



P. D. E. A's
Prof. Ramkrishna More Arts, Commerce
and Science
College Akurdi Pune-411044
(Autonomous)



Affiliated to

Savitribai Phule Pune University [SPPU]

B. Sc. With Major Botany

(Three years B. Sc. in Botany / Four Years Honors in Botany)

2024 Pattern

Choice Based Credit System-2024 Pattern

Under

Autonomy and NEP-2020

From Academic Year
2025-2026

Syllabus

F. Y. B. Sc. With Major Botany

Board of Studies in Botany

Department of Botany

Prof. Ramkrishna More Arts, Commerce and Science
College Akurdi Pune-411044

Rules and Regulations

1. National Credit Framework (NCrF): For creditisation and integration of all higher education qualifications leading to a certificate/ diploma/ degree with multiple entry and exit options, college will refer to National Credit Framework (NCrF) which encompasses the qualification frameworks for higher education, vocational and skill education and school education, namely National Higher Education Qualification Framework (NHEQF), National Skills Qualification Framework (NSQF) and National School Education Qualification Framework (NSEQF) respectively.

2. Structure of Four years multidisciplinary UG Programme and Five Years Integrated Multidisciplinary Master's Degree Programmes with Multiple Entry and Exit Options at Different Levels:

- (i) Students will have the flexibility to enter four years multidisciplinary Under Graduate Programme in odd semesters and exit a programme after the successful completion of even semesters as per their future career needs.
- (ii) Students will get a Certificate after a One year programme (minimum 40 Credits), a Diploma after two years (minimum 80 Credits), a Bachelor's degree after three years (minimum 120 Credits), and a Bachelor's degree with Research or Honours after Four years (minimum 160 Credits).

3. Qualification Type and Credit Requirements of Four Years Multidisciplinary Degree Programme with Multiple Entry and Exit Options

- (i) Details of qualifications, minimum credit requirements, exit credit courses, year and semester are as under:

Levels	Qualification Title	Credit Requirements		Semester	Year
		Minimum	Maximum		
4.5	UG Certificate	40	44	2	1
5.0	UG Diploma	80	88	4	2
5.5	Three Years Bachelor's degree	120	132	6	3
6.0	Bachelor's degree Honour's with Major	160	176	8	4
	Bachelor's degree Honour's with Major	160	176	8	4
7.0	Master's Degree	200	220	10	5
8.0	Ph. D.	----	-----	-----	----

- (ii) An exit 6-credit bridge course(s) lasting two months, including at least 6-credit job specific internship/apprenticeship that will help the graduates acquire job-ready competencies required to enter the workforce will be an additional requirement for the award of the undergraduate Certificate/ Diploma/ three year Bachelor's Degree.
 - (iii) On exit, the students will have the option to re-enter the programme in the college, or in a different higher education institution. Re-entry at various levels for lateral entrants in academic programmes should be based on the earned and valid credits as deposited and accumulated in the Academic Bank of Credits (ABC) through Registered Higher Education Institutions (RHEI) and proficiency test records.
 - (iv) Eligibility for admission to the fourth year of four-year **Honours with Research Degree Programmes** as per UGC guidelines: Minimum CGPA of 7.5 or minimum 75% at three-year degree.
 - (v) PG curriculum, as illustrated below, have flexibility a) One-year Post-Graduate Diploma (PGD), b) Two year Post-graduate Programme and c) 5 Years Master's degree programmes with multiple Entry and Exit options at different levels.
- (a) Post-Graduate Diploma (PGD):** Programme duration- One year (2 semesters) after any bachelor's degree, min. 40 credits
- (i) UGC: 1-Year (2 semesters) Post-Graduate Diploma (PGD) after 3-years Bachelor's degree: Level 6.0

(ii) UGC: 1-Year (2 semesters) PGD after 4 years Bachelor's degree (Honors/ Research): Level 6.5

(b) Master's Degree:

(i) UGC: 2-Years (four semesters) Master's Degree after obtaining a 3-years Bachelor's degree, Minimum 40 credits/year, second year devoted entirely to research, PG – 2nd year: Level 6.5

OR

(i) 1-Year (two semesters) Master's Degree after obtaining a 4-year Bachelor's degree (Honours/Research): Minimum 40 credits: Level 6.5

(c) Level 8 represents Ph. D. Research Degree.

(d) A 5-year Integrated Bachelor's and Master's programme shall have a minimum of 220 credits.

(e) Master's and doctoral programmes, while providing rigorous research-based specialization, should also provide opportunities for multidisciplinary work, in academia, government, research institutions, and industry.

4. Lateral Entry/ Re-entry at higher Levels after exit from lower levels of four years multidisciplinary UG degree programme:

(i) The credit points earned and accumulated shall be used to determine the eligibility for taking admission to various programs at multiple levels, subject to fulfilment of the broad principles laid down under NCrF. Students who leave with a Certification, Diploma, or a Basic Bachelor's Degree will be eligible to re-enter the programme at the exit level to complete or progress to the next level through lateral entry mode. Depending upon the academic and physical facilities available, the State Universities/ Autonomous Colleges (Higher Education Institutions or HEI) may earmark specific seats/ intake for lateral entry into the second year/ third year/ fourth year of a four years multidisciplinary UG degree programme as approved by Professional Standard Setting Bodies (PSSB/Govt. of Maharashtra/ statutory council of affiliating University plus any consequential vacancies caused by exits to an ongoing programme (four-year Degree Programme and Integrated Master's or second year Master's). Lateral entry or Re-entry is open to those students if he/she has either –

(a) successfully completed the first year/second year/third year of the particular four years multidisciplinary degree programme in any ABC registered HEI with valid credits in ABC and re-entering into the second year/third year/fourth year, respectively of the same four years degree programme of any ABC registered HEI, within stipulated/ permissible period of years as decided by Statutory Councils of that HEI

OR

(b) Already successfully completed a multidisciplinary four-year first-degree programme and is desirous of and academically capable of pursuing another multidisciplinary four years first-degree programme in an allied subject.

(ii) A student will be allowed to enter/re-enter only at the odd semester. Re-entry at various levels for lateral entrants in academic programmes should be based on the earned and valid credits as deposited and accumulated in Academic Bank of Credits (ABC) through Registered Higher Education Institutions (RHEI) and proficiency test records. However, in terms of the admission eligibility requirements, the student shall belong to the same faculty/ discipline in terms of Major Subject i.e., the Major subject of his earlier Programme and the Major subject of the new Programme for which he is seeking admission must be from the same faculty/discipline. Reservation for lateral entry will be executed as per the Government of Maharashtra norms.

5. Distribution of Credits across Multidisciplinary Four Years Degree Programme:

(i) Four-year multidisciplinary degree programme with Honours/ Specialization Degree will have Internship and Core /Major Courses with a minimum of 22 credits per sem. in the Fourth Year.

(ii) Four-year multidisciplinary degree programme with Research will have Research Projects, Seminars, Dissertations and Internships with a minimum of 22 credits per Sem. in the Fourth Year.

(iii) Students shall select a 'Major or Core Subject/ Discipline' and a '**Minor Subject/Discipline**' from the lists of various Subject Combinations and Options provided the Colleges. In general, for the four years multidisciplinary bachelor's degree programme, the distribution of credits will be as follows:

(a) Disciplinary/interdisciplinary Major/ Core Subject (minimum of 68 credits)- Mandatory and Elective Courses

(b) Disciplinary/interdisciplinary Minor Subject (maximum of 22 credits)

- (c) Skill based/Vocational studies corresponding to the Major/ Core Subject (8 credits)
- (d) Field projects/internship/apprenticeship/community engagement and service corresponding to the Major/ Core Subject (14-22 credits) with a maximum of six credits per Semester
- (e) Generic/ Open Electives through Baskets of Elective Courses (12 credits),
- (f) Ability Enhancement Courses including Languages, Literature and Environmental Studies (12 credits),
- (g) In-built modules on the Indian Knowledge System (IKS) in Major/ Core Subject at Level 4.5 – 2 credits
- (h) Value-based Education, Life Skills and Professional Ethics: Co-curricular Courses such as Sports and Culture, NSS/NCC and Fine/ Applied/Visual Arts (8 credits).

Student can earn some credits (SEC/VSC/GE/OE) in the form of online from-

- (i) The National Skills Qualifications Framework (NSQF) organizes qualifications for Vocational and Skill Courses in a series of 8 levels based on professional knowledge, professional skills, core skills and responsibilities, in the increasing order of complexity and competency.
- (ii) University Grants Commission (Credit Framework For Online Learning Courses through Study Webs of Active-Learning for Young Aspiring Minds) Regulations, 2021, **permits up to 40 per cent of the total courses being offered in a particular programme in a semester through the Online Learning Courses offered through the Study Webs of Active-Learning for Young Aspiring Minds (SWAYAM) platform.**

6. Examination and Assessment Process:

- (i) The basic principle of the credit framework is that credits are a function of the successful completion of a program of study/ vocational education/ training and assessment. No credit can be earned by the student unless the student is assessed for the achievement of the desired competencies and outcome of a program.
- (ii) Exit options are provided with certification, diploma and basic Bachelor's degrees to the students at the end of the second, fourth and sixth semesters of a four years multidisciplinary degree programme. Students will receive a Bachelor's degree with Honours/ Research on successfully completing of all eight semesters of the UG Program either at a stretch or with opted exits and re-entries.
- (iii) For the smooth success of four-year multidisciplinary degree programme with multiple entry and exit systems, the examination mode will be based on the combination of innovative trends in formative (informal and formal tests administered during the learning process) and summative (evaluation of students learning at the end of an instructional unit) examination modes. This is in line with the UGC Report on 'Evaluation Reforms in Higher Educational Institutions (2019)'.

(iv) Evaluation of each students in each course will be done as follows

- a. Each theory or practical course will be of 2 credits = 50 marks
- b. Internal evaluation 30% weightage (15 marks)
- c. External evaluation 70% weightage (35 marks)
- d. Students should secure 40% marks in each type of evaluation for successful completion of a course (student should secure at least 6 marks in internal and 14 marks in external evaluation).

(v) Evaluation Pattern.

a. Internal evaluation - Two written test, each of 20 marks will be conducted i. e. two tests on two modules. 1st assignment after completing 6 weeks of teaching and 2nd on completion of 13th week of teaching. 5 marks out of 15 will be assigned from these written tests. Remaining 10 marks will be assigned from other types of evaluation such as seminars, orals, poster presentation, open book challenging tests, surprise test, objective test etc. Examination (Internal and external) will conducted so that CO, PO, PSO can be evaluated.

b. External Evaluation - External evaluation will be done at the end of each semester.

- i. For theory, 35 marks written examination will be conducted and time of examination will be 2-hours.
- ii. For practical, 35 marks practical examination will be conducted and time of examination will be 4-hours.
- iii. For project / field project, 35 marks evaluation will done on the basis of viva-voce and examination of thesis by the examiners.
- iv. For OJT 35 marks evaluation will be done on the basis of report of industrial mentor /

supervisor / industry and viva-voce. However, student has to produce and submit OJT certificate from competent authority of industry.

7. Attendance: The student must have at least 70% attendance, to appear any type of examination.

8. Declaration of Results:

- (i) Declaration of result is based on the Semester Grade Point Average (SGPA) earned towards the end of each semester or the Cumulative Grade Point Average (CGPA) earned at the completion of all eight semesters of the programme and the corresponding overall alpha-sign or letter grades as given in Table 2. If some candidates exit at the completion of the first, second or third year of the four years Undergraduate Programmes, with Certificate, Diploma or Basic Degree, respectively, then the results of successful candidates at the end of the second, fourth or sixth semesters shall also be classified on the basis of the CGPA obtained in the two, four, six or eight semesters, respectively. Successful candidates at the end of the tenth semester of the integrated Master's Degree Programmes shall also be classified on the basis of CGPA obtained in the ten semesters of the Programmes. Likewise, the successful candidates of one year or two semesters Master's Degree Programme are also classified on the basis of the CGPA of two semesters of the Master's Degree Programme.

Table-2: Grades on degree certificate/mark sheet will be assigned to the students as per the following table

Semester GPA/ Program CGPA Semester/Program	% of Marks	Alpha-Sign / Letter Grade Result
9.00-10.00	90-100	O (outstanding)
8.00 - <9.00	80.00 – <90.00	A+ (Excellent)
7.00 - <8.00	70.00-<80.00	A (Very Good)
6.00 - <7.00	60.00-<70.00	B+ (Good)
5.50 - <6.00	55.00-<60.00	B (Above Average)
5.00 - <5.50	50.00-<55.00	C (Average)
4.00 - <5.00	40.00-<50.00	P (Pass)
Below 4.00	< 40	F (Fail)
Ab	-----	Absent

- (ii) A student obtaining Grade F shall be considered failed and will be required to reappear in the examination. 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.

9. Award of Major and Minor Degree:

- (i) A student pursuing four-year multidisciplinary UG programme will be awarded an appropriate Honours/ Research degree in Major/ Core Subject on completion of VIII Semester with the minimum of 176 credits if he secures in that Subject at least 50% of the total credits for that programme. He shall thus study the specific number of Mandatory Core Courses, Core Electives, Vocational and Skill Courses and Field projects/ Internships connected to Core Subjects in eight semesters so as to cover at least 50% of the total credits.
- (ii) In case of Research Degree, a student shall pursue research project and write dissertation in that Major in the VII and VIII semesters.

On the basis of above rules and regulations under NEP-2020 following course frame work is adopted by the Prof. Ramkrishna More Arts, Commerce and Science College, Akurdi, Pune-411044 for the completing of four years honours degree in Major and Minor subjects.

10. Distribution of Credits across Four Years Degree Programmes:

In general, for the four years' bachelor's degree programme, the distribution of credits will be as follows:

(a) Major (Core) Subject comprising Mandatory and Elective Courses:

- Minimum 50% of total credits corresponding to Three/Four - year UG Degree- Mandatory Courses offered in all Four years;
- 2 credit course on Major Specific IKS shall be included under Major;

- iii. Elective courses of Major will be offered in the third and/or final year.
- iv. Vocational Skill Courses, Internship/ Apprenticeship, Field Projects, Research Projects connected to Major first to fourth year.

(b) Minor Subject: 18-20 Credits

- i. The Minor subjects may be from the different disciplines of the same faculty of DSC Major (Core) or they can be from different faculty altogether.
- ii. The credits of Minor subjects shall be completed in the first three years of UG Programme.

(c) Generic/ Open Elective Courses (OE): 10-12 credits

- i. It is to be offered in I and/or II year
- ii. Faculty-wise baskets of OE shall be prepared by University/ Autonomous Colleges.
- iii. OE is to be chosen compulsorily from faculty other than that of the Major.

(d) Vocational and Skill Enhancement Courses (VSEC): 14-16 credits

Vocational Skill Courses (VSC): 8-10 credits, including Hands on Training corresponding to the Major and/or Minor Subject:

- i. To be offered in first to three years;
- ii. Wherever applicable vocational courses will include skills based on advanced laboratory practicals of Major

Skill Enhancement Courses (SEC): 06 credits

- i. To be offered in I and II year;
- ii. To be selected from the basket of Skill Courses approved by University/ Autonomous Colleges

(e) Ability Enhancement Courses (AEC), Indian Knowledge System (IKS) and Value Education Courses (VEC): 14 Credits

- **AEC: 08 credits**

- i. To be offered in I and II year
 - ii. English: 04 Credits
 - iii. Modern Indian Language: 04 credits
 - iv. To be offered from the Basket approved by the College;
- The focus for both languages should be on linguistic and communication skills.

- o **IKS: 2 Credits**

- i. To be offered in I Year
- ii. Courses on IKS to be selected from the basket of IKS courses approved by the Colleges

- o **VEC: 04 Credits**

- i. To be offered in I year
- ii. Value Education Courses (VEC) Environmental Science Education (Compulsory), Understanding India, and Digital and Technological Solutions.

(f) Field Projects/ Internship/ Apprenticeship/ Community Engagement and Service corresponding to the Major (Core) Subject, Co-curricular Courses (CC) and Research Project

- o **Internship/Apprenticeship corresponding to the Major (Core) Subject: 8 Credits**

- o **Field Projects/Community Engagement and Service corresponding to the Major (Core) Subject: minimum 4-6 credits**

To be offered in II, and III years of UG Degree Programmes.

- o **Co-curricular Courses (CC) such as Health and Wellness, Yoga education sports, and fitness, Cultural Activities, NSS/NCC and Fine/ Applied/ Visual/ Performing Arts: 8 credits.** To be offered in I and/or II year

- o **Research Projects: 12 credits**

To be offered in the final year for 4-year Honours with Research UG Degree

The UGC Regulations, 2021 permit up to 40% of the total courses being offered in a particular programme in a semester through the Online Learning Courses offered through the SWAYAM platform and/or other State Level Common Platforms which can be developed in due course with the participation of different Universities/ HEIs.

Abbreviations: Generic/ Open Electives: **GE/OE**; Vocational Skill and Skill Enhancement Courses: **VSEC**; Vocational Skill Courses: **VSC**; Skill Enhancement Courses: **SEC**; Ability Enhancement Courses: **AEC**; Indian Knowledge System: **IKS**; Value Education Courses: **VEC**; **OJT**: On Job Training; Internship/ Apprenticeship; Field projects: **FP**; Community engagement and service: **CEP**; Co-curricular Courses: **CC**; Research Methodology-**RM**; Research Project: **RP** Note: The Credit Distribution Table given above is illustrative only. The Universities/ Autonomous Colleges may suitably modify within the broader framework

of credit distribution across six verticals.

11. Definitions:

i. One semester = 15 weeks

ii. 1-credit theory = 15 hours i.e. for 1 credit, 1 hour per week teaching is to be performed.

15 hours of 1-credit are splinted as 12 hours actual teaching + 3 hours Tutorial (Numerical problem solving sessions, revision on difficult topics, dialog on student's difficulties, and internal evaluation)

iii. 1-credit practical = 30 hours. Thus, 1 credit practical = 2 contact hours in laboratory per week. 30 hours splinted as 24 hours actual table work and 6 hours for journal competition, oral on each practical and other internal evaluation.

iv. Each theory course of any type (major, minor, VSC, VEC, OE/GE, VEC, SEC, CC, etc.) **is of 2 credits.**

v. Theory per semester: Each theory course is of 2 credits. Thus, for each theory course contact hours = 24 teaching + 6 tutorials

vi. Each practical course is of 2 credits = 60 hours per semester

a. Minimum 12 laboratory sessions will be conducted in one semester.

b. Each laboratory sessions will be of 4 hour.

Eligibility Criteria: (a) Higher Secondary School Certificate (10+2) or its equivalent Examination with English with any three science subjects such as Physics, Chemistry, Biology, Mathematics, Geography, Geology, etc. OR (b) Three Years Diploma Course of Board of Technical Education conducted by Government of Maharashtra or its equivalent. OR (c) Three Years Diploma in Pharmacy Course of Board of Technical Education conducted by Government of Maharashtra or its equivalent.

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Revised Credit Framework / Structure for NEP-2020(II); CBCS Pattern-2024 with two Major at FY

To be Implemented from Academic Year 2024-25

Level / Difficulty	Sem	Subject-1				Subject-2	GE/OE	SEC	IKS	AEC	VEC	CC	Total
Certificate													
4.5 / 100	I	4T + 2P/T				4T + 2P/T	2T	2T/P	2T (General)	2T	2T	0	22
	II	4T + 2P/T				4T + 2P/T	2T/P	2T/P	0	2T	2T	2	22
Exit option: Award of UG Certificate in Major with 44 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor Continue option: Student will select one subject among the (subject 1, subject 2 and subject 3) as major and another as minor and third subject will be dropped.													
Diploma													
Level / Difficulty	Sem	Credits Related to Major				Subject-2	GE/OE	SEC	IKS	AEC	VEC	CC	Total
		Major Core	Major Elective	VSC	FP / CEP / OJT								
5.0 / 200	III	4T + 2P/T	0	2T/P	2 FP	2T+ 2T/P	2T	0	2T (Major Specific)	2T	0	2	22
	IV	4T + 2P/T	0	2T/P	2 CEP	2T + 2P/T	2T/P	2T/P	0	2T	0	2	22
Exit option: Award of UG Diploma in Major and Minor with 88 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor													
Three years Graduation Degree													
5.5 /300	V	8T + 4P/T	4T + 2P/T	2T/P	2 FP/RP	0	0	0	0	0	0	0	22
	VI	8T + 4P/T	2T + 2P/T	2T/P	4 OJT	0	0	0	0	0	0	0	22
	Total Credits	48	10	8	10	20	8	6	4	8	4	6	132
Four Years Graduate Degree with Honours (Major and Minor subjects)													
6.0 /400		10T + 4P/T	2T + 2P/T	0	0	4T RM	0	0	0	0	0	0	22
		10T + 4P/T	2T + 2P/T	0	4 OJT	0	0	0	0	0	0	0	22
	Total Credits	76	18	8	14	24	8	6	4	8	4	6	176
Four Years Graduate Degree with Honours (Research)													
6.0 /400		6T + 4P/T	2T + 2P/T	0	4 RP	4T RM	0	0	0	0	0	0	22
		6T + 4P/T	2T + 2P/T	0	8 RP	0	0	0	0	0	0	0	22
	Total Credits	68	18	8	22	24	8	6	4	8	4	6	176

Abbreviations:

VSC - Vocational Skill Course;

FP – Field Project

AEC – Ability Enhancement Courses

GE/OE – Generic or Open elective courses

T – Theory **P** – Practical

SEC – Skill Enhancement Course;

CEP – Community Engagement Project

VEC – Value Education Course

RP – Research Project

IKS – Indian Knowledge System

OJT – On Job Training

CC – Curricular Courses

RM – Research Methodology

1. A student can select three subject from the same faculty in first year. **At second year From Subject-1 and -2 student will select any one subject as major and one subject as minor.** Student cannot select Major and Minor subjects other than these two subjects taken at first year.
2. **VSC, IKS-2, OJT, FP, CEP, RP, RM should be related to Major subject**
3. OE/GE – Must be selected from basket approved by college and **selected from the faculty other than faculty of Major subject.**
4. **SEC should be selected from the basket of same faculty approved by the college.**
5. Each theory course may be of 2 or 4 credit; each practical course should be of 2 credit only.
6. For those subject's practical cannot be conducted, they have to convert practical credits into theory credits. The decision should be taken BOS of respective subject.
7. This credit framework is applicable to all faculties in the college. The courses which are under AICET, they must take approval to this framework from AICET or respective body.

NEP Coordinator

IQAC Coordinator

Deans

Vice Principal

Principal

1. **Arts Faculty** : _____

2. **Commerce Faculty:** _____

3. **Science Faculty:** _____

4. **Inter- disciplinary courses:** _____

Year	Sem	Major Courses	Major Elective Courses	Subject 2 (Minor Course)	VSC	IKS	GE /OE	SEC
FY	I	2 Theory + 1 Practical BOMAT-111 Basic Plant Science BOMAT-112 Applied Plant Science BOMAP-113 Practical Botany I	0	0	0	1 Theory GEIKT-111 Generic IKS	1 Theory/ 1 Practical BOGET-111 Agrotourism and Ecotourism	1 Theory/ 1 Practical BOSET-111 Cultivation technique of mushroom and algae OR BOSEP-111 Practical on Cultivation technique of mushroom and algae
	II	2 Theory + 1 Practical BOMAT-121 Basics of Plant Ecology BOMAT-122 Cell Biology BOMAP-123 Practical Botany II	0	0	0	0	1 Theory/ 1 Practical BOGET-121 Plant resources OR BOGEP-121 Practical on Agro-tourism and Ecotourism	1 Theory / 1 Practical BOSEP-121 Practical on Biofertilizers and Biopesticides OR BOSET-121 Biofertilizers and Biopesticides
SY	III	2 Theory + 1 Practical BOMAT -231 Lower Cryptogams BOMAT -232 Plant Physiology BOMAP -233 Practical botany III	0	1 Theory + 1 Practical BOMIT-231 Nursery and Gardening Management BOMIP-232 Practical on Nursery and gardening management	1 Theory BOVST-231 Herbal Technology	1 Theory BOIKT-231 Indian Agriculture	1 Theory/ 1 Practical BOGET-231 Agriculture for Competitive Exams	0
	IV	2 Theory + 1 Practical BOMAT -241 Higher Cryptogams and Gymnosperms BOMAT -242 Phytochemistry BOMAP -243 Practical botany IV	0	1 Theory + 1 Practical BOMIT-241 Applied Botany and Entrepreneurship BOMIP-242 Practical on	1 Practical BOVSP-241 Practical on Herbal Technology	0	1 Practical/ 1 Theory BOGET-241 Ayurvedic Botany OR BOGEP-241 Practical on Ayurvedic Botany	1 Practical BOSEP-241 Practical on Plant Identification and Herbarium

				Applied Botany & Entrepreneurship				
TY	V	4 Theory + 2 Practical BOMAT – 351 Angiosperms and Plant Evolution BOMAT -352 Plant Molecular Biology BOMAT-353 Plant Pathology BOMAT-354 Research Methodology and Scientific writing BOMAP -355 Practical botany V BOMAP -356 Practical botany VI	2 Theory + Practical BOMET-351 A Study of Medicinal Plants BOMET-351 B Gardening and Landscape designing BOMET-351 C Medicinal botany BOMEPE-352 Elective practical botany AB/BC/CA	0	1 Theory/ 1 Practical BOVST-351 Plant Tissue Culture	0	0	0
	VI	4 Theory + 2 Practical BOMAT-361 Genetics and Plant Breeding BOMAT-362 Plant Biotechnology BOMAT-363 Seed Technology and Post-Harvest technology BOMAT-364 Plant based Food and Nutrition BOMAP-365 Practical botany VII BOMAP-366 Practical botany VIII	1 Theory + 1 Practical BOMET-361A Computational Botany BOMET-361B Environmental Botany BOMEPE-362 A Practical on Computational Botany BOMEPE-362 B Practical on Environmental Botany	0	1 Theory/ 1 Practical BOVSP-361 Practical on Plant Tissue Culture	0	0	0
VII and VIII Sem honors degree with major								
Year	Sem	Major Courses	Major Elective Courses	Minor Courses	VSC	IKS	GE /OE	SEC
TY Honors Major	VII	5 Theory + 2 Practical BOMAT-471 Plant Systematics - I (Algae & Fungi) BOMAT-472 Advanced Cell Biology BOMAT-473 Genetics & Plant Breeding BOMAT-474 Plant organism Interaction BOMAT-475 Floriculture and Pomoculture BOMAP -476 Practical botany IX BOMAP -477 Practical botany X	1 Theory + 1 Practical BOMET -471A Crop Physiology BOMEPE -472A Practical on Crop Physiology BOMET-471B Pharmacognosy BOMEPE- 472B Practical on Pharmacognosy	RM 4 credits	0	0	0	0

	VIII	5 Theory + 2 Practical BOMAT-481 Plant Systematics - II (Bryophytes and Pteridophytes) BOMAT-482 Advanced Molecular Biology BOMAT-483 Biostatistics BOMAT-484 Tools and Techniques in Plant Science BOMAT-485 Plant Evolution BOMAP – 486 Practical botany XI BOMAP- 487 Practical botany XII	1 Theory + 1 Practical BOMET-481A Applied Biotechnology and Nanotechnology BOMEPE-482A Practical on Applied Biotechnology and Nanotechnology BOMET-481B Biodiversity BOMEPE- 482B Practical on Biodiversity	0	0	0	0	0
VII and VIII Sem Honors degree with research								
TY Honors Research	VII	4 Theory + 1 Practical BOMAT-471 Plant Systematics - I (Algae & Fungi) BOMAT-472 Advanced Cell Biology BOMAT-473 Genetics & Plant Breeding BOMAT-474 Plant organism Interaction BOMAT-475 Floriculture and Pomoculture BOMAP – 476 Practical botany XI	1 Theory + 1 Practical BOMET -471A Crop Physiology BOMEPE -472A Practical on Crop Physiology BOMET-471B Pharmacognosy BOMEPE- 472B Practical on Pharmacognosy	RM 4 credits	0	0	0	0
	VIII	4 Theory + 1 Practical BOMAT-481 Plant Systematics - II (Bryophytes and Pteridophytes) BOMAT-482 Advanced Molecular Biology BOMAT-483 Biostatistics BOMAT-484 Tools and Techniques in Plant Science BOMAT-485 Plant Evolution BOMAP – 486 Practical Botany XII	1 Theory + 1 Practical BOMET-481A Applied Biotechnology and Nanotechnology BOMEPE-482A Practical on Applied Biotechnology and Nanotechnology BOMET-481B Biodiversity BOMEPE- 482B Practical on Biodiversity	0	0	0	0	0

PDEA's
Prof. Ramkrishna More College, Akurdi, Pune 44
Dept of Botany

B.Sc.(Honours) in Botany is intended to provide a broad framework within which both the undergraduate programs in Botany help to create an academic base that responds to the need of the students to understand the basics of Botany and its ever evolving nature of applications in explaining all the observed natural phenomenon as well as predicting the future applications to the new phenomenon with a global perspective. The curriculum framework is designed and formulated in order to acquire and maintain standards of achievement in terms of knowledge, understanding and skills in Botany and their applications to the natural phenomenon as well as the development of scientific attitudes and values appropriate for rational reasoning, critical thinking and developing skills for problem solving and initiating research which are competitive globally and are on par in excellence with the standard Higher Education Institutions (HEI) in the advanced countries of America, Asia and Europe. The multicultural fabric of our nation requires that the institutions involved in implementing this curriculum framework also work hard towards providing an environment to create, develop and inculcate rational, ethical and moral attitudes and values to help the creation of knowledge society needed for scientific advancement of our nation.

Goals:

The Department has formulated three broad educational goals for the undergraduate degree programs:

Botany knowledge: To provide students with the basic foundation in Botany the interplay of theory and experiment, and to motivate scientific enthusiasm and curiosity and the joy of learning.

Problem solving skills: To provide students with the tools needed to analyse problems, apply experimentation, and synthesize ideas.

Employment and technical skills: To provide the students with technical skills necessary for successful careers in Botany and related or alternative careers for which a physics foundation can be very useful. These include computers and communication skills (oral and written).

Structure of Course
F.Y. B.Sc. Botany syllabus

Sem	Course code	Course Name	Credits	lectures or Practicals
Major Courses				
1	BOMAT-111	Basic Plant Science	2	30L
	BOMAT-112	Applied Plant Science	2	30L
	BOMAP-113	Practical Botany-I	2	12P
2	BOMAT-121	Basics of Plant Ecology	2	30L
	BOMAT-122	Cell Biology	2	30L
	BOMAP-123	Practical Botany-II	2	12P
Indian Knowledge System Based Paper*				
1	GEIKT-111	Generic IKS (A Basic Course on Indian Knowledge System)	2	30L
Value Education Course*				
1	VEAET-111	Environmental Awareness	2	30L
2	VEPOT-121	Democracy & Indian Constitution	2	30L
General Or Open Elective Course*(From Botany Department)				
1	BOGET-111	Agro and Eco-tourism	2	30L
2	BOGET-121	Plant Resources OR	2	30L
2	BOGEP-121	Practical on Agro and Eco-tourism	2	12P
Skill Enhancement Course (From Botany Department)				
1	BOSEP-111	Cultivation technique of mushroom and algae Lab OR	2	12P
1	BOSEP-111	Cultivation technique of mushroom and algae	2	30L
2	BOSEP-121	Bio-fertilizers and Bio-pesticides Lab OR	2	12P
2	BOSEP-121	Bio-fertilizers and Bio-pesticides	2	30L
Ability Enhancement Course*				
1	MAAET-111	व्यावहारिक मराठी भाग १	२	30L
2	MAAET-121	व्यावहारिक मराठी भाग २	२	30L
1	HIAET-111	सामान्य हिंदी I [कहानी कविता और निबंध लेखन]	२	30L
2	HIAET-121	सामान्य हिंदी II [कहानी कविता और निबंध लेखन]	२	30L
Curricular Courses (CC)				
2	CCPEP-121	Physical Education and Sports	2	30L

OE/GE From College basket For Science Faculty				
1.	ECGET-111	Basic Course in Stock Market	2	30L
2.	COGET-111	Entrepreneurial Skill Development I	2	30L
3.	POGET-111	Indian Constitution and Political Process	2	30L
4.	GGGET-111	Introduction to GIS	2	30L
5.	PSGET-111	Psychology of Adjustment and stress	2	30L
6.	BBGET-121	Business communication and corporate social responsibility	2	30L
7.	ECGET-121	Advance course in stock market	2	30L
8.	COGET-121	Entrepreneurial Skill Development II	2	30L
9.	POGEP-121	Practical on Indian Constitution and Political Process	2	12P
10.	GGGEP-121	Practical in Remote Sensing	2	12P
11.	PSGET-121	Psychological Interpersonal Relationship	2	30L
12.	BCGET-121	E-Commerce	2	30L
13.	BCGET-121	Basics of Hardware and Networking	2	30L
Skill Enhancement Course (SEC) College basket for Science Faculty				
I.	CHSEP-111	Practical: Formulation of Soaps and related products	2	12P
2.	CHSET-121	Formulation of Soaps Detergents and related products	2	30L
3.	ZOSEP-111	Medical Laboratory Techniques-I	2	12P
4.	ZOSEP-121	Medical Laboratory Techniques-II	2	12P
5.	PHSEP-111	Physics workshop Skills	2	12P
6.	PHSET-121	Arduino Programming for Physics	2	30L
7.	BOSEP-111	Practical on Cultivation technique of mushroom and algae	2	12P
8.	BOSEP-121	Practical on Bio-fertilizers and Bio-pesticides	2	12P
9.	MTSET-111	Analytical Geometry of three Dimensions	2	30L
10.	MTSEP-121	Practical on Analytical Geometry of three Dimensions	2	12P

Equivalence to Previous i.e. 2019 CBCS pattern of SPPU

Sr. no	2019 CBCS Pattern		NEP-2020; 2023 CBCS Pattern	
	Course code	Course name	Course code	Course name
1.	BO 111	Plant life and utilization I	BOMAT-111	Fundamentals of Plant Diversity-I
2.	BO 112	Plant morphology and Anatomy	BOMAT-112	Introduction to Plant Morphology
3.	BO 113	Practical based on BO 111 & BO 112	BOMAP-113	Practical Botany I
4.	BO 121	Plant life and utilization II	BOMAT-121	Fundamentals of Plant Diversity-II
5.	BO 122	Principles of plant science	BOMAT-122	Introduction to Plant Anatomy & Utilization
6.	BO 123	Practical based on BO 121 & BO 122	BOMAT-123	Practical II

Equivalence to Previous syllabus i.e. CBCS 2023 pattern, NEP-2020

Sr. no	2019 CBCS Pattern		NEP-2020; 2023 CBCS Pattern	
	Course code	Course name	Course code	Course name
1.	BOMAT-111	Fundamentals of Plant Diversity-I	BOMAT-111	Basic Plant Science
2.	BOMAT-112	Introduction to Plant Morphology	BOMAT-112	Applied Plant Science
3.	BOMAP-113	Practical Botany I	BOMAP-113	Practical Botany-I
4.	BOMAT-121	Fundamentals of Plant Diversity-II	BOMAT-121	Basics of Plant Ecology
5.	BOMAT-122	Introduction to Plant Anatomy & Utilization	BOMAT-122	Cell Biology
6.	BOMAT-123	Practical Botany II	BOMAP-123	Practical Botany-II

Program: B.Sc. [Botany], 2024-25

Program Outcomes (POs) for B.Sc. Botany:

1. **Core Botanical Knowledge:** Demonstrate a thorough understanding of core concepts in plant science including morphology, physiology, ecology, cell biology, taxonomy, and evolution.
2. **Applied Botanical Skills:** Apply botanical knowledge to practical areas such as biofertilizers, Biopesticides, nursery management, herbal technology, and Phytochemistry.
3. **Ecological & Environmental Awareness:** Develop ecological sensitivity and environmental consciousness through courses like plant ecology, environmental awareness.
4. **Scientific Research & Methodology:** Acquire skills in scientific research design, experimental techniques, data analysis, and scientific writing.
5. **Practical Laboratory Competence:** Perform standard laboratory Practicals in plant identification, microscopy, Phytochemistry, molecular biology, plant pathology, and biotechnology.
6. **Vocational skills:** Gain hands-on vocational skills in nursery techniques, herbal product development, plant tissue culture, and plant-based nutrition.
7. **Communication Skills:** Enhance scientific and creative communication skills in both regional languages (Marathi and Hindi) and scientific English through integrated language and writing courses.
8. **Computational & Analytical Skills:** Apply computational tools and quantitative reasoning in plant sciences, especially in genetics, bioinformatics, and data-driven ecological assessments.
9. **Interdisciplinary Approach:** Integrate concepts from biotechnology, nanotechnology, ethnobotany, and traditional knowledge systems to solve real-world botanical problems.
10. **Sustainable Development Goals Orientation:** Align botanical knowledge with sustainable agriculture, biodiversity conservation, and community welfare, especially in field projects and community engagement.
11. **Ethical and Social Responsibility:** Exhibit ethical practices and understand the socio-cultural implications of botanical research and biotechnological applications.
12. **Entrepreneurship and Employability:** Prepare for employment or entrepreneurship in the fields of agriculture, horticulture, herbal medicine, seed technology, and environmental consultancy.
13. **Global and Local Relevance:** Understand the global importance of plants in climate change, food security, and health, while valuing indigenous and local knowledge systems like Ayurveda and IKS.

Program Specific Outcomes(PSo):

PSO1: Understanding Plant Diversity and Evolution

Demonstrate in-depth knowledge of plant biodiversity from lower cryptogams (algae, fungi, lichens) to higher cryptogams and gymnosperms, as well as the classification, morphology, and evolution of angiosperms.

PSO2: Mastery of Plant Function and Structure

Apply core concepts in plant physiology, cell biology, molecular biology, and phytochemistry to understand plant function, structure, and metabolism at the cellular and organismal levels.

PSO3: Application of Botany in Agriculture and Industry

Utilize botanical knowledge in agriculture, seed technology, herbal medicine, nursery and gardening, biofertilizers production, and food and nutrition sciences, with practical exposure to field and lab-based practices.

PSO4: Proficiency in Research and Scientific Inquiry

Design and conduct botanical experiments, analyze data using appropriate methods, and communicate findings through research methodology, scientific writing, and participation in field/research projects.

PSO5: Environmental and Ethical Awareness with Community Relevance

Evaluate ecological issues and biodiversity conservation strategies, apply traditional knowledge systems (e.g., Ayurveda, IKS), and engage in community-based initiatives for sustainable development and environmental education.

Paper Wise Detailed Syllabus of F. Y. B. Sc. (2024-25)

NEP 2020
B. Sc. First Year

Course : Major
Code : BOMAT 111
Subject : Basic Plant Science

Total Credit : 2
Course Type : Theory
Total Lecture : 30

Module I: Plant Kingdom 15 Lectures

Chapter 1: Introduction to Plant diversity 01 L

- 1.1 Definition and concept of Plant Diversity.
- 1.2 General outline of Plant Kingdom.

Chapter 2: Algae 02 L

- 2.1 Introduction
- 2.2 Definition and characters of Algae, suitable examples.
- 2.3 Economic and industrial importance of Algae

Chapter 3: Fungi 02 L

- 3.1 Introduction
- 3.2 Definition and general characters of fungi, suitable examples.
- 3.3 Ecological, Economic and industrial importance of Fungi

Chapter 4: Lichens 02L

- 4.1 Introduction
- 4.2 Definition and general characters of Lichens; suitable examples.
- 4.3 Ecological and economic importance of Lichens.

Chapter 5: Bryophytes 02L

- 5.1 Introduction
- 5.2 Definition and general characters of bryophytes; suitable examples.
- 5.3 Ecological and Economic Importance of Bryophytes

Chapter 6: Pteridophytes 02L

- 6.1 Introduction
- 6.2 Definition and general characters of pteridophytes; suitable examples.
- 6.3 Ecological and economic importance of Pteridophytes

Chapter 7: Gymnosperms 02L

- 7.1 Introduction
- 7.2 Definition and general characters of gymnosperms; suitable examples.
- 7.3 Ecological and economic importance of Gymnosperm

Chapter 8: Angiosperms 02L

- 8.1 Introduction
- 8.2 Definition and general characters of angiosperms; suitable examples.
- 8.3 Ecological and economic importance of Angiosperms

Module II: Plant Morphology**15 Lectures****Chapter 9: Introduction to Plant morphology****01L**

- 9.1 Introduction,
- 9.2 Definition, Types of morphology – Descriptive and Interpretative.
- 9.3 Importance of Morphology.

Chapter 10: Root morphology**02L**

- 10.1 Definition, Parts / regions of root
- 10.2 Types of root – Tap root and fibrous / adventitious root.
- 10.3 Modifications of roots with examples.
- 10.4 Functions of roots.

Chapter 11: Stem morphology**02L**

- 11.1 Definition, Parts of stem.
- 11.2 Types of stem.
- 11.3 Modifications of Stem.
- 11.4 Functions of stem.

Chapter 12: Leaf morphology**02L**

- 12.1 Definition, Parts of leaf; Venation, Phyllotaxy, Leaf duration
- 12.2 Types of leaves
- 12.3 Leaf Modifications
- 12.4 Functions of leaves.

Chapter 13: Morphology of Flower**03L**

- 13.1 Definition, typical structure of flower.
- 13.2 Types of flowers based on Symmetry
- 13.3 Floral whorls
- 13.4 Functions of flower

Chapter 14: Morphology of Inflorescence**03L**

- 14.1 Definition, Parts of Inflorescence.
- 14.2 Types of Inflorescence

Chapter 15: Morphology of Fruit and Seed**02L**

- 15.1 Fruit: Definition and parts of fruit.
- 15.2 Seed: Definition, Parts of typical seed.

Suggested Readings:

- 1) Smith, G.M. (1971). Cryptogamic Botany. Vol. I: Algae & Fungi. Tata McGraw Hill Pub. Co., New Delhi.
- 2) Vashista, B.R., Sinha, A.K. and Singh, V.B. (2005). Botany for degree students- Algae, S. Chand Publications.
- 3) B.P. Pandey, (2017). Botany for degree students- Biodiversity, S. Chand Publication.
- 4) Dutta, A.C. (2003). Botany for Degree students. Oxford University Press, New Delhi.
- 5) Pandey, B.P. (2009). A Text Book of Botany- Angiosperms. S. Chand and Co. Ltd. New Delhi.
- 6) Radford, Albert E. (1986). Fundamentals of Plant Systematics. Publ. Harper and Row, New York.
- 7) Saxena, A.K. and Sarabhai, R.P. (1968). A Text Book of Botany. Vol. III. Ratan Prakashan mandir, Agra.
- 8) Sharma, O.P. (1993). Plant Taxonomy. 2nd Edition, McGraw Hill Education, New Delhi.
- 9) Singh, Gurucharan (2005). Systematics- Theory and Practice. Oxford IBH. Sutaria, R.N.A. Text Book of Systematic Botany.

Course Outcome:**After the completion of this course students are able to,**

- Understand the plant diversity, including major groups of the plant kingdom.
- Understand the important characteristics and roles of Pteridophytes, gymnosperms, and angiosperms in ecosystems and human welfare.
- Analyse the ecological and economic significance of fungi in nutrient cycling and industry.
- Identify algae and explain their economic and biotechnological importance.

**NEP 2020
B. Sc. First Year**

Course :	Major	Total Credit :	2C
Code :	BOMAT 112	Course Type :	Theory
Subject :	Applied Plant Science	Total Lecture :	30L

Module I	Advancements in Plant Science	15L
Chapter 1	Introduction to Applied Plant Science	02L
	1.1 Definition and Concept of Applied Plant Science	
	1.2 Scope and Importance of Applied Plant Science	
Chapter 2	<i>In-Vitro</i> Propagation	05L
	2.1 Introduction, History of Plant Tissue Culture	
	2.2 Laboratory organization and instruments used in PTC	
	2.3 Concept of Potency (Totipotency and Pluripotency)	
	2.4 Media formulation and type of media	
	2.5 Culture methods and their types	
	2.6 Application of Plant Tissue Culture	
Chapter 3	Plant Biotechnology	05L
	3.1 Concept, History of Biotechnology	
	3.2 Recombinant DNA Technology	
	i. Introduction	
	ii. Enzymes	
	iii. Vectors	
	iv. Techniques	
	v. Application	
	3.1 Plant Metabolites and their Application in the Biopharmaceuticals	
	3.2 Biotic and Abiotic Stress Resistant Plant Production	
	3.3 Genetically Modified organism and their Production methods	
	3.4 cDNA Library, synthesis of cDNA and their application	
Chapter 4	Plant Breeding	03L
	4.1 Scope and importance of Plant Breeding	
	4.2 Objectives of Plant Breeding	
	4.3 Steps involved in the Plant Breeding	
	4.4 Application of Plant Breeding	
Module II	Green Innovations: Agriculture, Biofuels, and Environment	15L
Chapter 5	Agriculture	07L
	5.1 Introduction, History and Importance of Agriculture	
	5.2 Concept of Domestication	
	5.3 Types of Cropping pattern in India	

- 5.5 Traditional and Urban Agriculture
- 5.6 Concept of Vertical Farming
- 5.7 Concept of Hydroponics and Aeroponics
- 5.8 Fertilizers and their Types
- 5.9 Integrated Pest Management (IPM) and their strategies
- 5.9 Impact of climate change on plants and agriculture

Chapter 6 Biofuels and Biodiesel Engineering

05L

- 6.1 Introduction of Biologically synthesized Fuels and Diesel
- 6.2 Concept of Energy, Renewable and Non-renewable Energy
- 6.3 Types of biomass and available resources for energy production
- 6.4 Biomass gasification followed by Fischer-Tropsch synthesis for liquid fuels
- 6.5 Hydrothermal technology for biofuels
- 6.6 Algae to biofuels and challenges

Chapter 7 Environmental Application

03L

- 7.1 Plant ecology and conservation
- 7.2 Ecological restoration techniques
- 7.3 Phytoremediation and air purification

Suggested Readings:

1. "Principles of Applied Botany" by Mary E. Gressel
2. "Applied Plant Science: Principles and Practices" by Pamela M. Vance and Vance C. Ostolaza.
3. "Plant Pathology" by George N. Agrios.
4. "Soil Science: Principles and Practices" by R.K. Mehra.
5. "Principles of Plant Biotechnology" by P.K. Gupta.
6. "Principles of Weed Science" by S.S. Hundal.
7. "Introduction to Horticulture" by Kumar and Singh.
8. "Plant Physiology" by Pandey and Sinha.
9. "Principles of Plant Pathology" by S.N. Agarwal.
10. "Principles of Agronomy" by S.R. Reddy and G.H. Sankara Reddy.
11. "Plant Breeding: Principles, Methods and Applications" by B.D. Singh.
12. "Postharvest: An Introduction to the Physiology and Handling of Fruit, Vegetables and Ornamentals" by R. Wills, B. McGlasson, D. Graham, and D. Joyce
13. "Plant Nutrition and Soil Fertility Manual" by J. Benton Jones Jr.
14. "Sustainable Agriculture" edited by Eric Lichtfouse
15. "Crop Production: Evolution, History, and Technology" by C. Wayne Smith and Julian R. Smith.
16. "Plant Physiology and Development" by Lincoln Taiz, Eduardo Zeiger, Ian M. Møller, and Angus Murphy.
17. "Plant Biotechnology and Agriculture: Prospects for the 21st Century" edited by Arie Altman and Paul Michael Hasegawa.
18. "Principles of Plant Genetics and Breeding" by George Acquaah.

Course Outcome:

After the successful completion of this course students are able to,

- Understand the importance of plants for sustaining life on earth.
- To study the impact of climate change on plants and agriculture.
- Discuss the benefits of employing the precision agriculture technologies
- Explain the modern agricultural practices such as vertical farming, hydroponics and aeroponics

NEP 2020
B. Sc. First Year

Course : Major	Total Credit : 2
Code : BOMAP 113	Course Type : Practical
Subject : Practical Botany I (Practical Based on BOMAT 111 & 112)	Total Practicals : 12

Practical Botany I (Practical Based on BOMAT 111 & 112)		12 Practical
1	Study of life forms of Algae (<i>Spirogyra</i> , <i>Nostoc</i>)	1P
2	Study of life forms of Fungi (<i>Aspergillus</i>) and Lichens.	1P
3	Study of life forms of Bryophytes (<i>Riccia</i>) and Pteridophytes (<i>Nephrolepis</i>).	1P
5	Study of life forms of Gymnosperm (<i>Cycas</i>) and Angiosperms (Any herb, Shrub and Tree at least one)	1P
6	Study of Root, Shoot and Leaf w.r.t. its types and modifications.	1P
7	Study of typical flower w.r.t. floral whorls calyx, corolla, perianth, androecium, gynoecium (e.g., <i>Hibiscus</i> , <i>Datura</i> , <i>Brassica</i> , <i>Gliricidia</i> / <i>Clitoria</i> / Bean, <i>Adhatoda</i> / <i>Ocimum</i> , <i>Polyanthus</i> , <i>Bougainvillea</i> , <i>Citrus</i> , Sunflower, <i>Cucurbita</i>)	1P
8	Study of types of inflorescence.	1P
9	Study of principles, working and practical applications of instruments and equipment used in plant tissue culture. (<i>pH</i> meter, Autoclave, Hot air oven, Laminar Air Flow, Micropipettes, Distillation Unit).	1P
10	Demonstration of genetically modified crops: Bt–Cotton, Golden Rice, Round-up ready Soybean.	1P
11	Demonstration of <i>Azolla</i> cultivation, nutrition and production attributes and its application as bio fertilizer.	1P
12	Study of preparation of <i>Dashparni</i> Ark and EM solution.	1P
13	Demonstration of Hydroponics/ Aroponics	1P
14	Visit to natural habitats to study diversity OR Visit to the plant based industry related to applied plant science	1P

***Note: Conduct any 12 practical's from the above mentioned list. (Visit compulsory)**

Suggested Readings:

- 1) Smith, G.M. (1971). Cryptogamic Botany. Vol. I: Algae & Fungi. Tata McGraw Hill Pub. Co., New Delhi.
- 2) Vashista, B.R., Sinha, A.K. and Singh, V.B. (2005). Botany for degree students- Algae, S. Chand Publications.
- 3) B.P. Pandey, (2017). Botany for degree students- Biodiversity, S. Chand Publication.
- 4) Dutta, A.C. (2003). Botany for Degree students. Oxford University Press, New Delhi.
- 5) Pandey, B.P. (2009). A Text Book of Botany- Angiosperms. S. Chand and Co. Ltd. New Delhi.
- 6) Radford, Albert E. (1986). Fundamentals of Plant Systematics. Publ. Harper and Row, New York.
- 7) Saxena, A.K. and Sarabhai, R.P. (1968). A Text Book of Botany. Vol. III. Ratan Prakashan mandir, Agra.
- 8) Sharma, O.P. (1993). Plant Taxonomy. 2nd Edition, McGraw Hill Education, New Delhi.
- 9) Singh, Gurucharan (2005). Systematics- Theory and Practice. Oxford IBH. Sutaria, R.N.A. Text Book of Systematic Botany.
- 10) "Principles of Applied Botany" by Mary E. Gressel
- 11) "Applied Plant Science: Principles and Practices" by Pamela M. Vance and Vance C. Ostolaza.
- 12) "Plant Pathology" by George N. Agrios.
- 13) "Soil Science: Principles and Practices" by R.K. Mehra.
- 14) "Principles of Plant Biotechnology" by P.K. Gupta.
- 15) "Principles of Weed Science" by S.S. Hundal.
- 16) "Introduction to Horticulture" by Kumar and Singh.
- 17) "Plant Physiology" by Pandey and Sinha.
- 18) "Principles of Plant Pathology" by S.N. Agarwal.
- 19) "Principles of Agronomy" by S.R. Reddy and G.H. Sankara Reddy.
- 20) "Plant Breeding: Principles, Methods and Applications" by B.D. Singh.
- 21) "Postharvest: An Introduction to the Physiology and Handling of Fruit, Vegetables and Ornamentals" by R. Wills, B. McGlasson, D. Graham, and D. Joyce
- 22) "Plant Nutrition and Soil Fertility Manual" by J. Benton Jones Jr.
- 23) "Sustainable Agriculture" edited by Eric Lichtfouse
- 24) "Crop Production: Evolution, History, and Technology" by C. Wayne Smith and Julian R. Smith.
- 25) "Plant Physiology and Development" by Lincoln Taiz, Eduardo Zeiger, Ian M. Møller, and Angus Murphy.
- 26) "Plant Biotechnology and Agriculture: Prospects for the 21st Century" edited by Arie Altman and Paul Michael Hasegawa.
- 27) "Principles of Plant Genetics and Breeding" by George Acquaah.

Course Outcome:

After the completion of the course students will be able to,

- Understand and identify key characteristics of inflorescences, flowers, fruits, and seeds for plant classification.
- Identify and classify diverse plant species, understanding their ecological role and evolutionary relationships.
- Explain the reproductive structures and life cycles of various plant groups, including algae, fungi, and higher plants.
- Gain hands-on experience in botanical fieldwork, documenting vegetation, and studying plant diversity in natural habitats.

Course : Major
Code : BOMAT 121
Subject : Basics of Plant Ecology

Total Credit : 2
Course Type : Theory
Total Lecture : 30

Module- I Plant Ecology**15 Lectures****Chapter 1: Introduction to Plant Ecology****2L**

- 1.1 Definition, Concept, Auto and Synecology
- 1.2 Importance of Plant Ecology

13L**Chapter 2: Ecological factor**

- 2.1 Introduction to Ecological Factors: Abiotic and Biotic Factors
- 2.2 Soil: Origin, formation, composition, soil profile
- 2.3 Water: States of water in the environment, precipitation types
- 2.4 Light and temperature
- 2.5 Ecological groups of Plants
- 2.6 General account of Adaptations in Hydrophytes, Mesophytes, Xerophytes and Halophytes

Module- II Ecosystem**15 Lectures****Chapter 3: Ecosystem****5L**

- 3.1 Introduction and Definition of ecosystem
- 3.2 Structure of ecosystem
- 3.3 Energy flow trophic organization
- 3.4 Food chains and food webs
- 3.5 Ecological pyramids production and productivity
- 3.6 Biogeochemical cycling- Cycling of Nitrogen and Phosphorous

Chapter 4: Plant communities**10**

- 4.1 Introduction, definition.
- 4.2 Characters of plant communities
- 4.3 Ecotone and edge effect
- 4.4 Succession
- 4.5 Processes and types (Hydrosere and Xerosere)

Suggested Readings:

1. Kormondy, E.J. (1996). Concepts of Ecology. Prentice Hall, U.S.A. 4th edition.
2. Sharma, P.D. (2010) Ecology and Environment. Rastogi Publications, Meerut, India.

Course Outcome:

At the end of course, student will be able to

- Understand plant ecology and ecosystem dynamics.
- Gain knowledge about the adaptations of plants to extreme environments (e.g., xerophytes and hydrophytes)
- Describe proficiency in ecosystem structure, including energy flow, trophic organization, and nutrient cycling.
- Describe ecological principles to real- world environmental challenges, focusing on sustainable ecosystem management and conservation.

NEP 2020
B. Sc. First Year

Course	: Major	Total Credit	: 2
Code	: BOMAT 122	Course Type	: Theory
Subject	: Cell Biology	Total Lecture	: 30

Module I Basics of cell biology	15L
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Chapter 1: Introduction to cell biology	5 L
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- 1.1 Introduction, History and Scope of cell biology, Historical: perspective and milestones in cell biology.
- 1.2 Applications, importance and interdisciplinary nature of cell biology. Cell as basic unit of life and cell theory.

Chapter 2: Overview of cells	10 L
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- 2.1 Basic characteristics of cells
- 2.2 Introduction to Prokaryotic and Eukaryotic cells. Structure and function of Prokaryotic (E. coli)
- 2.3 Structure and function of Eukaryotic cells (Animal and Plant).
- 2.4 Cell cycle, phases of cell cycle- G-phase, S -Phase M-Phase
- 2.5 Mitosis and Meiosis.

Module 2 Structure and function of cell organelles	15L
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Chapter 3: Structure and functions of plasma membrane:	7L
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- 3.1 Structure of plasma membrane: Fluid mosaic model.
- 3.2 Transport across membranes: Active and Passive transport,
- 3.3 Exocytosis, endocytosis, phagocytosis – vesicles and their importance in transport.
- 3.4 Functions of the Cell membrane.
- 3.5 Structure of Nucleus: Nuclear envelope, nuclear pore complex, Nucleoplasm, Nucleolus.
- 3.6 Chromatin: Eu-chromatin and Hetero-chromatin, nature and differences.
- 3.7 Functions of the nucleus.

Chapter 4: Structure and function of cell organelles:	6L
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- 4.1 Endomembrane System - Introduction, Structure, location, and Functions of Endoplasmic Reticulum,
- 4.2 Golgi apparatus, Lysosomes, vacuoles and microbodies.
- 4.3 Mitochondria - structure and function of the mitochondrion.
- 4.4 Chloroplast - Structure and functions of chloroplast.
- 4.5 Peroxisomes- Structure and functions of Peroxisomes.
- 4.6 Ribosomes-Structure and functions of Ribosomes, Prokaryotic and eukaryotic ribosomes.

2L

Chapter 5: Future trends in cell biology:

5.1 Applications of cell biology in Medical Research and Healthcare

5.2 Biotechnology, Environmental Science

5.3 Agricultural Biotechnology.

Suggested Readings:

1. "Molecular Biology of the Cell" by Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts, and Peter Walter.
2. "Cell Biology" by Thomas D. Pollard, William C. Earnshaw, and Jennifer Lippincott-Schwartz.
3. "The Cell: A Molecular Approach" by Geoffrey M. Cooper and Robert E. Hausman.

Course Outcome.

After Completion of this course students are able to,

- Understand the internal organization of the cell.
- Describe the applications of Cell Biology in Medicinal Research, Agriculture Biotechnology and Environmental Science.
- Discuss the cellular processes and cellular communication mechanisms
- Explain the signaling pathways and cellular responses to environmental stimuli.

NEP 2020
B.Sc. First Year

Course :	Major	Total Credit :	2
Code :	BOMAP 123	Course Type :	Practical
Subject :	Practical Botany –II (Practical Based on BOMAT 121 & 122)	Total Practical :	12

Practical Based on BOMAT 121 & 122		12 practical
1	Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter.	1P
2	Determination of pH, and analysis of two soil samples for carbonates, organic matter.	1P
3	Comparison of bulk density, porosity, rate of infiltration of water in soil and Water holding capacity of soil.	1P
4	Study of morphological adaptations of hydrophytes and xerophytes.	1P
5	Study of biotic interactions of the following: Stem parasite (<i>Cuscuta</i>), Root parasite (<i>Orobanch</i>), Epiphytes, Predation (Insectivorous plants)	1P
6	Quantitative analysis of herbaceous vegetation for frequency and comparison with Raunkiers frequency distribution law.	1P
7	Study of simple and compound microscopes and observation of onion peel or <i>Rheo</i> cells.	1P
8	Study of prokaryotic and eukaryotic cells and their comparison.	1P
9	Study of various stages of mitosis using cytological preparation of Onion root tips.	1P
10	Study of various stages of meiosis using cytological preparation of Onion flower buds or <i>Rheo</i> buds.	1P
11	Histochemical localization of nucleic acid and protein in a cell.	1P
12	Study of Electron microphotographs of the following cell organelles: a. Plasma membrane b. Chromosome c. Golgi complex and other cell organelles.	1P
13	Study the phenomenon of plasmolysis and understanding of role of plasma membrane using <i>Rheo</i> epidermal peel.	1P

Suggested Readings:

1. Kormondy, E.J. (1996). Concepts of Ecology. Prentice Hall, U.S.A. 4th edition.
2. Sharma, P.D. (2010) Ecology and Environment. Rastogi Publications, Meerut, India.
3. "Molecular Biology of the Cell" by Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts, and Peter Walter.
4. "Cell Biology" by Thomas D. Pollard, William C. Earnshaw, and Jennifer Lippincott-Schwartz.
5. "The Cell: A Molecular Approach" by Geoffrey M. Cooper and Robert E. Hausman.

Course Outcome:

At the end of the course, students will be able to,

- 1) Understand microclimatic variations across different habitats such temperature, humidity, wind speed, precipitation, etc
- 2) Determine the pH levels, carbonate content and organic matter between soil samples from various habitats.
- 3) Analyze the different properties of soil such as bulk density, porosity, and water infiltration rate across different habitats, revealing variations in soil structure and water movement capabilities.
- 4) Explain the specific morphological adaptations of hydrophytes and xerophytes that enable them to thrive in aquatic and arid environments respectively.
- 5) Discuss the biotic interactions including parasitism (*Cuscuta* and *Orobanche*), epiphytism, and predation (insectivorous plants), highlighting mechanisms used by these plants to interact with their hosts or prey.

Skill Enhancement Course

First Year B.Sc.

Botany

NEP 2020

B.Sc First Year

Course	: Skill Enhancement Course (SEC)	Total Credit	: 2
Code	: BOSEP-111	Course Type	: Practical
Subject	: Practical on Cultivation techniques of Mushroom and Algae	Total Lecture	: 12

Practical on Culture Techniques of Mushroom and Algae		12 Practical
1.	Media Preparation for the isolation of Pure culture of Mushroom	1P
2.	Techniques for isolation of Pure Culture	1P
3.	Spawn Production and substrate preparation	1P
4.	Cultivation techniques of Mushroom	1P
5.	Harvesting, processing, and post-harvest management of mushrooms	1P
6.	Packaging and lyophilization techniques	1P
7.	Introduction to Algae for cultivation	1P
8.	<i>Spirulina</i> cultivation: Pure culture method	1P
9.	Substrate preparation and laboratory scale production	1P
10.	Harvesting, Drying and powder techniques for <i>Spirulina</i>	1P
11.	Product preparation from cultivated algae	1P
12.	Analysis of cultivated <i>Spirulina</i>	1P

Suggested readings:

1. Manual of Microbiology Lab Techniques – Cappuccino & Sherman
2. Methods in Mushroom Cultivation and Microbiology – R.D. Rai et al.
3. Laboratory Manual for Fungal Biology – S.K. Singh
4. Microbiological Methods – Collins & Lyne
5. Mushroom Cultivation: Technology and Applications – Satish Kumar
6. Handbook of Mushroom Spawn Production – ICAR-DMR
7. A Complete Guide to Mushroom Cultivation – Peter Oei

8. Technology of Mushroom Cultivation – ICAR Publication
9. Postharvest Management of Horticultural Crops – K.P. Sudheer & V. Indira
10. Mushroom Production and Processing Technology – ICAR/DMR Guidelines
11. Introduction to Algae – R.N. Singh
12. Algae: An Introduction to Phycology – van den Hoek et al.
13. Spirulina: Nature's Superfood – Earthrise Nutritionals
14. Cultivation of Spirulina – C.V. Seshadri, MCRC/UNIDO Manual
15. Microalgal Production for Biomass and High-Value Products – Stephen Slocombe
16. Handbook of Microalgal Culture – Amos Richmond

Course Outcome:**At the end of course, student will be able to,**

- Students can start small scale industry of mushroom cultivation.
- Understand the diseases of post harvesting techniques of mushroom.
- Student study the morphology and types of mushroom
- They are aware of the identification of edible and poisonous mushroom
- Study the techniques of mushroom cultivation

NEP 2020

B.Sc. First Year

Course : Skill Enhancement Course (SEC)
Code : BOSET-111
Subject : Cultivation techniques of Mushroom and Algae

Total Credit : 2
Course Type : Practical
Total Lecture : 12

Module -I: Mushroom cultivation**15 Lectures****Chapter 1: Introduction to Mushroom Culture Technology****08 Lectures**

- 1.1 History of mushroom, Nutritional and medicinal value of edible mushrooms; Poisonous mushrooms. Types of edible mushrooms.
- 1.2 Infrastructure required for cultivation: Preparation room, composition room, Culture room, inoculation room culture room, storage, Autoclave room etc.
- 1.3 Pure culture: Medium, sterilization, preparation of spawn, multiplication. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, rice bran etc.
- 1.4 Cultivation of button, oyster and paddy straw mushroom – raising a pure culture – spawn preparation and mass cultivation – harvest pests and diseases in mushroom

Chapter 2: Storage Food Preparation and nutrition:**07 Lectures**

- 2.1. Types and techniques of storage: Short-term, long term (canning, pickles, papads, drying, storage in salt solutions).
- 2.2. Nutritional composition- Proteins, amino acids, mineral elements, carbohydrates, crude fibre content, vitamins. Types of foods prepared from mushroom.
- 2.3. Research Centres-National level and Regional level. Cost benefit Ratio-Marketing in India and abroad, export value.

Module -II: Algae cultivation**15 Lectures****Chapter 3:****05 Lectures**

- 3.1. Introduction to algae
- 3.2. Resource potential of algae
- 3.3. single cell proteins (SCP)
- 3.4. Algae as a source of food and feed
- 3.5. Algae as a source of pigments, fine chemicals, biofuel and bio-fertilizers.

Chapter 4:**05 Lectures**

- 4.1. Algal production systems;
- 4.2. Strain selection;
- 4.3. Culture media;
- 4.4. Algal growth curve; Measurement of algal growth.

Chapter 5:

- 5.1. Production techniques: small scale
- 5.2. Commercial production - commercial and mass cultivation
(tank construction, culture medium, strain selection, scaling up of the process)
- 5.3. Harvesting, Drying and Packing.

Reference: Becker, E.W. (1994) Page 63 to 172

Suggested Readings:

1. Barsanti, Laura and Paolo Gualtieri 2005 Algae-Anatomy, Biochemistry and Biotechnology. Taylor & Francis, London, New York.
2. Becker, E.W. 1994 Microalgae- Biotechnology and microbiology. Cambridge University Press.
3. Chandramohan, D. 2007. Prospects of Biodiesel from marine microorganisms.
4. Proceedings of the National Workshop on BIODIESEL, Organized by School of Energy, Environment & Natural Resources, Madurai Kamaraj University,
5. Madurai and Ahimsa Agri division, Chennai, 17th and 18th October, 2007.
6. Changs T. and Hayanes W.A. (Ed.) (1978) Biology and Cultivation of Edible Mushrooms. Academic Press. N.Y.
7. Biswas S., Datta M. and Ngachan S.V. (2012) Mushrooms: A Manual for Cultivation, PHI

Course Outcomes:

After the completion of this course, Students are able to,

- Understand history of mushroom, nutritional and medicinal value of edible mushrooms
- Explain the required infrastructure for cultivation, Pure culture and cultivation practices
- Describe Storage, Food Preparation for Mushroom and Algae
- Elaborate the required infrastructure for cultivation, Pure culture and cultivation practices of Algae and source of Single Cell Protein
- Discuss small scale and commercial production.

NEP 2020
B.Sc. First Year

Course	: Skill Enhancement Course	Total Credit	: 2
Code	: BOSEP 121	Course Type	: Practical
Subject	: Practical on Biofertilizers and Biopesticides	Total Practical	: 12

Practical on Biofertilizers and Biopesticides	12 Practical
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- | | | |
|-----|---|----|
| 1. | Preparation of biofertilizers using agricultural and plant waste. | 1P |
| 2. | Assessing the Impact of chemical fertilizer and biofertilizers on Growth Parameters and Yield on crop plants. | 2P |
| 3. | Isolation, identification and preparation of biofertilizers using <i>Rhizobium</i> . | 1P |
| 4. | Isolation and identification of Phosphate solubilizing bacteria from soil. | 1P |
| 5. | Mass multiplication of BGA and Azolla and its application in paddy field.. | 1P |
| 6. | To study the impact of chemical pesticides and Biopesticides on crop plants | 2P |
| 7. | Development of Biopesticides from <i>Trichoderma</i> and their Impact on Plant Health and Yield | 1P |
| 8. | Preparation of Biopesticides using neem leaves. | 1P |
| 9. | Application of Biopesticides in sustainable agriculture. | 1P |
| 10. | Visits to Commercial Biofertilizers/Biopesticides/biocontrol units. | 1P |

Suggested Readings:

1. Biofertilizers and Biopesticides Unknown Binding – 29 June 2019 by Krishnendu Acharya, Surjit Sen, Manjula Rai.
2. Handbook Of Biofertilizers And Biopesticides Paperback – 1 January 2007 by A.M. Deshmukh, R.M. Khobragade, P.P. Dixit.
3. Biofertilizers and Biopesticides in Sustainable Agriculture Editors: B. D. Kaushik, PhD Deepak Kumar, PhD Md. Shamim, PhD.
4. Biofertilizers and Biopesticides in Sustainable Agriculture Edited By B. D. Kaushik, Deepak Kumar, Md. Shamim.
5. Biofertilizers and Biopesticides: A Sustainable Approach" by Prem Lal Kashyap.
6. Handbook of Microbial Biopesticides by Opender Koul, Gurdeep R. J. Randhawa, and Gadi V. P. Reddy.
7. Microbial Inoculants in Sustainable Agricultural Productivity by Dinesh K. Maheshwari

8. Principles of Biopesticides by Opendar Koul and Gadi V. P. Reddy.
9. Biopesticides: An eco-friendly approach for pest control by S.K. Chauhan and S. Sharma.
10. Biofertilizers: A Sustainable Eco-friendly Agricultural Approach by Abhay Pratap Singh and S. S. Saxena (Published in 2018 in Journal of Pharmacognosy and Phytochemistry).
11. Biopesticides and their role in sustainable agricultural production" **by P. K. Khare, K. K. Jha**, and M. P. Singh (Published in 2011 in Pest Management in Horticultural Ecosystems).
12. **Biofertilizers and their impact on soil fertility and crop productivity"** by M. K. Awasthi, P. Singh, and S. K. Gupta (Published in 2014 in International Journal of Bio-resource and Stress Management).

Course outcome:

After the completion of the course, students are able to,

- Explain isolation and role of various soil bacteria in bio-fertilizer production.
- Describe production steps and specific requirements for each bio-fertilizers
- Demonstrate the method for restoring soil fertility via organic farming
- Apply the knowledge gained for sustainable agricultural practices and self-employability.

**NEP 2020
B.Sc First Year**

Course : Skill Enhancement Course
Code : BOSET 121
Subject : Bio-fertilizers and Bio-pesticides

Total Credit : 2
Course Type : Theory
Total Lecture : 30

Module I: Biofertilizers

15 Lectures

Chapter 1: Introduction to Biofertilizers

- | | | |
|-----|---|----|
| 1.1 | Introduction, concept, scope and importance of biofertilizers, classification of biofertilizers. | 1L |
| 1.2 | Isolation and identification of potential microbes for biofertilizer. Production technology: Strain selection, sterilization, growth and fermentation, equipment, mass production of carrier based and liquid bio fertilizers. Quality control of bio fertilizers. | 4L |
| 1.3 | Structure and characteristic features of bacterial Bio fertilizers- <i>Azotobacter</i> , <i>Rhizobium</i> , <i>Azospirillum</i> and <i>Frankia</i> ; Cynobacterial biofertilizers- <i>Anabaena</i> , <i>Nostoc</i> and fungal bio fertilizers - AM mycorrhiza and ectomycorrhiza. | 4L |
| 1.4 | <i>Azotobacter</i> : classification, characteristics–crop response to <i>Azotobacter</i> inoculum and maintenance and mass multiplication. | 2L |
| 1.5 | Cyanobacteria (blue green algae), <i>Azolla</i> and <i>Anabaena azollae</i> association. nitrogen fixation, factors affecting growth, blue green algae and <i>Azolla</i> in rice cultivation. | 2L |
| 1.6 | Mycorrhizal association, types of mycorrhizal association, taxonomy occurrence and distribution, phosphorus nutrition, growth and yield – colonization of VAM –isolation and inoculums production of VAM, and its influence on growth and yield of crop plants. | 2L |

Module II: Biopesticides

15 Lectures

Chapter 2: Introduction to Biopesticides

- | | | |
|-----|--|----|
| 2.1 | Introduction to Biopesticides and their classification (insecticides, herbicides, bactericides, fungicides and larvicides), mechanism of toxicity, use in agriculture and household practices. | 4L |
| 2.2 | Bio-control: Understanding the mechanisms by which biopesticides control pest. Specific examples of microbial, plant-derived, and biochemical biopesticides. | 2L |
| 2.3 | Formulation and Application of Biopesticides; Formulation techniques for microbial biopesticides, Challenges in formulation and storage, Methods of application: foliar spray, seed treatment, soil drenching. | 2L |
| 2.4 | Integrated Pest Management (IPM) strategies, Case studies of successful biopesticide applications. Mechanism of disease control by these organisms bioagents. | 3L |
| 2.5 | Important commercial products – Source, preparation, and uses of Pyrethrins, <i>Azadiractin</i> , <i>Trichoderma</i> . | 2L |

- 2.6 Current research trends in biopesticides, Emerging technologies and innovations in the field. Discussion on the future role of biopesticides in agriculture. **2L**

Suggested Readings:

1. Biofertilizers and Biopesticides Unknown Binding – 29 June 2019 by Krishnendu Acharya, Surjit Sen, Manjula Rai.
2. Handbook Of Biofertilizers And Biopesticides Paperback – 1 January 2007 by A.M. Deshmukh, R.M. Khobragade, P.P. Dixit.
3. Biofertilizers and Biopesticides in Sustainable Agriculture Editors: B. D. Kaushik, PhD Deepak Kumar, PhD Md. Shamim, PhD.
4. Biofertilizers and Biopesticides in Sustainable Agriculture Edited By B. D. Kaushik, Deepak Kumar, Md. Shamim.
5. Biofertilizers and Biopesticides: A Sustainable Approach" by Prem Lal Kashyap.
6. Handbook of Microbial Biopesticides by Opendar Koul, Gurdeep R. J. Randhawa, and Gadi V. P. Reddy.
7. Microbial Inoculants in Sustainable Agricultural Productivity by Dinesh K. Maheshwari
8. Principles of Biopesticides by Opendar Koul and Gadi V. P. Reddy.
9. Biopesticides: An eco-friendly approach for pest control by S.K. Chauhan and S. Sharma.
10. Biofertilizers: A Sustainable Eco-friendly Agricultural Approach by Abhay Pratap Singh and S. S. Saxena (Published in 2018 in Journal of Pharmacognosy and Phytochemistry).
11. Biopesticides and their role in sustainable agricultural production" by **P. K. Khare, K. K. Jha**, and M. P. Singh (Published in 2011 in Pest Management in Horticultural Ecosystems).
12. **Biofertilizers and their impact on soil fertility and crop productivity**" by M. K. Awasthi, P. Singh, and S. K. Gupta (Published in 2014 in International Journal of Bio-resource and Stress Management).

Course outcome:

After the completion of the course, students are able to,

- Define and describe Bio-fertilizers and Biopesticides.
- Explain the production technology for Bio-fertilizers and Biopesticides
- Discuss the use of microbes and phytomaterial for sustainable agriculture practices.
- Compare the role of biofertilizers and Biopesticides over chemical ones.

General / Open Elective
First Year B.Sc.
Botany
NEP 2020
B.Sc. First Year

Course : General / Open Elective	Total Credit : 2
Code : BOGET 111	Course Type : Theory
Subject : Agro-tourism and Eco-tourism	Total Lecture : 30
Module I: Agro-tourism	15 Lectures

Chapter : Basics of Agro-tourisms **06L**

- 1.1 Concept of agro-tourism- definition, nature and scope and importance.
- 1.2 Needs, opportunities and challenges in agro-tourism.
- 1.3 Agro-tourism and traditional tourism in India
- 1.4 Types of Agro-tourisms in India and abroad
- 1.5 Selection of Locations for development of Agro-tourism.
- 1.6 Geographical factors: relief, climate, drainage pattern, soil and vegetation, Water reservoirs, Hills/ Mountains.

Chapter 2: Organization of agro-tourism center **9L**

- 2.1 Daily activities in the Agro-Tourism centers (Animal Feeding, Guided field visits and tour, Watching domestic animals, Harvest Festival).
- 2.2 Exploring Rural Festival/Jatra, Farmer's markets, Milking the Cow and Buffalos, Religious Temple visits for Agro-tourism.
- 2.3 Arrangement of adventure Activities - mountaineering, trekking, river crossing, cycling.
- 2.4 Swimming and water games at well, ponds, or river, fishing, Local site seeing.
- 2.5 Rural games in Agro-tourism center - Bullock cart, Bicycle, Tractor rides. *Vittidandu, Surparambhya, Kabaddi, Langadi, Kho-Kho, Bullock ploughing, Lagori & Gallori.*
- 2.6 Who Can Start Agro-Tourism Centers?
- 2.7 Requirements for Agro-Tourism Centers- Infrastructure Facilities, livestock, Recreation facilities,
- 2.8 Agro-tourism policies.
- 2.9 Benefits of Agro-Tourism Centres.
- 2.10 Problems of the Agro-Tourism centers.

Chapter 3: Introduction to Ecotourism**08L**

- 3.1 Concept and scope of Ecotourism
- 3.2 Components of Ecotourism.
- 3.3 Principles and characteristics of ecotourism
- 3.4 Ecotourism planning: Site diagnostics
- 3.5 Ecotourism industry and its stake holders
- 3.6 Resources and products of ecotourism.
- 3.7 Types of Ecotourism; Agro-tourism, Geo-ecotourism, Cultural-ecotourism- tangible and intangible heritage and tourism.
- 3.8 Ecotourism management Plans.

07L**Chapter 2: Ecotourism resource in India and community participation**

- 4.1 Eco-regions; vegetation types; Protected areas.
- 4.2 Endemism and biodiversity hotspots
- 4.3 Community participation in ecotourism- sustainability of ecotourism.
- 4.4 Ecotourism in developed countries
- 4.5 Community based ecotourism.
- 4.6 Joint forest management, Role of NGO's, Ethical and legal aspects.
- 4.7 Impact of ecotourism, Green report card, Environmental sustainability practices.

Suggested Readings:

1. Agritourism, Micha, Sznajder, Lucyna Przezbórska, Frank Scrimgeour CABI, 2009
2. International Handbook on Ecotourism – Import, 30 August 2
3. Routledge Handbook Ecotourism (Routledge Environment and Sustainability Handbooks) Hardcover – Import, 22 September 2021
4. Agricultural Policy Framework for Maharashtra: Issues and Options. Dev, M. S. Proceeding/Project Report No. 21, July 1996, Indira Gandhi Institute of Development Research, Mumbai. (1996).
5. Agro-Tourism: Innovative Supplementary Income Generating Activity for Enterprising Farmers. Taware, P. <https://www.agritourism.in/>
6. Farm-Based Recreation: A Statistical Profile Brown, D. M., Reeder, R. J. USDA, Economic Research Service, USA. (2007).

7. The Business of Tourism. Holloway, J.C. Prentice Hall, London. (2002).
8. Tourism Operations and Management. Roday, S., Biwal, A., Joshi. V. Oxford University Press, New Delhi. (2009).
9. Tourism: Practices, Principles and Philosophies. Goeldner, C. R., Brent Ritchie, B. J. John Wiley and Sons, London. (2011).
10. Travel Agency and Tour Operations. Bhatia, A. K. Sterling Publications, New Delhi. (2012).
11. Ecotourism 3rd Edition David A. Fennell.

Course Outcome

After completion of this course Students are able to,

- Define and Discuss agro-tourism and Ecotourism and articulate the latest trends.
- Describe interdisciplinary academic approaches, theories, and critical lenses on tourism.
- Explain the regulations, impediments, key organizations, and partnerships required.
- Identify multiple career opportunities in Agro-Tourism and Ecotourism

NEP 2020
B.Sc First Year

Course : General / Open Elective
Code : BOGET 121
Subject : Plant Resources

Total Credit : 2
Course Type : Theory
Total Lecture : 30

Module I: Introduction to Plant Resources**15 Lectures****Chapter 1: Introduction****06L**

- 1.1 Introduction,
- 1.2 Diversity of plants
- 1.3 Distribution of plants
- 1.4 Difference between Edible plants and Major food crops.
- 1.5 [Reference: Thomas \(2004\)](#)

Chapter 2: Uses:**09**

- 2.1 Primary uses of plants in daily life
- 2.2 Types of plant resources
- 2.3 Medicinal Plants,
- 2.4 Food plants,
- 2.5 Woody Plants,
- 2.6 Plants with general uses,
- 2.7 repellent plants and others.
- [Reference: Simpson & Ogorzaly \(1986\)](#)

Module II: Economic & Aesthetic Value of Plants**15 Lectures****Chapter 3: Economic importance of plant****09L**

- 3.1 As an Industrial Uses,
- 3.2 As a Medicinal,
- 3.3 As a Food,
- 3.4 As a Wood,
- 3.5 As a Fiber,
- 3.6 As a Fodder,
- 3.7 As a Pharmaceutical use
- 3.8 Economic crops and their cultivation- Onion, Cotton
- [Reference: Simpson & Ogorzaly \(1986\)](#)

Chapter 4: Aesthetic value and Beauty**06 L**

- 4.1 Landscape design- Introduction, Requirements, Plants used in landscape design, Plants as beauty of nature.
- 4.2 Plants used in garden development
- 4.3 Aesthetic value of plants

Suggested Readings:

- Economic Botany: Plants in Our World, 3rd Edition by Beryl Brintnall Simpson & Molly Conner-Ogorzaly
- Botany for Gardeners, Revised Edition by Brian Capon
- Botany in a Day: Thomas J. Elpel's Herbal Field Guide to Plant Families, 4th Ed. Thomas J. Elpel
- Rashtra Vardhana.2009. Economic Botany. Sarup Book Publishers Pvt. Ltd, New Delhi – 110002.

Course Outcome:

At the end of course, student will be able to,

- Discuss the economic importance of plants.
- To study the various plant resources.
- To gain the knowledge about economically important crops.

NEP 2020
B.Sc First Year

Course	: General / Open Elective	Total Credit	: 2
Code	: BOGEP 112	Course Type	: Practical
Subject	: Practical on Agro-tourism and Eco-tourism	Total Lecture	: 12

Practical on Agro-tourism and Eco-tourism	15 Lectures
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- | | | |
|----|---|----|
| 1 | To study the difference between Indian and Abroad agro tourism. | 1P |
| 2 | To study the different types of cropping pattern. | 1P |
| 3 | To study the different geographical factors involved in agro-tourism. | 1P |
| 4 | To study the daily activities in the agriculture farm. | 1P |
| 5 | To study the different requirement involved in agro tourism | 1P |
| 6 | Prepare a model of agro tourism | 1P |
| 7 | To study the difference between agro tourism and Eco-tourism in India | 1P |
| 8 | Prepare a model of Eco-tourism | 1P |
| 9 | To study the different rural games involved in agro tourism | 1P |
| 10 | Visit to rural festival/ Jatra/ farmers market/ milking the cow and buffalos/ religious temple. | 1P |
| 11 | Visit to agro tourism center/Eco tourism center | 1P |

Suggested Readings:

1. Agritourism, Micha, Sznajder, Lucyna Przezbórska, Frank Scrimgeour CABI, 2009
2. International Handbook on Ecotourism – Import, 30 August 2
3. Routledge Handbook Ecotourism (Routledge Environment and Sustainability Handbooks) Hardcover – Import, 22 September 2021
4. Agricultural Policy Framework for Maharashtra: Issues and Options. Dev, M. S. Proceeding/Project Report No. 21, July 1996, Indira Gandhi Institute of Development Research, Mumbai. (1996).
5. Agro-Tourism: Innovative Supplementary Income Generating Activity for Enterprising Farmers. Taware, P. <https://www.agritourism.in/>
6. Farm-Based Recreation: A Statistical Profile Brown, D. M., Reeder, R. J. USDA, Economic Research Service, USA. (2007).
7. The Business of Tourism. Holloway, J.C. Prentice Hall, London. (2002).
8. Tourism Operations and Management. Roday, S., Biwal, A., Joshi. V. Oxford University Press, New Delhi. (2009).
9. Tourism: Practices, Principles and Philosophies. Goeldner, C. R., Brent Ritchie, B. J. John Wiley and Sons, London. (2011).
10. Travel Agency and Tour Operations. Bhatia, A. K. Sterling Publications, New Delhi. (2012).
11. Ecotourism 3rd Edition David A. Fennell.

Course Outcome:**After the completion of the course, students are able to,**

- Understand the concept of Agro-tourism and Eco-tourism
- Study the different centres of Agro-tourism and Eco-tourism
- Understand the importance of Agriculture and Ecology in tourism
- Design the model for Agro and Ecotourism center.



Prof. Ramkrishna More Arts, Commerce and Science College

(Autonomous College)

Akurdi Pradhikaran, Pune 411044.

www.pdearmacs.edu.in

Course Code: GEIKT-111 (Generic IKS)
Course Name: A Basic Course on Indian Knowledge System
Credits: 02
Course Duration: 01 Semester

Course Aim and Objectives:

Bhārata boasts a rich and versatile knowledge system and cultural heritage that has evolved over millennia. Originating during the Vedic period and the Saraswatī-Sindhu Civilization, and continuing through the Middle Ages to modern times, the Bhāratīya knowledge system has had a profound and enduring influence. The course “A Basic Course on Indian Knowledge System” introduced in NEP 2020 This course focuses on the historical development of ideas in ancient society, exploring their implications for understanding the material world, as well as religious, social, and cultural beliefs. Upon closer examination, it becomes evident that religion, culture, and science are epistemologically interconnected within the Bhāratīya knowledge system. Bhārata has made invaluable contributions to society and the world across various spheres, including aeronautics, astronomy, mathematics, life science, medical science, architecture, polity, trade, art, music, dance, literature, and drama. By studying these interconnected areas, one can gain a comprehensive understanding of the depth and breadth of the Bhāratīya knowledge system and its cultural heritage.

The Indian Knowledge System course is not just an academic endeavor but a vital component of holistic education. It nurtures a deeper understanding of India's intellectual traditions and their relevance in contemporary times, fostering a balanced and enriched perspective on life and knowledge.

Learning Outcomes

- Understanding the foundational concepts and principles of IKS
- Appreciating the contributions of ancient Indian scholars and scientists
- Integrating IKS perspectives into modern academic and practical contexts
- Promoting cultural awareness and appreciation of India's intellectual heritage

Credits: 2 (30 Hours)

Course Contents

UNIT -I: Bharatiya Civilization and Knowledge System

(6 hours)

The primary sources of ancient Indian philosophy: Vedas and Upanishads, Overview of the six schools of Indian philosophy. Ancient Indian civilization: the discovery of the Saraswatī River and the Saraswatī-Sindhu civilization. The ancient Indian education system: Gurukul system, Takṣaśilā University, Nālandā University, and their notable alumni. History of knowledge export from Bhārata.

[प्राचीन भारतीय तत्त्वज्ञानाचे प्राथमिक स्रोत: वेद आणि उपनिषद, भारतीय तत्त्वज्ञानाच्या सहा शाळांचे मसांहावलोकन. प्राचीन भारतीय सांस्कृती: सरस्वती नदीचा शोध आणि सरस्वती-मसांधू सांस्कृती. प्राचीन भारतीय शिक्षण पद्धती: गुरुकुल पद्धती, तक्षमशला मवद्यापीठ, नालंदा मवद्यापीठ आणि त्ांच्या प्रसिद्ध िाजी मवद्यापी. भारतातून ज्ञान मनयातीचा इमतहास.]

UNIT-II: Arts, Literature, and Scholars in Ancient India

(6 hours)

The history of ancient Indian art, music, and dance. Natarāja a unique symbol of Indian art. In the field of literature, the works of Agastya, Ghṛṣā, Vālmīki, Patañjali, Gārgī, Vedwalmiki, Lopāmudrā, Maitreyī, and Bodhāyana. In the fields of science and medicine, the contributions of Caraka, Suśruta, Jīvaka, Nāgārjuna, Kaṇāda, Patañjali, Kauṭīlya, Pāṇini, Thiruvalluvar, Ādi Śaṅkarācārya, Bhāskarācārya, and Mādhavācārya

[प्राचीन भारतीय कला, सांगीत, आणि नृत्ाचा इमतहास. नटराज हा भारतीय कलेचा एक अमितीय प्रतीक. सामहत् क्षेत्रात अगस्त्य, घोषा, वाल्मिकी, पतांजली, गागी, वेदवािमिक, लोपाुद्रा, िेत्रेयी आणि बोधायन यांचे काया. मवज्ञान आणि वैद्यक क्षेत्रात चरक, सुश्रुत, जीवक, नागाजुन, किद, पतांजली, कौमटल्य, पामिनी, मतरुवल्लुवर, आमद शांकराचाया, भास्कराचाया आणि िाधवाचाया यांचे योगदान..]

UNIT-III: Ancient Science, Astronomy, and Mathematics

(6 hours) ,

Āryabhaṭa and Varāhamihira's contributions, concepts like matter, life, and gravity, technological advancements like Sage Agastya's battery model, the velocity of light, and Vimāna aeronautics. Vedic cosmology, Bhāratiya Kāla-gaṇanā, Kerala School for Mathematics and Astronomy, history and culture of astronomy, celestial bodies such as the sun, earth, moon, eclipses, earth's spherical nature and rotation, archaeoastronomy, mathematical concepts zero, pi, number system, Pythagoras theorem, and Vedic mathematics.

[आयाभट्ट आणि वराहमिहिरांचे योगदान, पदाथा, जीवन, आणि गुरुत्वाकर्षाि या सांकल्पनांचे िहत्त्व, सांगिकीय प्रगती, जसे की सेज अगस्त्यांच्या बॅटरी िंडेल, प्रकाशाची वेगता, आणि मविन वायुयान, वैमदक ब्रह्ांडशास्त्र, भारतीय काल-गिना, के रळ सांख्याशास्त्र आणि खगोलशास्त्राचा इमतहास व सांस्कृती, सूया, पृथ्वी, चंद्र, ग्रहि, पृथ्वीच्या गोलाकार आणि घुटि, पुरातत्त्वशास्त्र, शून्य, पाई, सांख्या प्रिली, पायथागोरसचा प्रिय, आणि वैमदक गमित.]

UNIT-IV: Ancient Engineering, Technology, and Architecture

(6 hours)

Urban planning and sophisticated drainage systems: Mohenjo-daro and Harappa. Rock-cut architecture : Ajanta and Ellora caves, temple designs found in Khajuraho and Konark. Stepwells (Baolis): water management systems. metallurgical techniques for metal extraction and artifact crafting. Textile technology such as weaving and dyeing. Scientific instruments used for astronomical observations and calculations. Bhāskarācārya and his contributions to mathematics. Trade and Commerce in Ancient India.

[नगर योजना आढि ढुरगत ढनजालीकरि ढुरिली: िोहनजो-दारो आढि हरढ्ढा. ढशलामचत्र कला: अजांता आढि एलोरा लेण्ांकी चालक शैली, खजुराहो आढि कोिाका िधील िांढदर ढडझाइन. ढायराडी (बावली): ढाण्ाचे व्यवस्थाढन ढुरिली. धातूची शैली: धातू ढनकालण्ाची आढि अढभजात वास्तुकला. काढडी तांत्रज्ञान जसे की बुनि आढि रां गि. खगोलशास्त्रात वाढरलेले वैज्ञाढनक उपकरि आढि गिना. भास्कराचाया आढि त्ांाचा गढितातील ढोगदान. ढुराचीन भारतातील व्याढार आढि वाढिज्य.]

UNIT-V: Life, Environment, and Health in Ancient India (6 hours)

Ancient Indian Religions: Hinduism, Buddhism, Jainism, Sikhism: Teachings and Philosophies, Ancient agricultural practices, crop cultivation techniques, and innovations. Comprehensive healthcare systems integrating Āyurveda, yoga, and other traditional practices. Surgical techniques and procedures practiced in ancient India

[ढुराचीन भारतीय धि: ढहांदू धि, ढौद्धधि, जैनधि, ढसखधि: ढशक्षि आढि दशान, ढुराचीन कृ ढष ढुरथा, ढसल उत्पादन तांत्रज्ञान आढि नवीन उपक्रि.

आयुवेद, ढोग आढि इतर ढारांढररक व्यवस्थांाच्या सांयुक्त स्वास्थ्यव्यवस्था. ढुराचीन भारतातील क्षेत्रजन्य तांत्रज्ञान आढि ढुरढक्रया.]

Text books:

1. History of Science in India Volume-1, Part-I, Part-II, Volume VIII, by Sibaji Raha, et al. National Academy of Sciences, India and The Ramkrishan Mission Institute of Culture, Kolkata (2014).
2. Textbook on The Knowledge System of Bhārata by Bhag Chand Chauhan,

Suggested Readings:

1. A History of Ancient and Early Medieval India: From the Stone Age to the 12th Century" by Upinder Singh:
2. Pride of India- A Glimpse of India's Scientific Heritage edited by Pradeep Kohle et al. Samskrit Bharati (2006).
3. Vedic Physics by Keshav Dev Verma, Motilal Banarsidass Publishers (2012).
4. "Indian Art and Culture" by Nitin Singhanian, McGraw Hill

NEP-2020 First Year UG Environmental Awareness (Value Education Course)

Course Code – VEAET 111

Course Type-Theory

No. of Credits: 02

No. of Periods: 30

MODULE-1

[12 L + 3T]

Unit 1: Introduction to environmental studies

[02 L]

- Multidisciplinary nature of Environmental studies;
- Scope and importance; Concept of sustainability and sustainable development.

Unit 2: Ecosystems

[06 L]

- Concept and structure.
- Ecosystem functions.
- Types of Ecosystem.

Unit 3: Biodiversity and Conservation

[07 L]

- India as a mega-Biodiversity nation; Endangered and endemic species of India
- Threats to Biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions;
- Conservation of Biodiversity: In-situ and Ex-situ conservation of Biodiversity.

MODULE-2

[12 L + 3T]

Unit 4: Environmental Pollution

[07 L]

- Environmental pollution: types, causes, effects and controls; Air, Water, and Soil pollution.
- Solid and liquid waste management: Control measures of urban and industrial waste.

Unit 5: Environmental Programs and Policies

[08 L]

- Developed Countries, Developing Countries.
- New Environmental policy of India; Government initiatives.

Suggested Readings:

1. Singh R. B. (1993) Environmental Geography. Delhi, India: Heritage Publishers.
2. Odum, E.P., Odum, H.T. & Andrews, J. 1971. Fundamentals of Ecology. Philadelphia: Saunders.
3. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.
4. Rosencranz, A., Divan, S., & Noble, M. L. 2001. Environmental law and policy in India. Tripathi 1992.
5. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.
6. Gadgil, M., & Guha, R. 1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
7. Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge.
8. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi

Unit-1: The Concept of Democracy

- A. Meaning – Nature and Definition.
- B. Origin and Development.
- C. Types of Democracy. Direct and Indirect

- Unit-2:**
- A. Major Feature of Democracy.
 - B. Social Democracy.
 - C. Demerits of Democracy.

Unit-3: Making of Indian Constitution.

- A. Fundamental Rights in the Indian Constitution.
- B. Basic Structure of the Indian Constitution.

- Unit: 4**
- A. Fundamental Duties of Citizens
 - B. Election Commission of India (Electoral Reforms/ E.V.M./Code of Conduct)

English Reference Books/Text

1. An introduction to Political Theory, Author: Rajiv Bhargava Publication: Pearson.
2. Bryce, Modern Democracies.
3. E. Asirvatham, political Theory.
4. Bharatiya Rajyaghatna va Ghatanatmak prakriya, Author: Tukaram Jadhav
Publication: Unique Academy Pune.
5. Introduction to the Constitution of India Author: Dr. Durga
मराठी संदर्भ साधने:
 - १) डॉ. बाळ कांबळे, २०१२, भारताची राज्यघटना, राजकारण व कायदा डायमंड प्रकाशन पुणे.
 - २) पाटील बी. बी., २०१६, भारतीय शासन आणि राजकारण फडके प्रकाशन कोल्हापूर.
 - ३) डॉ. जोती बीडलन, डॉ. देशपांडे. भारतीय संविधानाचा परिचय, निराली प्रकाशन, पुणे.
 - ४) प्राचार्य. काने राजकीय सिद्धांत आणि राजकीय विचार, पिंपळापुरे प्रकाशन, नागपूर
 - ५) प्रा. प्रमोद तांबे, राज्यशास्त्र परिचय, निराली प्रकाशन, पुणे.
 - ६) डॉ. विजय देव, आधुनिक राजकीय विश्लेषण कोश, डायमंड प्रकाशन, पुणे,
 - ७) भार्गव राजीव, राजकीय सिद्धांत परिचय, अनुवाद-हेमंत खानझोडे, पीयरसन प्रकाशन.
 - ८) ना य. डोळे, राजकीय विचाराचा इतिहास, कॉन्टिनेन्टल प्रकाशन, पुणे.

PROGRAMME OUTCOMES

Political Science undergraduate program was born out of recognition of the increasing significance of cross-disciplinary studies in the social sciences. The program is organized around the combined perspectives and analytical tools of Sociology, Political Science, International Relations, and History.

1. Develop knowledge of theories, concepts, and research methods in humanities and social sciences.
2. Assess how global, national and regional developments affect society.

3. The Political Science degree furnishes the students with a unique multidisciplinary approach in social sciences and prepares them for further academic study and for careers in the public and the private sector.

Video Lecture Links

Unit 1: <https://youtu.be/fJaLKyF8Qhw?si=qhL26a4lYps9UV4C>

Unit 1 and 2 : <https://www.youtube.com/watch?v=DXcJoihea7Y>

Unit 2: <https://www.youtube.com/watch?v=GIyyEBlpH4>

Unit 3: <https://youtu.be/XCvTZzvzh2E?si=kd4eVMXfTTf-IsAL>

Unit 4: https://drive.google.com/file/d/1v_E9q_5UwgyVXF0BcR35u2LOgYVMgYa7/view

प्रथम वर्ष कला, SEM-I

व्यावहारिक मराठी भाग -१ AEC - MAAET-111

अभ्यासक्रम :

घटक	तपशील	श्रेयांक	घड्याळी तास
१.	अर्जलेखन अर्जलेखन विविध नमुने –विनंती अर्ज , संगणकीय अर्ज ,माहिती अधिकारातील अर्ज इ .	१	१५
२	- भाषांतर - साग्रहण - परिच्छेद लेखन	१	१५

संदर्भ ग्रंथ

- व्यावहारिक मराठी –ल.रा.नासिराबादकर .
- व्यावहारिक व उपयोजित मराठी –डॉ.वेदश्री थिंगळे ,डॉ. प्रभाकर जोशी .

CO 1 नोकरीसाठी अर्ज करता येईल .

CO 2 भाषांतर करता येईल .

CO 3 साग्रहण करता येईल .

CO 4 व्यावहारिक मराठीतील वाक्यांचे समजतील .

प्रथम वर्ष कला ,SEM-II

व्यावहारिक मराठी भाग -१ AEC- MAAET-121

अभ्यासक्रम :

घटक	तपशील	श्रेयांक	घड्याळी तास
१.	पत्रलेखन पत्रलेखनाचे विविध प्रकार व घटक व स्वरूप	१	१५
२	- संवादलेखन - पारिभाषिक संज्ञा - निबंध लेखन	१	१५

संदर्भ ग्रंथ

- व्यावहारिक व उपयोजित मराठी – डॉ. प्रभाकर जोशी , डॉ .वासुदेव वळे ,प्रशांत पब्लिकेशन.
- व्यावहारिक मराठी –ल.रा.नासिराबादकर .

CO 1 पत्र लिहिता येईल व पत्राचे इतर प्रकार समजतील .

CO 2 संवाद लेखन करता येईल .

CO 3 कार्यालयीन पत्रव्यवहार करता येईल .

CO 4 पारिभाषिक संज्ञा समजतील .

Ability Enhancement Courses (AEC), Hindi

AEC FIRST YEAR- BBA, B.VOC, BCS, BBA CA, B.Sc, SEMESTER-I & II] २०२३-२४ से		
Title of the Course	सामान्य हिंदी SEMESTER --I & II	Number of Credits : 02
Course Code	HIAET-111 AEC सामान्य हिंदी - I] कहानी, कविता और निबंध लेखन [HIAET-121 AEC सामान्य हिंदी - II] कहानी, कविता और व्यावहारिक हिंदी [	

HIAET-111 AEC सामान्य हिंदी - I] कहानी, कविता और निबंध लेखन

Unit No.	Title of Unit and Contents	No. of Lectures
I	अ] कहानी विधा - १. एक टोकरी भर मिट्टी- माधवराव सप्रे २. कफ़न-प्रेमचंद ३. आकाश द्वीप- जयशंकर प्रसाद ४. क्लेम- मोहन राकेश	12
II	आ] कविता विधा- १. फूल की चाह- माखनलाल चतुर्वेदी २. जन-जन का चेहरा एक- गजानन माधव मुक्तिबोध ३. माँ- चित्रा डोंगे ४. नॉट आउट- प्रवीण कोटला	10
III	इ] साहित्येतर पाठ्यक्रम १. निबंध लेखन] पर्यावरण, आत्मकथा, विज्ञान, समस्या, समाचार आदि [२. पत्राचार लेखन] सरकारी गैर सरकारी[	8

संदर्भ ग्रन्थ-

- १ [हिंदी कथाधारा- सं. दूधनाथ सिंह
- २ [गद्य वैभव- सं. राजेंद्र खैरनार
- ३ [वसुधा- चित्रा डोंगे
- ४ [फिर से शून्य- प्रवीण कोटला
- ५ [हिंदी कविता- सं. दूधनाथ सिंह

Course Outcomes (COs) On completion of the course, the students will be able to:	
CO1	हिंदी कहानियों की गरिमा को समझ जायेंगे।
CO2	चरित्र प्रधान कहानियों की जानकारी प्राप्त होंगी।
CO3	घटना प्रधान कहानियों से परिचित हो जायेंगे।
CO4	आत्मकथा परक विषयों पर निबंध लिखना सिख जायेंगे।
CO5	सरकारी कार्यालयों के लिए पत्राचार करना सिख जायेंगे।
CO6	सरकारी पत्राचार के महत्व को समझ जायेंगे।

F.Y. BSC,BCS,VOC,BBA &ALL SCI DEPT Semester II		
Title of the Course	II –SEMESTER HIAET-121 सामान्य हिंदी –II [कहानी,कविता और व्यावहारिक हिंदी]	Number of Credits : 02
Course Code	HIAET-121 सामान्य हिंदी – II	
Unit No.	Title of Unit and Contents	No. of Lectures
I	अ] कहानी विधा – १.उसने कहा था– चंद्रधर शर्मा गुलेरी' २. खेल– जैनेन्द्र कुमार ३.लाल पान की बेगम– फनीश्वरनाथ रेणु ४.पार्वती एक– दीप्ती खंडेलवाल	10
II	ब) कविता विधा – १.तोड़ती पत्थर– निराला २.हम दीवानों की क्या हस्ती– भगवती चरण वर्मा ३.अकाल और उसके बाद– नागार्जुन ४.साथी दुःख से घबराता हूँ– नीरज	10
III	क] पाठ्यपुस्तकें 1.कल्पना विस्तार 2.पारिभाषिक शब्दावली १.कल्पना विस्तार] विषय:- १[जहाँ सुमति वहाँ सम्पति नाना, २[जिन खोजा तिन पाइयां गहरे पानी पैठी, ३[मन के हारे हार हैं.मन के जीते जीत ४[वही मनुष्य हैं कि जो मनुष्य के लिए मरे, ५[पराधीन सपने हूँ सुख नहीं २.पारिभाषिक शब्द] अंग्रेजी के 30 शब्द हिंदी पर्याय :-	10

	1)ACCOUNT-लेखा/ खाता 2)BILL-विधायक 3] CIRCULAR-परिपत्र 4] COMMISSION-आयोग 5] DESIGNATION-पदनाम 6] DIRECTOR-निर्देशक 7] EMPLOYEE-कर्मचारी 8] FUND-निधि 9] FACULTY-संकाय 10] GRANT-अनुदान 11] HEAD-प्रमुख 12] INVESTIGATER-अन्वेषक 13] JUDGE-न्याय देनेवाला 14] ISSUE-जारी करना 15] JUNIOR-कनिष्ठ 16] LEAVE-छुट्टी/ अवकाश 17] MANAGER-प्रबंधक 18] MINISTER-मंत्री 19] MINISTRY-मंत्रालय 20] NOTICE-सूचना 21] OFFICIAL- कार्यालयीन 22] PLAN-योजना 23] POST-पद 24] QUALIFICATION-अहर्ता,योग्यता 25] RECORD-अभिलेख/ रिकार्ड 26] REGISTRATION-पंजीकरण 27] SANCTION-स्वीकृति/ मंजूरी 28] SECRETARY-सचिव 29] TRANSFER-तबादला/ बदली 30] UNDERTAKING-उपक्रम/ वचनबद्धता 31] WHIP-सचेतक	
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संदर्भ ग्रन्थ-

१ [हिंदी कथाधारा- सं.हिंदी अध्ययन मंडल,प्रा.रामकृष्ण मोरे महाविद्यालय,आकुर्डी पुणे- ४४

२ [काव्य वैभव- सं . हिंदी अध्ययन मंडल,प्रा.रामकृष्ण मोरे महाविद्यालय,आकुर्डी पुणे- ४४

Course Outcomes (COs) On completion of the course, the students will be able to:	
CO1	हिंदी कहानियों की गरिमा को समझ लेंगे।
CO2	चरित्र प्रधान कहानियों की जानकारी प्राप्त कर लेंगे।
CO3	घटना प्रधान कहानियों से परिचित हो जायेंगे।
CO4	कल्पना विस्तार का महत्व समझ लेंगे।
CO5	पारिभाषिक शब्दों की जानकारी प्राप्त कर लेंगे।
CO6	पारिभाषिक शब्दावली की महत्ता को समझ जायेंगे।
अंक विभाजन- पूर्णांक = 50 आंतरिक परीक्षा- 15 अंक शोध परियोजना, समूह चर्चा, मौखिक प्रस्तुति, क्षेत्रीय अध्ययन आदि। सत्रांत परीक्षा- 35 अंक समय- दो घंटे पूर्णांक- 35 १. प्रथम इकाई पर प्रश्न] दो में से एक [१० अंक २. द्वितीय इकाई पर प्रश्न] दो में से एक [१० अंक ३. तृतीय इकाई पर प्रश्न] तीन में से एक निबंध लेखन [१० अंक ४. तृतीय इकाई] पत्राचार लेखन [५ अंक	

Curricular Course; 2 Credits, 60L (Sem.-II)

CCPEP-121: Physical Education and Sports

Theory and Active Participation

- Introduction to Physical Education and Sports
- Concept of Physical Education, its Definition and Scope.
- Concept of Physical Fitness
- Components of Health Related Physical Fitness
- (Cardio-vascular Endurance, Muscular Strength, Endurance, Flexibility, and Body Composition)
- Components of Skill Related Physical Fitness (Agility, Balance, Co-ordination, Speed, Power, Reaction Time)
- Concept of Health, Wellness, and Health & Hygiene.

Fitness Assessment & Participation in Sports

In order to improve the physical fitness standards of students, they should be given opportunity and facilities to participate in Physical Fitness Activity and a game / sport from the list of Association of Indian Universities, New Delhi (List of events available on website www.aiuweb.org). The choice of game / sports will be according to the facilities available in the college.

Participation in Fitness Activity:

- Every student should participate in Fitness Activity for 12 hours.

Participation in Games and Sports:

- A student will have to select one game/sport from the list of Association of Indian Universities, New Delhi (List of events available on website www.aiuweb.org). The choice of game/sports will be according to the facilities available in the college.

Every student should participate in Games and sports for 12 hours.

Fitness Assessment:

- Cardiovascular Endurance
- Flexibility
- Muscular Strength Endurance
- Body Composition (No marks)

EVALUATION STRUCTURE:

Table 1

Course	Type of Assessment	Marks	Mode of Evaluation
COURSE – CCPEP-121 PHYSICAL EDUCATION, SPORTS	Internal Assessment	15	Assignment (15 marks) Project on the selected Sports Event
	External Assessment	35	Participation (10 marks) (24 hrs. of participation in Fitness and selected game/sport). Practical – Fitness Test- 25 marks

To complete first credit of Course – Physical Education, Sports, Teacher will have to **conduct 5 theory lectures** (college may schedule these lectures during first or second semester before

fitness assessment) and student will have to attend 5 theory lectures and has to participate in Fitness and selected game / sport for **minimum 24hrs.and submit the assignment.**

- Procedure for fitness tests are given in the guidelines section which also includes Norms Table. Marks to be awarded in accordance with the norms table.

Sr. No.	Component	Test	Marks
1	Cardiovascular Endurance (Any One)	1. Modified Queens College Test or 2. 12 Min. Run Walk	10
2	Flexibility	2. Sit and Reach Test	05
3	Muscular Strength Endurance	3. Bent Knee Sit Ups	10
4	Body Composition	4. Fat Percentage	----
Total			25

CONSIDERATIONS AND EXEMPTIONS:

Differently Able Students

Differently able students will be exempted from the course **CCPEP-121 PHYSICAL EDUCATION AND SPORTS** after producing the valid documents. This is not depriving them from the equality of opportunity with other students. The student shall have to submit his/her medical certificate at the time of admission from a Civil Surgeon of respective District Civil Hospital.

Important Note:

- Temporary illness will not give students exemption from the course. If he / she miss any assessment/task he / she will be given opportunity in the ensuing semester.

Exemption

Any Student representing college / institute in the enlisted games of Association of Indian Universities / Indian Olympic Association / State Olympic Association shall be **exempted from mandatory participation in selected game / sport for minimum 24hrs** of first credit

Question Paper Pattern Courses Related to Botany

Marks: 35		Time: 2 Hour	
Instructions to the Candidate:			
1. All questions are compulsory.			
2. Figures to right indicate full marks.			
3. Use of Log table and scientific calculator is allowed./ Draw well labelled diagram wherever necessary.			
Question-1	Solve Any five of the following (Short Answers) i. ii. iii. iv. v. vi. vii.	Three def. type, two tricky questions and two questions problem type (if applicable)	5 Marks
Question-2	A. Solve any two of the following i. ii. iii.	Note or Describe type questions	6 Marks
	B. Solve the following Single question of four marks i. ii.	Problem type or tricky reasoning type question	4 marks
Question-3	A. Solve any two of the following i. ii. iii.	Write Note / Differentiate type questions	6 Marks
	B. Solve the following Single question of four marks i. ii.	Problem type or Derive equation or Tricky discussion type question	4 marks
Question-4	Solve Any four of the following i. ii. iii. iv. v.	Application type, Justification type question	10

