

Syllabus for B.Sc. (Honors) Microbiology

FOUR-YEAR FULL TIME HONORS PROGRAMME

(Under UGCF 2022)

Based on NEP 2020

Meeting of CoC held on 27-04-2022

Meeting of Faculty held on 1-6-22

Passed by Academic Council on

Passed by Executive Council on



***Note: Syllabi applicable for students seeking admission in the
B.Sc. (H) Microbiology Programme from the academic year 2022-2023***

**DEPARTMENT OF MICROBIOLOGY
FACULTY OF INTERDISCIPLINARY AND APPLIED SCIENCES
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INTRODUCTION AND OBJECTIVES OF UGCF 2022

The Undergraduate Curriculum Framework- 2022 (UGCF) is meant to bring about systemic change in the higher education system in the University and align itself with the National Education Policy 2020. The Preamble of the Undergraduate Curriculum Framework-2022 underlines the historical perspective, philosophical basis, and contemporary realities of higher education as enshrined in the National Education Policy 2020 and endeavours to synchronize these cornerstones while charting the road ahead for the state of higher education.

The following objectives of NEP are kept in perspective while framing UGCF:

- ▶ to promote holistic development of students having the world view of a truly global citizen;
- ▶ to provide flexibility to students so that learners have the ability to choose their learning trajectories and programmes, and thereby choose their paths in life according to their talents and interests;
- ▶ to eliminate harmful hierarchies among disciplines/fields of study and silos between different areas of learning;
- ▶ multidisciplinary and holistic education to ensure the unity and integrity of all knowledge;
- ▶ to promote creativity and critical thinking and to encourage logical decision-making and innovation;
- ▶ to promote ethics and human & Constitutional values;
- ▶ to promote multilingualism and the power of language in learning and teaching;
- ▶ to impart life skills such as communication, cooperation, teamwork, and resilience;
- ▶ to promote outstanding research as a corequisite for outstanding education and development;
- ▶ to incorporate Indian Knowledge System relevant for a particular discipline or field of studies.

The UGCF 2022 clearly brings out the multidisciplinary approach, adhering to innovative ways within the curriculum framework to allow the student maximum flexibility in pursuing his/ her studies at the undergraduate level to the extent of having the liberty to eventually design the degree with multiple exit options depending upon the needs and aspirations of the student in terms of his/ her goals of life, without compromising on the teaching learning, both in qualitative and quantitative terms.

ABBREVIATIONS

1. 'AEC' indicates 'Ability Enhancement Course'
2. 'DSC' indicates 'Discipline Specific Core'
3. 'DSE' indicates 'Discipline Specific Elective'
4. 'GE' indicates 'Generic Elective'
5. 'SEC' indicates 'Skill Enhancement Course'
6. 'VAC' indicates 'Value Addition Course'

DEFINITIONS

1. **Academic credit** – An academic credit is a unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week.
2. **Courses of study** – Courses of the study indicate pursuance of study in a particular discipline. Every discipline shall offer three categories of courses of study, viz. Discipline Specific Core courses (DSCs), Discipline Specific Electives (DSEs) and Generic Electives (GEs).
 - a) **Discipline Specific Core (DSC):** Discipline Specific Core is a course of study, which should be pursued by a student as a mandatory requirement of his/her programme of study. DSCs shall be the core credit courses of that particular discipline which will be appropriately graded and arranged across the semesters of study, being undertaken by the student, with multiple exit options as per NEP 2020. The DSCs specified in the framework would be identified by the concerned Department as core courses to be taught in a Programme.
 - b) **Discipline Specific Elective (DSE):** The Discipline Specific Electives (DSEs) shall be a pool of credit courses of that particular discipline (single discipline programme of study) or those disciplines (multidisciplinary programme of study), as the case may be, which a student chooses to study from his/her particular discipline(s). There shall be a pool of DSEs from which a student may choose a course of study. The DSEs specified in the framework would be identified by the concerned Department as elective courses to be taught in a Programme.
 - c) **Generic Elective (GE):** Generic Electives shall be a pool of courses which is meant to provide multidisciplinary or interdisciplinary education to students. GEs shall consist of a pool of courses offered by various disciplines of study (excluding the GEs offered by the parent discipline), in groups of odd and even semesters, from which a student can choose. The GEs specified in the framework would be identified by the concerned Department as GEs to be taught in a Programme.
 - d) **Ability Enhancement course (AEC), Skill Enhancement Course (SEC) & Value Addition Course (VAC):** These three courses shall be a pool of courses offered by all the Departments in groups of odd and even semesters from which students can choose.
 - (i) AEC courses are the courses based upon the content that leads to knowledge enhancement through various areas of study. They are

Language and Literature and Environmental Science and Sustainable Development which will be mandatory for all disciplines.

- (ii) SEC are skill-based courses in all disciplines and are aimed at providing hands-on training, competencies, proficiency and skills to students. SEC courses may be chosen from a pool of courses designed to provide skill-based instruction. Every discipline may provide skill-based courses, some of which may be offered to students of its discipline while the rest can be open to students of all other disciplines.
 - (iii) VAC courses are common pool of courses offered by different disciplines and aimed towards personality building; embedding ethical, cultural and constitutional values; promoting critical thinking, Indian Knowledge Systems, scientific temperament, communication skills, creative writing, presentation skills, sports & physical education and team work which will help in all round development of students.
3. **Major Discipline** - A student pursuing four-year undergraduate programme in a specific discipline shall be awarded an appropriate Honours degree with Major in the Discipline on completion of VIII Semester, if he/she secures in that Discipline at least 50% of the total credits i.e., at least 88 credits in that Discipline out of the total of 176 credits. He/she shall study 20 DSCs and at least 2 DSEs in eight semesters.
4. **Minimum acceptable level of academic standards** - The minimum acceptable level of achievement that a student must demonstrate to be eligible for the award of academic credit or a qualification is the minimum acceptable level of academic standards. The Letter Grades and Grade Points which shall be used to reflect the outcome of assessment process of the student's performance is indicated in Table - 1.

Table - 1

Letter Grade	Grade point
O (outstanding)	10
A+ (Excellent)	9
A (Very good)	8
B+ (Good)	7
B (Above average)	6
C (Average)	5
P (Pass)	4
F (Fail)	0
Ab (Absent)	0

STRUCTURE OF THE PROGRAMME

The UGCF structure for four-year undergraduate programmes in different disciplines offers multiple exit options. The details of the structure are provided below in Tables 2 and 3.

The structure provides a mandatory programme on Research Methodology as one of the discipline specific elective (DSE) courses at the VI & VII semester for students who opt for the Four Years Honors with Research degree. Further, provision for internship / apprenticeship/ project/ community outreach right from the III semester up to VI semester provides ample opportunity to the students to explore areas of knowledge / activity beyond the four walls of the classroom and reach out to the world outside without any dilution of the academic feature of the course of study, he/she is pursuing. This also acts a precursor for the students to take up academic project or entrepreneurship at a later stage in VII & VIII semester. Such an initiative will help in skill development and lay a strong foundation for research and thus contribute towards overall national development through the development of skilled manpower and innovation.

Table-2

Sl. No.	Type of Award	Stage of exit	Mandatory credits
1	<i>Undergraduate Certificate in the Discipline</i>	After successful completion of Semester II	44
2	<i>Undergraduate Diploma in the Discipline</i>	After successful completion of Semester IV	88
3	<i>Bachelor of (Field of Study) (Honours) Discipline</i>	After successful completion of Semester VI	132
4	<i>Bachelor of (Field of Study) (Honours with Research / Academic Projects/Entrepreneurship) Discipline</i>	After successful completion of Semester VIII	176

Table – 3
Bachelor of (Discipline) (Hons.)

Semester	Core (DSC)	Elective (DSE)	Generic Elective (GE)	Ability Enhancement Course (AEC)	Skill Enhancement Course (SEC)	Internship/ Apprenticeship/Project/ Community outreach (2)	Value addition course (VAC)	Total Credits
I	DSC - 1(4)		Choose one from a pool of courses GE-1 (4)	Choose one from a pool of AEC courses (2)	Choose one from a pool of courses (2)		Choose one from a pool of courses (2)	22 credits
	DSC - 2(4)							
	DSC - 3(4)							
II	DSC - 4(4)		Choose one from a pool of courses GE-2 (4)	Choose one from a pool of AEC courses (2)	Choose one from a pool of courses (2)		Choose one from a pool of courses (2)	22 credits
	DSC - 5(4)							
	DSC - 6(4)							
Students on exit shall be awarded Undergraduate Certificate (in the Discipline) after securing the								Total = 44
III	DSC - 7(4)	Choose one from pool of courses, DSE – 1 (4) OR Choose one from pool of courses, GE -3 (4)**		Choose one from a pool of AEC courses (2)	Choose one SEC OR Internship/Apprenticeship/ Project/Community Outreach (IAPC) (2)*		Choose one from a pool of courses (2)	22 credits
	DSC - 8(4)							
	DSC -9 (4)							
IV	DSC - 10(4)	Choose one from pool of courses, DSE – 2 (4) OR in the alternative choose one from pool of courses GE - 4 (4)**		Choose one from a pool of AEC courses (2)	Choose one SEC OR 'Internship/Apprenticeship/ Project/community outreach (IAPC) (2)*		Choose one from a pool of courses (2)	22 Credits
	DSC - 11(4) DSC – 12(4)							
Students on exit shall be awarded Undergraduate Diploma (in the Discipline) after securing the requisite 88 credits on completion of Semester IV								Total = 88
V	DSC - 13(4)	Choose one from a pool of courses DSE - 3 (4)	Choose one from a pool of courses GE-5 (4)		Choose one SEC OR Internship/Apprenticeship/ Project/Community Outreach (IAPC) (2)***			22 credits
	DSC – 14(4)							
	DSC- 15(4)							

VI	DSC - 16(4)	Choose one from a pool of courses DSE – 4 (4)^	Choose one from a pool of courses GE-6 (4)		Choose one SEC OR 'Internship/Apprenticeship/ Project/Research/Community Outreach (2)***		22 credits
	DSC -17 (4)						
	DSC -18 (4)						
<p align="center">Students on exit shall be awarded Bachelor of (in the Discipline) Honours (3 years) after securing the requisite 132 credits on completion of Semester VI</p>							Total = 132
VII	DSC-19 (4)	Choose three DSE (3x4)^ courses OR Choose two DSE- (2x4) and one GE (4) course OR Choose one DSE (4) and two GE (2x4) courses (total = 12) #				Dissertation on Major (6) OR Dissertation on Minor (6) OR Academic project/ Entrepreneurship (6)	22 credits
VIII	DSC -20 (4)	Choose three DSE (3x4) courses OR Choose two DSE- (2x4) and one GE (4) course OR Choose one DSE (4) and two GE (2x4) courses (total = 12) #				Dissertation on Major (6) OR Dissertation on Minor (6) OR Academic project/ Entrepreneurship (6)	22 credits
<p align="center">Students on exit shall be awarded Bachelor of (in the Discipline) (Honours with Research/Academic Projects/Entrepreneurship) after securing the requisite 176 credits on completion of Semester VIII</p>							Total = 176

- * There shall be choice in III and IV Semesters to choose either one 'SEC' or in the alternative 'Internship/Apprenticeship/Project/Community Outreach' in each Semester for two credits each.
- ** There shall be choice in Semester III and IV to either choose a DSE or a GE.
- *** There shall be choice in V and VI Semesters to choose either one 'SEC' or in the alternative 'Internship/Apprenticeship/Project/Research/Community Outreach' in each Semester for two credits each.
- # There shall be three choices in VII and VIII Semesters –
 - (i) to choose three DSEs of 4 credits each OR
 - (ii) to choose two DSEs and one GE of 4 credits each OR
 - (iii) to choose one DSE and two GEs of 4 credits each.
- ^ 'Research Methodology' shall be offered as one of the DSE courses in VI and VII Semesters. Students can opt for it either in VI semester or VII semester.

Dissertation/Academic Project/Entrepreneurship in the 4th year shall commence from VII semester and conclude in VIII semester. Detailed outcomes of each track chosen out of these three options shall be notified and assessment at the end of VII and VIII semesters shall be done accordingly.

(pages 2-8 of this document have been adopted from the University of Delhi's Undergraduate Curriculum Framework 2022 document)

Design of B.Sc. (Honors) Microbiology Program:

The teaching-learning will involve theory classes (Lectures) of one hour duration and practical classes. The curriculum will be delivered through various methods including chalk and talk, power-point presentations, audio, video tools, E-learning/ E-content, virtual labs, simulations, field trips/ Industry visits, seminars (talks by experts), workshops, projects, models and class discussions. The assessment broadly will comprise of Internal Assessment (Continuous Evaluation) and End Semester Examination. **Each theory paper will be of 100 marks with 25% marks for Internal Assessment and 75% for End Semester examination.** The internal Assessment will be through MCQ, test, assignment, oral presentation, worksheets and short project. **Each practical paper will be of 50 marks.**

Programme Framework:

The programme will consist of **six-credit courses, four-credit courses and two credit courses**. For theory classes one credit indicates a one-hour lecture per week while for practicals one credit indicates a two-hour session per week. Each practical batch will be of fifteen students. A number exceeding fifteen (by at least ten) will be divided into two equal batches. The distribution of the courses is shown in Table 3 above.

There are **only two six-credit courses**, being offered in semesters VII and VIII. These are the courses on Dissertation / Academic Project / Entrepreneurship. These courses will include theoretical research as well as experimental work. The evaluation of these will be according to the guidelines provided by the University of Delhi.

There are **three categories of four credit courses**: Discipline-Specific Core (DSC), Discipline-Specific Elective (DSE) and Generic Elective (GE).

Discipline-Specific Core (DSC) courses are compulsory courses offered by the Microbiology programme, distributed over the eight semesters. The four-credit DSC courses will comprise of three credits theory classes and one credit practical. Students who complete the B.Sc. (Honors with research /academic project / entrepreneurship) Microbiology programme will study twenty DSC courses.

Discipline-Specific Elective (DSE) courses are a pool of four-credit courses offered by the Microbiology programme from which the student can choose. The four-credit DSE courses will comprise of two credits of theory classes and two credits practicals. Students who complete the B.Sc. (Honors with research /academic project / entrepreneurship) Microbiology programme will study a minimum of four and maximum of ten DSE courses.

Generic Elective (GE) courses are a pool of four-credit courses offered by programmes of other Disciplines, from which the student can choose. The Microbiology programme is offering a pool of GE courses which students of other Disciplines can opt for. The distribution of these courses over the odd and even semesters is as listed in the Table below. The four-credit GE courses will comprise of two credits of theory classes and two credits practicals. Students who complete the B.Sc. (Honors with research /academic project / entrepreneurship) Microbiology programme will study a minimum of four and maximum of ten GE courses.

There are **three categories of two credit courses**: Ability Enhancement Courses (AEC), Skill Enhancement Courses (SEC) and Value Addition Courses (VACs).

Ability Enhancement Courses (AECs) are a pool of two-credit courses in

Language and Literature and Environmental Science and Sustainable Development for all disciplines offered by the University of Delhi. Students will have to study two courses on “Environmental Science and Sustainable Development” (courses I and II of two credits each in the first year (I/II semester) and the second year (III/IV semester), respectively). The AEC pool will also consist of credit courses in languages listed in the Eighth Schedule of the Constitution of India, as updated from time to time. Students who complete the B.Sc. (Honors with research /academic project / entrepreneurship) Microbiology programme will study four AECs.

Skill Enhancement Courses (SECs) are a pool of two-credit courses for all disciplines offered by the University of Delhi from which the student can choose. The Microbiology programme is offering a pool of SECs, with some courses being designed for students of the Microbiology Discipline while other courses have been designed for students of other Disciplines. The two-credit SECs comprise entirely of either theory classes or practicals. Students who complete the B.Sc. (Honors with research /academic project / entrepreneurship) Microbiology programme will study a minimum of two and maximum of six SECs. Students can opt for Internship/Apprenticeship/ project/ Community Outreach in lieu of the SECs in semesters III-VI.

Value Addition Courses (VACs) are a pool of two-credit courses for all disciplines offered by the University of Delhi from which the student can choose. Students who complete the B.Sc. (Honors with research /academic project / entrepreneurship) Microbiology programme will study four VACs.

Thus, to acquire a B.Sc. (Honors by research / academic project / entrepreneurship) degree in Microbiology a student must study:

20 Discipline-Specific Cores, 4-10 Discipline-Specific Electives, 4-10 Generic Electives, 2 Skill Enhancement Courses, 4 Ability Enhancement Courses, 4 Value Addition Courses, 2 Dissertation / academic project / entrepreneurship courses, and 4 SECs / internship / Apprenticeship / Project /Community outreach project.

*A student who exits after the first year upon completion of 44 credits will graduate with an **Undergraduate Certificate in Microbiology**.*

*A student who exits after the second year upon completion of 88 credits will graduate with an **Undergraduate Diploma in Microbiology**.*

*A student who exits after the third year upon completion of 132 credits will graduate with a **Bachelor in Science (Honours) in Microbiology**.*

*A student who exits after the fourth year upon completion of 176 credits will graduate with a **Bachelor in Science (Honours with Research/Academic Project/Entrepreneurship) in Microbiology**.*