

**Outline of the syllabus based on Choice Based Credit System (CBCS)
M. Sc. (Honours) Botany (Five Year Integrated Course)
(Session 2017-18)**

M. Sc. (Honours) Botany (Five Year Integrated Course) Part-I (Semester I)

Subject Code	Subject	Paper Option	Hours Per Week			Credits	Marks		
			L	T	P		Ext.	Int.	Tot.
FYBOT-TP 101	Punjabi	Core	3	1	0	3.5	60	20	80
FYBOT-TP 102	Biology and Diversity of Viruses, Bacteria and Fungi	Core	3	1	0	3.5	60	20	80
FYBOT-TP 103	Biology and Diversity of Algae and Bryophytes	Core	3	1	0	3.5	60	20	80
FYBOT-TP 104	Zoology	Elective	3	1	0	3.5	60	20	80
FYBOT-TP 105	Evolutionary Biology	Elective	3	1	0				
FYBOT-PP 101	Practical paper pertaining to FYBOT-TP 102 & 103	Core	0	0	4	2	60	0	60
FYBOT-PP 102	Practical pertaining to FYBOT-TP 104/105	Elective	0	0	2	1	30	0	30
	Total					17	330	80	410

L=Lecture, T=Tutorial, P=Practical

INTERNAL ASSESSMENT

House Tests (Average of Two House Tests)	32 Marks	80 Marks
Assignment	32 Marks	
Attendance	16 Marks	

Internal Assessment marks will be distributed equally in all the theory paper. The duration of final practical paper will be from 04 to 06 hours depending upon the practical component.

M. Sc. (Honours) Botany (Five Year Integrated Course) Part-I (Semester II)

Subject Code	Subject	Paper Option	Hours Per Week			Credits	Marks		
			L	T	P		Ext.	Int.	Tot.
FYBOT-TP 201	English	Core	3	1	0	3.5	60	20	80
FYBOT-TP 202	Biology and Diversity of Pteridophytes and Gymnosperms	Core	3	1	0	3.5	60	20	80
FYBOT-TP 203	Cell and Molecular Biology	Core	3	1	0	3.5	60	20	80
FYBOT-TP 204	Inorganic Chemistry	Elective	3	1	0	3.5	60	20	80
FYBOT-TP 205	Applied Microbiology	Elective	3	1	0				
FYBOT-PP 201	Practical paper pertaining to FYBOT-TP 202 & 203	Core	0	0	4	2	60	0	60
FYBOT-PP 202	Practical paper pertaining to FYBOT-TP 204 /205	Elective	0	0	2	1	30	0	30
	Total					17	330	80	410

FYBOT-TP 206	Drug Abuse: Problem, Management and Prevention	Core (Qualifying)	3	0	0	3.0	70	30	100
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(Qualifying)		**Open+ Elective	3	0	0	3.0	70	30	100
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L=Lecture, T=Tutorial, P=Practical

INTERNAL ASSESSMENT

House Tests (Average of Two House Tests)	32 Marks	80 Marks
Assignment	32 Marks	
Attendance	16 Marks	

Internal Assessment marks will be distributed equally in all the theory paper. The duration of final practical paper will be from 04 to 06 hours depending upon the practical component.

** Open Elective Paper: BOT-OE: PLANTS FOR HUMAN WELFARE will be offered by the department for students of other departments who have not studied Biology at +2 level.

+ The students will opt any one open elective from the list of open elective subjects offered by the University. The students of M. Sc. (Honours) Botany (Five Year Integrated Course) may opt open elective either in the 2nd semester or 8th semester of the course. If any student wants to exit after passing first three years of the course, he/she must qualify open elective for the award of B.Sc. (Honours) Botany degree.

DEPARTMENT OF BOTANY
PUNJABI UNIVERSITY, PATIALA

NAME OF THE COURSE: M. Sc. (HONOURS) BOTANY (FIVE YEAR INTEGRATED COURSE)								
PART: I	SEMESTER: I			SESSION: 2017-18				
PAPER: PUNJABI-I (OPTION-I)				Time: 3 Hours				
PAPER CODE: FYBOT-TP 101		CORE	Theory	Internal	Total	L	T	Credit
MAXIMUM MARKS			60	20	80	3	1	3.5

ਸਿਲੇਬਸ ਅਤੇ ਪਾਠ ਪੁਸਤਕਾਂ

- ਭਾਗ-ੳ ਜੁਗ ਬਦਲ ਗਿਆ (ਨਾਵਲ) ਸੋਹਣ ਸਿੰਘ ਸ਼ੀਤਲ
- ਭਾਗ-ਅ: 1) ਨਿਬੰਧ-ਰਚਨਾ: ਸਮਾਜਕ, ਵਾਤਾਵਰਣ ਅਤੇ ਸਭਿਆਚਾਰ ਵਿਸ਼ੇ ਨਾਲ ਸਬੰਧਤ।
2) ਵਿਆਕਰਣ:
ੳ) ਪੰਜਾਬੀ ਧੁਨੀ-ਵਿਉਂਤ, ਸਵਰ, ਵਿਅੰਜਨ, ਉਚਾਰਨ ਅੰਗ, ਉਚਾਰਨ ਸਥਾਨ ਤੇ ਉਚਾਰਨ ਵਿਧੀ ਅਨੁਸਾਰ ਧੁਨੀਆਂ ਦਾ ਵਰਗੀਕਰਣ।
ਅ) ਸ਼ਬਦ-ਸ਼੍ਰੇਣੀਆਂ ਅਤੇ ਰੂਪਾਂਤਰਨ: ਨਾਂਗ, ਪੜਨਾਂਵ, ਵਿਸ਼ੇਸ਼ਣ, ਕਿਰਿਆ ਵਿਸ਼ੇਸ਼ਣ, ਸੰਬੰਧਕ, ਯੋਜਕ, ਪ੍ਰਸ਼ਨ ਸੂਚਕ ਸ਼ਬਦ।
- ਭਾਗ-ੲ: ਭਾਗ-ੳ ਅਤੇ ਭਾਗ-ਅ ਦੇ ਵਿਆਕਰਣ ਵਾਲੇ ਭਾਗ ਵਿੱਚੋਂ ਸੰਖੇਪ ਉੱਤਰਾਂ ਵਾਲੇ ਪ੍ਰਸ਼ਨ।

ਅੰਕ-ਵੰਡ ਅਤੇ ਪੇਪਰ ਸੈਟਰ ਲਈ ਹਦਾਇਤਾਂ

1. ਸਿਲੇਬਸ ਦੇ ਸਾਰੇ ਭਾਗਾਂ ਵਿੱਚੋਂ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
2. ਪੇਪਰ ਨੂੰ ਤਿੰਨ ਭਾਗਾਂ ਲ਼, ਅ ਅਤੇ ਲ ਵਿੱਚ ਵੰਡਿਆ ਜਾਵੇਗਾ।
3. ਭਾਗ ਲ਼ ਵਿੱਚੋਂ:
 - ੳ) ਨਾਵਲ ਦਾ ਵਿਸ਼ਾ/ਸਾਰ/ਕਥਾਨਕ/ਲੇਖਕ ਦਾ ਯੋਗਦਾਨ ਜਾਂ ਨਾਵਲ ਕਲਾ। (ਤਿੰਨ ਵਿੱਚੋਂ ਇਕ) 10 ਅੰਕ
 - ਅ) ਪਾਤਰ ਚਿਤਰਨ (ਪੰਜ ਵਿੱਚੋਂ ਦੋ) 10 ਅੰਕ
4. ਭਾਗ ਅ-1 ਕਿਸੇ ਵਿਸ਼ੇ ਤੇ ਨਿਬੰਧ ਲਿਖਣ ਲਈ ਕਿਹਾ ਜਾਵੇਗਾ। (ਤਿੰਨ ਵਿੱਚੋਂ ਇਕ) 6 ਅੰਕ
2 ਦੇ ਦੋਵਾਂ ਭਾਗਾਂ ਵਿੱਚੋਂ ਇਕ-ਇਕ ਪ੍ਰਸ਼ਨ ਪੁੱਛਿਆ ਜਾਵੇਗਾ ਅਤੇ ਵਿਦਿਆਰਥੀ ਨੇ ਦੋਵਾਂ ਵਿੱਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਕਰਨਾ ਹੋਵੇਗਾ। 10 ਅੰਕ
5. ਭਾਗ-ੲ ਜੁਗ ਬਦਲ ਗਿਆ (ਨਾਵਲ) ਅਤੇ ਵਿਆਕਰਣ ਵਾਲੇ ਭਾਗ ਵਿੱਚੋਂ ਸੰਖੇਪ ਉੱਤਰਾਂ ਵਾਲੇ 12 (ਪਾਠ ਪੁਸਤਕ ਜੁਗ ਬਦਲ ਗਿਆ ਵਿੱਚੋਂ 6 ਅਤੇ ਵਿਆਕਰਣ ਵਿੱਚੋਂ 6) ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਵਿਦਿਆਰਥੀ ਨੇ ਸਾਰੇ ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਸੰਖੇਪ ਉੱਤਰ ਦੇਣੇ ਹੋਣਗੇ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ 2 ਅੰਕ ਹੋਣਗੇ। 12 x 2 = 24 ਅੰਕ

ਸਹਾਇਕ ਪੁਸਤਕਾਂ

1. ਹਰਕੀਰਤ ਸਿੰਘ, ਭਾਸ਼ਾ ਵਿਗਿਆਨ ਅਤੇ ਪੰਜਾਬੀ ਭਾਸ਼ਾ, ਬਾਹਰੀ ਪਬਲਿਸ਼ਰਜ਼, ਦਿੱਲੀ, 1973.
2. ਬਲਦੇਵ ਸਿੰਘ ਚੀਮਾ, ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਵਿਗਿਆਨ ਅਤੇ ਵਿਆਕਰਨ (ਤਕਨੀਕੀ ਸ਼ਬਦਾਵਲੀ ਦਾ ਵਿਸ਼ਾ ਕੋਸ਼), ਪੰਜਾਬੀ ਯੂਨੀਵਰਸਿਟੀ, ਪਟਿਆਲਾ, 2000.
3. ਬੂਟਾ ਸਿੰਘ ਬਰਾੜ, ਪੰਜਾਬੀ ਵਿਆਕਰਨ : ਸਿਧਾਂਤ ਤੇ ਵਿਹਾਰ, ਚੇਤਨਾ ਪ੍ਰਕਾਸ਼ਨ, ਲੁਧਿਆਣਾ, 2008.
4. ਪ੍ਰੇਮ ਪ੍ਰਕਾਸ਼ ਸਿੰਘ, ਸਿਧਾਂਤਕ ਭਾਸ਼ਾ ਵਿਗਿਆਨ, ਮਦਾਨ ਪਬਲਿਸ਼ਰਜ਼, ਪਟਿਆਲਾ, 2002.
5. ਪ੍ਰੇਮ ਪ੍ਰਕਾਸ਼ ਸਿੰਘ, ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦਾ ਸ੍ਰੋਤ ਤੇ ਬਣਤਰ, ਪੰਜਾਬੀ ਯੂਨੀਵਰਸਿਟੀ, ਪਟਿਆਲਾ, 1996.
6. ਪ੍ਰੇਮ ਪ੍ਰਕਾਸ਼ ਸਿੰਘ, ਰੂਪ ਵਿਗਿਆਨ, ਮਦਾਨ ਪਬਲਿਸ਼ਰਜ਼, ਪਟਿਆਲਾ, 2002.
7. ਜੋਗਿੰਦਰ ਸਿੰਘ ਪੁਆਰ ਅਤੇ ਹੋਰ, ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦਾ ਵਿਆਕਰਨ, (I, II ਅਤੇ III), ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਅਕਾਦਮੀ, ਜਲੰਧਰ।
8. ਸੁਖਵਿੰਦਰ ਸਿੰਘ ਸੰਘਾ, ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਵਿਗਿਆਨ, ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਅਕਾਦਮੀ, ਜਲੰਧਰ, 1999.
9. ਖੋਜ ਪਤ੍ਰਿਕਾ (ਗਲਪ ਵਿਸ਼ੇਸ਼ ਅੰਕ), ਪੰਜਾਬੀ ਯੂਨੀਵਰਸਿਟੀ, ਪਟਿਆਲਾ

10. ਡਾ. ਗੁਰਪਾਲ ਸਿੰਘ ਸੰਧੂ, ਪੰਜਾਬੀ ਨਾਵਲ ਦਾ ਇਤਿਹਾਸ, ਪੰਜਾਬੀ ਅਕਾਦਮੀ, ਦਿੱਲੀ.

NAME OF THE COURSE: M. Sc. (HONOURS) BOTANY (FIVE YEAR INTEGRATED COURSE)								
PART: I	SEMESTER: I	SESSION: 2017-18			Time: 3 Hours			
PAPER: PUNJABI COMPULSORY (ਮੁੱਢਲਾ ਗਿਆਨ) (OPTION-II)								
PAPER CODE: FYBOT-TP 101	CORE	Theory	Internal	Total	L	T	Credit	
MAXIMUM MARKS		60	20	80	3	1	3.5	

SECTION-A

- ਗੁਰਮੁਖੀ ਵਰਣਮਾਲਾ ਤੇ ਲੇਖਣ-ਪ੍ਰਬੰਧ 09 ਅੰਕ
(ੳ) ਅੱਖਰ ਸਿੱਖਿਆ: ਤਰਤੀਬਵਾਰ ਤੇ ਭੁਲਾਵੇਂ ਅੱਖਰ।
(ਅ) ਅੱਖਰ ਬਣਤਰ: ਅੱਖਰ ਰੂਪ ਤੇ ਲੇਖਣ ਦੇ ਨਿਯਮ।
- ਗੁਰਮੁਖੀ ਅੱਖਰ ਤੇ ਪੰਜਾਬੀ ਧੁਨੀਆਂ ਦਾ ਪ੍ਰਬੰਧ 09 ਅੰਕ
(ੳ) ਸਵਰ ਤੇ ਵਿਅੰਜਨ: ਵਰਗੀਕਰਨ ਦੇ ਸਿਧਾਂਤ ਤੇ ਉਚਾਰਨ।
(ਅ) ਸਵਰ ਸੂਚਕ ਅੱਖਰਾਂ ਤੇ ਧੁਨੀਆਂ ਦੀ ਪਛਾਣ ਤੇ ਵਰਤੋਂ।
(ੲ) ਵਿਅੰਜਨ ਸੂਚਕ ਅੱਖਰਾਂ ਤੇ ਧੁਨੀਆਂ ਦੀ ਪਛਾਣ ਤੇ ਵਰਤੋਂ।
(ਸ) ਲਗਾਂ ਮਾਤਰਾਂ ਦੀ ਪਛਾਣ ਤੇ ਵਰਤੋਂ।
(ਹ) ਲਗਾਖਰਾਂ ਦੀ ਪਛਾਣ ਤੇ ਵਰਤੋਂ।

SECTION-B

- ਲਿਪੀ ਦੇ ਅੱਖਰਾਂ ਦੀ ਵਰਤੋਂ ਦੇ ਨਿਯਮ 09 ਅੰਕ
(ੳ) ਪੂਰੇ ਤੇ ਅੱਧੇ ਅੱਖਰਾਂ ਦੀ ਪਛਾਣ ਤੇ ਵਰਤੋਂ
(ਅ) ਸਵਰ ਸੂਚਕ ਅੱਖਰਾਂ ਦੀ ਪਛਾਣ ਤੇ ਵਰਤੋਂ
(ੲ) ਸਵਰ ਵਾਹਕਾਂ ਦੀ ਪਛਾਣ ਤੇ ਵਰਤੋਂ
(ਸ) ਮਾਤਰਾ ਤੇ ਸਵਰ ਵਾਹਕਾਂ ਦੀ ਸਾਂਝੀ ਵਰਤੋਂ
(ਹ) ਮਾਤਰਾ ਦੀ ਵਿਅੰਜਨ ਸੂਚਕਾਂ ਨਾਲ ਵਰਤੋਂ
- ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ ਨਾਲ ਜਾਣ ਪਛਾਣ 09 ਅੰਕ
(ੳ) ਗਿਣਤੀ
(ਅ) ਹਫ਼ਤੇ ਦੇ ਦਿਨ
(ੲ) ਮਹੀਨਿਆਂ ਦੇ ਨਾਂ
(ਸ) ਰੰਗਾਂ ਦੇ ਨਾਂ
(ਹ) ਫਲਾਂ-ਸਬਜ਼ੀਆਂ ਦੇ ਨਾਂ
(ਕ) ਪਸ਼ੂ ਪੰਛੀਆਂ ਦੇ ਨਾਂ
(ਖ) ਪੰਜਾਬੀ ਰਿਸ਼ਤਾ-ਨਾਤਾ ਪ੍ਰਬੰਧ ਦੀ ਸ਼ਬਦਾਵਲੀ
(ਗ) ਘਰੇਲੂ ਵਸਤਾਂ ਦੀ ਸ਼ਬਦਾਵਲੀ

SECTION-C

ਸਾਰੇ ਸਿਲੇਬਸ ਤੇ ਆਧਾਰਤ 12 ਆਬਜੈਕਟਿਵ ਟਾਈਪ/ਛੋਟੇ ਪ੍ਰਸ਼ਨ।

12 x 2 = 24 ਅੰਕ

ਪੇਪਰ ਸੈਟਰ ਲਈ ਹਦਾਇਤਾਂ

- ਵਿਦਿਆਰਥੀ ਪਹਿਲੀ ਵਾਰ ਗੁਰਮੁਖੀ ਲਿਖੀ ਸਿੱਖ ਰਹੇ ਹਨ। ਹੋ ਸਕਦਾ ਹੈ ਵਿਦਿਆਰਥੀ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਤੋਂ ਵੀ ਅਣਜਾਣ ਹੋਣ, ਸੋ ਪ੍ਰਸ਼ਨਾਂ ਦਾ ਪੱਧਰ ਵਿਦਿਆਰਥੀਆਂ ਦੀ ਇਸ ਸੀਮਾਂ ਨੂੰ ਧਿਆਨ ਵਿਚ ਰੱਖਿਆ ਜਾਵੇ।
- ਸਾਰੇ ਭਾਗਾਂ ਵਿੱਚੋਂ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣ।
- ਸਰਲ ਤੇ ਸਪਸ਼ਟ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣ।
- ਵਰਣਾਤਮਕ ਪ੍ਰਸ਼ਨ ਨਾ ਪੁੱਛੇ ਜਾਣ।
- ਵਿਦਿਆਰਥੀ ਨੂੰ ਲਿਪੀ ਦਾ ਬੋਧ ਕਰਵਾਉਣ ਲਈ ਧੁਨੀਆਂ, ਲਿਪੀ ਚਿੰਨ੍ਹਾਂ ਦੀ ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ ਸਬੰਧੀ ਸੰਖੇਪ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣ। ਲੋੜ ਅਨੁਸਾਰ ਵਿਦਿਆਰਥੀਆਂ ਨੂੰ ਛੋਟੇ ਜਾਂ ਚੋਣ ਦੇਣੀ ਲਾਜ਼ਮੀ ਹੈ।
- ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ ਦੇ ਸਾਰੇ ਭਾਗਾਂ ਵਿੱਚੋਂ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣ। ਲੋੜ ਅਨੁਸਾਰ ਚੋਣ ਅਤੇ ਛੋਟੇ ਦਿੱਤੀ ਜਾਵੇ।

ਸਹਾਇਕ ਪਾਠ ਸਮੱਗਰੀ

- 1) ਸਤਿਨਾਮ ਸਿੰਘ ਸੰਧੂ, ਆਓ ਪੰਜਾਬੀ-ਸਿਖੀਏ, ਪਬਲੀਕੇਸ਼ਨ ਬਿਊਰੋ, ਪੰਜਾਬੀ ਯੂਨੀਵਰਸਿਟੀ, ਪਟਿਆਲਾ, 2009 (ਹਿੰਦੀ ਤੋਂ ਪੰਜਾਬੀ ਸਿੱਖਣ ਲਈ)
- 2) ਸਤਿਨਾਮ ਸਿੰਘ ਸੰਧੂ, ਗੁਰਮੁਖੀ ਸਿੱਖੋ, ਪਬਲੀਕੇਸ਼ਨ ਬਿਊਰੋ, ਪੰਜਾਬੀ ਯੂਨੀਵਰਸਿਟੀ, ਪਟਿਆਲਾ, 2011 (ਅੰਗਰੇਜ਼ੀ ਤੋਂ ਪੰਜਾਬੀ ਸਿੱਖਣ ਲਈ)
- 3) ਸੀਤਾ ਰਾਮ ਬਾਹਰੀ, ਪੰਜਾਬੀ ਸਿਖੀਏ, ਪਬਲੀਕੇਸ਼ਨ ਬਿਊਰੋ, ਪੰਜਾਬੀ ਯੂਨੀਵਰਸਿਟੀ, ਪਟਿਆਲਾ, 2002 (ਹਿੰਦੀ)
- 4) ਰਾਜਵਿੰਦਰ ਸਿੰਘ, ਪੰਜਾਬੀ ਗਿਆਨ ਸੀ.ਡੀ. (ਕੰਪਿਊਟਰ ਐਪਲੀਕੇਸ਼ਨ ਟੂ-ਲਰਨ ਐਂਡ ਟੀਚ ਪੰਜਾਬੀ), ਪਬਲੀਕੇਸ਼ਨ ਬਿਊਰੋ, ਪੰਜਾਬੀ ਯੂਨੀਵਰਸਿਟੀ, ਪਟਿਆਲਾ, 2011.
- 5) Hardev Bahri, Teach Yourself Punjabi, Publication Bureau, Punjabi University, Patiala, 2011.
- 6) Henry A. Gleason and Harjeet Singh Gill, A Start in Punjabi, Publication Bureau, Punjabi University, Patiala, 1997.
- 7) Ujjal Singh Bahri and Parmajit Singh Walia, Introductory Punjabi, Publication Bureau, Punjabi University, Patiala, 2003.

NAME OF THE COURSE: M. Sc. (HONOURS) BOTANY (FIVE YEAR INTEGRATED COURSE)							
PART: I	SEMESTER: I	SESSION: 2017-18			Time: 3 Hours		
PAPER: BIOLOGY AND DIVERSITY OF VIRUSES, BACTERIA AND FUNGI							
PAPER CODE: FYBOT-TP 102	CORE	Theory	Internal	Total	L	T	Credit
MAXIMUM MARKS		60	20	80	3	1	3.5

INSTRUCTIONS TO THE PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions each from the respective section of syllabus and will carry 9 marks each. Section C will consist of 12 short-answer type questions (8-10 lines) of 2 marks each which will cover the entire syllabus uniformly and will carry 24 marks in all.

INSTRUCTIONS FOR CANDIDATES

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

SECTION – A

1. Viruses: General characteristics, classification, morphology and ultra structure. Replication (Lytic and Lysogenic cycles); Viroids, Prions and Interferons.
2. Archaeobacteria, structure, constituent groups of Archaeobacteria and their distinguishing features.
3. Mollicutes/Mycoplasma, cell shape, structure, metabolism, constituent groups and reproduction
4. Bacteria: Salient features, classification and phylogeny, ultrastructure and nutritional types, Growth, reproduction and genetic recombination in Bacteria: Binary Fission, Endospore formation ; Genetic exchange and recombination with particular reference to Conjugation, Transformation and Transduction.

SECTION – B

5. Kingdom Fungi: Introduction to Fungi, General characteristics of fungi; fungal nomenclature, classification.
6. Phylum Chytridiomycota, Glomeromycota and Zygomycota: Introduction and General Characteristics; life history of *Physoderma*, *Glomus* and *Rhizopus*.
7. Phylum Ascomycota and Basidiomycota: Introduction and General Characteristics: life history of *Protomyces*, *Saccharomyces*, *Penicillium*, *Xylaria*, and *Peziza*, *Puccinia*, *Ustilago*, and *Agaricus*.
8. Fungi like organisms: General Characteristics of fungi like organisms under kingdom Chromista; (Oomycota – *Albugo* and *Phytophthora*) and Kingdom Protozoa (Dictyostelid Cellular Slime molds, Acrasid Cellular Slime molds and True Slime molds); Mitosporic fungi: General characteristics; life history of *Cercospora*, *Alternaria*, *Fusarium* and *Colletotrichum*.

RECOMMENDED READINGS

1. Black, J.G. 1999. *Microbiology: Principles and Explorations*, John Wiley and Sons, Inc., Singapore.
2. Frobisher, M. 1974. *Fundamentals of Microbiology*, W. B. Saunders Co. Philadelphia, PA, USA.
3. Mandahar, C. L. 1978. *Introduction to Plant Viruses*. S. Chand & Co. Ltd., Dehli.
4. Pelczar, M.J., Chan, E.C.S. and Noel, R. Krieg. 1986. *Microbiology*. McGraw Hill Book Company, London.
5. Pelczar, M.J., Chan, E. C. S. and Noel, R. Krieg. 1993. *Microbiology - Concepts and Applications*. McGraw Hill Book Company, London.
6. Stainer, R.Y., Doudoroff, M. and Adelberg, E. A. 1963. *The Microbial World* 2nd Ed. Prentice Hall, Englewood Cliffs, NJ.
7. Stainer, R.Y., Ingraham, J.L., Wheelis, M.L. and Painter, P.R. 1989. *General Microbiology*, Macmillan Education Ltd., London.

NAME OF THE COURSE: M. Sc. (HONOURS) BOTANY (FIVE YEAR INTEGRATED COURSE)							
PART: I	SEMESTER: I	SESSION: 2017-18	Time: 3 Hours				
PAPER: BIOLOGY AND DIVERSITY OF ALGAE AND BRYOPHYTES							
PAPER CODE: FYBOT-TP 103	CORE	Theory	Internal	Total	L	T	Credit
MAXIMUM MARKS		60	20	80	3	1	3.5

INSTRUCTIONS TO THE PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions each from the respective section of syllabus and will carry 9 marks each. Section C will consist of 12 short-answer type questions (8-10 lines) of 2 marks each which will cover the entire syllabus uniformly and will carry 24 marks in all.

INSTRUCTIONS FOR CANDIDATES

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

SECTION-A

1. Basic characteristics of algae; habitat, range of thallus, cell structure, photosynthetic pigments, cell wall, flagella, reserves food materials and nutrition. Fritsch system of classification of algae. Economic importance of algae.
2. Salient features of Cyanophyta. A brief account on distribution, morphology and multiplication of *Nostoc*, *Oscillatoria*, *Scytonema* and *Westiellopsis*.
3. Salient features of Chlorophyta and Xanthophyta. A brief account on distribution, morphology, reproduction and life cycle of *Chlorella*, *Volvox*, *Spirogyra*, *Cladophora*, *Oedogonium*, *Chara*, *Ulva* and *Vaucheria*
4. Salient features of Rhodophyta, Phaeophyta and Bacillariophyta. A brief account on distribution, morphology, reproduction and life cycle of *Batrachospermum*, *Polysiphonia*, *Dictyota*, *Ectocarpus* and *Melosira*.

SECTION-B

5. Bryophytes: General characteristics, Origin of Bryophytes, Classification and brief account of fossil bryophytes, ecological significance and economic importance of Bryophytes.
6. General characters and classification of Hepaticopsida, a brief account of morphology, structure, reproduction and life cycle of *Porella*, *Pellia*, *Riccia* and *Marchantia*.
7. General characters and classification of Bryopsida, a brief account of morphology, structure, reproduction and life cycle of *Sphagnum*, *Polytrichum*, *Funaria* and *Archidium*.
8. General characters and classification of Anthocerotopsida, a brief account of morphology, structure, reproduction and life cycle of *Anthoceros*.

RECOMMENDED READINGS

1. Schofield, W.D. (1985). Introduction to Bryology. MacMillan, New York.
2. Puri P. (1986). Bryophytes: Morphology, Growth and Differentiation. Atma Ram & Sons, Delhi.
3. Van den Hoek C., Mann DJ and Jahn H.M. (1995). Algae: An introduction to Phycology. Cambridge University Press.
4. Vasishta, B.R. (1996). Bryophyta. S. Chand & Co. Ltd., New Delhi.
5. Rashid, A. (1998). An Introduction to Bryophyta. Vikas Pub. House Pvt. Ltd. New Delhi.
6. Kumar H.D. (2004). Introductory Phycology. Affiliated East-West Press Private Limited, New Delhi.
7. Singh, S.K. (2006). Textbook of Bryophyta. Campus Books International, New Delhi.
8. Lee, R.E. (2008). Phycology. Cambridge University Press.
9. Sharma, O.P. (2011). Diversity of Microbes and Cryptogams-Algae. Tata McGraw Hill, New Delhi
10. Vashishta, B.R., Sinha, A.K. and Singh, V.P. (2011). Botany for Degree Students-Algae. S. Chand Publisher, New Delhi.
11. Sahoo, D. and Sechbach J. (2015). The Algae World. Springer, Netherland.

NAME OF THE COURSE: M. Sc. (HONOURS) BOTANY (FIVE YEAR INTEGRATED COURSE)							
PART: I	SEMESTER: I	SESSION: 2017-18			Time: 3 Hours		
PAPER: ZOOLOGY							
PAPER CODE: FYBOT-TP 104	ELECTIVE	Theory	Internal	Total	L	T	Credit
MAXIMUM MARKS		60	20	80	3	1	3.5

INSTRUCTIONS TO THE PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions each from the respective section of syllabus and will carry 9 marks each. Section C will consist of 12 short-answer type questions (8-10 lines) of 2 marks each which will cover the entire syllabus uniformly and will carry 24 marks in all.

INSTRUCTIONS FOR CANDIDATES

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

SECTION: A

- Invertebrates:** General Characters and broad outline classification. **Protozoa:** General Characters with classification up to orders. Brief ecological note and economic importance of *Entamoeba*, *Trypanosoma*, *Giardia*, *Vorticella* and *Balantidium*. Detailed study of *Plasmodium*.
- Porifera:** General Characters with classification up to orders. Brief ecological note and economic importance of *Grantia*, *Euplectella*, *Hyalonema* and *Spongilla*. Detailed study of *Sycon*.
- Coelenterata:** General Characters with classification up to orders. Brief ecological note and economic importance of *Hydra*, *Physalia* and *Aurelia*. Detailed study of *Obelia*.
- Platyhelminthes:** General Characters with classification up to orders. Brief ecological note and economic importance of *Schistosoma*, *Echinococcus* and *Fasciola*. Detailed study of *Taenia*.

SECTION: B

- Aschelminthes and Annelida:** General Characters with classification up to orders. Brief ecological note and economic importance of *Wuchereria*, *Nereis*, *Tubifex* and *Pontobdella*. Detailed study of *Ascaris* and *Pheretima*.
- Arthropoda :** General Characters with classification up to orders. Brief ecological note and economic importance of Prawn, Lac insect, Silk moth, locust. Detailed study of Honey Bee.
- Mollusca:** General Characters with classification up to orders. Brief ecological note and economic importance of *Mytilus*, *Pecten*, *Loligo*, *Sepia* and *Octopus*. Detailed study of *Pila*.
- Echinodermata:** General Characters with classification up to orders. Brief ecological note and economic importance of *Echinus*, *Cucumaria* and *Antedon*. Detailed study of *Asterias* (Starfish).

RECOMMENDED READINGS

- Ashok Sabharwal & S. K. Malhotra : *Modern Zoology*, Vol. I, Modern Publishers.
- Barnes, R.D., *Invertebrates Zoology*, W.B. Saunders Philadelphia, 1999.
- Dhami P. S. & Dhami J. K., *Invertebrates*, R. Chand & Co., New Delhi, 2001.
- E.L. Jordan and others: *Invertebrate Zoology*, 14th ed. Rep. 2002 ISBN: 81-219-0367X.
- G.G. Simpson, Principle of Animal taxonomy, Oxford IBM Publishing Company.
- Gullan, P.J. and Cranston, P. The Insects, an outline of Entomology, 3rd Edition (2005). Blackwell Publishing Ltd., USA.
- Kotpal, R.L. 2013. Modern Text Book of Zoology: Invertebrates (10th Ed.) Rastogi Publications Meerut.
- Mayr, E. 1969. Principles of Systematic Zoology. McGraw-Hill, N.Y.

NAME OF THE COURSE: M. Sc. (HONOURS) BOTANY (FIVE YEAR INTEGRATED COURSE)							
PART: I	SEMESTER: I	SESSION: 2017-18	Time: 3 Hours				
PAPER: EVOLUTIONARY BIOLOGY							
PAPER CODE: FYBOT-TP 105	ELECTIVE	Theory	Internal	Total	L	T	Credit
MAXIMUM MARKS		60	20	80	3	1	3.5

INSTRUCTIONS TO THE PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions each from the respective section of syllabus and will carry 9 marks each. Section C will consist of 12 short-answer type questions (8-10 lines) of 2 marks each which will cover the entire syllabus uniformly and will carry 24 marks in all.

INSTRUCTIONS FOR CANDIDATES

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

SECTION – A

1. Evolutionary Biology: Importance and structure. Major points of evolutionary synthesis and evolutionary biology since the synthesis. A brief account of origin of earth.
2. Origin of life: History, Theories; abiogenesis, panspermia, chemical evolution, Oparin's hypothesis, Miller's experiments. Evolution of progenote. Protein evolution.
3. Theory of Organic Evolution. A detailed account on Lamarckism, Darwinism, Modern synthetic theory, germplasm theory and mutation theory.
4. Evidences of evolution: Direct and Indirect, Fossils; Fossilization, types and significance. Geological time scale, determination of age of rocks and fossils.

SECTION - B

5. Population genetics and evolution: Evolutionary processes in population and species: Hardy-Weinberg principle and its significance. Factors in evolution. Evolution by genetic drift and relationship between inbreeding and genetic drift.
6. Speciation and barriers: Modes of Speciation; Allopatric, sympatric speciation and alternatives to allopatric speciation. Role of polyploidy and hybridization in speciation, Rates of speciation and consequences of speciation. Physical and biological barriers.
7. Adaptation and isolation: Adaptive radiation, Micro-, macro- and mega-evolution. Isolation types: spatial, ecological temporal and sexual.
8. Phylogeny: Phenetics and cladistics, phylogenetic hypothesis. Molecular data in phylogenetic analysis.

RECOMMENDED READING

1. Mayr, E. (1963). Animal Species and Evolution. Harvard University Press, Cambridge, Massachusetts.
2. Gould, S. J. (1997). Ever Since Darwin, Reflections in Natural History. W.W. Norton and company Network.
3. Gould, S.J. (2002). The Structure of Evolutionary Theory. Harvard University Press, Cambridge, Massachusetts.
4. Avise, J.C. (2004). Molecular Markers, Natural History and Evolution (2nd Edition) Sinauer Associates, Inc., Sunderland, Massachusetts.
5. Coyne, J.A. and Orr, A.H. (2004). Speciation Sinauer Associates, Inc., Sunderland, Massachusetts.
6. Futuyama, D. J. (2005). Evolutionary Biology (3rd edition) Sinauer Associates, Inc., Sunderland, Massachusetts.
7. Freeman, S. and Harron, C. Jon.2006 Evolutionary Analysis (4th Edition). Prentice Hall, Inc. Pearson, NJ.
8. Verma, P.S. and Agarwal, B.K. (2015). Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand and Co. Pvt. Ltd., New Delhi.

NAME OF THE COURSE: M. Sc. (HONOURS) BOTANY (FIVE YEAR INTEGRATED COURSE)			
PART: I	SEMESTER: I	SESSION: 2017-18	Time: 3 Hours
PRACTICAL PAPER: PERTAINING TO FYBOT-TP 102 & 103			
PAPER CODE: FYBOT-PP 101	CORE	MAXIMUM MARKS: 60	CREDIT: 2.0

A. Biology and diversity of Viruses, Bacteria and Fungi

1. Study of common symptoms of viral, bacterial and mycoplasma pathogens
2. Study of bacteria from curd and root nodules using Gram staining
3. To study the morphology of *Physoderma*, *Rhizopus*, *Saccharomyces*, *Penicillium*, *Xylaria* and *Peziza*.
4. To study the symptoms and histopathological details of *Albugo*, *Phytophthora*, *Cercospora*, *Alternaria*, *Physarium*, *Colletotrichum*, *Puccinia* and *Ustilago*.

B. Biology and diversity of Algae and Bryophytes

1. Study of morphology and reproductive parts of following algal genera: *Nostoc*, *Oscillatoria*, *Scytonema*, *Westiellopsis*, *Chlorella*, *Volvox*, *Spirogyra*, *Claophora*, *Oedogonium*, *Chara*, *Ulva*, *Vaucheria*, *Batrachospermum*, *Dictyota* and common diatoms
2. Study of morphology and reproductive parts of following Bryophytes: *Pellia*, *Marchantia*, *Riccia*, *Polytrichum*, *Funaria* and *Anthoceros*.

NAME OF THE COURSE: M. Sc. (HONOURS) BOTANY (FIVE YEAR INTEGRATED COURSE)			
PART: I	SEMESTER: I	SESSION: 2017-18	Time: 3 Hours
PRACTICAL PAPER: PERTAINING TO FYBOT-TP 104 / 105			
PAPER CODE: FYBOT-PP 102	ELECTIVE	MAXIMUM MARKS: 30	CREDIT: 1.0

A. ZOOLOGY

1. Study of Morphology of following invertebrates: *Euplectella*, *Spongilla*, *Hydra*, *Physalia*, *Obelia*, *Sycon*, *Echinococcus*, *Fasciola*, *Taenia*, *Ascaris*, *Pheretima*, *Palaemon*, *Apis*, *Sepia*, *Pila*, *Cucumaria*, *Antedon* and *Asterias*.
2. Temporary mount preparation and study of protozoans and ciliates

B. EVOLUTIONARY BIOLOGY

1. Study of habitat, distribution and habits of following animals: *Naja naja*, *Columba livia*, *Hystrix*, *Hyla*, *Salmander*, *Apteryx* and *Archaeopteryx*.
2. Study of vestigial organs.
3. Study of Phytogeographical and Zoogeographical realms of the world.

DEPARTMENT OF BOTANY
PUNJABI UNIVERSITY, PATIALA

NAME OF THE COURSE: M. Sc. (HONOURS) BOTANY (FIVE YEAR INTEGRATED COURSE)							
PART: I	SEMESTER: II	SESSION: 2017-18	Time: 3 Hours				
PAPER: ENGLISH							
PAPER CODE: FYBOT-TP 201	CORE	Theory	Internal	Total	L	T	Credit
MAXIMUM MARKS		60	20	80	3	1	3.5

INSTRUCTIONS FOR THE PAPER -SETTER

The question paper shall consist of three Units. Unit-I shall be of 20 marks; Unit-II shall be of 16 marks; and Unit-III shall carry 24 marks; and shall contain questions from the preceding Units, thus covering the entire syllabus.

COURSE CONTENT

The following texts are prescribed:

- (I) **Prose Parables**, Orient Blackswan Private Limited-2013.

The following six stories from this book are to be studied:

- (i) Kabuliwallah, *Rabindranath Tagore*
- (ii) The Eyes are Not Here, *Ruskin Bond*
- (iii) The Death of a Hero, *Jai Nimbkar*
- (iv) Grief, *Anton Chekhov*
- (v) Uncle Podger Hangs a Picture, *Jrome K. Jerome*
- (vi) The Doctor's Word, *R.K. Narayan*

- (II) **The Student's Companion** by Wilfred D. Best, Rupa & Co.

The following portions of this book are to be studied:

- (a) Single words for Phrases and Sentences
 1. Words denoting Numbers
 2. Words denoting Places
 3. Words denoting Professions or Trades
 4. Names by which Persons with certain characteristics are known.
- (b) Word frequently mis-spelt.

- (III)

- (i) **Intermediate English Grammar**, 2nd Edition by Raymond Murphy. Cambridge University Press. The following units are to be studied:
Units 1 to 26 and Appendices 1 to 4.
- (ii) **Intermediate English Grammar Supplementary Exercises** by Hashemi and Murphy. Cambridge University Press. The following units are to be studied:
Exercises from this book which are relevant to Units 1 to 26 (from **Intermediate English Grammar**).

TESTING

UNIT-I

- I. One essay type question with an internal alternative on theme, incident, character or main ideas from **Prose Parables**. The answer should not exceed 200 words. 08 marks
- II. 4 short-answer questions to be set from **Prose Parables** out of which candidate shall attempt any 3 in 50-60 words each. 3 x 4 = 12 marks

UNIT-II

- III. (i) One passage of 10 sentences to be translated from Punjabi into English . 08 marks
- (ii) 4 phrases or sentences each of one mark to be substituted by single words from the prescribed portions of **The Student's Companion** all of which shall be attempted by candidates. 4 x 1 = 04 marks
- (iii) 4 mis-spelt words to be set from the prescribed portion of **The Student's Companion** whose correct versions are to be provided by candidates. 4 x 1 = 04 marks

UNIT-III

- IV. 15 sentences each of one mark to be set from exercises of the prescribed units of **Intermediate English Grammar** and those of **Intermediate English Grammar, Supplementary Exercises** out of which candidates shall attempt any 10 sentences. 10 x 1 = 10 marks
- V. (i) Four very short answer questions from **Prose Parables**. Each question is to be attempted in 3-4 lines. 4 x 1 = 04 marks
- (ii) 10 sentences to be set from the exercises of the prescribed units of the books on Grammar and Supplementary Exercises. All sentences are to be attempted. 10 x 1 = 10 marks

NAME OF THE COURSE: M. Sc. (HONOURS) BOTANY (FIVE YEAR INTEGRATED COURSE)							
PART: I	SEMESTER: II	SESSION: 2017-18	Time: 3 Hours				
PAPER: BIOLOGY AND DIVERSITY OF PTERIDOPHYTES AND GYMNOSPERMS							
PAPER CODE: FYBOT-TP 202	CORE	Theory	Internal	Total	L	T	Credit
MAXIMUM MARKS		60	20	80	3	1	3.5

INSTRUCTIONS TO THE PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions each from the respective section of syllabus and will carry 9 marks each. Section C will consist of 12 short-answer type questions (8-10 lines) of 2 marks each which will cover the entire syllabus uniformly and will carry 24 marks in all.

INSTRUCTIONS FOR CANDIDATES

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

SECTION-A

1. Pteridophytes: General characters, an account of classification, ecological distribution and economic importance; evolution of stele; heterospory and seed habit.
2. Psilotopsida & Lycopsida: Diagnostic features, Study of morphology, anatomy, reproduction and life cycle of *Psilotum*, *Lycopodium* and *Selaginella*.
3. Sphenopsida: Diagnostic features, Study of morphology, anatomy, reproduction and life cycle of *Equisetum*.
4. Pteropsida: Diagnostic features, Study of morphology, anatomy, reproduction and life cycle of *Ophioglossum*, *Dryopteris* and *Azolla*.

SECTION-B

5. Gymnosperms: General characters, origin, classification, economic importance and distribution in India. A brief account of Pteridosperms, Bennettitales, Pentoxylales and Cordaitales.
6. Cycadales and Ginkgoales: General characters, study of morphology, anatomy, reproduction and life cycle of *Cycas* and *Ginkgo*.
7. Coniferales and Taxales: General characters, study of morphology, anatomy, reproduction and life cycle of *Pinus*, *Taxodium*, *Cupressus*, *Podocarpus*, *Cephalotaxus*, *Araucaria* and *Taxus*.
8. Ephedrales, Welwitschiales and Gnetales: General characters, study of morphology, anatomy, reproduction and life cycle of *Ephedra*, *Welwitschia* and *Gnetum*.

RECOMMENDED READINGS

1. Bhatnagar, S. P. and Moitra, A. 1996. *Gymnosperms*, New Age International Pvt. Ltd., New Delhi.
2. Chamberlain, C. J. 1934. *Gymnosperms : Structure and Evolution*. Doves (Reprinted New York).
3. Kubitzki, K. (Ed.) 1990. *The Families & Genera of Vascular Plants, Vol I Pteridophytes and Gymnosperms*, Springer-Verlag, Berlin, New York.
4. Pandey, S. N., Mirza, S. P. & Trivedi, P. S. 1997. *A Text Book of Botany - Vol II*, Vikas Pub. House Pvt.Ltd., New Delhi.
5. Pant, D. D. 1973. *Cycas and the Cycadales*, Central Book Depot, Allahabad.
6. Parihar, N. S. 1996. *Biology and Morphology of Pteridophytes*, Central Book Depot, Allahabad.
7. Raizda, M. B. & Salmi, K.C. 1958. *Indian Forest Records, Vol 5 No.2 - Living Indian Gymnosperms*, F. R. I. Pub. Dehra Dun.

8. Rashid A. 1999. *An Introduction to Pteridophyta*, Vikas Publication House Pvt. Ltd., New Delhi.
9. Sahni, K.C. 1990. *Gymnosperms of India and Adjacent Countries*, BSMPS, Dehra Dun.
10. Sharma, O. P. 2001. *Gymnosperms*, Pragati Prakashan, Meerut.
11. Sporne, K.R. 1965. *The Morphology of Gymnosperms*. MIS Hutchinson & Co. Ltd., London.
12. Sporne, K.R. 1991. *The Morphology of Pteridophytes*, M/s Publishing Pvt. Ltd., Bombay.
13. Stewart, W. N. 1983. *Paleobotany and the Evolution of Plants*, Cambridge Univ. Press, London.
14. Stewart, W. N. & Rathwell, G. W. 1993. *Paleobotany and the Evolution of Plants*, Cambridge University Press.
15. Vasishta, P. C. 2003. *Gymnosperms*. S.Chand & Co. Ltd., New Delhi.

NAME OF THE COURSE: M. Sc. (HONOURS) BOTANY (FIVE YEAR INTEGRATED COURSE)							
PART: I	SEMESTER: II	SESSION: 2017-18			Time: 3 Hours		
PAPER: CELL AND MOLECULAR BIOLOGY							
PAPER CODE: FYBOT-TP 203	CORE	Theory	Internal	Total	L	T	Credit
MAXIMUM MARKS		60	20	80	3	1	3.5

INSTRUCTIONS TO THE PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions each from the respective section of syllabus and will carry 9 marks each. Section C will consist of 12 short-answer type questions (8-10 lines) of 2 marks each which will cover the entire syllabus uniformly and will carry 24 marks in all.

INSTRUCTIONS FOR CANDIDATES

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

SECTION-A

1. Structural organisation of cell: Prokaryotic and Eukaryotic cells; Plant and Animal cells. Structure and function of cell wall, Plasma membrane, Plasmodesmata, Endoplasmic reticulum, Golgi apparatus, Lysosomes, vacuoles, Peroxisomes, Ribosomes.
2. Structural organisation, function and semiautonomous nature of Mitochondria and Chloroplasts. Structure and function of Nucleus, Nucleolus and Chromosomes.
3. Cytoskeleton: Structure and function of filaments, microtubules and intermediate filaments. Extracellular matrix and cell junctions.
4. Cell division: Mitosis and Meiosis.

SECTION- B

5. Genetic material: Types of DNA and RNA, C- value paradox, cot curve and its significance. Organisation of genetic material in Eukaryote and prokaryotes; nucleosome assembly, supercoiling. Heterochromatin and euchromatin.
6. Macromolecules: Classification, structure and function of proteins, carbohydrates (Polysaccharides, mucopolysaccharides, mucoproteins and glycoproteins) and lipids.
7. Replication of genetic material in viruses, bacteria and Eukaryotes.
8. Mechanism of transcription and translation in Prokaryotes and Eukaryotes.

RECOMMENDED READINGS

1. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K. and Walter, P. 2008. Molecular Biology of the Cell, 5th Edition. Garland Science Taylor & Francis Group, USA.
2. Cooper G.M. and Hausman, R.E. 2007. The Cell A Molecular Approach, 4th Edition. Sinauer Associates, MA, USA.
3. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
4. Hardin, J., Bertoni, G. and Kleinsmith, L.J. 2012. Becker's World of the Cell, 8th Edition. Benjamin Cummings, NY, USA.
5. Karp, G. 2014, Cell and Molecular Biology: Concepts and Experiments, 8th Edition. John Wiley & Sons Inc. USA.
6. Klug, W.S., Cummings, M.R. Spenser, C.A. and Palladino, M.A. 2012. Concepts of Genetics, 10th Edition. Pearson Education Inc. USA.
7. Krebs, J.E., Goldstein, E.S. and Kilpatrick, S.T. 2016. Lewin's Genes XII. Jones & Bartlett, USA.
8. Lodish, H., Berk, A. Kaiser, C.A., Bretscher, A. Ploegh, H. Amon, A. and Martin, K.C. 2016. Molecular Cell Biology, 8th Edition. W. H. Freeman and company, New York, USA.
9. Nelson, D.L. and Cox, M.M. 2015. Lehninger's Principles of Biochemistry, 4th Edition.
10. Snustad, D.P. and Simmons, M.J. 2012. Principles of Genetics, 6th Edition. John Wiley & Sons Inc. USA.
11. Watson, J.D., Baker, T.A., Bell, S.P., Gann, A. Levine, M. and Losick, R. 2014. Molecular Biology of the Gene, 7th Edition. Pearson Education Inc. USA.

NAME OF THE COURSE: M. Sc. (HONOURS) BOTANY (FIVE YEAR INTEGRATED COURSE)							
PART: I	SEMESTER: II	SESSION: 2017-18			Time: 3 Hours		
PAPER: INORGANIC CHEMISTRY							
PAPER CODE: FYBOT-TP 204	ELECTIVE	Theory	Internal	Total	L	T	Credit
MAXIMUM MARKS		60	20	80	3	1	3.5

INSTRUCTIONS TO THE PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions each from the respective section of syllabus and will carry 9 marks each. Section C will consist of 12 short-answer type questions (8-10 lines) of 2 marks each which will cover the entire syllabus uniformly and will carry 24 marks in all.

INSTRUCTIONS FOR CANDIDATES

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

SECTION-A

- Wave mechanical concept of atomic structure:** Quantization of radiant energy, wave particle duality and uncertainty principle, formulation of Schrodinger wave equation (SWE), significance of ψ & ψ^2 , quantum numbers, radial probability distribution curves for s, p and d orbitals.
- Chemical Bonding-I:** Valence Bond theory and its limitations, directional characteristics of covalent Bond, Hybridization and Shape of simple molecules. BeX_2 BX_3 CX_4 PF_5 , SF_6 , IF , SnCl_2 , XeF_4 , BF_4^- $[\text{PF}_6^-]$, $[\text{PF}_4^-]$ SnCl_6^{2-} Application to some complexes and allied configurations, short comings of VB theory.
- Chemical Bonding-II:** Value shell electron pair expulsion (VSEPR) Theory: Geometry of NH_3 , H_3O^+ , SF_4 ClF_3 , ICl_2 , H_2O . Molecular orbital theory: Linear combination of atomic orbitals (LCAO) application to 1st row homonuclear diatomic molecules along with CN^- CO , CO^+ NO , NO^+ .
The crystal field theory, crystal field splitting of energy levels, crystal field stabilization energy (CFSE), Factors affecting the magnitude of crystal field splitting.
- Acid-Base Concept:** Arrhenius concept, Proton transfer theory, Concept of Lowry and Bronsted, Lux-Flood concept, The Solvent System concept, The Lewis concept, Relative strength of acids and bases: Effect of solvent, leveling effect, effect polarity and dielectric constant, effect of substituent, Pearson's concept of Hard and soft acids and bases. HSAB principle and its applications.

SECTION-B

- s-Block Elements:** Comparative studies, diagonal relationships (Li and Mg), Salient features, Atomic size, I.E., Reducing nature, flame color, alkali metals in NH_3 solutions, hydrides, hydroxide, halides; Fajan's Rule. Thermal stability of carbonate of alkaline earth metals Role of Na^+ , K^+ in biological system.
- Group Row-13 to 17 Elements:** Comparative studies including diagonal relation, General introduction, Oxidation number, I.E., Compounds like Hydride solids, diborane (Structure and Bonding), Oxides, Hydroxides, oxides, fluorocarbons, silicates, silicones. Halogens family: inter halogen compounds.
- d-Block Elements:** General trends in properties melting point, enthalpy of atomisation, atomic size, electronic configuration oxidation number, complex formation, catalytic behavior, colour of complexes, paramagnetism, Ionisation Energy, Interstitial compounds, Transition metals low reactivity of d-block elements, oxides, halides.
Lanthanides and actinides: Introduction to electronic configuration, lanthanide contraction causes and its consequences.

8. Coordination Compounds

Double salts, Coordination compounds, Coordination complexes and complex ions, Coordination number, unidentate, bidentate and polydentate ligands, Important ligands, Chelating ligands and chelates, Werner's coordination theory, Werner's theory and isomerism, Nomenclature of coordination compounds, Stereochemistry of coordination compounds with different coordination numbers, Isomerism in coordination compounds, Structural isomerism, Hydrate isomerism, Coordination isomerism, Linkage isomerism, Coordination position isomerism, Stereoisomerism, Geometrical isomerism, Optical isomerism.

RECOMMENDED READINGS

1. J.E. Huheey, Inorganic Chemistry, 3rd Ed.
2. F.A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry.
3. R.E. Douglas and D.H. McDaniel, Concepts and Models of Inorganic Chemistry.
4. R. Hilgenfeld and W. Saenger, Topics in current chemistry Vol-II.
5. Satya Prakash, G.D. Tuli, S.K. Basu & R.D. Madan, 2009. S. Chand & Company, New Delhi.
6. Puri, Sharma, Kalia, Principles of Inorganic Chemistry, Milestone Publishers and Distributions, New Delhi.

NAME OF THE COURSE: M. Sc. (HONOURS) BOTANY (FIVE YEAR INTEGRATED COURSE)							
PART: I	SEMESTER: II	SESSION: 2017-18	Time: 3 Hours				
PAPER: APPLIED MICROBIOLOGY							
PAPER CODE: FYBOT-TP 205	ELECTIVE	Theory	Internal	Total	L	T	Credit
MAXIMUM MARKS		60	20	80	3	1	3.5

INSTRUCTIONS TO THE PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions each from the respective section of syllabus and will carry 9 marks each. Section C will consist of 12 short-answer type questions (8-10 lines) of 2 marks each which will cover the entire syllabus uniformly and will carry 24 marks in all.

INSTRUCTIONS FOR CANDIDATES

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

SECTION – A

1. Scope of Microbiology; Groups of microorganisms and their distribution in nature, Applied areas of Microbiology.
2. Role of microorganisms in domestic and waste waters – chemical and microbiological characteristics of waste waters. Waste water treatment and disposal [single dwelling units (domestic and industrial) and municipal treatment process].
3. Microorganisms and industry- industrial uses of bacteria, yeasts, moulds in production of organic chemicals, vitamins, enzymes.
4. Microbial biotechnology – isolation and characterization of antibiotics. Genetically engineered microbes-Medical, Industrial and Agriculture uses.

SECTION – B

5. Role of microorganisms in food industry–bread, beer, wine, yoghurt, cheese, fermented fish, meat and vegetables. Microbial spoilage of foods. Microscopic/cultural techniques for microbial examination of foods.
6. Techniques and advantages of preservation of foods. Microorganisms as food, single cell proteins.
7. Detailed account of microbial vaccines
8. Microbiology and human health – causal organism, symptoms and control of diseases caused by bacteria, viruses, fungi and Mycoplasma (Tabulated account).

RECOMMENDED READINGS

1. Alexander N. Glazer and Hiroshi Nikaido. 2007. Microbial Biotechnology- Fundamentals of Applied Microbiology. Cambridge University Press, UK.
2. Michael T. Madigan, John M. Martinko and Jack Parker Brock. 2012. Biology Of Microorganisms. San Francisco Benjamin Cummings.
3. John L. Ingraham, Catherine A. Ingrahm. Introduction to Microbiology.
4. Black J.G. Microbiology Principles and Explorations. John Wiley and Sons.

NAME OF THE COURSE: M. Sc. (HONOURS) BOTANY (FIVE YEAR INTEGRATED COURSE)			
PART: I	SEMESTER: II	SESSION: 2017-18	Time: 3 Hours
PRACTICAL PAPER: PERTAINING TO FYBOT-TP 202 & 203			
PAPER CODE: FYBOT-PP 201	CORE	MAXIMUM MARKS: 60	CREDIT: 2.0

BIOLOGY AND DIVERSITY OF PTERIDOPHYTES AND GYMNOSPERMS

A. PTERIDOPHYTES

Study of morphology of the following genera: *Psilotum*, *Lycopodium*, *Selaginella*, *Equisetum*, *Ophioglossum*, *Dryopteris* and *Azolla*.

B. GYMNOSPERMS

Study of morphology and reproductive parts of following genera: *Cycas*, *Ginkgo*, *Pinus*, *Taxodium*, *Cupressus*, *Ephedra* and *Gnetum*. Study of following fossil gymnosperms: *Glossopteris*, *Pentoxylon*, *Cordaites* and *Cycadeoidea*

CELL AND MOLECULAR BIOLOGY

1. To determine the size of cells/spores/pollens by oculometer.
2. To isolate chloroplasts from spinach leaves.
3. To study mitosis from root tip cells.
4. Study of meiosis from pollen mother cells.
5. To determine the presence of proteins in the given sample.
6. Experiments for qualitative identification of carbohydrates: Molisch's Test for carbohydrates. Iodine Test for starch. Barford's Test or monosaccharides, Seliwanoffs Test for ketoses. Fehling's Test for reducing sugars and Bial's Test for pentoses.

NAME OF THE COURSE: M. Sc. (HONOURS) BOTANY (FIVE YEAR INTEGRATED COURSE)			
PART: I	SEMESTER: II	SESSION: 2017-18	Time: 3 Hours
PRACTICAL PAPER: PERTAINING TO FYBOT-TP 204 / 205			
PAPER CODE: FYBOT-PP 202	ELECTIVE	MAXIMUM MARKS: 30	CREDIT: 1.0

INORGANIC CHEMISTRY

1. To prepare and standardize 0.1N NaOH, N/10 KMNO₄ solution
2. To find out normality of HCl solution by titrating it against N/10 NaOH solution conductometrically.
3. To find out normality of HCl solution by titrating it against N/10 NaOH solution pH metrically.
4. To find strength of given mixture (Na₂CO₃+NaOH) by titrating it against N/10 HCl solution.
5. To find strength of given mixture (HCl+Oxalic acid) by titrating it against N/10 KMNO₄ solution.
6. To determine Fe²⁺ ions in given mixture of Mohr salt using N/10 KMNO₄ solution.

APPLIED MICROBIOLOGY

1. Preparation of media for cultivation of bacteria, cyanobacteria and fungi.
2. Isolation of microorganisms from soil, water and air by plating methods.
3. Enumeration of microorganisms from the soil by plate count method.
4. Counting of cells in the cultures by haemocytometer.
5. Isolation of N₂ fixing microorganisms from the soil.