic Concepts in Laboratory Techniques (L+P = 0+1)**

**Practical** – Question Paper will be set with the mutual consent of Internal and External Examiners on the spot.

**PGS 504: PRACTICAL**

*Max. Marks: 50*

*Pass Marks: 18 Marks*

Time Allowed: 3 Hours

Safety measures while in Lab; Handling of chemical substances; Use of burettes, pipettes, measuring cylinders, flasks, separatory funnel, condensers, micropipettes and vascupets; washing, drying and sterilization of glassware; Drying of solvents/chemicals. Weighing and preparation of solutions of different strengths and their dilution; Handling techniques of solutions; Preparation of different agrochemical doses in field and pot applications; Preparation of solutions of acids; Neutralization of acid and bases; Preparation of buffers of different strengths and pH values. Use and handling of microscope, laminar flow, vacuum pumps, viscometer, thermometer, magnetic stirrer, micro-ovens, incubators, sand bath, water bath, oil bath; Electric wiring and earthing. Preparation of media and methods of sterilization; Seed viability testing, testing of pollen viability; Tissue culture of crop plants; Description of flowering plants in botanical terms in relation to taxonomy

**Suggested Readings**

- ) Furr AK. 2000. *CRC Hand Book of Laboratory Safety*. CRC Press. Gabb MH & Latchem
- ) WE.1968. *A Handbook of Laboratory Solutions*. Chemical Publ. Co.

## SEMESTER II

### AGRON 503: PRINCIPLES AND PRACTICES OF WEED MANAGEMENT (L+P = 2+1)

*Max. Marks: 70*

*Pass Marks: 25*

*Time Allowed: 3 Hours*

#### INSTRUCTION TO THE CANDIDATE

The question paper will be divided into three Sections A, B and C. Section A and B will consist of four descriptive questions each of 10 marks each from Unit I and Unit II of syllabus, respectively. Candidates will be required to attempt any two questions from Section A and Section B. Section C will be compulsory consisting 15 short answer type questions from whole of the syllabus carrying 2 marks each.

**Practical** – Question Paper will be set with the mutual consent of Internal and External Examiners on the spot.

#### UNIT I

Weed biology and ecology, crop-weed competition including allelopathy; principles and methods of weed control and classification; weed indices; Herbicides introduction and history of their development; classification based on chemical, physiological application and selectivity; mode and mechanism of action of herbicides; Herbicide structure - activity relationship; factors affecting the efficiency of herbicides; herbicide formulations, herbicide mixtures; herbicide resistance and management.

#### UNIT II

Weed control through bio-herbicides, myco-herbicides and allelochemicals; Degradation of herbicides in soil and plants; herbicide resistance in weeds and crops; herbicide rotation. Weed management in major crops and cropping systems; parasitic weeds; weed shifts in cropping systems; aquatic and perennial weed control; Integrated weed management; cost : benefit analysis of weed management.

#### AGRON 503: PRACTICAL

*Max. Marks: 50*

*Pass Marks: 18 Marks*

*Time Allowed: 3 Hours*

- ) Identification of important weeds of different crops
- ) Preparation of a weed herbarium
- ) Weed survey in crops and cropping systems
- ) Crop-weed competition studies
- ) Preparation of spray solutions of herbicides for high and low-volume sprayers
- ) Use of various types of spray pumps and nozzles and calculation of swath width
- ) Economics of weed control
- ) Herbicide resistance analysis in plant and soil Bioassay of herbicide resistance
- ) Calculation of herbicidal requirement



**SUGGESTED READINGS**

- ) Aldrich R.J. and Kramer R.J. 1997. *Principles in Weed Management*. Panima Publishing corporation, New Delhi.
- ) Ashton F.M. & Crafts A.S. 1981. *Mode of Action of Herbicides*. 2<sup>nd</sup> Ed. Wiley Inter-Science, US.
- ) Gupta O.P. 2007. *Weed Management – Principles and Practices*. Agrobios. Mandal RC. 1990. *Weed, Weedicides and Weed Control - Principles and Practices*. Agro-Botanical Publication, Viyas Nagar, India.
- ) Rao V.S. 2000. *Principles of Weed Science*. Oxford & IBH, New Delhi.
- ) Subramanian S., Ali A.M. & Kumar R.J. 1997. *All About Weed Control*. Kalyani publication, Ludhiana.
- ) Zimdahl R.L. 1999. *Fundamentals of Weed Science*. 2<sup>nd</sup> Ed. Academic Press, New York.

**AGRON 507: AGRONOMY OF OILSEED, FIBRE AND SUGAR CROPS (L+P = 2+1)***Max. Marks: 70**Pass Marks: 25**Time Allowed: 3 Hours***INSTRUCTION TO THE CANDIDATE**

The question paper will be divided into three Sections A, B and C. Section A and B will consist of four descriptive questions each of 10 marks each from Unit I and Unit II of syllabus, respectively. Candidates will be required to attempt any two questions from Section A and Section B. Section C will be compulsory consisting 15 short answer type questions from whole of the syllabus carrying 2 marks each.

**Practical** – Question Paper will be set with the mutual consent of Internal and External Examiners on the spot.

**UNIT I**

Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition quality component, handling and processing of the produce for maximum production of :

*Rabi* oilseeds – Rapeseed and mustard, linseed. Sugar crops – Sugar-beet and sugarcane etc.

**UNIT II**

Origin and history, area and production, classification improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition quality component, handling and processing of the produce for maximum production of *Kharif* oilseeds - Groundnut, sesame, castor, sunflower, soybean etc. Fiber crops - Cotton, jute, sunhemp etc.

**AGRON 507: PRACTICAL***Max. Marks: 50**Pass Marks: 18 Marks**Time Allowed: 3 Hours*

- ) Planning and layout of field experiments
- ) Cutting of sugarcane setts, its treatment and methods of sowing, tying and propping of sugarcane
- ) Determination of cane maturity and calculation on purity percentage, recovery percentage and sucrose content in cane juice phenological studies at different growth stages of crop
- ) Intercultural operations in different crops
- ) Cotton seed treatment
- ) Working out growth indices (LER, CGR, RGR, NAR, LAD) aggressivity, relative crowding coefficient, monetary yield advantage and ATER of prominent intercropping systems
- ) Judging of physiological maturity in different crops and working out harvest index
- ) Working out cost of cultivation of different crops
- ) Estimation of crop yield on the basis of yield attributes
- ) Formulation of cropping schemes for various farm sizes and calculation of cropping and rotational intensities
- ) Determination of oil content in oilseeds and computation of oil yield
- ) Estimation of quality of fibre of different fibre crops
- ) Study of seed production techniques in various crops
- ) Visit of field experiments on cultural, fertilizer, weed control and water management aspects
- ) Visit to nearby villages for identification of constraints in crop production

**SUGGESTED READINGS**

- ) Das NR. 2007. *Introduction to Crops of India*. Scientific Publishers, New Delhi.
- ) Das PC. 1997. *Oilseed Crops of India*. Kalyani Publishers, New Delhi.
- ) Lakshmikantam N. 1983. *Technology in Sugarcane Growing*. 2<sup>nd</sup> Ed. Oxford & IBH, New Delhi.
- ) Prasad, Rajendra. 2002. *Text Book of Field Crop Production*. ICAR, New Delhi.
- ) Singh C, Singh P & Singh R. 2003. *Modern Techniques of Raising Field Crops*. Oxford & IBH, New Delhi.
- ) Singh SS. 1998. *Crop Management*. Kalyani Publisher, Ludhiana.

## SOILS 505 SOIL EROSION AND CONSERVATION (L+P = 2+1)

*Max. Marks: 70*

*Pass Marks: 25*

*Time Allowed: 3 Hours*

### INSTRUCTION TO THE CANDIDATE

The question paper will be divided into three Sections A, B and C. Section A and B will consist of four descriptive questions each of 10 marks each from Unit I and Unit II of syllabus, respectively. Candidates will be required to attempt any two questions from Section A and Section B. Section C will be compulsory consisting 15 short answer type questions from whole of the syllabus carrying 2 marks each.

**Practical** – Question Paper will be set with the mutual consent of Internal and External Examiners on the spot.

### UNIT I

History, distribution, identification and description of soil erosion problems in India. Forms of soil erosion; effects of soil erosion and factors affecting soil erosion; types and mechanisms of water erosion; raindrops and soil erosion; rainfall erosivity - estimation as  $EI_{30}$  index and kinetic energy; factors affecting water erosion; empirical and quantitative estimation of water erosion; methods of measurement and prediction of runoff; soil losses in relation to soil properties and precipitation. Wind erosion- types, mechanism and factors affecting wind erosion; extent of problem in the country.

### UNIT II

Principles of erosion control; erosion control measures – agronomical and engineering; erosion control structures - their design and layout. Soil conservation planning; land capability classification; soil conservation in special problem areas such as hilly, arid and semi-arid regions, waterlogged and wet lands. Watershed management - concept, objectives and approach; water harvesting and recycling; flood control in watershed management; socioeconomic aspects of watershed management; case studies in respect to monitoring and evaluation of watersheds; use of remote sensing in assessment and planning of watersheds.

### **Practical**

*Max. Marks: 50*

*Pass Marks: 18 Marks*

*Time Allowed: 3 Hours*

- Determination of different soil erodibility indices - suspension percentage, dispersion ratio, erosion ratio, clay ratio, clay/moisture equivalent ratio, percolation ratio, raindrop erodibility index
- Computation of kinetic energy of falling rain drops
- Computation of rainfall erosivity index ( $EI_{30}$ ) using rain gauge data
- Visits to a watersheds

### Suggested Readings

- ) Biswas TD & Narayanasamy G. (Eds.) 1996. *Soil Management in Relation to Land Degradation and Environment*. Bull. Indian Society of Soil Science No. 17.
- ) Doran JW & Jones AJ. 1996. *Methods of Assessing Soil Quality*. Soil Science Society of America, Spl Publ. No. 49, Madison, USA.
- ) Gurmali Singh, Venkataramanan C, Sastry G & Joshi BP. 1990. *Manual of Soil and Water Conservation Practices*. Oxford & IBH. Hudson N. 1995. *Soil Conservation*. Iowa State Univ. Press.
- ) Indian Society of Soil Science 2002. *Fundamentals of Soil Science*. ISSS, New Delhi. Oswal MC. 1994. *Soil Physics*. Oxford & IBH.

## STAT 502: EXPERIMENTAL DESIGNS FOR RESEARCH WORKERS (L+P = 2+1)

Max. Marks: 70

Pass Marks: 25

Time Allowed: 3 Hours

### INSTRUCTION TO THE CANDIDATE

The question paper will be divided into three Sections A, B and C. Section A and B will consist of four descriptive questions each of 10 marks each from Unit I and Unit II of syllabus, respectively. Candidates will be required to attempt any two questions from Section A and Section B. Section C will be compulsory consisting 15 short answer type questions from whole of the syllabus carrying 2 marks each.

**Practical** – Question Paper will be set with the mutual consent of Internal and External Examiners on the spot.

### UNIT I

Need for designing of experiments- characteristics of a good design, basic principles- randomization, replication and local control, uniformity trials- size and shape of plots and blocks, analysis of variance and interpretation of data, completely randomized, randomized block and latin square design, multiple comparison tests, factorial experiments- interpretation of main effects and interactions, orthogonality.

### UNIT II

Partitioning of degrees of freedom confounding in  $2^3$ ,  $2^4$  and  $3^3$  designs split and strip plot designs, crossover designs and balanced incomplete block designs, response surface designs, switch over trials and long term experiments; Selection of experimental design, mechanical errors in field experiments and methods of reducing it, presentation of research result

### STAT 502: PRACTICAL

Max. Marks: 50

Pass Marks: 18 Marks

Time Allowed: 3 Hours

Uniformity trials, completely randomized, randomized block and latin square designs, missing plot and analysis, covariance,  $2^3$ ,  $2^4$  and  $3^3$  simple and confounded experiments, split and strip plot designs, cross over and balanced incomplete block designs.

**Note:** student shall be trained to use computer to analysis the data, using available softweres. However, during university examination students are allowed to use scientific calculators to analyse the data.

### SUGGESTED READINGS

- J Black T.R. 1993. *Evaluating Social Science Research - An Introduction*. SAGE Publication, New Delhi.
- J Creswell J.W. 1999. *Research Design - Qualitative and Quantitative Approaches*. SAGE Publication, New Delhi.
- J Dhondyal S.P. 1997. *Research Methodology in Social Sciences and Essentials of Thesis Writing*. Amman Publication House, New Delhi.
- J Kothari C.R. 2004. *Research Methodology - Methods and Techniques*. Wishwa Prakashan, Chennai.
- J Rao K.V. 1993. *Research Methodology in Commerce and Management*. Sterling Publ., New Delhi.

**PGS 506: DISASTER MANAGEMENT (L+P = 1+0)**

Max. Marks: 70

Pass Marks: 25

Time Allowed: 3 Hours

**INSTRUCTION TO THE CANDIDATE**

The question paper will be divided into three Sections A, B and C. Section A and B will consist of four descriptive questions each of 10 marks each from Unit I and Unit II of syllabus, respectively. Candidates will be required to attempt any two questions from Section A and Section B. Section C will be compulsory consisting 15 short answer type questions from whole of the syllabus carrying 2 marks each.

**UNIT I**

Natural Disasters - Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves, Climatic change: Global warming, Sea level rise, Ozone depletion, Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire. oil fire, air pollution, water pollution, deforestation, Industrial wastewater pollution, road accidents, rail accidents, air accidents, sea accidents.

**UNIT II**

Disaster Management- Efforts to mitigate natural disasters at national and global levels. International strategy for disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, Community-based organizations, and media. Central, state, district and local administration; Armed forces in disaster response; Disaster response: Police and other organizations.

**READINGS**

- ) Gupta H.K.. 2003. *Disaster Management*. Indian National Science Academy. Orient Blackswan.
- ) Hodgkinson P.E. & Stewart M. 1991. *Coping with Catastrophe: A Handbook of Disaster Management*. Routledge.
- ) Sharma V.K. 2001. *Disaster Management*. National Centre for Disaster Management, India.

**PGS 502: TECHNICAL WRITING AND COMMUNICATIONS SKILLS (L+P = 0+1)**

Max. Marks: 50

Pass Marks: 18 Marks

Time Allowed: 3 Hours

**Practical** – Question Paper will be set with the mutual consent of Internal and External Examiners on the spot.

**PRACTICAL**

**Technical Writing** - Various forms of scientific writings - theses, technical papers, reviews, manuals, etc; Various parts of thesis and research communications (title page, authorship contents page, preface, introduction, review of literature, material and methods, experimental results and discussion); Writing of abstracts, summaries, précis, citations etc.; commonly used abbreviations in the theses and research communications; illustrations, photographs and drawings with suitable captions; pagination, numbering of tables and illustrations; Writing of numbers and dates in scientific write-ups; Editing and proof-reading; Writing of a review article.

**Communication Skills** - Grammar (Tenses, parts of speech, clauses, punctuation marks); Error analysis (Common errors); Concord; Collocation; Phonetic symbols and transcription; Accentual pattern: Weak forms in connected speech: Participation in group discussion: Facing an interview; presentation of scientific papers.

**SUGGESTED READINGS**

- ) *Chicago Manual of Style*. 14<sup>th</sup> Ed. 1996. Prentice Hall of India.
- ) Gordon HM & Walter JA. 1970. *Technical Writing*. 3<sup>rd</sup> Ed. Holt, Rinehart & Winston.
- ) Hornby AS. 2000. *Comp. Oxford Advanced Learner's Dictionary of Current English*. 6<sup>th</sup> Ed. Oxford University Press.
- ) James HS. 1994. *Handbook for Technical Writing*. NTC Business Books.
- ) Joseph G. 2000. *MLA Handbook for Writers of Research Papers*. 5<sup>th</sup> Ed. Affiliated East-West Press.
- ) Mohan K. 2005. *Speaking English Effectively*. MacMillan India.
- ) Richard WS. 1969. *Technical Writing*. Barnes & Noble.
- ) Robert C. (Ed.). 2005. *Spoken English: Flourish Your Language*. Abhishek. Sethi J & Dhamija PV. 2004. *Course in Phonetics and Spoken English*. 2<sup>nd</sup> Ed. Prentice Hall of India.