Vidya Bharati ShaikshanikMandal, Amravati's

Vidya Bharati Mahavidyalaya, Amravati

Affiliated to Sant Gadge Baba Amravati University, Amravati Maharashtra

NAAC Re-accredited with Grade “A”(CGPA 3.23-Third Cycle)
CPE Status (Third Time) by UGC,
Mentor College under Paramarsh Scheme by UGC
'Lead College' by S.G.B. Amravati University, Amravati
ISO Certification: 9001:2015 and 14001:2015

Website: vbmv.org

Programmes in which Choice Based Credit (CBCS) elective course system has been implemented

SANT GADGE BABA
AMRAVATI UNIVERSITY
AMRAVATI - 444602
(M.S.)

✆ : 2662206, 2662207, 2662208, 2662249, 2662358.
website : www.sgbau.ac.in

FAX NO. 0721-2660949, 2662135

S.G.B.A.U./GD/A23/2020
22/12/2020

Certificate regarding implementation of CBCS/Elective course system

This is to certify that Vidya Bharati Mahavidyalaya, Amravati is an affiliated institution to Sant Gadge Baba Amravati University, Amravati conducting UG and PG programmes. The affiliating university has already implemented CBCS/Elective course system in the colleges in its jurisdiction. The Vidya Bharati Mahavidyalaya, Amravati is running the following programmes-

Programme Details-

Programme	Status of implementation of CBCS/Elective course system (Yes/No)	Year of implementation of CBCS/Elective course system
B. Sc.	Elective-Yes	1973
B.Sc. Industrial Chemistry	Elective-Yes	1997
B.Sc. Electronic	Elective-Yes	1985
B.Com	Elective-Yes	1985
B.Com. (Accounting & Finance)	Elective-Yes	2018
BA	Elective-Yes	1992
BCA	Elective-Yes	2000
BBA	Elective-Yes	2000
B.Sc. Computer Science	Elective-Yes	1998
B.Sc. Computer Application	Elective-Yes	2001
B.Voc.(Cosmetics)	Elective- No	2018
B.Voc. (Software Development)	Elective- No	2019
M.Sc. Chemistry	CBCS- Yes	1992
M.Sc. Physics	CBCS- Yes	1993
M.Sc. Botany	CBCS- Yes	1994
M.Sc. Zoology	CBCS- Yes	1995
M.Sc. Mathematics	CBCS- Yes	2018
M.Sc. Computer Science	CBCS- Yes	2018
M.Com.	Elective-Yes	2018
MA (English)	Elective-Yes	2018
MBA	Elective-Yes	1995
MCA	CBCS- Yes	2006
MCM	Elective-Yes	2000
MHRD	Elective-Yes	1994

Registrar

SANT GADGE BABA AMRAVATI UNIVERSITY GAZETTE

Official Publication of Sant Gadge Baba Amravati University

PART ONE

Thursday, the 20th July, 2017

DIRECTION

No. : 29/2017 Date : 20 July, 2017

Subject : Corrigendum to Direction Nos. 9, 10, 12 & 13 of 2017 regarding implementation of Semester and Credit Grade System.

Whereas, Direction Nos. 9, 10, 12 and 13 of 2017 Dtd. 27.6.2017 regarding implementation of Semester and Credit Grade System are existence in the University,

AND

Whereas, the Academic Council in its meeting held on 6.6.2017 vide item No.43, while approving the recommendations of the various faculties resolved as under :

"The Council approved the syllabi and draft provisions of Ordinance / Regulations of various courses to be implemented phase-wise from the academic session 2017-2018 and onwards. After issuance of various Directions / Ordinance, the existing Directions / Ordinances shall stands cancelled. However, these Directions / Ordinances shall be applicable to students who have sought their admissions by these Directions / Ordinances and availing additional chances. Thereafter, these Directions / Ordinances stands cancelled totally."

AND

Whereas, it is necessary to carry out the corrections / changes in the above said Directions immediately as the matter is to be implemented from the Academic Session 2017-2018,

AND

Whereas, the above changes are to be regulated by framing the Ordinances,

AND

Whereas, making of Ordinance / Regulation is time consuming process.

Now, therefore I, Dr. Murlidhar Chandekar, Vice-Chancellor, Sant Gadge Baba Amravati University, Amravati in exercise of powers conferred upon me under Sub-section (8) of Section 12 of the Maharashtra Public Universities Act, 2016 do hereby direct as under-

1. This Direction may be called, "Corrigendum to Direction Nos. 9, 10, 12 and 13 of 2017 regarding implementation of Semester and Credit Grade System Direction, 2017".
2. This Direction shall come into force from the Academic Session 2017-2018.
3. **The corrections / Additions in above Directions are as under :**

A) Faculty of Humanities :

1) **Direction Nos. 9/2017 for Bachelor of Arts (B.A.) (वांङ्मय स्नातक)**
Para-9 of the above Direction :

i) In sub-para iv) of para 9, the figure "6" appeared in row No. 1 of Column No. 2 of the Table, be substituted by the figure "7".

2) After para No.20, the following new para No. '21' be added and existing para No. '21' be renumbered as para No. '22'.

" 21. The existing Ordinance / Directions of the course shall be repealed stage-wise and only applicable to the students who have already sought their admissions as per its provisions and shall repealed after exhausting the chances given to the failure students of old courses by the University".

1) **Direction Nos. 10/2017 for Master of Arts (M..A.) (वांङ्मय पारंगत)**
Para-7 of the above Direction :

i) The figure & alphabet, ''4 A' appeared under first line of para-7 A) be substituted by the figure & alphabet, '5 A'.

ii) The figure & alphabet, ''4 B' appeared under first line of para-7 B) be substituted by the figure & alphabet, '5 B'.

Para-9 of the above Direction :

i) In sub-para iv) of para 9, the figure "6" appeared in row No. 1 of Column No. 4 of the Table-I, be substituted by the figure "7".

2) After para No.23, the following new para No. '24' be added and existing para No. '24' be renumbered as para No. '25'.

" 24. The existing Ordinance / Directions of the course shall be repealed stage-wise and only applicable to the students who have already sought their admissions as per its provisions and shall repealed after exhausting the chances given to the failure students of old courses by the University".

B) Faculty of Commerce and Management :

Direction Nos. 12 and 13/2017 respectively for Bachelor of Commerce (B.Com.) (वाणिज्य स्नातक) and Bachelor of Business Administration (B.B.A.) (व्यवसाय प्रशासन स्नातक)

1) After Para No. 23 of above Directions, the following new para No. '24' be added and existing para No. '24' be renumbered as para No. '25'.

" 24. The existing Ordinance / Directions of the course shall be repealed stage-wise and only applicable to the students who have already sought their admissions as per its provisions and shall repealed after exhausting the chances given to the failure students of old courses by the University".

Sd/-
(Dr.Murlidhar Chandekar)
Vice-Chancellor,
Sant Gadge Baba Amravati University.

Date : 17/7/2017.

*****

NOTIFICATION

No. 61/2017 Date : 29 June, 2017

Subject : Implementation of New Syllabi of Various Course/Subjects as per semester and credit & Grade System in the Faculty of Commerce & Management from the session 2017-2018 & onwards.

It is notified for general information of all concerned that, the authorities of the University has accepted Semester & Credit & Grade System syllabi of various Course/ Subjects of **B.Com. Part-I, Semester- I & Semester - II** mentioned in column No.2 and which is to be implemented stagewise from the session 2017-2018 and onwards with appendices as shown in column No.3 of the following table.

TABLE

Sr.No.	Course / Subjects	Appendices of the new syllabi.
1	2	3
B.Com. Semester- I & II		
1.	**Compulsory English**	The Syllabi prescribed for the subject Compulsory English which is appended herewith as **Appendix - A**
2.	**Suppllementary English**	The Syllabi prescribed for the subject Suppllementary English which is appended herewith as **Appendix - B**
3.	**Hindi**	The Syllabi prescribed for the subject Hindi which is appended herewith as **Appendix - C**
4.	**Sanskrit**	The Syllabi prescribed for the subject Sanskrit which is appended herewith as **Appendix - D**
5.	**Marathi**	The Syllabi prescribed for the subject Marathi which is appended herewith as **Appendix - E**
6.	**Urdu**	The Syllabi prescribed for the subject Urdu which is appended herewith as **Appendix - F**
7.	**Pali**	The Syllabi prescribed for the subject Pali which is appended herewith as **Appendix - G**
8.	**Computer Fundamental Operating System- I & II**	The Syllabi prescribed for the subject Computer and Fundamental and Operating System- I & II which is appended herewith as **Appendix - H**
9.	**Principles of Economics**	The Syllabi prescribed for the subject Principles of Economics which is appended herewith as **Appendix - I**
10.	**Business Economics**	The Syllabi prescribed for the subject Business of Economics which is appended herewith as **Appendix - J**
11.	**Advanced Accountancy**	The Syllabi prescribed for the subject Advanced Accountancy which is appended herewith as **Appendix - K**
12.	**Financial Accounting**	The Syllabi prescribed for the subject Financial Accounting which is appended herewith as **Appendix - L**
13.	**Principles of Business organization**	The Syllabi prescribed for the subject Principles of Business organization which is appended herewith as **Appendix - M**
14.	**Principles of Business Management**	The Syllabi prescribed for the subject Principles Management of Business Management which is appended herewith as **Appendix - N**

Sd/-
Registrar
Sant Gadge Baba Amravati University
Amravati.

Appendix- A

Compulsory English
B. Com. I
Semester I

Theory :- 80 Marks **Time :- Hours**

Text Prescribed for study : A S OF LETTE S

As per model curriculum of the U.G.C. for B.Com. Part- I and published by Raghav Publisher and Distributors, Mahal, Nagpur.

Unit I : P OSE

1. The Eyes are not Here — Ruskin Bond
2. The Romance of a Busy Broker — O. Henry

Unit II : P OSE

3. Bores — E. . ucas
4. The ost Child — Mulk Raj Anand

Unit III : POET

1. The orld is too Much ith us — illiam ordsworth
2. Once Upon a time — Gabriel Okara
3. If — Rudyard ipling

Unit IV : G AMMA strictly based on the prescribed text

A. Change the Narration
B. Articles
C. Synonyms & Antonyms
D. Tense Forms

Unit V : BUSINESS CO ESPONDENCE AND ITING SKILLS

As given in the prescribed text.

A. etter riting Formal & Informal
   i Formal
   Applications for Job/Complaint/Order
   ii Informal/ Personal etters
B Resume riting

Distribution of Marks 80 : 20

A Theory 80 Marks

Textual Components :

ue. 1 P OSE
Any two long answer uestions to be attempted out of four each carrying eight marks . 2 8 16 Marks

ue. 2- POET
Any Four short answer uestions to be attempted out of Si each carrying four marks. 4 4 16 Marks

ue. G AMMA TE TUAL

a Change the narration
Two uestions carrying two marks each Articles 2 2 4 Marks

b Articles
Four uestions carrying one mark each 4 1 4 Marks

c Synonyms & Antonyms
Four uestions carrying one mark each 4 1 4 Marks

d Tense Forms
Four uestions carrying one mark each 4 1 4 Marks

ue. BUSINESS CO ESPONDENCE AND ITING SKILLS

a Letter riting
i Formal etter
Application for Job/Complaint/Order 5 1 5 Marks
Any one out of two

ii Informal etters/Personal etters 5 1 5 Marks
Any one out of two

b esume riting **Marks**

B Internal Assessment **20 Marks**

i Class Test 10 Marks.
ii Home Assignment 10 Marks.

B.Com. □I
Semester □II
□Compulsory English□

Theory :- 80 Marks **Time :- □Hours**

....

Text Prescribed for study : □A□S OF LETTE□S
□As per model curriculum of the U.G.C. for B.Com. Part- I and published by Raghav Publisher and Distributors, Mahal, Nagpur.□

Unit I : P□OSE

1. Each is Great in His Own Place □ Swami □ivekananda
2. The Postmaster □ Rabindranath Tagore

Unit II : P□OSE

3. How I Became a Public Speaker □ George Bernard Shaw
4. Prospects of Democracy in India □ Dr. B.R. Ambedkar

Unit III : POET□□

1. Success is Counted Sweetest □ Emily Dickinson
2. □augh and Be Merry □ John Masefield
3. The Impossible Dream □ Joe Darion

Unit IV : G□AMMA□ □strictly based on the prescribed te□t□

A. Change the □oice
B. Idioms & Phrases
C. One □ ord Substitute
D. Prepositions

Unit V : BUSINESS CO□□ESPONDENCE AND □ □ITING SKILLS

A□ E- mail
B□ Newspaper Reports

<u>Distribution of Marks : □80 : 20 Marks□</u>

Textual Components :

□ue. 1□P□OSE
Any two long answer □uestions to be attempted out of four each carrying eight marks . 2□8□16 Marks

□ue. 2- POET□□
Any Four short answer □uestions to be attempted out of Si□ each carrying four marks. 4□4□16 Marks

□ue. □ MULTIPLE CHOICE □UESTIONS
□10 □uestions from Prose and si□ □uestions from Poetry, each carrying one mark. 16□1□ 16 Marks

□ue. □ G□AMMA□ □TE□TUAL□

a□ Change the □oice
Four □uestions carrying one marks each 4□1□4 Marks
b□ Idioms & Phrases
Four □uestions carrying one mark each 4□1 □4 Marks
c□ One □ ord Substitute
Four □uestions carrying one mark each 4□1 □4 Marks
d□ Preposition
Four □uestions carrying one mark each 4□1 □4 Marks

□ue. □- BUSINESS CO□□ESPONDENCE AND □ □ITING SKILLS
a□ E- Mail 6□1 □6 Marks
□Any one out of two□
b□ Newspaper Reports 10□1 □10 Marks
□Any one out of two□

B□Internal Assessment □ **20 Marks**
□i□ Class Test □ 10 Marks.
□ii□ Home Assignment □ 10 Marks.

□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

Appendix- B

B.Com. □I
Semester □I
□Supplementary English□

Theory :- 80 Marks **Time :- □Hours**

Text Prescribed :
Practical English Prose and □erse edited by G.E.B. COE Orient □ongman.

Unit I : P□OSE

The following prose lessons are prescribed for study.

1. A Slip of Tongue □ J.E.B. Gray
2. Socrates and the School Master □ F.□. Brayne

Unit II : P□OSE

3. Good Manners □ J.C. Hill
4. The Bottle Imp □ R.□. Stevenson

Unit III : POET□□

The following poems are prescribed for study.

1. The Daffodils □ □ illiam □ ordsworth
2. Break Break Break □ Alfred □ord Tennyson
3. The □ ild Swans □ □ .B. □eats
4. All in June □ □ .H. Davies

Unit IV : a□Comprehension of an Unseen Passage
b□Precis □ riting

Unit V : COMPOSITION :-
An essay of about 300 words on Social, Economic, Commercial and Information Technology Issues.

Distribution of Marks

A□ Theory 80 Marks

□ue. 1: P□OSE
Any two long answer □uestions to be attempted out of four each carrying eight marks 2□8□16 Marks

□ue. 2 : POET□□
Any four short answer □uestions to be attempted out of Si□ each carrying four marks. 4□4□16 Marks

□ue. □: MULTIPLE CHOICE □UESTIONS
Eight Multiple Choice □uestions based on Prose, each carrying one mark : 8 Marks
Eight Multiple Choice □uestions based on Poetry, each carrying one mark : 8 Marks

□ue. □: □a□Comprehension of an Unseen Passage : 8 Marks
□b□Precis □ riting : 8 Marks

□ue. □: An essay of about 300 words to be attempted out of the five given topics. : 16 Marks

B□ Internal Assessment □ **20 Marks**
□i□ Class Test □ 10 Marks
□ii□Home Assignment □ 10 Marks

□□□□□□□□□□□□□□□□□□□□□□

B.Com. □I
Semester □II
□Supplementary English□

Theory :- 80 Marks **Time :- □Hours**

Text Prescribed :
Practical English Prose and □erse edited by G.E.B. COE Orient □ongman.

Unit I : P□OSE

The following prose lessons are prescribed for study.

1. Playing the English Gentleman □ Mahatma Gandhi
2. The Home Coming □ Rabindranath Tagore

Unit II : P□OSE

3. The Miracle of Radio □ H. Shipp
4. Robin □ Jim Corbett

Unit III : POET□□

The following poems are prescribed for study.

1.	Adlestrop	□	Edward Thomas
2.	The Soldier	□	Rupert Brooke
3.	To the Indian □ ho Died in South Africa	□	T.S. Eliot
4.	That □ hitsun	□	Philip □arkin

Unit IV : a□Comprehension of an Unseen Passage
b□Precis □ riting

Unit V : COMPOSITION :-

An essay of about 400 words on Social, Economic, Commercial and Information Technology Issues.

Distribution of Marks

A□ Theory 80 Marks

□ue. 1 : P□OSE
Any two long answer □uestions to be attempted out of four each carrying eight marks 2□8:□16 Marks

□ue. 2 POET□□
Any four short answer □uestions to be attempted out of Si□ each carrying four marks. 4□4 □16 Marks

□ue. □ :
Eight Multiple Choice □uestions based on Prose, each carrying one mark : 8 Marks
Eight Multiple Choice □uestions based on Poetry, each carrying one mark : 8 Marks

□ue. □:
□a□Comprehension of an Unseen Passage : 8 Marks
□b□Precis □ riting : 8 Marks

□ue. □:
An essay of about 400 words to be attempted out of the five given topics. : 16 Marks

B□ Internal Assessment □ 20 Marks

□i□ Class Test □ 10 Marks
□ii□Home Assignment □ 10 Marks

□□□□□□

Appendix- C

हिन्दी अनिवार्य
बी.कॉम. प्रथम वर्ष
प्रथम सत्र

समय - ३ घण्टे) (पूर्णांक - ८०

पाठ्य पुस्तक - □गुंजन □ सम्पादक - डॉ.अरुण घोगरे
- डॉ.तीर्थराज राय
प्रकाशक - राघव पब्लिशर्स एंड डिस्ट्रिब्यूटर्स,नागपुर

पाठ्यपुस्तक का इकाईयों मे अंक विभाजन एवं प्रश्नों का स्वरुप निम्नानुसार है -

इकाई एक	-	गद्य खण्ड - (प्रथम सात पाठों से)		
		अ) दीघात्तरी प्रश्न (एक)	----	(०८ अंक)
		ब) लघुत्तरी प्रश्न (चार)	---	(१ अंक)
इकाई दो	-	पद्य खण्ड - (प्रथम छः कविताओं से)		
		अ) दो कविताओं के केन्ीय भाव	----	(१ अंक)
इकाई तीन	-	व्यावहारिक भाषा एवं व्याकरण		
		१) संधि विग्रह (दो)	----	(०२ अंक)
		२) शब्द शु (दो)	---	(०२ अंक)
		३) एकार्थक शब्द (दो)	----	(०२ अंक)
		४) अनेक शब्दों के लिए एक शब्द (दो)	---	(०२ अंक)
		५) विराम चिन्ह (दो)	----	(०२ अंक)
		) हिन्दी के संख्यावाचक शब्दोंकी मानक वर्तनी (दो)	---	(०२ अंक)
इकाई चार -		पत्र लेखन (एक)	---	(०८ अंक)
		व्यावसायिक अथवा कार्यालयीन पत्र (शब्द सीमा लगभग १५० शब्द)		
इकाई पॉच -		वस्तुनिष्ठ प्रश्न	---	(२० अंक)
		(प्रत्येक प्रश्न पर एक अंक)		

सूचना -- १. प्रथम चार इकाईयों से विकल्प के साथ प्रश्न पूछे जायेंगे
२. वस्तुनिष्ठ प्रश्न इकाई एक और दो से ही पूछे जायेंगे
३. दीघात्तरी प्रश्न का उत्तर लगभग ५० पं तियों मे अपेक्षित है
४. लघूत्तरी प्रश्न का उत्तर लगभग २५ पं तियों मे अपेक्षित है
५. जिन पाठों से दीघात्तरी प्रश्न पूछे जायेंगे, उनमे से लघूत्तरी प्रश्न न पुछे जायें
. पत्र लेखन -- शब्द सीमा लगभग १५० शब्द

आन्तरिक मुल्यांकन - (२० अंक)
१. गृहपाठ -- (१० अंक)
२. इकाई मूल्यांकन – (१० अंक)

हिन्दी अनिवार्य
बी.कॉम. प्रथम वर्ष
द्वितीय सत्र

समय - ३ घण्टे) (पूर्णांक - ८०

पाठ्य पुस्तक - ठगुंजनठ सम्पादक - डॉ.अरुण घोगरे
- डॉ.तीर्थराज राय
प्रकाशक - राघव पब्लिशर्स एंड डिस्ट्रिब्यूटर्स,नागपुर

पाठ्यपुस्तक का इकाईयों मे अंक विभाजन एवं प्रश्नों का स्वरुप निम्नानुसार है -

इकाई एक	-	गद्य खण्ड - (पाठ आठ से चौदह तक)		
		अ) दीघात्तरी प्रश्न (एक)	----	(०८ अंक)
		ब) लघुत्तरी प्रश्न (चार)	---	(१ अंक)
इकाई दो	-	पद्य खण्ड - (सात से बारह कविताओं से)		
		अ) दो कविताओं के केन्ीय भाव	----	(१ अंक)
इकाई तीन	-	व्यावहारिक भाषा एवं व्याकरण		
		१) देवनागरी लिपि	----	(० अंक)

(सामान्य परिचय, मानक वर्णमाला, विशेषताएँ, वर्तनी का मानक रुप)

२) पदनाम (तीन) ---- (०३ अंक)

३) परिभाषिक प्रशासनिक शब्दावली ---- (०३ अंक)

इकाई चार - निबंध (एक : व्यावसायिक विषयों पर) — (०८ अंक)

इकाई पॉच - वस्तुनिष्ठ प्रश्न (२०) --- (२० अंक)

(प्रत्येक प्रश्न पर एक अंक)

सूचना -- १. प्रथम चार इकाईयों से विकल्प के साथ प्रश्न पूछे जायेंगे

२. वस्तुनिष्ठ प्रश्न इकाई एक और दो से ही पूछे जायेंगे

३. दीघात्तरी प्रश्न का उत्तर लगभग ५० पं तियों मे अपेक्षित है

४. लघूत्तरी प्रश्न का उत्तर लगभग २५ पं तियों मे अपेक्षित है

५. जिन पाठों से दीघात्तरी प्रश्न पूछे जायेंगे, उनमे से लघूत्तरी प्रश्न न पुछे जायें

. निबंध लेखन -- शब्द सीमा लगभग ५०० शब्द

आन्तरिक मुल्यांकन - (२० अंक)

१. गृहपाठ -- (१० अंक)

२. इकाई मूल्यांकन — (१० अंक)

Appendix- D

वाणिज्य स्नातक भाग- १

(सत्र - १)

संस्कृत आवश्यक

पुस्तक : गीर्वाणसारथिः - भाग १ (प्रथम विभाग),

मुख्य संपादक - डॉ. भगवान पंडा,

सह संपादक - डॉ. रुपाली कवि ार, अथर्व प्रकाशन, जळगाव

गुण - लेखी परीक्षा - ८०

अन्तर्गत मूल्यमापन- २० एकूण गुण - १००

घटक □१ : गद्य पाठ १ व २ - १ गुण

घटक □२ : गद्य पाठ ३ व ४ - १ गुण

घटक □३ : पद्य पाठ १ व २ - १ गुण

घटक □४ : पद्य पाठ ३ व ४ - १ गुण

घटक □५ : प्रश्नावली भाग १ - १ गुण

———

प्रश्नपत्रिकेचे स्वरूप

लेखी परीक्षा - ८०

वेळ - ३ तास पूर्ण गुण - ८०

प्रश्न १.(अ) ४ पैकी २ अनुवाद करा (५ ते ओळ चे उतारे) - १० गुण

(ब) दीघात्तरी प्रश्न (दोन पैकी एक) - ० गुण

प्रश्न २.(अ) ४ पैकी २ अनुवाद करा (५ ते ओळ चे उतारे) - १० गुण

(ब) दीघात्तरी प्रश्न (दोन पैकी एक) - ० गुण

प्रश्न ३.(अ) ४ पैकी २ श्लोकांचा अनुवाद करा (४ ओळ चे) - १० गुण

(ब) दीघात्तरी प्रश्न (दोन पैकी एक) - ० गुण

प्रश्न ४.(अ) ४ पैकी २ श्लोकांचा अनुवाद करा (४ ओळ चे) - १० गुण

(ब) दीघात्तरी प्रश्न (दोन पैकी एक) - ० गुण

प्रश्न ५. २० पैकी १ वस्तुनिष्ठ प्रश्न - १ गुण

अन्तर्गत मूल्यमापन - पूर्ण गुण - २०

१) स्वाध्याय - १० गुण

२) मौखिक - १० गुण

वाणिज्य स्नातक भाग- १

(सत्र - २)

संस्कृत आवश्यक

पुस्तक : गीर्वाणसारथिः - भाग १ (द्वितीय विभाग)

मुख्य संपादक - डॉ. भगवान पंडा,

सह संपादक - डॉ. रुपाली कवि ार, अथर्व प्रकाशन, जळगाव

गुण - लेखी परीक्षा - ८०

अन्तर्गत मूल्यमापन - २० एकूण गुण - १००

घटक □१ : गद्य पाठ १ व २ - १ गुण
घटक □२ : गद्य पाठ ३ व ४ - १ गुण
घटक □३ : पद्य पाठ १ व २ - १ गुण
घटक □४ : पद्य पाठ ३ व ४ - १ गुण
घटक □५ : प्रश्नावली भाग २ - १ गुण

प्रश्नपत्रिकेचे स्वरूप

लेखी परीक्षा - ८०
वेळ - ३ तास पूर्ण गुण - ८०

प्रश्न १.(अ) ४ पैकी २ अनुवाद करा (५ ते ओळ चे उतारे) - १० गुण
(ा) दीघात्तरी प्रश्न (दोन पैकी एक) - ० गुण
प्रश्न २.(अ) ४ पैकी २ अनुवाद करा (५ ते ओळ चे उतारे) - १० गुण
(ा) दीघात्तरी प्रश्न (दोन पैकी एक) - ० गुण
प्रश्न ३.(अ) ४ पैकी २ श्लोकांचा अनुवाद करा (४ ओळ चे) - १० गुण
(ा) दीघात्तरी प्रश्न (दोन पैकी एक) - ० गुण
प्रश्न ४.(अ) ४ पैकी २ श्लोकांचा अनुवाद करा (४ ओळ चे) - १० गुण
(ा) दीघात्तरी प्रश्न (दोन पैकी एक) - ० गुण
प्रश्न ५. २० पैकी १ वस्तुनिष्ठ प्रश्न - १ गुण

अन्तर्गत मूल्यमापन - पूर्ण गुण - २०

१) स्वाध्याय - १० गुण
२) मौखिक - १० गुण

गीर्वाणसारथिः (भाग - १)

अनुक्रमणिका

पहिलेसत्र

गद्य विभाग

१) सर्वधर्मपरिषदि विवेकानन्दः
२) स्वामिभि ः
३) प्रतिमागृहवर्णनम्
४) लक्ष्मीमदः

पद्य विभाग

१) कर्मयोगः
२) हंसविलापः
३) दिलीपसिंहसंवादः
४) सुभाषितानि

प्रश्नावली भाग - १

दुसरेसत्र

गद्य विभाग

१) वानरयूथकथा
२) दिलीपभरतसंवादः
३) समस्यायाः परिहाराय....
४) विनयाधिकरणम्

पद्य विभाग

१) अयं मे हस्तो भगवान्
२) विदुरोपदेशः
३) वैद्यकीयसुभाषितानि
४) J ावतरणम्

प्रश्नावली भाग - २

Appendix- E

मराठी (आवश्यक) बी. कॉम. भाग-१

पुस्तकाचे नाव : अनुबंध भाग □१

संपादक : डॉ. अशोक नामदेव पळवेकर, डॉ. पंडित गोबरा राठोड, डॉ. अनंत सिरसाट

प्रकाशकाचे नाव : राघव पब्लिशर्स ॲण्ड डिस्ट्रिब्यूटर्स , नागपूर

सत्र □१

अनुक्रमणिका

घटक : अ - वैचारिक

१) नवीन ग्रथांची आवश्यकता	:	लोकहितवादी
२) शेती सुधारण्याचे उपाय	:	जोतीराव ुले
३) भारतीय लोकशाहीचे भवितव्य काय	:	डॉ. बाबासाहेब आंबेडकर
४) भाषा आणि लोकजीवन	:	डॉ. कुसुमावती देशपांडे

घटक : ब - ललित

५) वेणु	:	बाबा पद्मनजी
) इहलोकचा स्वर्ग	:	हरी नारायण आपटे
७) सांजवात	:	आनंदीबाई शिक
८) युवा कोण	:	बाबा आमटे
९) कवितेचा जन्म	:	बाबुराव बागूल
१०) लाट	:	हमीद दलवाई

घटक : क □कविता

९) संतवाणी	:	ाने ार / जनाबाई / तुकाराम
१०) स्वर्ग, पृथ्वी आणि मनुष्य	:	केशवसुत
११) धर्मांतर म्हणजे देशांतर नव्हे	:	लक्ष्मीबाई टिळक
१२) हिरीताचं देणं घेनं	:	बहिणाबाई चौधरी
१३) शीगवाला	:	नारायण सुव
१४) निर ा	:	तुळशीराम काजे
१५) मनातल्या मनात मी	:	सुरेश भट
१) वटहुकूम	:	ीपाद भालचं जोशी.

घटक : ड - उपयोजित लेखन

१) प्रसारमाध्यमांसाठी लेखन	:	संतोष शेणई
२) अपठित उतारा - प्रश्नोत्तरे		
३) सारांश लेखन - १/३ शब्दांत सारांश		

मराठी (आवश्यक)

बी.कॉम. प्रथम वर्ष

प्रथम सत्र

वेळ : ३ तास एकू ण गुण : ८०

सूक्ष्म वाचनाकरिता पाठ्यपुस्तक : अनुबंध भाग □१

प्रकाशकाचे नाव : राघव पब्लिशर्स ॲण्ड डिस्ट्रिब्यूटर्स, नागपूर, हे पुस्तक अभ्यासक्रमासाठी राहील.

उपयोजित लेखन (प्रसारमाध्यमांसाठी लेखन आणि अपठित उतारा - प्रश्नोत्तरे व सारांश लेखन)

प्रश्न विभागणी :

प्रश्न :१) वैचारिक विभाग	:	दीघात्तरी एक प्रश्न	□१० गुण
प्रश्न :२) वैचारिक विभाग	:	लघूत्तरी एक प्रश्न	– ० गुण
प्रश्न :३) ललित विभाग	:	दीघात्तरी एक प्रश्न	□१० गुण
प्रश्न :४) ललित विभाग	:	लघूत्तरी एक प्रश्न	□० गुण
प्रश्न :५) कविता विभाग	:	दीघात्तरी एक प्रश्न	□१० गुण
प्रश्न :) कविता विभाग	:	लघूत्तरी एकप्रश्न	– ० गुण
प्रश्न :७) प्रसारमाध्यमांसाठी लेखन	:	दीघात्तरी एक प्रश्न	□१० गुण
प्रश्न :८) अपठित उतारा - प्रश्नोत्तरे व सारांश लेखन	:	लघूत्तरी एकप्रश्न	□० गुण

(वरील सर्व प्रश्नांना अंतर्गत पर्याय राहतील.)

प्रश्न :९) वस्तुनिष्ठ प्रश्न (प्रत्येकी एक गुण) – १ गुण

(पाठ्यपुस्तकातील विभाग अ,ब,क,ड यावर प्रत्येकी चार गुणांचे चार वस्तुनिष्ठ प्रश्न विचारले जातील.)

अंतर्गत मूल्यमापन :

१)घटक चाचणी (Class Test)	: एक	□१० गुण
२)स्वाध्याय (Home - Assignment)	: एक	□१० गुण

मराठी (आवश्यक) बी. कॉम. - भाग - १

पुस्तकाचे नाव : अनुबंध भाग □१

संपादक : डॉ. अशोक नामदेव पळवेकर, डॉ. पंडित गोबरा राठोड, डॉ. अनंत सिरसाट

प्रकाशकाचे नाव : राघव पब्लिशर्स ॲण्ड डिस्ट्रिब्युटर्स , नागपूर

सत्र □२

अनुक्रमणिका

घटक : अ - वैचारिक

१) स्वातंत्र्य : संकल्पना आणि व्यवहार	:	डॉ. आ. ह. साळुंखे
२) प्रशासक नेता	:	प्रा. सुरेश व्दादशीवार
३) सारे युग वाट पाहाते आहे	:	डॉ. प्रल्हाद लुलेकर
४) ती मीच आहे	:	मलाला

घटक : ब - ललित

५) गोदो	:	नामदेव कांबळे
) अवधूत	:	रमेश अंधारे
७) दिंडी गेली पु`	:	किशोर सानप
८) महालूट	:	सदानंद देशमुख
९) जन्मचिंतन	:	अनंत नानोटी
१०) पीळ	:	ऐ ार्य पाटेकर

घटक : क □कविता

११) माय	:	स. ग. पाचपोळ
१२) सावज	:	नारायण कुळकण कवठेकर
१३) अद्याप	:	प्रभा गणोरकर
१४) जखम	:	उषाकिरण आत्राम
१५) देणं	:	जयराम खेडेकर
१) कबीर	:	लोकनाथ यशवंत
१७) ते आले, त्यानंतरची गोष्ट	:	प्रभू राजगडकर
१८) दरवेशी	:	अजीम नवाज राही
१९) यापु` मा ी ल ाई	:	सिध्दार्थ भगत
२०) अभंग	:	वीरा राठोड

घटक : ड - उपयोजित लेखन

१) कार्यालयीन पत्रव्यवहार स्वरूप वैशिष्ट्ये आणि प्रकार	:	डॉ. कल्याणी दिवेकर
२) आशयलेखन व भाषांतर		

मराठी (आवश्यक)

बी.कॉम. प्रथम वर्ष

द्वितीय सत्र

वेळ : ३ तास एकू ण गुण : ८०

सूक्ष्म वाचनाकरिता पाठ्यपुस्तक : अनुबंध भाग □१

प्रकाशकाचे नाव : राघव पब्लिशर्स ॲण्ड डिस्ट्रिब्युटर्स, नागपूर, हे पुस्तक अभ्यासक्रमासाठी राहील.

उपयोजित लेखन (कार्यालयीन पत्रव्यवहार : स्वरूप, वैशिष्ट्ये आणि प्रकार. तसेच आशयलेखन व भाषांतर)

प्रश्न विभागणी :

प्रश्न :१) वैचारिक विभाग	:	दीघात्तरी एक प्रश्न □१० गुण
प्रश्न :२) वैचारिक विभाग	:	लघूत्तरी एक प्रश्न – ० गुण
प्रश्न :३) ललित विभाग	:	दीघात्तरी एक प्रश्न □१० गुण
प्रश्न :४) ललित विभाग	:	लघूत्तरी एक प्रश्न □० गुण
प्रश्न :५) कविता विभाग	:	दीघात्तरी एक प्रश्न □१० गुण
प्रश्न :) कविता विभाग	:	लघूत्तरी एकप्रश्न – ० गुण
प्रश्न :७) कार्यालयीन पत्रव्यवहार (स्वरूप, वैशिष्ट्ये आणि प्रकार)	:	दीघात्तरी एक प्रश्न □१० गुण
प्रश्न :८) आशयलेखन व भाषांतर	:	लघूत्तरी एकप्रश्न □० गुण

(वरील सर्व प्रश्नांना अंतर्गत पर्याय राहतील.)

प्रश्न :९) वस्तुनिष्ठ प्रश्न (प्रत्येकी एक गुण) – १ गुण

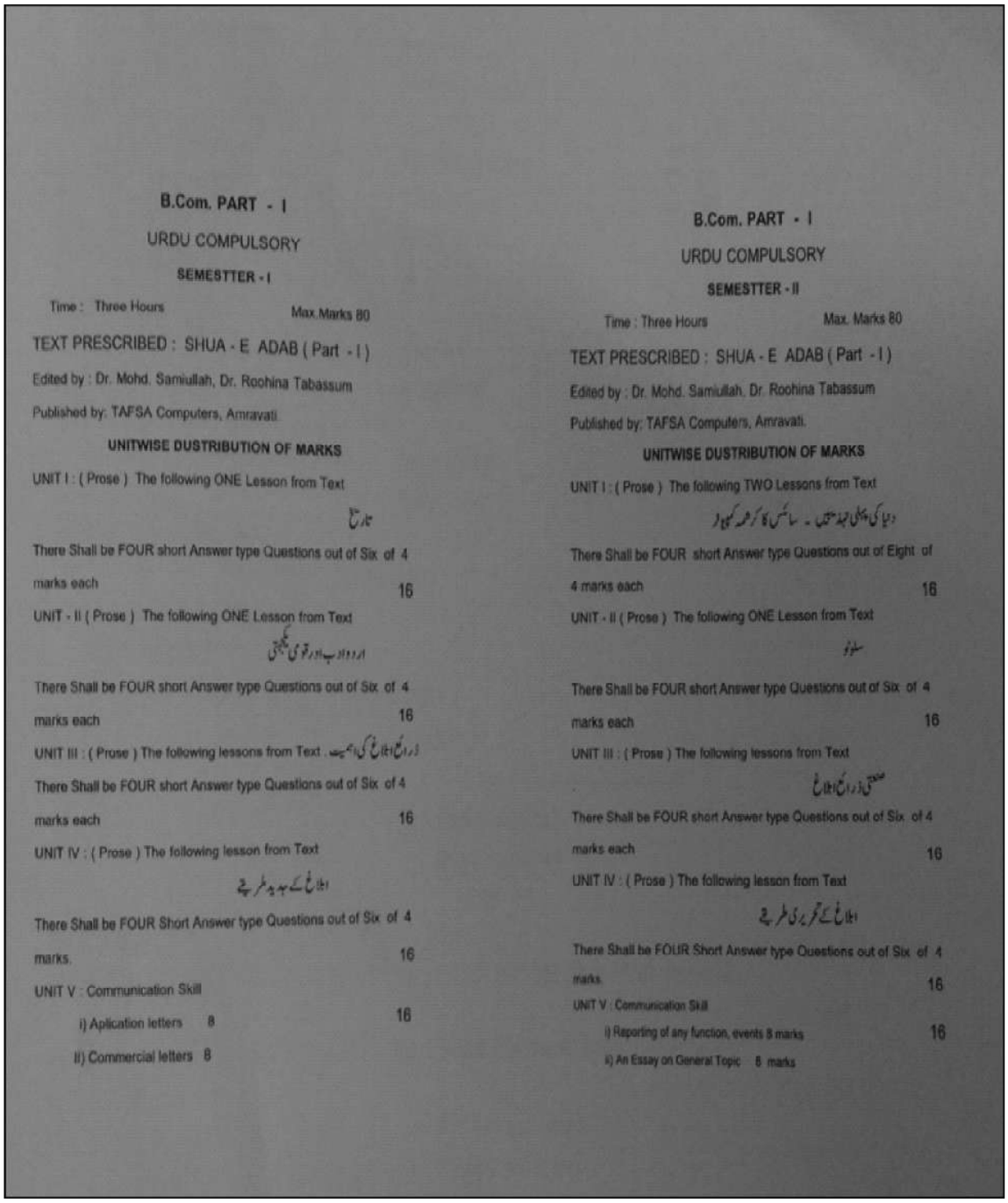
(पाठ्यपुस्तकातील विभाग अ,ब,क,ड यावर प्रत्येकी चार गुणांचे चार वस्तुनिष्ठ प्रश्न विचारले जातील.)

अंतर्गत मूल्यमापन :

१) वर्ग चाचणी (Class Test) : एक □१० गुण

२) स्वाध्याय (Home - Assignment): एक □१० गुण

Appendix-F



B.Com. PART - I

URDU COMPULSORY

SEMESTTER - I

Time : Three Hours Max.Marks 80

TEXT PRESCRIBED : SHUA - E ADAB (Part - I)

Edited by : Dr. Mohd. Samiullah, Dr. Roohina Tabassum

Published by: TAFSA Computers, Amravati.

UNITWISE DUSTRIBUTION OF MARKS

UNIT I : (Prose) The following ONE Lesson from Text

تاج

There Shall be FOUR short Answer type Questions out of Six of 4 marks each 16

UNIT - II (Prose) The following ONE Lesson from Text

اردو ادب اور قومی یکجہتی

There Shall be FOUR short Answer type Questions out of Six of 4 marks each 16

UNIT III : (Prose) The following lessons from Text . ذرائع ابلاغ کی اہمیت

There Shall be FOUR short Answer type Questions out of Six of 4 marks each 16

UNIT IV : (Prose) The following lesson from Text

ابلاغ کے جدید طریقے

There Shall be FOUR Short Answer type Questions out of Six of 4 marks. 16

UNIT V : Communication Skill

i) Aplication letters 8

II) Commercial letters 8 16

B.Com. PART - I

URDU COMPULSORY

SEMESTTER - II

Time : Three Hours Max. Marks 80

TEXT PRESCRIBED : SHUA - E ADAB (Part - I)

Edited by : Dr. Mohd. Samiullah, Dr. Roohina Tabassum

Published by: TAFSA Computers, Amravati.

UNITWISE DUSTRIBUTION OF MARKS

UNIT I : (Prose) The following TWO Lessons from Text

دنیا کی پہلی تجدید گاہیں ۔ سائنس کا کرشمہ کمپیوٹر

There Shall be FOUR short Answer type Questions out of Eight of 4 marks each 16

UNIT - II (Prose) The following ONE Lesson from Text

سفرنامہ

There Shall be FOUR short Answer type Questions out of Six of 4 marks each 16

UNIT III : (Prose) The following lessons from Text

صنعتی ذرائع ابلاغ

There Shall be FOUR short Answer type Questions out of Six of 4 marks each 16

UNIT IV : (Prose) The following lesson from Text

ابلاغ کے تحریری طریقے

There Shall be FOUR Short Answer type Questions out of Six of 4 marks. 16

UNIT V : Communication Skill

i) Reporting of any function, events 8 marks

ii) An Essay on General Topic 8 marks 16

Appendix- G

पाली (आवश्यक)
बी.कॉम. प्रथम वर्ष
प्रथम सत्र

वेळ : ३ तास — गुण : ८०

गज्जो विभागो

Unit I :

जातक कथा – बकजातक — १ गुण
सिलविमंसनजातक

Unit II :

महावग्ग – धम्मच कपवत्तनसुत्त — ०८ गुण
ख कपाठ – सरणत्तय — ०८ गुण
दससि खापद — १ गुण

पज्जो विभागो

Unit III :

धम्मपद – यमकवग्गो — १ गुण
अप्पमादवग्गो

Unit IV :

थेरीगाथा – अम्बपाली थेरी — १ गुण
पुण्णिका थेरी

Unit V : व्याकरण

१) पाली वर्णमाला व वर्णपरिवर्तन — १ गुण
२) काळ

अन्तर्गत मुल्यमापन

१) वर्ग चाचणी : एक — १० गुण
२) स्वाध्याय : गृहपाठ — १० गुण

पाली (आवश्यक)
बी.कॉम. प्रथम वर्ष
प्रथम सत्र

वेळ : ३ तास — गुण : ८०

प्रश्न १ अ,ब,क-गद्य पाठावरील मुळ पाली उताऱ्याचे तीन पैकी दोनचे मराठी भाषांतर करा. — १ गुण

प्रश्न २ पद्य पाठावरील मुळ पाली गाथांचे चार पैकी दोन गाथांचे ससंदर्भ भाषांतर करा — १ गुण

प्रश्न ३ (अ) गद्य पाठावरील दिघात्तरी प्रश्न दोन पैकी एक सोडवा — १० गुण
(ब) पद्य पाठावरील लघुत्तरी प्रश्न दोन पैकी एक सोडवा — ० गुण — १ गुण

प्रश्न ४ खालील प्रश्नांची योग्य पर्याय निवडुन उत्तरे लिहा — १ गुण
(प्रत्येक प्रश्नाला एक गुण)

प्रश्न ५ व्याकरण सोडवा — १ गुण
१) पाली वर्णमाला लिहा
२) स्वाध्याय

अन्तर्गत मुल्यमापन

१) वर्ग चाचणी — १० गुण
२) स्वाध्याय — १० गुण

पाठ्य ग्रंथ
□बुध्दवाणी □
संपादक – डॉ.रेखा जे. वानखडे
प्रकाशक - सुगम प्रकाशन - ग्रीन पार्क कॉलनी, शंकर नगर, अमरावती.

पाली (आवश्यक)
बी.कॉम. प्रथम वर्ष
द्वितीय सत्र

वेळ : ३ तास — गुण : ८०

गज्जो विभागो

Unit I :

जातक कथा – गिज्जातक — १ गुण
कल्याणधम्मजातक

Unit II :

माज्झिम निकाय – पियजातिकसुत्त — १ गुण
मखादेवसुत

पज्जो विभागो

Unit III :

धम्मपद – तन्हावग्गो — १ गुण
बुध्दवग्गो

Unit IV :

थेरीगाथा – सुनित थेर — १ गुण
आनंद थेर

Unit V : व्याकरण

१) सन्धि — १ गुण
स्वर संन्धी, व्यंजन संन्धी
२) क्रियापद
भू, गम, पठ, चज, चर

अन्तर्गत मुल्यमापन

१) वर्ग चाचणी — १० गुण
२) स्वाध्याय — १० गुण

पाली (आवश्यक)
बी.कॉम. प्रथम वर्ष
द्वितीय सत्र

वेळ : ३ तास — गुण : ८०

प्रश्न १ — गद्य पाठावरील मुळ पाली उताऱ्याचे तीन पैकी दोनचे मराठी भाषांतर करा. — १ गुण

प्रश्न २ — पद्य पाठावरील मुळ पाली गाथांचे चार पैकी दोन गाथांचे ससंदर्भ भाषांतर करा — १ गुण

प्रश्न ३ — (अ) गद्य पाठावरील दिघात्तरी प्रश्न दोन पैकी एक सोडवा — १० गुण
(ब) पद्य पाठावरील लघुत्तरी प्रश्न दोन पैकी एक सोडवा — ० गुण

प्रश्न ४ — खालील प्रश्नांची योग्य पर्याय निवडुन उत्तरे लिहा — १ गुण
(प्रत्येक प्रश्नाला एक गुण)

प्रश्न ५ — व्याकरण सोडवा

१) संधी विग्रह करा (कोणतेही चार) — ०८ गुण
२) क्रियापद — ०८ गुण
भू, गम, पठ, चज, चर

अन्तर्गत मुल्यमापन

१) घटक चाचणी — १० गुण
२) स्वाध्याय — १० गुण

पाठ्य ग्रंथ

बुध्दवाणी

संपादक – डॉ.रेखा जे. वानखडे

प्रकाशक - सुगम प्रकाशन - ग्रीन पार्क कॉलनी, शंकर नगर, अमरावती.

Appendix- H

B.Com. Part - I

Semester I

COMPUTER FUNDAMENTAL AND OPERATING SYSTEM -I

Time : 3 Hours — Theory : Marks 60

Practical: Marks 40

Objective: The objectives of this course are to impart basic knowledge about Computer, Word Processing.

Unit-I

Fundamentals of Computer: Introduction to Computer- Definition, Evolution, Characteristics, Generations, Types & Applications of Digital Computer.

Unit-II

Computer Organization: Block Diagram of Computer, Input Unit, Output Unit.

CPU: Memory Unit, Arithmetic Logic Unit, Control Unit.

Computer Software: Concept of Software and Hardware.

Types of Software: System Software, Application Software, and Firmware.

Unit-III

Memory organization of Computer:

Primary Memory: Concept, Types: RAM, SRAM, DRAM.

Read-Only Memory: PROM, EPROM, EEPROM.

Secondary Memory: Concept, Types: Hard Disk, Optical Disk, Pen Drive, Memory Card, Data Card, Blue Ray Disc.

Unit-IV:

Input/Output Devices of Computer System:

Input Devices: Keyboard, MICR, OCR, Bar Coding, Mouse.

Output Devices: Printers, Types of Printers: Dot Matrix Printer, Laser Printer, and Inkjet Printer.

Monitor: CRT, LCD, LED.

Unit-V:

Word Processing Working with Text MS-Word 2007:

Concept of Word processing, MS-Word Screen Components, Working with Ribbon, Creating, Opening, Saving and Printing a Document.

Formatting Document: Paragraph Format, Aligning Text and Paragraph, Line Spacing, Bullets and Numbering, Border and Shading, Header & Footer, Multiple Columns, Change Case, Subscript, Superscript.

BOOKS RECOMMENDED :

1. Fundamentals of Computers V. Rajaraman PHI
2. Computer Fundamentals-B.Ram New E
3. Introduction to IBMPC & Applications-Tamali.
4. MS-OFFICE PHI
5. MS-OFFICE BPB
6. MS-OFFICE TMH
7. Leats : Systems Analysis & Design Macmillan India, New Delhi.
8. Basics of Computer and Business Mathematics, By Dr. Rajiv Ashtikar, Dr. Santosh Sadar and Prof. Lilas Chopade : Payal Prakashan, Nagpur.
9. Computer Fundamentals & Operating System : Supriya Bhagade-Pimpalapure & Co. Pub.,Nagpur.
10. संगणक मूलतत्वे आणि चलन प्रणाली -Prof. S.M.Golte, Pimpalapure & Co. Publishers, Nagpur.

Practicals based on Microsoft Word 2007.

Note : B.Com. Sem. I & II Practical Batch will be of 20 students.

SCHEME

Year	Paper	Total Marks		Min. Passing Marks	
		T	P	T	P
B.COM.Sem.I	Computer Fundamentals & Operating System-I	60	40	24	16

Division of Marks for Practical

Record preparation	10 Marks
Practical	15 Marks
Discription	10 Marks
Viva	05 Marks
TOTAL	**50 Marks**

Use Answer Book for practical provided by the University

B.Com. Part - I

Semester □II

COMPUTE□ FUNDAMENTAL AND OPE□ATING S□STEM -II

Time : 3 Hours Theory : Marks 60

Practical : Marks 40

Objective: The objectives of this course are to impart basic knowledge about Computer, MS-□ ord Processing 2007 and MS-PowerPoint 2007.

Unit-I :Operating System:

Operating System Basics: Introduction, Main Functions, Structure, Types of Operating System. Concepts of Popular Operating Systems: MS DOS, MS □ INDO□ S, MS □ indow NT, UNI□, □INU□, MACINTOSH.

□ **indow 7:** Introduction, Features, Types and Elements of □ indows.

□ **indow Screen :** Desktop, Computer, Documents, Recycle Bin, Internet E□plorer, Task Bar, Properties, Management of the Files & Folders.

Unit□II :Operating System □Advance□:

Program and Features: Installing and uninstalling various programs, Accessories.

Functions of operating system- Memory management, CPU Management, File Management, I/O Device Management, Data Management, Security.

Unit-III :Modern communications □Concepts only□:

Communications: FA□, □oice mail, and information services□e- Mail, Group Communication: Tele conferencing, □ideo conferencing, File e□change□Bandwidth□Modem□Network Topologies: Network types □AN, MAN, □ AN and their Architecture, Dial up access.

Unit-IV :□ ord Processing working with Table and Graphics: □MS-□ O□D 2007□

□ orking with Tables□Create, Add Rows & Columns, Convert Table to Te□t, Using Graphics & Objects□ Insert Clip Arts, □inks, Shapes, Te□t Bo□, □ ordArt, Drop Cap, Procedure and Application of Mail Merge

Unit-V :PowerPoint Presentation:

□ **orking with MS-PowerPoint 2007 :** Concept of Presentation, MS-PowerPoint Screen, Creating, Opening and Saving Presentations, Inserting Te□t, Clips & □ ordArt to Slides, □ orking with Different Slide □iews, Background features, Gallery, Color □ayout, Slide Effects, Slide Show and Printing.

BOOKS □ECOMMENDED :

1. Fundamentals of Computers □□. Rajarman□PHI□
2. Computer Fundamentals-B.Ram □□ E□
3. Introduction to IBMPC & Applications-Ta□ali.
4. MS-OFFICE □PHI□
5. MS-OFFICE □BPB□
6. MS-OFFICE □TMH□
7. □eats : Systems Analysis & Design □Macmillan India, New Delhi.
8. Basics of Computer and Business Mathematics, By Dr. Rajiv Ashtikar, Dr. Santosh Sadar and Prof. □ilas Chopade : Payal Prakashan, Nagpur.
9. Computer Fundamentals & Operating System : Supriya Bhagade-Pimpalapure & Co. Pub.,Nagpur.
10. संगणक मूलतत्वे आणि चलन प्रणाली -Prof. S.M.□olte, Pimpalapure & Co. Publishers, Nagpur.

Practicals based on Microsoft □ ord 2007 & Microsoft Power Point 2007

Note : B.Com. Sem. I & II Practical Batch will be of 20 students.

SCHEME

□ear	Paper	Total Marks		Min. Passing Marks	
		T	P	T	P
B.COM.Sem.I	Computer Fundamentals & Operating System-I	60	□40	24	16

□Division of Marks for Practical

Record preparation	10 Marks
Practical	15 Marks
Discription	10 Marks
□iva	05 Marks
TOTAL	**□0 Marks**

□Use Answer Book for practical provided by the University□

Appendix- I

B.Com. Part - I

Semester I

PRINCIPLES OF ECONOMICS

Time : Hours **Marks : 80**

Unit-I : INTRODUCTION :

1.1 Definition of Economics : Adam Smith, Marshall & Robbins.
1.2 Definition of J.N. Mehta, Amartya Sen & Mahanobis.
1.3 Economic Laws : Nature, Characteristics, Limitation & Importance.
1.4 Micro Economics-Meaning, Scope, Merits & Demerits, Importance.
1.5 Macro Economics-Meaning, Scope, Merits & Demerits, Importance.

Unit-II : UTILITY APPROACH :

2.1 Meaning and Definition.
2.2 Marginal deminishing Utility Theory.
2.3 Equi Marginal Utility Theory.
2.4 Demand : Meaning, Definition, Change in Demand.
2.5 Law of Demand & its Exceptions.

Unit-III : ELASTICITY OF DEMAND :

3.1 Concept and Types.
3.2 Measurments.
3.3 Determinants and Importance.
3.4 Indifference Curve : Meaning, Definition & Rate of Marginal Substitute. (MRS)
3.5 Characteristics of Indifference Curve.

Unit-IV : PRODUCTION FUNCTION :

4.1 Meaning and Definition.
4.2 Law of Variable proportion.
4.3 ISO Quants : Concept & Characteristics.
4.4 Internal economies & diseconomies.
4.5 External economies & diseconomies.

Unit-V : COST AND REVENUE :

5.1 Meaning & Types of Cost.
5.2 Short run Cost Curve.
5.3 Long run Cost Curve.
5.4 Meaning & Types of revenue.
5.5 Total, Average & Marginal revenue Curve.

BOOKS RECOMMENDED :

1. Ahuja H.N. : Business Economics : S.Chand & Co.New Delhi.
2. Business Economics : Pimpalkar, Bapat, Joshi, Orient-Longmans.
3. Koutsoyianni A Modern Micro Economics:Macmillan New Delhi.
४. अर्थशास्त्राचे सिध्दांत प्रा. जी.एन्. गामरे, पिंपळापूरे प्रकाशन.
५. व्यावसायिक अर्थशास्त्र डॉ.रा.य.माहोरे,अंशुल पब्लीकेशन, नागपूर.
. अर्थशास्त्रके सिध्दांत जोशी, सिंग, गीवास्तव, जयपूर.
७. आधुनिक सुक्ष्मअर्थशास्त्र के.पी.एम्.सुंदरम्.
8. व्यवसायिक अर्थशास्त्र प्रा.एच.आर.तिवारी, डॉ.के.के.पाटील, डॉ. गी. गी.तायवाडे आणि वाय.पी.सिंग - अव्दैत प्रकाशन, अकोला.
9. Business Economics : Dr.Sudhir Bodhankar, Dr, Medha Ranetkar, Shri Sainath Prakashan, Nagpur.
10. Business Economics : Dr. (Mrs.) Pushpa Tayade-Shree MangeshPrakashan, Ramdaspeth, Nagpur-10.
11. Business Economics (English Edition) : Dr.G.N.Kamare-Pimpalapure & Co.Publishers, Nagpur.
१२. व्यावसायिक अर्थशास्त्र (मराठी आवृत्ती) :डॉ.जी.एन. गामरे- Pimpalapure & Co. Publishers, Nagpur.

Appendix- J

B.Com. Part - I
Semester II
BUSINESS ECONOMICS

Time : Hours **Marks : 80**

Unit-I : BUSINESS AND MANEGE IAL ECONOMICS :

1.1 Meaning and characteristics of Business Economics.

1.2 Meaning, Definition and characteristics managerial Economics.

1.3 Nature and Scope of Managerial Economics.

1.4 Objectives and Importance of managerial Economics.

1.5 Relation of manegerial Economics with Business Economics and Business Management.

Unit-II: MA KET ST UCTU E :

2.1 Meaning and classification of Markets.

2.2 orking of Price Mechanism.

2.3 Monopoly : Meaning and Characteristics.

2.4 Price determination under monopoly

2.5 Price discrimination under monopoly.

Unit-III: MA KET ST UCTU E :

3.1 Monopolistics competition **:** Meaning and Characteristics.

3.2 Price determination in monopolistic competition.

3.3 Oligopoly : Meaning and Characteristics.

3.4 Price determination under Oligopoly.

3.5 Perfect competition : Meaning, Characterstics and determination.

Unit-IV: FACTO S P ICING :

4.1 Nature of demand & supply of factors inputs.

4.2 Marginal productivity theory.

4.3 AGES : Meaning & Types.

4.4 Determination of wages and E ploitation of abour.

4.5 RENT : Concept, Ricardian and modern theories of Rent, uasi Rent.

Unit-V : FACTO S P ICING :

5.1 INTEREST : Concept and time preference.

5.2 oanable funds and i uidity preference theory of Interest.

5.3 PROFIT : Meaning and Definition.

5.4 Dynamic & Risk bearing theory of Profit.

5.5 Innovation theory of Profit.

BOOKS ECOMMENDED :

1. Ahuja H. : Business Economics : S.Chand & Co.New Delhi.
2. Business Economics : Pimpalkar, Bapat, Joshi, Orient- ongmans.
3. oustsoyianni A Modern Micro Economics:Macmillan New Delhi.
४. अर्थशास्त्राचे सिध्दांत प्रा. जी.एन्. ामरे, पिंपळापूरे प्रकाशन.
५. व्यावसायिक अर्थशास्त्र डॉ.रा.य.माहोरे,अंशुल पब्लीकेशन, नागपूर.
. अर्थशास्त्रके सिध्दांत जोशी, सिंग, ीवास्तव, जयपूर.
७. आधुनिक सुक्ष्मअर्थशास्त्र के.पी.एम्.सुंदरम्.
8. व्यवसायिक अर्थशास्त्र प्रा.एच.आर.तिवारी, डॉ.के.के.पाटील, डॉ.बी.बी.तायवाडे आणि वाय.पी.सिंग -अव्दैत प्रकाशन, अकोला.
9. Business Economics : Dr.Sudhir Bodhankar, Dr, Medha anetkar, Shri Sainath Prakashan, Nagpur.
10. Business Economics : Dr. Mrs. Pushpa T
11. ayade-Shree Mangesh Prakashan, Ramdaspeth, Nagpur-10.
12. Business Economics English Edition : Dr.G.N. amare-Pimpalapure & Co. Publishers, Nagpur.
१३. व्यावसायिक अर्थशास्त्र (मराठी आवृत्ती) :डॉ.जी.एन. ामरे-Pimpalapure & Co. Publishers, Nagpur.

Appendix- K

B.Com. Part - I
Semester I
ADVANCED ACOUNTANC

Time : 3 Hours Marks : 80

Objectives : To impart basic Accounting nowledge as applicable to business.

Unit-I 1.1 Meaning,definition, scope, need and development of Book keeping & Accounting. Objectives, principles Concepts and conventions of Accounting. Branch Accounts.

1.2 **Accounting Transactions :**

Classification of Accounts, Rules of debit and credit, Journal & ledger, Rules regarding posting and balancing of ledger Account and Trial Balance.

1. ectification of errors :

Types of errors, Rectification entries and suspense Account.

Unit-II 2.1 **Sub- sidiary Book :**

Sub-sidiary Book, Purchases Book, Purchases Return Book, Sales Book, Sales Return Book.

2.2 **Cash Book :**

Single column/Simple Cash Book, Double column Cash Book, Triple column Cash Book and petty Cash Book.

Unit-III Final Accounts of individual, Manufacturing Account, Trading Account, Profit & oss Accounts, Balance Sheet with Adjustment.

Unit-IV 4.1 **Depreciation Methods :**

Concepts of depreciation, Different methods of depreciation.

Problem on :

I Straight line Method.

II Reducing Balance Method.

Unit-V **Bank econciliation statement :**

Meaning, Importance and need, Cause of difference between cash book and pass book. Preparation of all types of Bank Reconciliation statement.

BOOKS ECOMMENDED

- Anthony, R. N. and Reece, J. S. : Accounting Principles Richard Irwin Inc.
- Gupta, R. . and Radhaswamy, M : Financial Accounting Sultanchand and Sons, New Delhi.
- Monga J. R. Ahuja Girish, and Sehgal Ashok : Financial Accounting Mayur Paper Back, Noida.
- Shukla, M. C., Grewal T S., and Gupta, S. C. : Advanced Accounts S. Chand & Co. New Delhi.
- Compendium of Statement and Standards of Accounting The Institute of Chartered Accountants of India, New Delhi.
- Agarwala A. N., Agarwala . N. : Higher Sciences of Accountancy itab Mahal, Allahabad. HIndi and English

Ashok Banerjee : Financial Accounting E cel Books, New Delhi-110028.

N. inayakam, P. . Mani, . . Nagarajan : Principles of Accountancy Eurasia Publishing House Pvt. td., New Delhi-110 055.

- R.R. Gupta : Advanced Accountancy.
- Jain, Narang alyanipulli : Advanced Accountancy.
- illiam Pickles : Accountancy.
- A. Mukherjee, M.Hanif : Modern Accountancy Tata McGraw Hill Publishing Co. td.
- P.C. Tulsian : Accountancy Tata McGraw Hill Publishing Co. td.
- Monga, Gandhi, adu : Advanced Accounts National Publishing House.
- S. Chakravorti : Advanced Accounting.
- Fundamentals of Accounting : R. . Gupta & . . Gupta, Sultanchand & Sons.
- fundamentals of Accounting : T.P Ghosh, Sultanchand & Sons.
- Financial Accounting : Payal Prakashan, Nagpur.
- Financial Accounting : .R. Mohota, Rashi publication, Arni, Distt. avatmal.

- Financial Accounting : Dr. Gajanan Patil, Dr. Shakil Sattar, Dr. Anil Bhawsar, Dr. Dattatraya Gujrathi-Das Ganu Prakashan, Nagpur.
- Financial Accounting : Dr. anetkar Medha, Dr. Baheti D.R. Shri Sainath Prakashan, Nagpur.
- Financial Accounting : N. Chopde, D.H. Choudhary, Dr. Raju, . Rathi, Sheth Publishers Pvt. td, Mumbai-31.

हिंदी

रूपराम गुप्त, विद्यासरन गुप्त : एडवांस्ड एकांउन्टेसी आगरा बुक स्टोअर्स

डॉ. एस.एम.शु ला : अडव्हान्स अकौन्टन्सी.

स सेना, वैश्य : उच्च लेखाकर्म

डॉ.एम.पी.खंडेलवाल : उच्चतर लेखाकर्म.

ए.एन.अग्रवाल : उच्चतर लेखावि ान.

जे.के.अग्रवाल : बृहत लेखाकर्म.

गुप्ता, अग्रवाल : एडवान्सड एकाउन्ट्स एस.चान्द.

मराठी

डॉ.शु ल, डोंगरे, मोहता : लेखा तत्व आणि व्यवहार पिंपळापुरे ॲण्ड कं. प लिशर्स, नागपुर.

प्रा. अरविंद शेंडे, प्रा. अब्दुल बारी : वित्तिय लेखांकन भाग-१ अनुराधा प्रकाशन, नागपुर.

प्रा. अरविंद शेंडे, प्रा. अब्दुल बारी : आ थक लेखांकन भाग-१ अनुराधा प्रकाशन, नागपुर.

गजानन पाटील, भरत मेघे, विकास चोपडे : आ थक लेखांकन दत्त सन्स, सदर, नागपुर.

प्रा.भ.नी. गग, प्रा.वि.द. पें ारकर, ज.अ. पाध्ये : उच्च लेखाकर्म मंगेश प्रकाशन.

प्रा. लांजेवार, गुल्हाने, कडु : लेखाकर्म भाग-१ संगम प्रकाशन.

नाथ, लांजेवार, भागवत : उच्च लेखाकर्म भाग-१ : महाराष्ट्र राज्य ग्रंथ नि मती मंडळ.

प्रा.ए.एस. उखळकर : उच्च लेखाकर्म भाग-१ विद्या प्रकाशन.

रोडे, स्मार्थ, ोन्बारे : प्रथम वर्ष जमाखर्च खंड १ एस.चांद कं. लि.

Appendix- L

B.Com. Part - I
Semester II

FINANCIAL ACCOUNTING

Time : 3 Hours Marks : 80

Objective : To develop conceptual understanding of fundamentals of financial accounting system and to impart skills in accounting for various kinds of business transaction.

Unit-I Accounts of Non-trading Institutions

Unit-II Special Accounting Areas : Accounts of Co-operative societies.

Unit-III Accounting for Agriculture Farms.

Unit-IV Hire purchases & Instalment purchase Accounts.

Unit-V Insolvency Account of and Individuals : aws of insolvency- Provisions for preferential creditors, Meaning of insolvency, Procedure of insolvency, Problems on Insolvency Accounts.

BOOKS ECOMMENDED

Anthony, R. N. and Reece, J. S. : Accounting Principles Richard Irwin Inc.

Gupta, R. . and Radhaswamy, M : Financial Accounting Sultanchand and Sons, New Delhi.

Monga J. R. Ahuja Girish, and Sehgal Ashok : Financial Accounting Mayur Paper Back,Noida.

Shukla, M. C., Grewal T S., and Gupta, S. C. : Advanced Accounts S. Chand & Co.New Delhi.

Compendium of Statement and Standards of Accounting The Institute of Chartered Accountants of India, New Delhi.

Agarwala A. N., Agarwala . N. : Higher Sciences of Accountancy itab Mahal, Allahabad. Hindi and English

Ashok Banerjee : Financial Accounting Excel Books, New Delhi-110028.

N. inayakam, P. Mani, . Nagarajan : Principles of Accountancy Eurasia Publishing House Pvt. td., New Delhi-110 055.

R.R. Gupta : Advanced Accountancy.

Jain, Narang alyanipulli : Advanced Accountancy.

illiam Pickles : Accountancy.

A. Mukherjee, M.Hanif : Modern Accountancy Tata McGraw Hill Publishing Co. td.
P.C. Tulsian : Accountancy Tata McGraw Hill Publishing Co. td.
Monga, Gandhi, adu : Advanced Accounts National Publishing House.
S. Chakravorti : Advanced Accounting.
Fundamentals of Accounting : R. Gupta & . . Gupta, Sultanchand & Sons.
fundamentals of Accounting : T.P Ghosh, Sultanchand & Sons.
Financial Accounting : Payal Prakashan, Nagpur.
Financial Accounting : R. Mohota, Rashi publication, Arni, Distt. avatmal.
Financial Accounting : Dr. Gajanan Patil, Dr. Shakil Sattar, Dr. Anil Bhawsar, Dr. Dattatraya Gujrathi-Das Ganu Prakashan, Nagpur.
Financial Accounting : Dr. anetkar Medha, Dr. Baheti D.R. Shri Sainath Prakashan, Nagpur.
Financial Accounting : N. Chopde, D.H. Choudhary, Dr. Raju, Rathi, Sheth Publishers Pvt. td, Mumbai-31

हिंदी

रूपराम गुप्त, विद्यासरन गुप्त : एडवांस्ड एकांउन्टेसी आगरा बुक स्टोअर्स

डॉ. एस.एम.शु ला : अडव्हान्स अकौन्टन्सी.

स सेना, वैश्य : उच्च लेखाकर्म

डॉ.एम.पी.खंडेलवाल : उच्चतर लेखाकर्म.

ए.एन.अग्रवाल : उच्चतर लेखावि ान.

जे.के.अग्रवाल : बृहत लेखाकर्म.

गुप्ता, अग्रवाल : एडवान्सड एकाउन्ट्स एस.चान्द.

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गजानन पाटील, भरत मेघे, विकास चोपडे : आ थक लेखांकन दत्त सन्स, सदर, नागपुर.
प्रा.भ.नी. गग, प्रा.वि.द. पें ारकर, ज.अ. पाध्ये : उच्च लेखाकर्म मंगेश प्रकाशन.
प्रा. लांजेवार, गुल्हाने, कडु : लेखाकर्म भाग-१ संगम प्रकाशन.
नाथ, लांजेवार, भागवत : उच्च लेखाकर्म भाग-१ : महाराष्ट्र राज्य ग्रंथ नि मती मंडळ.
प्रा.ए.एस. उखळकर : उच्च लेखाकर्म भाग-१ विद्या प्राकाशन.
रोडे, स्मार्थ, ोन्बारे : प्रथम वर्ष जमाखर्च खंड १ एस.चांद कं. लि.

Appendix- M

B.Com. Part - I
Semester I
PRINCIPLES OF BUSINESS ORGANIZATION

Unit 1 Commerce and Industry

1.1 Commerce and Industry - Meaning, Scope and Evolution
1.2 Industrial Revolution- Its Effects
1.3 Emergence of Indian MNC
1.4 Recent Trends in Business orld
1.5 Indian Business in New Millennium.

Unit 2 Business

2.1 Business Sectors and Its Form
2.2 Forms of Business Organization
2.3 Unorganised Business-Mom and Pop Stores, Peddlers and Hawkers, Market Traders and Street Traders
2.4 E-Commerce and Online Trade
2.5 E- Tailers, Cashless Transaction

Unit Merger and Acquisition

3.1 Mergers and Acquisition- Meaning and Mergers In India
3.2 Networking of Business
3.3 Franchising ,Dealership, Business Outlets
3.4 BPOs and POs
3.5 Patents ,Trademarks, Copyrights

Unit □□New Enterprises

4.1 Decisions in Setting up Enterprises
4.2 Opportunity and Idea Generation
4.3 Role of Creativity And Innovation
4.4 Feasibility Study and Business Plan
4.5 Business Size and □ocation Decision

Unit □□Trade In India

5.1 □ hole Sale and Retail Trade
5.2 Malls, Super Markets, Hypermarket
5.3 Stores-Speciality, Convenience, Departmental and Discount
5.4 Transport, Insurance, Communication and Other Services
5.5 Import □E□port Trade Procedure

Reference :

1. **Organization: Text, Cases and □eadings on the Management of Organizational Design and Change,** J.P.□otter, □.A. Schlesinger and □. Sathe.
2. **Business Organization & Management,** Mr.Mahesh Chaudhary.
3. **Business Organization & Management,** □aul □ □Pearson Education 2012□
4. **Business Organization & Management,** Tulsian P and Pandey □ □Pearson Education 2011□
5. **Business Environment,** Cherunilam F. □Himalaya Publishing House 2010□
6. **Business Sutra,** Pattanaik D. □Aleph Book Company 2013□
7. **Organizational Traps: Leadership, Culture, Organizational Design,** Chris A □O□ford University Press 2010□
8. □ **orld Class in India,** Piramal G and Ghoshal S □Penguin India 2002□
9. **Business Maharajas,** Piramal G □Penguin India 2011□
10. **On Becoming a Leader,** □ arren B,. □Perseus Books Group 2009□

Appendix- N

B.Com. Part - I
Semester □II

P□INCIPLES OF BUSINESS MANAGEMENT

Unit □1 Management Concept

1.1 Management-Concept, Meaning, Definition and Importance
1.2 Management Thought and Schools
1.3 Contribution of Fredrik Taylor
1.4 Contribution of Henry Fayol
1.5 Contribution of Elton Mayo

Unit □2 Planning

2.1 Planning : Concept, Meaning and Definition.
2.2 Nature and Importance of Planning
2.3 Objectives of Planning
2.4 Forecasting and Planning
2.5 Planning Process.

Unit □□Organizing

3.1 Organization -Concept, Nature, Meaning and Importance
3.2 Principles of Organization.
3.3 □ine Organization
3.4 Staff Organization
3.5 Departmentalization

Unit □□Directing

4.1 Directing- Concept, Meaning, Definition and Importance.
4.2 Nature of Direction
4.3 Advantages and Disadvantages
4.4 Motivations □Concept, Meaning and Importance
4.5 Coordination: - Meaning and Principle

Unit □□Controlling

5.1 Controlling-Concept, Meaning, Definition and Importance.
5.2 Advantages and Disadvantages
5.3 Techni□ue of Controlling
5.4 Tool of Controlling
5.5 Process of Controlling.

□eference :

1. **MGMT: Principles of Management,** Chuck □ illiams, Cengage □earning,
2. **Boston :** Cengage □earing Cop. 2016
3. **Principles of Management 1st Edition,** Charles □ .□ Hill □Author□ Steven McShane.
4. **Principles of Management Paperback-200□,** Mason Carpenter □Author□ Talya Bauer, Berrin Endogan

M.Sc. Sem-I to IV (Botany) **Prospectus No. 2017126**

संत गाडगे बाबा अमरावती विद्यापीठ

SANT GADGE BABA AMRAVATI UNIVERSITY

विज्ञान विद्याशाखा
(FACULTY OF SCIENCE)

अभ्यासक्रमिका
विज्ञान पारंगत परिक्षा (वनस्पतीशास्त्र)
सत्र- १ ते ४

PROSPECTUS
OF
MASTER OF SCIENCE EXAMINATION
IN
BOTANY
Semester - I & III, Winter 2016
Semester - II & IV, Summer 2017,

2016

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M.Sc.Part-I & Part-II (Semester I to IV) Examinations in Botany
(Prospectus No.2017126)

SANT GADGE BABA AMRAVATI UNIVERSITY
SPECIAL NOTE FOR INFORMATION OF THE STUDENTS

(1) Notwithstanding anything to the contrary, it is notified for general information and guidance of all concerned that a person, who has passed the qualifying examination and is eligible for admission only to the corresponding next higher examination as an ex-student or an external candidate, shall be examined in accordance with the syllabus of such next higher examination in force at the time of such examination in such subjects papers or combination of papers in which students from University Departments or Colleges are to be examined by the University.

(2) Be it known to all the students desirous to take examination/s for which this prospectus has been prescribed should, if found necessary for any other information regarding examinations etc., refer the University Ordinance Booklet the various conditions/provisions pertaining to examination as prescribed in the following Ordinances.

Ordinance No. 1	:	Enrolment of Students.
Ordinance No. 2	:	Admission of Students
Ordinance No. 4	:	National cadet corps
Ordinance No. 6	:	Examinations in General (relevent extracts)
Ordinance No. 18/2001	:	An Ordinance to provide grace marks for passing in a Head of passing and Inprovement of Division (Higher Class) and getting Distinction in the subject and condonation of defficiency of marks in a subject in all the faculties prescribed by the Statute NO.18, Ordinance 2001.
Ordinance No. 9	:	Conduct of Examinations (relevent extracts)
Ordinance No. 10	:	Providing for Exemptions and Compartments
Ordinance No. 19	:	Admission of Candidates to Degrees.
Ordinance No. 109	:	Recording of a change of name of a University student in the records of the University.

Ordinance No.19/2001	:	An Ordinance for Central Assessment Programme, Scheme of Evaluation and Moderation of answerbooks and preparation of results of the examinations, conducted by the University, Ordinance 2001.

Dr. Ajay P. Deshmukh
Registrar
Sant Gadge Baba Amravati University.

PATTERN OF QUESTION PAPER ON THE UNIT SYSTEM.

The pattern of question paper as per unit system will be broadly based on the following pattern

(1) Syllabus has been divided into units equal to the number of question to be answered in the paper. On each unit there will be a question either a long answer type or a short answer type.

(2) Number of question will be in accordance with the unit prescribed in the syllabi for each paper i.e. there will be one question on each unit.

(3) For every question long answer type or short answer type there will be an alternative choice from the same unit. However, there will be no internal choice in a question.

(4) Division of marks between long answer and short answer type question will be in the ratio of 40 and 60

(5) Each short answer type question shall contain 4 to 8 short sub question with no internal choice.

%ORDINANCE NO. 4 of 2008

Examinations leading to the Degree of विज्ञान पारंगत (Master of Science)(Four Semesters Degree Course), Ordinance, 2008.

Whereas it is expedient to provide an Ordinance regarding Examinations leading to the Degree of विज्ञान पारंगत (Master of Science) (Four Semesters Degree Course), in the faculty of Science. The Management Council is hereby pleased to make the following Ordinance.

1. This Ordinance may be Called, "Examinations leading to the Degree of विज्ञान पारंगत (Master of Science) (Four Semesters Degree Course), Ordinance, 2008".
2. This Ordinance shall come into force w.e.f. the date of its approval by the Management Council.
3. The duration of the course shall be two academic years,
   (a) M.Sc. Course is divided into Semester-I, Semester-II, Semester-III & Semester-IV.
   (b) University shall hold examinations in Winter and in Summer every year for all semesters.
   (c) The main examination of odd semesters shall be held in Winter and the main examination of even semesters shall be held in Summer every year. The supplementary examination for odd semesters shall be held in Summer and the supplementary examination for even semesters shall be held in Winter every year.
4. The period of Academic Session/Term shall be such as may be notified by the University and the Examination shall be held at such places and on such dates as may be fixed by the Board of Examinations.
5. Subject to their compliance with the provisions of this Ordinance and of other Ordinances in force from time to time, the following persons shall be eligible for admission to the examinations, namely:-

   (A) For विज्ञान पारंगत भाग-१ प्रथम सत्र M.Sc.Part-I:-

   (a) A collegiate candidate admitted to the Degree of Bachelor of Science who has prosecuted a regular course of study in a college or a University Department.
   (b) a teacher admitted to the Degree of Bachelor of Science and eligible under Ordinance No. 18;
   (c) a woman candidate admitted to the Degree of Bachelor of Science, who has not pursued a course of study in the University or a College;

% As approved by Management Council on dated 30.5.2008, Vide Item No. 196, and latest amended vide Ordinance No. 14 of 2009 (M.C. dated 25.5.09)

Provided that, applicants eligible under clauses (b) and (c) above shall, if laboratory work is prescribed in the subject which they offer for examination, attend the full course of laboratory instruction in the University Department or a College or a recognised Institution imparting instruction upto the standard of the examination;

Provided further, that in the case of applicants under clauses(b) and (c) above, not less than one academic year shall have elapsed since the date of their passing the examination for the Degree of विज्ञान स्नातक (Bachelor of Science);

(d) Candidate who has passed B.Sc.Examination of Sant Gadge Baba Amravati University with Chemistry as one of the optional subjects and has also passed the Diploma of Associateship of Institution of Chemists (India) Calcutta and is working as Jr/Sr.Laboratory Asstt. in National Environmental Engineering Research Institute, Nagpur (NEERI) or Council of Scientific and Industrial Research (CSIR), Nagpur or Indian Bureau of Mines (IBM) will be eligible to appear at M.Sc.Semester-I in Chemistry only, without prosecuting a regular course of study in a College/ Department in the University.

Provided he produces certificate of completion of practical course prescribed for M.Sc. Part-I (Semester-I & Semester-II) Examination in Chemistry from his employer.

(e) any other graduate in Science not eligible under clause (a) (b) or (c) above, shall be eligible for admission to the examination in Mathematics only, after a lapse of not less than one academic year since the date of his passing the examination for the Degree of विज्ञान स्नातक (Bachelor of Science):

(f) an applicant holding the भेषजी स्नातक (B.Pharm) or the विज्ञान स्नातक कृषी (B.Sc.Agri.) Degree shall be eligible for admission to the विज्ञान पारंगत (M.Sc.) Course in Biochemistry only;

(Note: The विज्ञान स्नातक (B.Sc.) Degree referred to in clause (a) above, shall include the विज्ञान स्नातक (B.Sc.) Degree of the University or an equivalent Degree of any other Statutory University)

(g) an applicant holding the B.Sc. (Ind.Chem.) Degree of the Banaras Hindu University;

(h) an applicant holding B.A./B.Sc. with Mathematics/ Statistics or Bachelor of Computer Science Degree for admission to M.Sc. Course in Statistics or Mathematics ;

(i) i) for admission to M.Sc. Microbiology a candidate shall have offered Microbiology or Industrial Microbiology or Biochemistry as a subject of study and examination at the B.Sc. degree.

ii) for admission to M.Sc. Biochemistry a candidate shall have offered Microbiology or Industrial Microbiology or Biochemistry as a subject of study and examination at the B.Sc. degree.

For admission to M.Sc.Biochemistry, in case of vacancies, a students offering Chemistry alongwith Biological Science shall be admitted.

(j) i) for admission to M.Sc. Electronics (Instrumentation) a candidate shall have offered Physics or Electronics (Instrumentation) or Electronics or Electronics Science or Computer Maintenance as subjects of study and examination at the B.Sc. level and B.C.S. degree of this University or any other equivalent Degree of Statutory University.

ii) a person passing B.E. (Electronics & Telecommunication or Industrial Electronics) Examination of Sant Gadge Baba Amravati University is eligible to take admission direcltly at second year of M.Sc. Electronics (Instrumentation). Such a student who is admitted to second year of M.Sc. Electronics (Instrumentation) shall be awarded M.Sc. degree on the basis of his performance at M.Sc. Part-II only.

(k) for admission to (M.Sc.) Geography a candidate shall have offered Geography as a subject to study and examination at the B.Sc. Degree.

(l) for admission to (M.Sc.) Petrochemical Science, a candidate shall have offered Petrochemical Science subject to study and examination at the B.Sc. Degree.

(m) i) for admission to M.Sc. Part-I (Environmental Science) a candidate shall have offered one of the optional subject as Environmental Science or Botany or Zoology or Life Sciences or Microbiology or Biochemistry or Biotechnology at B.Sc. degree,

ii) Sixty percent seats of the total intake shall be reserved for students who have passed B.Sc. with Environmental Science. If students having Environmental Science as an optional subject are not available then students having other optional subjects be considered.

(n) for admission to M.Sc. Geoinformatics or Remote Sensing and GIS, a candidate shall have passed B.Sc. in any discipline of Life Sciences. Preference shall be given to graduates having offered Geology at undergraduate level.

(o) for admission to M.Sc. Bioinformatics a candidate shall have passed B.Sc. in any discipline of Life Sciences, Bio Sciences or Bachelor Degree in Agriculture, Veternary and Fishery Sciences, Pharmacy, or Medical Sciences - Bachelor of Medicine and Bachelor of Surgery, Bachelor of Dental Surgery, B.A.M.S., B.H.M.S. or any equivalent examination recognised by Sant Gadge Baba Amravati University.

(B) For विज्ञान पारंगत भाग-२ (M.Sc. Part-II) Examination:-

(a) a student who has been admitted to the Degree of विज्ञान स्नातक (Bachelor of Science) and who has since passing the M.Sc.Part-I (Semester-I & II) Examinations, prosecuted a regular course of study for not less than one academic year in the University or in the College in the subject in which he offers himself for the M.Sc.Part-II Examinations;

(b) a teacher admitted to the Degree of विज्ञान स्नातक (Bachelor of Science) and eligible under Ordinance

No. 18 and who has not less than one academic year previously, passsed the M.Sc.Part-I Examination in the subject in which he offers himself for M.Sc.Part-II Examinations;

(c) a woman candidate admitted for the Degree of विज्ञान स्नातक (Bachelor of Science) and who has not less than one academic year previously, passed the M.Sc. Part-I Examination in that subject in which she offers herself for the M.Sc. Part-II Examinations;

(d) a candidate who has been admitted under Para 3 (A) (d) above and who has not less than one academic year previously, passed M.Sc. Part-I Examination in the subject Chemistry in which he offers himself for the M.Sc.Part-II Examination.

Provided he produces a certificate of completing of practical course prescribed for M.Sc. Part-II Examination in Chemistry from his empolyer;

(e) any other Graduate in Science not eligilbe under clause (a) (b) or (c) who has not less than one academic year presiously, passed the M.Sc. Part-I (Semester-I & Semester-II) Examinations in the subject which he offers himself for the Part-II Examination;

6. Subject to his / her compliance with the provisions of this Ordinance and other Ordinances (Pertaining to Examination in General) in force from time to time, the applicant for admission, at the end of the course of study of a perticular term shall be eligible to appear at it, if,
   (i) He / She satisfied the conditions in the table and the provisions thereunder.
   (ii) He / She has prosecuted a regular course of study in the university / college affiliated to the university.
   (iii) He / She has in the opinion of the Head of the Department / Principal shown satisfactory progress in his / her study.

Name of Exam.	The student should have passed the Examination of satisfactory	The student should have completed the session/semester
M.Sc.Part-I(Semester-I)	The qualifying examination mentioned in para 5	M.Sc.Part-I (Semester-I)
M.Sc.Part-I (Semester-II)		M.Sc.Part-I (Semester-I & II)
M.Sc.Part-II (Semester-III)	Semester-I	M.Sc.Part-II (Semester-III)
M.Sc.Part-II (Semester-IV)	Semester-I	M.Sc.Part-II (Semester-III & IV)

7. Without prejudice to the provisions of Ordinance No.6 relating to the Examinations in General, the provisions of Paragraphs 8,10, and 31 of the said Ordinance shall apply to every collegiate candidate.
8. The fee for each Semester Examination shall be as prescribed by the University time to time.

   Provided that a non-collegiate candidate, other than an ex-student shall also pay a registration fee as prescribed by the University time to time.
9. Every candidate for admission to the examination shall offer one of the following subjects for his examination, namely-
   (1) Mathematics,
   (2) Physics,
   (3) Chemistry,
   (4) Botany,
   (5) Zoology,
   (6) Geology,
   (7) Statistics,
   (8) Biochemistry,
   (9) Microbiology,
   (10) Electronics (Instrumentation),
   (11) Geography,
   (12) Geoinformatics,
   (13) Remote Sensing & GIS,
   (14) Environmental Science, and
   (15) Bioinformatics.

Provided firstly, that an examinee who has passed Part-II Examination in one of the subjects listed above from 1 to 15 and is desirous of appearing.

(a) in any other subject, or

(b) in a new paper or a combination of papers in the subject in which he has passed, may, without prosecuting a regular course of study present himself in any subsequent academic year for Part-I of the Examination in that other subject or that new paper or new combination of papers, and after not less than one academic year after passing the said Part-I Examination, for Part-II Examination in the said new paper or the said new combination of papers.

Provided secondly, that a candidate eligible for appearing at a examination under the first proviso shall, in the subject or a new paper or the new combination of papers which he is offering for the examination, attend the full course of practical Training, wherever such training is prescribed in the University Department or a College or a recognised Institution imparting instruction upon the standard of the Examination.

Provided thirdly, that an examination successful under clause (b) of the first proviso shall not be awarded division nor shall he be eligible for any scholarship, medal or prize of the University.

10. An examinee at the M.Sc.Part-I or the M.Sc. Part-II Examination shall have the option of not being declared successful at the examination in case he does not secure a minimum of Second Division marks /Higher Second Division marks fifty five percent marks (55%) at the Examination. The option will have to be exercised everytime an application is submitted to any of the three examinations and shall be on the proforma printed on the application form itself. Once exercised the option shall be binding upon the examinee, and shall not be revoked under any circumstances.

11. Any person who has obtained a Third Division at the M.Sc. Examination of this University shall be eligible to take the examination again under this Ordinance in the same subject or group of subjects as the case may be for improving his division. In such a case the provisions of Ordinance No.138 relating to Improvement of Division shall apply.

12. (1) The scope of the subject shall be as indicated in the syllabus.
(2) The medium of instruction and examination shall be English.

13. The number of papers and marks alloted to each subject and the minimum marks which an examinee must obtain in order to pass the examination shall be as indicated in Appendix-óÂô

14. Examinees who are sucessful in the M.Sc. Semester-I, II, III & IV Examination and have obtained not less than 60% marks in the aggregate of the M.Sc. Semester-I, II, III & IV Examinations taken together shall be placed in the First Division, those obtained less than 60% but not less than 55% marks, in the Higher Second Division, those obtained less than 55% but not less than 48% marks, in the Second Division, and all other successful examinees, in the Third Division.

15. Provision of Ordinance No. 18 of 2001 relating to the an Ordinance to provide grace marks for passing in a Head of passing and improvement of division (higher class) and getting distinction in the subject and Condonation of Deficiency of Marks in a subject in all the faculty prescribed by the Statute No.18, Ordinance, 2001, shall apply to the examinations under this ordinance.

16. As soon as possible after the examination, but not later than 30th, June next following, the Management Council shall publish a list of successful examinees arranged in Three Divisions. The names of examinees passing the examination as a whole in the minimum prescribed period and obtaining the prescribed number of places in each subject in the First or Second Division, shall be arranged in Order of Merit as provided in the Examinations in General Ordinance No.6.

17. Save as provided in Paragraph 11 of this ordinance, no person shall be admitted to an examination under this ordinance, if he has already passed the same examination of this University or an equivalent examination in M.Sc. Part-I (Semester-I & II), and M.Sc. Part-II (Semester-III & IV) of any other Statutory Univerisity.

18. Examinees successful at the M.Sc. Part-I (Semester-I & II), and M.Sc. Part-II (Semester-III & IV) shall on payment of the prescirbed fees, be entitled for the award of the respective Degree in the prescribed form, signed by the Vice-Chancellor.

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(Note : - " P.G. Workload in the faculty shall be as per Ordinance No. 131.")

APPENDIX-A
SCHEME OF EXAMINATION FOR M.Sc. PART-I & II.
(FOR ALL SUBJECTS)

i) M.Sc. Part-I	Paper-I	-	50 Marks	Practical-I	-	40 Marks
Semester-I	Paper-II	-	50 Marks	Internal Assessment	-	10 Marks
	Paper-III	-	50 Marks	Practical-II	-	40 Marks
	Paper-IV	-	50 Marks	Internal Assessment	-	10 Marks
M.Sc. Part-I	Paper-V	-	50 Marks	Practical-III	-	40 Marks
Semester-II	Paper-VI	-	50 Marks	Internal Assessment	-	10 Marks
	Paper-VII	-	50 Marks	Practical-IV	-	40 Marks
	Paper-VIII	-	50 Marks	Internal Assessment	-	10 Marks
M.Sc. Part-II	Paper-IX	-	50 Marks	Practical-V	-	40 Marks
Semester-III	Paper-X	-	50 Marks	Internal Assessment	-	10 Marks
	Paper-XI	-	50 Marks	Practical-VI	-	40 Marks
	Paper-XII	-	50 Marks	Internal Assessment	-	10 Marks
M.Sc. Part-II	Paper-XIII	-	50 Marks	Practical-VII	-	40 Marks
Semester-IV	Paper-XIV	-	50 Marks	Internal Assessment	-	10 Marks
	Paper-XV	-	50 Marks	Project Work	-	40 Marks
	Paper-XVI	-	50 Marks	Internal Assessment	-	10 Marks

ii) For the subject Mathematics, there shall be five theory papers of sixty marks for each semester.

Notes:-(1) Minimum pass marks for theory and practical examination including internal assessment shall be 36% separately.

(2) (a) Topic of project work shall be given by concerned supervisor with prior approval of Head of Department.

There shall be no duplication of the topic of the project work. Project shall be based on research in the laboratory

and / or field work. Project work shall be allotted at the beginning of third semester and the student shall have to

submit it atleast 15 days before commencement of practical examination of the fourth semester. Project work will be

evaluated by external and internal examiners.

(b) There should be atleast 2 to 3 external examiner for a batch of 10 students or 3 to 5 external examiner for a batch

more than 10 students.

(3) There shall be seperate exemption in theory and / or practical on getting minimum pass marks.

(4) Internal Assessment marks for all semesters shall be granted on the basis of - performance of students in any of the following activities:-

(i) Study tour, (ii) Seminar, (iii) field visits, (iv) Industrial visits, (v) visit to research institute / organisation.

(vi) Assignments, (vii) Unit test and any other co-curricular activities.

(5) The concerned Department or College shall have to maintain the record of award of internal assessment marks.

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DIRECTION

No. : 14 / 2009 Date : 29.6.2009

Subject : Examinations leading to the Degree of विज्ञान पारंगत (Master of Science) (Four Semester Degree Course), Direction, 2009.

Whereas, Ordinance No.4 of 2008 in respect of Examinations leading to the Degree of विज्ञान पारंगत (Master of Science) (Four Semester Degree Course) Ordinance, 2008 is in existance in the University.

AND

Whereas, the Board of Studies in Computer Science (including Computer Application and Computer Science (Computer Software)) in the faculty of Science in its meeting held on 5.6.2009 has resolved to accept revised syllabi of M.Sc. Semester-I to IV Computer Software, eligibility criteria and other details.

AND

Whereas, the Board of Studies further recommended that the scheme of examination will be applicable as per Ordinance No.4 of 2008 to M.Sc. Computer Software, as it is, and the revised syllabi shall be implemented from the academic session 2009-10 expeditiously in the light of advancement of knowledge in the subject.

AND

Whereas the Hon'ble Vice-Chancellor has accepted the revised syllabi of M.Sc. Computer Software, Eligibility criteria, Scheme of examinations and other details under section 14(7) of the Maharashtra Universities Act, 1994 on behalf of the faculty of Science and Academic Council.

AND

Whereas, Original Ordinance No.4 of 2008 is required to be amended for inclusion of the above said course.

AND

Whereas, the matter for the admission to student at the examination of above said course is required to be regulated by an Ordinance, and making amendments in Ordinance is time consuming process.

AND

Now, therefore, I, Dr. Kamal Singh, Vice Chancellor of Sant Gadge Baba Amravati University, in exercise of powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act., 1994, do hereby direct as under:

1. This Direction may be called ñExaminations leading to the Degree of विज्ञान पारंगत (Master of Science) (Four Semester Degree Course), Direction, 2009ò.
2. This direction shall come into force from the date of its issuance.
3. Eligibility criteria for admission to M.Sc. Computer Software shall be as given below.

   ñA person who has passed the Degree of Bachelor of Science with Computer Science/Vocational Computer Application Subjects

   OR

   A person who has passed the Degree of Bachelor of Science with Post Graduate Diploma in Computer Science of this University

   OR

   An Examination Recognised as an equivalent of this University or of any other statutory University.ò
4. The Scheme of Examination for M.Sc. Computer Software shall be as per Ordinance No.4 of 2008 as other Science subjects, as it is.

Amravati
Date : 29/6/2009

Sd/
(Dr.Kamal Singh)
Vice-Chancellor

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DIRECTION

No. : 26 / 2010 Date : 24/06/2010

Subject : Scheme for Choice Based Credit System (CBCS) and Awarding Grades to the Post Graduate Students in the Faculty of Science, Direction, 2010.

Whereas, University Grants Commission, New Delhi vide D.O.No.F-2/2008/(XI Plan), Dtd.31 Jan.2008 regarding new initiatives under the 11th Plan ï Academic Reforms in the University has suggested for improving quality of higher education and to initiate the Academic Reform at the earliest.

AND

Whereas, the Academic Council while considering the above letter in its meeting held on 30.4.2008, vide item No.55 has resolved to refer the same to Deanôs Committee, and the Deanôs Committee in its meeting held on 19.07.2008 has decided to refer the matter to all Board of Studies.

AND

Whereas, the recommendations of various Board of Studies in the faculty of Science regarding Upgradation and Revision of various syllabi and introduction of choice based credit pattern Examination System at post graduate level was considered by the faculty of Science in its meeting held on 7.12.2009 and constituted a Committee of all Chairmen of Board of Studies and one member nominated by Chairmen of respective B.O.S. under the Chairmanship of Dean of faculty to decide the policy decision regarding choice based credit system examination pattern at P.G. level.

AND

Whereas, the faculty of Science in its emergent meeting held on 11th May, 2010 vide item No.27, has considered, accepted and recommended to Academic Council, the policy decision regarding introduction of Scheme for Choice Based Credit System (CBCS) and Awarding Grades to the Post Graduate Students in the Faculty of Science under ordinance No.4 of 2008. The recommendations of the faculty was approved by the Academic Council in its emergent meeting held on 28.5.2010, vide item No.36.

AND

Whereas, Ordinance No.4 of 2008 in respect of Examinations leading to the Degree of विज्ञान स्नातक (Bachelor of Science) is in existence in the University as per semester pattern examination system.

AND

Whereas, it is necessary to frame the Regulation regarding the Scheme for Choice Based Credit System (CBCS) and Awarding Grades to the Post Graduate Students in the Faculty of Science which is to be implemented from the Academic Session 2010-11 of M.Sc.Semester-I & onwards to all subjects in the faculty of Science and framing of Regulation for the above examination is likely to take some time.

AND

Whereas, the admission of students in the above pattern at M.Sc. Part-I (Semester-I) of all subjects in the faculty of Science are to be made in the Academic Session 2010-11.

Now, therefore, I, Dr. Kamal Singh, Vice Chancellor of Sant Gadge Baba Amravati University, in exercise of powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act., 1994, do hereby direct as under:

1. This Direction may be called ñScheme for Choice Based Credit System (CBCS) and Awarding Grades to the Post Graduate Students in the Faculty of Science, Direction, 2010.
2. This Direction shall come into force with effect from the examination as shown below for all subjects for the Examinations leading to the Degree of Master of Science in the faculty of Science-
   (i) Winter 2010 examination for M.Sc. Part-I, Semester-I,
   (ii) Summer-2011 examination for M.Sc. Part-I, Semester-II,
   (iii) Winter-2011 examination for M.Sc. Part-II, Semester-III,
   (iv) Summer-2012 examination for M.Sc. Part-II, Semester-IV.
3. The detailed Scheme for Choice Based Credit System (CBCS) and Awarding Grades to the Post Graduate students in the Faculty of Science is as given below-

I. The CBCS System

All Programmes (named after the Core subject) mentioned in para 9 of Ordinance No.4 of 2008 shall be run on Choice Based Credit System (CBCS) and the grades in 7 point scale will be awarded to the students. It is an instructional package developed to suit the needs of students to keep pace with the developments in higher education and the quality assurance expected of it in the light of liberalization and globalization in higher education.

II. Credits and Degrees

i) A candidate who has successfully completed all the core courses Compulsory, Elective/ Specialised courses and project prescribed and optional approved by the University for the programme

and accumulated not less than 72 (52 core and elective) Credits and who has put in the minimum residence time shall be eligible to receive the degree.

ii) One Credit shall mean one teaching period per week for one semester (of 16 weeks) for theory courses and one laboratory session of two periods / week for one semester. One teaching period shall be of 60 minutes duration including 10 minutes for discussion / movement.

III. Courses

(i) Core Course :- A core course is a course that a student admitted to a particular programme must successfully complete to receive the degree. There may be two kinds of core courses: The **hard-core** courses which cannot be substituted by any other course and which must be successfully completed and **soft-core** courses which may be substituted by equivalent courses from the same department. In all P.G. programmes a project with 03 credits shall be included. The project may include a viva-voce examination with a credit of 1, Normally no theory course shall have more than 4 credits.

(ii) Elective Course : Means a optional course from the basic subject or specilization.

The core credits for any P.G. programme (inclusive of hard-core, soft-core and project) shall not exceed 60 credits and shall not be less than 48 credits. Each Board of Studies shall specify the core-credit load for their respective programme apart from approving syllabi,for all the courses offered by the department.

(iii) General Interest Course (GIC)

The General Interest Course shall be the choice of student. The student who choose the GIC shall have to register for it on payment of fees as prescribed by the University.

The Departmental Committee shall follow a selection procedure on a first come first served basis, fixing the maximum number of students, after counselling to the students etc. to avoid overcrowding to particular course(s) at the expense of some other courses.

(iv) Each **Course** is designed such that it includes lectures / tutorials / laboratory or field work / Seminar / Practical training / Assignments / Term paper / Report writing or review of literature and any other innovative practice etc., to meet effective teaching and learning needs.

(v) Attendance :- Students must have 75% of attendance in each Core and Elective course for appearing the examination. However student having attendance less than 75% may apply to the H.O.D. for condonation of attendance upto 15% under the provision of para 6-A (i) of Ordinance No.6.

IV. Registration for General Interest Course :-

i) Each student, on admission shall be assigned to a faculty advisor who shall advise the student about the academic programme and counsel him on the choice of courses listed in Appendix-Q depending on his general interest, academic background and objective.

ii) With the advice and consent of the faculty advisor the student shall register for courses he plans to take for the semester before classes start. No student shall be permitted to register for courses exceeding 30 credits per semester including those of repeat courses nor shall any student be permitted to register for any course without satisfactorily completing the prerequisites for the course except with the permission of the concerned teacher in the prescribed format.

iii) If the student feels he has registered for more courses than he can handle, he shall have the option of dropping one or more of the courses he has registered for, with the consent of his advisor before the end of 3rd week of the semester. However, a student, to retain his status, should have registered at least for core course and elective course of that semester.

iv) Students, other than those freshly admitted, shall register for the courses of their choice in the preceding semester by filling in the prescribed forms.

v) The University shall prescribe the maximum number of students in each General Interest Course taking into account the teachers and Physical facilities available in the Department.

vi) The University may make available to all students a listing of all the courses offered in every semester specifying the credits, the prerequisites, a brief description or list of topics the course intends to cover, the instructor who is giving the courses, the time and place of the classes for the course. This information shall be made available on the University website.

vii) Normally no course shall be offered unless a minimum of 10 students are registered.

viii) The student shall have to pay the prescribed fee per course for the registration.

V. Programme Committee :-

There shall be the programme committee at the University level constituted as under-

i) Dean of the faculty (Chairman)

ii) Heads of all the Departments ï (Member)

iii) Three teachers from the affiliated colleges having post graduate courses other than University Department ï nominated by the Vice-Chancellor. (Member)

iv) Deputy Registrar (Acad) ï (Secretary)

Duties and responsibilities of the Programme Committee shall be as under-

i) To identify the General Interest Courses (GIC) as per the need of the student and availability of teachers in the Departments.

ii) To approve the time table of GIC and make it available to the students before the commencement of respective semester. This time table also be made available on the University website.

iii) To consider and approve the report of grivence redresal committee.

iv) To remove the difficulties if any faced during implementation of the CBCS and report it to Hon'ble Vice-Chancellor for further action.

v) Any other matter as it think fit for the effective implementation of CBCS.

VI. Departmental Committee

1. Every P.G. programme of the University/College shall be monitored by a committee constituted for this purpose by the Department.

   The Committee shall consist of H.O.D. as a Chairman and all the teachers of the Deptt. of its members including one student members per class. There shall be atleast one student member on the committee.

VII. Grievances Redressal Committee

The University or College shall form a Grievance Redressal Committee for each course in each department with the Course Teacher and the HOD. This Committee shall solve all grievances relating to the Internal Assessment marks of the students.

VIII. Total credits per semester :-

Table-I
For all subjects other than Mathematics, Biotechnology & Computer Science

Course	Credits				Total
	Sem-I	Sem-II	Sem-III	Sem-IV	
Core	12	12	12	12	48
Elective	04	04	04	04	16
GIC	00	04	04	04	12
Lab. Course	06	06	06	03	21
I.A.	04	04	04	04	16
Project	00	00	00	03	03
Total	26	26 or 30	26 or 30	26 or 30	116

Table-II
For Mathematics

Course	Credits				Total
	Sem-I	Sem-II	Sem-III	Sem-IV	
Core courses	12	12	12	12	48
Elective Courses	08	08	08	08	32
GIC	ð	04	04	04	12
Internal Assessment	05	05	05	05	20
Project	ð	ð	ð	04	04
Total	25	25 or 29	25 or 29	25 or 33	116

Table-III
For Biotechnology

Course	Credits				Total
	Sem-I	Sem-II	Sem-III	Sem-IV	
Core courses	16	12	12	08	48
Elective Courses	ð	9	ð	9	18
Lab courses	24	18	18	12	72
Seminar	ð	01	01	ð	02
Project				06	06
Assignment			02		02
Internal Assessment			02		02
Total	40	40	35	35	150

Table-IV
For Computer Science

Course	Credits				Total
	Sem-I	Sem-II	Sem-III	Sem-IV	
Core	25	20	15	10	70
Elective	-	05	05	05	15
GIC	-	-	05	-	05
Lab. Course	06	06	06	03	22
I.A.	-	-	-	02	02
Project	-	-	-	04/02	06
Total	31	31	31	26	119

IX. Grade Awards :-

(i) A seven point rating scale is used for the evaluation of the performance of the student to provide letter grade for each course and overall grade for the Masterôs Programme. Grade points are based on the total number of marks obtained by him/her in all the heads of examination of the course. These grade points and their equivalent range of marks are shown separately in Table-I. The performance of the student in theory, practical, internal assessment, subjects shall be evaluated in accordance with following Table-I.

TABLE –I

Grade	**Range of Marks obtained out of 100 or Equivalent fraction**	**Grade Points**	**Remarks** (Not to be displayed On transcripts)
O	**90-100**	**10**	**Outstanding**
A+	**80-89**	**9**	**Excellent**
A	**70-79**	**8**	**Very Good**
B+	**60-69**	**7**	**Good**
B	**55-59**	**6**	**Fair**
C+	**50-54**	**5**	**Average**
C	**40-49**	**4**	**Below Average**
F	**Below 40**	**0**	**Fail**

TABLE-II: Final Grade Points for SGPA and CGPA

Grade Points	Final Grade	Remarks (Not to be displayed On transcripts)
9.00-10.00	**O**	**Outstanding**
8.00 – 8.99	**A+**	**Excellent**
7.00-7.99	**A**	**Very Good**
6.00-6.99	**B+**	**Good**
5.50 – 5.99	**B**	**Fair**
5.00 – 5.49	**C+**	**Average**
4.00 – 4.99	**C**	**Below Average**

Equivalence of the conventional division/class with the CGPA is in accordance with the following table no. 4.

Table III. Equivalence of Class/Division to CGPA

Sr.No.	CGPA	Class/Division
1	8.00 or more	First Class ï Exemplary
2	7.50 or more but less than 8.00	First Class with Distinction
3	6.00 or more but less than 7.49	First Class
4	5.50 or more but less than 5.99	Higher Second Class
5	4.00 or more but less than 5.49	Second Class
6	Less than 4.00	Fail

The overall performance of a student is evaluated by assigning appropriate weightage to all the ***four*** semesters in order to maintain the quality of education. A student is permitted to appear for the semester examination subject to he or she has a minimum attendance of 75% in theory and practical classes, completes all his/her internal/ sessional assignments and clears all his/her dues. Non appearance in any examination is treated as the student having secured zero mark in that subject examination.

The evaluation is based on an average weightage system. Every subject has credit points based on the hours of study required. Every student is assessed in a subject with appropriate weightage to internal/ sessional work and semester examination, thereby making the students study regularly. Every student is awarded Grade points out of maximum 10 points in each subject (based on 7 Points Scale). Based on the Grade points obtained in each subject, Semester Grade Point Average (SGPA) and then Cumulative Grade Point Average (CGPA) are computed.

X. Computation of SGPA & CGPA

Every student will be awarded points out of maximum 10 points in each subject. (based on 7 Points Scale). Based on the Grade points obtained in each subject the Semester Grade Point Average (SGPA) and then Cumulative Grade Point Average (CGPA) are computed. The computation of SGPA & CGPA, is as under:

Semester Grade Point Average (SGPA) is the weighted average of points obtained by a student in a semester and is computed as follows:

$$SGPA = \frac{U1 \times M1 + U2 \times M2 + ... + Un + Mn}{U1 + U2 + ...Un}$$

Where U1, U2, é .. are subject credit of the respective course and M1, M2, é .. are the Grade Points obtained in the respective subject (out of 10)

The Semester Grade Point Average (SGPA) for all the four semesters is also mentioned at the end of every semester.

The Cumulative Grade Point Average (CGPA) is used to describe the overall performance of a student in the course and is computed as under:

$$CGPA = \frac{\sum_{n=1}^{4} SGPA(n)C_n}{\sum_{n=1}^{n=4} C_n}$$

Where SGPA (n) is the nth Semester SGPA of the student and C_{-n} is the nth Semester total credit. The SGPA and CGPA are rounded off to the second place of decimal.

XI. Internal Evaluation Method :-

(i) At the beginning of each course, every teacher shall inform his/her students unambiguously the method he/she proposes to adopt for the continuous assessment. Normally the teacher concerned may conduct three written sessional examinations spread periodically during the semester and select best two for contributing to the final marks.

(ii) At the end of each semester the Departmental Committee shall assign grades to the students.

(iii) The Departmental Committee shall prepare the copies of the result sheet in duplicate.

(iv) Every student shall have the right to scrutinize answer scripts of sessional/end-semester examinations and seek clarifications from the teacher regarding eveluation of the scripts immediately thereafter or within 3 days of receiving the evaluated scripts.

(v) The Department shall display the grade points and grades for the notice of students.

(vi) The department shall send all records of evaluation, including sessional evaluation, for safekeeping to the Controller of Examinations as soon as all the formalities are over.

XII. Grade Card

The University shall issue at the beginning of each semester a grade card for the student, containing the grades obtained by the student in the previous semester and his Semester Grade Point Average (SGPA).

The grade card shall list:

(a) the title of the courses along with code taken by the student

(b) the credits associated with the course,

(c) the grade and grade points secured by the student,

(d) the total credits earned by the student in that semester.

(e) the SGPA of the student,

(f) the total credits earned by the students till that semester and

(g) the CGPA of the student (At the end of the IVth Semester)

XIII. At the end of the IVth semester, the University shall issue the statement of marks to the Students showing details of marks obtained by the student in each Head in each semester along with grade total marks.

XIV. Power to modify and remove difficulties :-

1. Not withstanding anything contained in the foregoing, Hon'ble V.C. in consultation with the Dean of the faculty shall have the power to issue directions or orders to remove any difficulty,
2. Nothing in the foregoing may be construed as limiting the power of the University to amend, modify or repeal any all of the above.

sd/-

Amravati
Date : 2/6/2010

(Dr.Kamal Singh)
Vice-Chancellor

Appendix-A

Examination Scheme under C.B.C.S. for the subject other than Mathematics, Biotechnology and Computer Science in the faculty of Science

M.Sc. Part-I

Semester-I

SA-Subject abbrivation; C-Core; E-Elective

Sr.No.	Paper / Code	Course	Theory				Practical		
			Max. Marks (Credits)	Min Pass Marks (Min. Grade Pt.)	Int. Ass. (Credits)	Min. Pass Marks (Min. Grade Pt.)	Th + Int. Ass. Min.Pass Mar (Grade Pt.)	Max. Marks (Credit)	Min. Marks marks (Min. Grade Point)
1	2	3	4	5	6	7	8	9	10
1	1SA-1	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ð	ð
2	1SA-2	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ð	ð
3	1SA-3	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ð	ð
4	1SA-4	E	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ð	ð
5	1SA-5	Lab-I	ð	ð	ð	ð	ð	100 (03)	40 (04)
6	1SA-6	Lab-II	ð	ð	ð	ð	ð	100 (03)	40 (04)

Total Marks : 600; Minimum Total Credits : 26

Note :- (1) If the student has scored minimum marks or minimum grade points mentioned in Column No.8 out of the sum of total marks of theory and internal assessment taken together then he/she will be declared to have cleared with (04+01) 05 credits.

(2) If the student has scored minimum marks or minimum grade points in either theory or in internal assessment then he/she will be declared to have cleared in that particular head.

Appendix-B

Examination Scheme under C.B.C.S. for the subject other than Mathematics, Biotechnology and Computer Science in the faculty of Science

M.Sc. Part-I

Semester-II

SA-Subject abbrivation; C-Core; E-Elective; GIC-General Interest Course

Sr.No.	Paper / Code	Course	Theory				Practical		
			Max. Marks (Credits)	Min Pass Marks (Min. Grade Pt.)	Int. Ass. (Credits)	Min. Pass Marks (Min. Grade Pt.)	Th + Int. Ass. Min.Pass Mar (Grade Pt.)	Max. Marks (Credit)	Min. Marks marks (Min. Grade Point)
1	2	3	4	5	6	7	8	9	10
1	2SA-1	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ð	ð
2	2SA-2	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ð	ð
3	2SA-3	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ð	ð
4	2SA-4 Or 2GIC-X	E and/or GIC	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ð	ð
5	2SA-5	Lab-III	ð	ð	ð	ð	ð	100 (03)	40 (04)
6	2SA-6	Lab-IV	ð	ð	ð	ð	ð	100 (03)	40 (04)

Total Marks : 600; Minimum Total Credits : 26

Note :- (1) If the student has scored minimum marks or minimum grade points mentioned in Column No.8 out of the sum of total marks of theory and internal assessment taken together then he/she will be declared to have cleared with (04+01) 05 credits.

(2) If the student has scored minimum marks or minimum grade points in either theory or in internal assessment then he/she will be declared to have cleared in that particular head.

Appendix-C

Examination Scheme under C.B.C.S. for the subject other than Mathematics, Biotechnology and Computer Science in the faculty of Science

M.Sc. Part-II

Semester-III

SA-Subject abbrivation; C-Core; E-Elective; GIC-General Interest Course

Sr.No.	Paper / Code	Course	Theory				Practical		
			Max. Marks (Credits)	Min Pass Marks (Min. Grade Pt.)	Int. Ass. (Credits)	Min. Pass Marks (Min. Grade Pt.)	Th + Int. Ass. Min.Pass Mar (Grade Pt.)	Max. Marks (Credit)	Min. Marks marks (Min. Grade Point)
1	2	3	4	5	6	7	8	9	10
1	3SA-1	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ð	ð
2	3SA-2	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ð	ð
3	3SA-3	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ð	ð
4	3SA-4 Or 3GIC-Y	E and/or GIC	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ð	ð
5	3SA-5	Lab-V	ð	ð	ð	ð	ð	100 (03)	40 (04)
6	3SA-6	Lab-VI	ð	ð	ð	ð	ð	100 (03)	40 (04)

Total Marks : 600; Minimum Total Credits : 26

Note :- (1) If the student has scored minimum marks or minimum grade points mentioned in Column No.8 out of the sum of total marks of theory and internal assessment taken together then he/she will be declared to have cleared that (04+01) 05 credits.

(2) If the student has scored minimum marks or minimum grade points in either theory or in internal assessment then he/she will be declared to have cleared in that particular head.

Appendix-D

Examination Scheme under C.B.C.S. for the subject other than Mathematics, Biotechnology and Computer Science in the faculty of Science

M.Sc. Part-II
Semester-IV

SA-Subject abbrivation; C-Core; E-Elective; GIC-General Interest Course

Sr.No.	Paper / Code	Course	Theory				Practical		
			Max. Marks (Credits)	Min Pass Marks (Min. Grade Pt.)	Int. Ass. (Credits)	Min. Pass Marks (Min. Grade Pt.)	Th + Int. Ass. Min.Pass Mar (Grade Pt.)	Max. Marks (Credit)	Min. Marks marks (Min. Grade Point)
1	2	3	4	5	6	7	8	9	10
1	4SA-1	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ð	ð
2	4SA-2	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ð	ð
3	4SA-3	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ð	ð
4	4SA-4 Or 4GIC-Z	E and/or GIC	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ð	ð
5	4SA-5	Lab-V	ð	ð	ð	ð	ð	100 (03)	40 (04)
6	4SA-6	Project	ð	ð	ð	ð	ð	100 (03)	40 (04)

Total Marks : 600; Minimum Total Credits : 26

Note :- (1) If the student score Minimum Marks or Minimum Grade Points mentioned in Column No.8 out of the sum total marks of theory and internal assessment taken together then he/she will be declared to have clear (04+01) 05 credits.

(2) If the student has score minimum marks or minimum grade points in either theory or in internal assessment then he/she will be declared to have cleared in that Particular head.

Appendix-E

Examination Scheme under C.B.C.S. for the subject Mathematics in the faculty of Science

M.Sc. Part-I
Semester-I

Sr.No.	Paper / Code	Course	Theory				
			Max. Marks (Credits)	Min Pass Marks (Min. Grade Pt.)	Int. Ass. (Credits)	Min. Pass Marks (Min. Grade Pt.)	Th + Int. Ass. Min.Pass Mar (Grade Pt.)
1	2	3	4	5	6	7	8
1	1MTH-1	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
2	1MTH-2	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
3	1MTH-3	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
4	1MTH-4	E	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
5	1MTH-5	E	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
			400 (20)		100 (05)		

Total Marks : 500; Total Credits : 25

Note :- (1) If the student score Minimum Marks or Minimum Grade Points mentioned in Column No.8 out of the sum total marks of theory and internal assessment taken together then he/she will be declared to have clear (04+01) 05 credits.

(2) If the student score Minimum Marks or Minimum Grade Points in either theory or internal assessment then he/she will be declared to have clear either of the head.

Appendix-F

Examination Scheme under C.B.C.S. for the subject Mathematics in the faculty of Science

M.Sc. Part-I
Semester-II

Sr.No.	Paper / Code	Course	Theory				
			Max. Marks (Credits)	Min Pass Marks (Min. Grade Pt.)	Int. Ass. (Credits)	Min. Pass Marks (Min. Grade Pt.)	Th + Int. Ass. Min.Pass Mar (Grade Pt.)
1	2	3	4	5	6	7	8
1	2MTH-1	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
2	2MTH-2	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
3	2MTH-3	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
4	2MTH-4	E	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
5	2MTH-5 and/or 2GIC-X	E and/or GIC	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
			400 (20)		100 (05)		

Total Marks : 500; Total Credits : 25

Note :- (1) If the student score Minimum Marks or Minimum Grade Points mentioned in Column No.8 out of the sum total marks of theory and internal assessment taken together then he/she will be declared to have clear (04+01) 05 credits.

(2) If the student score Minimum Marks or Minimum Grade Points in either theory or internal assessment then he/she will be declared to have clear either of the head.

Appendix-G

Examination Scheme under C.B.C.S. for the subject Mathematics in the faculty of Science

M.Sc. Part-II
Semester-III

Sr.No.	Paper / Code	Course	Theory				
			Max. Marks (Credits)	Min Pass Marks (Min. Grade Pt.)	Int. Ass. (Credits)	Min. Pass Marks (Min. Grade Pt.)	Th + Int. Ass. Min.Pass Mar (Grade Pt.)
1	2	3	4	5	6	7	8
1	3MTH-1	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
2	3MTH-2	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
3	3MTH-3	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
4	3MTH-4	E	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
5	3MTH-5 and/or 3GIC-Y	E and/or GIC	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
			400 (20)		100 (05)		

Total Marks : 500; Min.Total Credits : 25

Note :- (1) If the student score Minimum Marks or Minimum Grade Points mentioned in Column No.8 out of the sum total marks of theory and internal assessment taken together then he/she will be declared to have clear (04+01) 05 credits.

(2) If the student score Minimum Marks or Minimum Grade Points in either theory or internal assessment then he/she will be declared to have clear either of the head.

Appendix-H

Examination Scheme under C.B.C.S. for the subject Mathematics in the faculty of Science

M.Sc. Part-I

Semester-IV

Sr.No.	Paper / Code	Course	Theory				
			Max. Marks (Credits)	Min Pass Marks (Min. Grade Pt.)	Int. Ass. (Credits)	Min. Pass Marks (Min. Grade Pt.)	Th + Int. Ass. Min.Pass Mar (Grade Pt.)
1	2	3	4	5	6	7	8
1	4MTH-1	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
2	4MTH-2	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
3	4MTH-3	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
4	4MTH-4	E	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
5	4MTH-5 and/or 4GIC-Z and/or Project	E and/or GIC and/or Project	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
			400 (20)		100 (05)		

Total Marks : 500; Min.Total Credits : 25

Note :- (1) If the student score Minimum Marks or Minimum Grade Points mentioned in Column No.8 out of the sum total marks of theory and internal assessment taken together then he/she will be declared to have clear (04+01) 05 credits.

(2) If the student score Minimum Marks or Minimum Grade Points in either theory or internal assessment then he/she will be declared to have clear either of the head.

Appendix-I

Scheme of Teaching and Examination under C.B.C.S. for the Subject Biotechnology
M.Sc. (Biotechnology) SEMESTER PATTERN
M.Sc.Part-I (SEMESTER-I)

T: Lectures, P: Practical, TU: Tutorial/Assignment; G.I.C. – General Interest Course

S N	Subject Code	Paper	Course	Hrs/ Week		Credits		Examination Scheme								
								Theory					Practical			
				T	P/ TU	Theory	Pract.	Paper Hrs	Max External; Marks	Max Internal Marks	Total	Min Passing Grade Points	Max Marks Practical	Max Marks Int. Ass	Total	Min Passing Grade Points
1	1BTB-1	I	C	04	06	04		3	100		100	4	--	--	--	--
2	1BTB-2	II	C	04	06	04		3	100		100	4	--	--	--	--
3	1BTB-3	III	C	04	06	04		3	100		100	4	--	--	--	--
4	1BTB-4	IV	C	04	06	04		3	100		100	4	--	--	--	--
5	1BTB-5	Lab-I		--	P 01		12	--	--	--	--	-	80	20	100	5
6	1BTB-6	Lab-II		--	P 02		12	--	--	--	--	--	80	20	100	5
				16	24	16	24				400				200	

Total Credits: 40

Appendix-J

Scheme of Teaching and Examination under C.B.C.S. for the Subject Biotechnology
M.Sc. (Biotechnology) SEMESTER PATTERN
M.Sc.Part-I (SEMESTER-II)

T: Lectures, P: Practical, TU: Tutorial/Assignment; G.I.C. – General Interest Course

S N	Subject Code	Paper	Course	Hrs/ Week		Credits		Examination Scheme								
								Theory					Practical			
				T	P/ TU	Theory	Practical	Paper Hrs	Max Theory	Max Internal	Total	Min Passing Grade Points	Max Marks Practical	Max Marks Int. Ass	Total	Min Passing Grade Points
1	2BTB-1	V	C	04	06	4		3	100		100	4	--	--	--	--
2	2BTB-2	VI	C	04	06	4		3	100		100	4	--	--	--	--
3	2BTB-3	VII	C	04	06	4		3	100		100	4	--	--	--	--
4	2BTB-4 and/or 2GIC-X	VIII	E and/or GIC	04	06	4		3		100	100	4	--	--	--	--
5	2BTB-5	Lab-III			P 02		12	--	--	--	--	--	80	20	100	5
6	2BTB-6	Lab-IV			P 02		12	--	--	--	--	--	80	20	100	5
		Total		16	25	16	24				400				200	

Total Credits: 40

Appendix-K

Scheme of Teaching and Examination under C.B.C.S. for the Subject Biotechnology
M.Sc. (Biotechnology) SEMESTER PATTERN
M.Sc.Part-II (SEMESTER-III)

T: Lectures, P: Practical, TU: Tutorial/Assignment; G.I.C. – General Interest Course

S N	Subject Code	Paper	Course	Hrs/ Week		Credits		Examination Scheme								
								Theory					Practical			
				T	P/ TU	Theory	Pract.	Paper Hrs.	Max Theory	Max Internal	Total	Min Passing Grade Points	Max Marks Practical	Max Marks Int. Ass	Total	Min Passing Grade Points
1	3BTB-1	IX	C	04	06	04		3	100	--	100	4	--	--	--	--
2	3BTB-2	X	C	04	06	04		3	100	--	100	4	--	--	--	--
3	3BTB-3	XI and 3GIC-Y	C and GIC	04	06	04		3	100	--	100	4	--	--	--	--
4	3BTB-4	Lab-V			P 02		18	--	--	--	--	--	80	20	100	5
5	3BTB-5	Internal Assessment			01		02		--	--	--	--	--	75	75	5
6	3BTB-6	Assignment					02		--	--	--	--	--	50	50	5
7		Seminar			01	1		-	--	--	--	--		75	75	5
		Total		12	20	13	22	-	--	--	300	--	--	--	300	--

Total Credits: 35

Appendix-L

Scheme of Teaching and Examination under C.B.C.S. for the Subject Biotechnology
M.Sc. (Biotechnology) SEMESTER PATTERN
M.Sc.Part-II (SEMESTER-IV)

T: Lectures, P: Practical, TU: Tutorial/Assignment; G.I.C. – General Interest Course

S N	Subject Code	Paper	Course	Hrs/ Week		Credits		Examination Scheme								
								Theory					Practical			
				T	P/ TU	Theory	Pract.	Paper Hrs.	Max Theory	Max Internal	Total	Min Passing Grade Points	Max Marks Practical	Max Marks Int. Ass	Total	Min Passing Grade Points
1	4BTB-1	XII	C	04	06	04		3	100	--	100	4	--	--	--	--
2	4BTB-2	XIII	C	04	06	04		3	100	--	100	4	--	--	--	--
3	4BTB-3 and/or 4GIC-Z	XIV	E and/or GIC	04	06	04		3		100	100	4	--	--	--	--
4	4BTB-4	Lab-VI					18						80	20	100	5
5	4BTB-5	Project			06		06						200	--	200	5
		Total		12	24	12	24	-	--	--	300	--	--	--	300	--

Total Credits: 35

Appendix-M

Scheme of Teaching and Examination under C.B.C.S. for the subject Computer Science
M.Sc. (Computer) SEMESTER PATTERN
M.Sc.Part-I (SEMESTER-I)

T: Lectures, P: Practical, TU: Tutorial/Assignment; G.I.C. General Interest Course, C-Core

SN	Subject Code	Paper	Course	Hrs/ Week		Credits		Examination Scheme								
								Theory						Practical		
				T	P/ TU	Theory	Practical	Paper Hrs	Max External; Marks	Max Internal Marks	Total	Min Passing Grade Points	Max Marks Practical	Max Marks Int. Ass	Total	Min Passing Grade Points
1	1MCS-1	I	C	5	-	5	-	3 Hrs	100	-	100	40 4.00				
2	1MCS-2	II	C	5	-	5	-	3 Hrs	100	-	100	40 4.00				
3	1MCS-3	III	C	5	-	5	-	3 Hrs	100	-	100	40 4.00				
4	1MCS-4	IV	C	5	-	5	-	3 Hrs	100	-	100	40 4.00				
5	1MCS-5	V	C	5	-	5	-	3 Hrs	100	-	100	40 4.00				
6	1MCS-6	Lab-I	-	-	7	-	03			-						
7	1MCS-7	Lab-II	-	-	7	-	03			-			100	-	100	40 4.0
		Total		25	14	25	06						100	-	100	40 4.0

Total Credits: 40

Appendix-N

Scheme of Teaching and Examination under C.B.C.S. for the subject Computer Science
M.Sc. (Computer) SEMESTER PATTERN
M.Sc.Part-I (SEMESTER-II)

T: Lectures, P: Practical, TU: Tutorial/Assignment; G.I.C. – General Interest Course, C-Core

SN	Subject Code	Paper	Course	Hrs/ Week		Credits		Examination Scheme								
								Theory						Practical		
				T	P/ TU	Theory	Practical	Paper Hrs	Max Theory	Max Internal	Total	Min Passing Grade Points	Max Marks Practical	Max Marks Int. Ass	Total	Min Passing Grade Points
1	2MCS-1	VI	C	5	-	5	-	3 Hrs	100	-	100	40 4.00				
2	2MCS-2	VII	C	5	-	5	-	3 Hrs	100	-	100	40 4.00				
3	2MCS-3	VIII	C	5	-	5	-	3 Hrs	100	-	100	40 4.00				
4	2MCS-4	IX	C	5	-	5	-	3 Hrs	100	-	100	40 4.00				
5	2MCS-5 Or 2GIC-X	X	E or GIC	5	-	5	-	3 Hrs	100	-	100	40 4.00				
6	2MCS-6	Lab-III	-	-	7	-	03	-	-	-	-					
7	2MCS-7	Lab-IV	-	-	7	-	03	-	-	-	-		100	-	100	40 4.0
				25	14	25	06						100	-	100	40 4.0

Total Credits: 40

Scheme of Teaching and Examination under C.B.C.S. for the subject Computer Science
M.Sc. (Computer) SEMESTER PATTERN
M.Sc.Part-II (SEMESTER-III)

Appendix-O

T: Lectures, P: Practical, TU: Tutorial/Assignment; G.I.C. – General Interest Course

S N	Subject Code	Paper	Course	Hrs/ Week		Credits		Examination Scheme								
								Theory					Practical			
				T	P/ TU	Theory	Pract.	Paper Hrs.	Max Theory	Max Internal	Total	Min Passing Grade Points	Max Marks Practical	Max Marks Int. Ass	Total	Min Passing Grade Points
1	3MCS-1	XI	C	5	-	5	-	3 Hrs	100	-	100	40 4.00				
2	3MCS-2	XII	C	5	-	5	-	3 Hrs	100	-	100	40 4.00				
3	3MCS-3	XIII	C	5	-	5	-	3 Hrs	100	-	100	40 4.00				
4	3MCS-4	XIV	E	5	-	5	-	3 Hrs	100	-	100	40 4.00				
5	3MCS-5 Or 3GIC-Y	XV	E or GIC	5	-	5	-	3 Hrs	100	-	100	40 4.00				
6	3MCS-6	Lab-V	-	-	7	-	03			-			100	-	100	40 4.0
7	3MCS-7	Lab-VI	-	-	7	-	03			-			100	-	100	40 4.0
		Total		25	14	25	06						100	-	100	40 4.0

Total Credits: 35

Scheme of Teaching and Examination under C.B.C.S. for the subject Computer Science
M.Sc. (Computer) SEMESTER PATTERN
M.Sc.Part-II (SEMESTER-IV)

Appendix-P

T: Lectures, P: Practical, TU: Tutorial/Assignment; G.I.C. – General Interest Course

S N	Subject Code	Paper	Course	Hrs/ Week		Credits		Examination Scheme								
								Theory					Practical			
				T	P/ TU	Theory	Pract.	Paper Hrs.	Max Theory	Max Internal	Total	Min Passing Grade Points	Max Marks Practical	Max Marks Int. Ass	Total	Min Passing Grade Points
1	4MCS-1	XVI	C	5	-	5	-	3 Hrs	100	-	100	40 4.00				
2	4MCS-2	XVII	C	5	-	5	-	3 Hrs	100	-	100	40 4.00				
3	4MCS-3 Or 4GIC-Z	XVIII	E or GIC	5	-	5	-	3 Hrs	100	-	100	40 4.00				
4	4MCS-4	Lab-VII	-	-	7	-	03	4 Hrs	-	-	-	-	100		100	40 04
5	4MCS-5	Project	-	-	7	-	03+1			-	-	-	100	50	100	40 04
6	4MCS-6	Seminar	-	02	-	-	01+1			-	-	-	100	50	150	60 04
7	4MCS-7	Internal Assessement	-	06	-	-	02		-	-	-	40 4.00		50	50	20 04
		Total		23	14	15	11									

Total Credits: 35

Appendix-Q

List of General Interest Courses (GIC) to be opted by the student/s in Semester-II

Sr.No.	Subject	Subject Code Elective	Equivalent General Interest Course Code
1	2	3	4
1	Chemistry	2CHE3	2GIC-1
		2CHE4	2GIC-2
2	Physics	2PHY3	2GIC3
		2PHY4	2GIC4
3	Mathematics	2MTH4	2GIC5
		2MTH5	2GIC6
4	Zoology	2ZOO3	2GIC7
		2ZOO4	2GIC8
5	Botany	2BOT3	2GIC9
		2BOT4	2GIC-A
6	Statistics	2SCA3	2GIC-B
		2SCA4	2GIC-C
7	Biotechnology	2BTB3	2GIC-D
		2BTB4	2GIC-E
8	Computer Science	2CMS3	2GIC-F
		2CMS4	2GIC-G
9	Microbiology	2MCB3	2GIC-H
		2MCB4	2GIC-I
10	Electronics	2ELE3	2GIC-J
		2ELE4	2GIC-K
11	Biochemistry	2BMC3	2GIC-L
		2BMC4	2GIC-M
12	Geology	2GEO3	2GIC-N
		2GEO4	2GIC-O
13	Bioinformatics	2BIT3	2GIC-P
		2BIT4	2GIC-Q
14	Environmental Science	2ENV3	2GIC-R
		2ENV4	2GIC-S
15	Geoinformatics	2GIT3	2GIC-U
		2GIT4	2GIC-V
16	Computer Software	2CSW3	2GIC-W
		2CSW4	2GIC-1A
17	Remote Sensing and GIS	2RSG3	2GIC-1B
		2RSG4	2GIC-1C
18	Pharmaceutical Chemistry	2PCH3	2GIC-1D
		2PCH4	2GIC-1E

Note : Title of the paper shall prescribed in the respective prospectuses.

DIRECTION

No. : 27 / 2010 Date : 24.6.2010

Subject : Examinations leading to the Degree of विज्ञान पारंगत (Master of Science) (Four Semester Degree Course), Direction, 2010.

Whereas, Ordinance No.4 of 2008 in respect of Examinations leading to the Degree of विज्ञान पारंगत (Master of Science) (Four Semester Degree Course) Ordinance, 2008 is in existance in the University.

AND

Whereas, the Academic Council in its meeting held on 28.5.2010 vide item No.36 has approved the policy decision regarding introduction of Scheme for Choice Based Credit System (CBCS) and Awarding Grades to the Post Graduate Students in the Faculty of Science, for all subjects along with Draft Regulation in this behalf.

AND

Whereas, due to implementation of Scheme for Choice Based Credit System (CBCS) and Awarding Grades to the Post Graduate Students in the Faculty of Science, the provision under Ordinance No.4 of 2008 need to be revised accordingly.

AND

Whereas, admission to students for M.Sc. Part-I (Semester-I) for all subjects in the faculty of Science are to be made in the Academic Session 2010-11 in choice based credit system (C.B.C.S.).

AND

Whereas, making amendments in Original Ordinance No.4 of 2008 is likely to take some time.

Now, therefore, I, Dr. Kamal Singh, Vice Chancellor of Sant Gadge Baba Amravati University, in exercise of powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act., 1994, do hereby direct as under:

1. This Direction may be called ñExaminations leading to the Degree of विज्ञान पारंगत (Master of Science) (Four Semester Degree Course), Direction, 2010ò.
2. This direction shall come into force from the date of its issuance.
3. The word ñor Biochemistryò in clause i) of sub-para (i) of para 5 shall be deleted.
4. The title of the subject ñElectronics (Instrumentation)ò be substituted as ñElectronicsò wherever occur in the Ordinance.
5. Following shall be the eligibility criteria for admission to M.Sc. Part-I Semester-I for the subjects ï (i) Pharmaceutical Chemistry, (ii) Biotechnology, (iii) Computer Science.

(a) for admission to M.Sc. Pharmaceutical Chemistry a candidate shall have offered Chemistry or Industrial Chemistry or Biochemistry as a subject of study and examination at the B.Sc. Degree.

(b) following shall be the eligibility for admission to M.Sc. Semester-I (Biotechnology) -

(i) B.Sc. in any discipline of Life Sciences, Bio Sciences or Bachelorôs Degree in Agriculture, Veternary and fishery Sciences, Pharmacy, or Bachelor of Medicine and Bachelor of Surgery (M.B.B.S.) or Bachelor of Dental Surgery or equivalent examination recognized by Sant Gadge Baba Amravati University are eligible to appear in entrance test as given in para (iii) below.

(ii) The student should have minimum 50% marks as aggregate in the degree course.

(iii) The student will have to pass entrance examination for admission in M.Sc. Semester-I (Biotechnology) as per the Sant Gadge Baba Amravati University rules.

(c) following shall be the eligibility for admission to M.Sc. Semester-I (Computer Science) -

i. A person who has passed the Degree of Bachelor of Science of this university with Computer Science / Computer Application (Vocational) as on the subjects.

OR

ii. A person who has passed B.A. / B.Sc. with Mathematics plus Post Graduate Diploma in Computer Science of this University.

OR

iii. A person who has passed a Degree of Bachelor of Computer Science.

6. The following subject be inserted in para 9) of the Ordinance after Sr.No. ñ15. Bioinformaticsò.

ñ16. Computer Software,
17. Computer Science
18. Biotechnology, and
19. Pharmaceutical Chemistry.

7. A person who desire to improve the division obtained by him/her at M.Sc. examination shall be eligible for improvement of division under the provision of Ordinance No.6 of 2008. However, for improvement of division he/she shall have to offer the core courses only. In no case he/she shall be allowed for improvement of division/grade/CGPA by offering General Interest Course.

8. The number of papers and marks allotted to each subject and the minimum marks which an examinee must obtained in order to pass the examination shall be as indicated in Appendices, appended with the Regulation.

9. The classification in reference to the class/division/grade to be awarded to the examinee shall be as per the Table-III (Equivalence to Class / Division to CGPA) of para No.IX, appended to the Regulation.

10. As soon as possible after the examination, but not later than 30th, June following, the B.O.E. shall publish a list of successful examinees arranged in Division as mentioned in Table-III (Equivalence to Class / Division to CGPA) of para No.IX, appended to the Regulation. The names of examinees passing the examination as a whole in the minimum prescribed period and obtaining the prescribed number of places in each subject in the division as per Table-III of the Regulation shall be arranged in order of merit as provided in the Examinations in General Ordinance No.6.

Sd/-

Amravati
Date : 21/6/2010

(Dr.Kamal Singh)
Vice-Chancellor

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DIRECTION

No. :39/ 2011 Date :23.8.2011

Subject : Corrigendum to Direction No. 26/2010

Whereas, the Direction No.26 of 2010 in respect of Scheme of Choice Based Credit System (CBCS) and awarding Grades to the Post Graduate students in the faculty of Science is in existence.

AND

Whereas, the Academic Council in its emergent meeting held on 28.5.2010 vide item No.36 has approved the decision regarding introduction of scheme for C.B.C.S. and Awarding grades to the P.G. students in the faculty of Science under Ordinance No.4 of 2008..

AND

Whereas, in sub-para V of para 3, under Direction No.26 of 2010, there shall be Programme Committee and the duties of the Programme Committee shall be to remove the difficulties if any faced during implementation of C.B.C.S. and report it to Honôble Vice-Chancellor for further action and any other matter as it think fit for the effective implementation of C.B.C.S.

AND

Whereas, the Programme Committee in its meetings held on 14.7.2011, 20.7.2011, 30.7.2011 & 9.8.2011 has recommended necessary corrections in the above Direction which will be effective from the academic session 2011-12. The minutes of the Programme Committee was accepted by Honôble Vice-Chancellor on dated 22.8.2011.

AND

Whereas, it is necessary to carry out the corrections in the above said Direction immediately.

Now, therefore, I, Dr.Mohan K.Khedkar, Vice Chancellor of Sant Gadge Baba Amravati University, in exercise of powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act., 1994, do hereby direct as under:

1. This Direction may be called ñCorrigendum to Direction No.26/2010.
2. This direction shall come into force from the date of its issuance.
3. (A) In Direction No.26/2010 in respect of Scheme of Choice Based Credit System (CBCS) and awarding Grades to the Post Graduate students in the faculty of Science following paras be corrected as follows :

i) In para II, sub para (i) of para 3 in the fifth line after the words óless thanô the figure, sign, and words ó72 (52 core and elective)ôbe substituted by the figures, sign, and words ó88(64 core and elective)ô

ii) In para VI: the title ñDepartmental Committeeò be replaced as ñProgramme Monitoringò and Para 1 be completely deleted. Instead of this, the new para should be ñEvery P.G. programme of the University/College shall be monitored by the Head of the Department of the University/College of the concerned subject.ò

iii) The para VII shall be substituted as given below -
ñVII. Grievance Redressal
All the grievances regarding Internal Assessment shall be settled by H.O.D. or the teacher of the department nom inated by H.O.D. / Principalò.

iv) In para IX : Table I: the grades in column No.2 shall be substituted as under -

"O	by	AA
A^+	by	AB
A	by	BB
B^+	by	BC
B	by	CC
C^+	by	CD
C	by	DD"

v) **In para X :**

i) In the first line the word óGradeô be added after the word óawardedô and before the word ópointsô.

ii) In third line the words óobtained in each subjectô be substituted by the words óobtained in Core and Elective courses of the subjectô

vi) **In para XI :**

- In sub para (i) in the first line the word ñHead of the Departmentô be inserted after the words & sign ñeach course,ò and before the words ñevery teacherò.
- The sentence ñNormally the teacher concerned may conduct three written sessional examinations spread periodically during the semester and select best two for contributing to the final marksò shall be deleted.
- Sub para (ii) & (iii) be deleted completely.

- Sub para (iv) be renumbered as sub para (ii) and the word ñteacherò in the second line of the original sub para (iv) be substituted by the words ñHead of Departmentsò.
- Sub para (v) be renumbered as sub para (iii). In original sub para (v) the words ñgrade points and gradesò be deleted.
- Sub para (vi) be deleted completely.

vii) The word ôMinimumô printed below the table in Appendix A, B, C, D, G, and H, shall be deleted.

viii) Following special explanatory Note be added below the table in Appendix-D, H, L, and P respectively.

ñ**Special Explanatory Note** :- At the end of IVth semester, the students/examinee who accumulated atleast 88 credits (out of these 88 credits, 64 credits must be on core and elective course) and who has put in the minimum residence time shall be eligible to receive the degree in the subject he/she has admittedò.

(B) The students should have accumulated 28 credits of M.Sc. Part-I, Sem-I & II taken together for admission to III Semester and should have completed the term of M.Sc. Part-I (Semester-I & II) satisfactorily.

Sd/-

Amravati
Date : 22/8/2011

(Mohan K.Khedkar)
Vice-Chancellor

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DIRECTION

No. : 25 / 2012 Date : 29/6/2012

Subject : Corrigendum to Direction No.26/ 2010 and 39/2011

Whereas, the Direction No.26 of 2010 in respect of Scheme of Choice Based System (CBCS) and awarding Grades to the Post Graduate Students in the faculty of Science is in existence.

AND

Whereas, University has issued corrigendum to Direction No.26 of 2010 vide Direction No.39 of 2011 on dated 23.8.2011.

AND

Whereas, in sub-para V of para 3, under Direction No.26 of 2010, there shall be Programme Committee and the duties of the Programme Committee shall be to remove the difficulties if any faced during implementation of C.B.C.S. and report it to Honôble Vice-Chancellor for further action and any other matter as it think fit for the effective implementation of C.B.C.S.

AND

Whereas, the Programme Committee in its meeting held on 1st March, 2012 and 18th April 2012 has recommended necessary corrections in the above said Directions which shall be effective for 2011-12 session and the minutes of the Programme Committee was accepted by the Honôble Vice-Chancellor.

AND

Whereas, the Academic Council in its meeting held on 13.1.2012, vide item No.14(5) F) R-3, I) R-2 & R6 has accepted additional eligibility criteria for Admission to M.Sc. (Zoology), Direct admission to M.Sc. Part-II (Computer Science) for the students who have passed the degree of M.Sc. (Computer Software), and revised syllabi of M.Sc. (Computer Science), which is to be implemented from the Academic Session 2012-13.

AND

Whereas, it is necessary for carryout the corrections in the above said Direction immediately.

Now, therefore, I, Dr.Mohan K.Khedkar, Vice Chancellor of Sant Gadge Baba Amravati University, in exercise of powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act., 1994, do hereby direct as under:

1. This Direction may be called ñ Corrigendum to Direction No.26/2010 and 39/2011ò.
2. This direction shall come into force from the date of its issuance.

3. In Direction No.26/2010 in respect of Scheme of Choice Based System (CBCS) and awarding Grades to the Post Graduate Students in the faculty of Science, following corrections shall be carried out-

A) i) In para 5th , the words and brackets ñDegree of विज्ञान स्नातक (Bachelor of Science)ò shall be substituted as ñDegree of विज्ञान पारंगत (Master of Science)ò

ii) The clause (i), of sub-para (II) of para 3 shall be deleted.

iii) The clause (i), of sub-para (II) of para 3 shall be renumbered as para (ñiiò) and new para (ii) shall be added as follows.

ñMinimum total credits that students shall have to accumulate in all four semesters for receiving the M.Sc. degree core subject shall be as shown in the table given as under ï

Subject/s	Minimum total credits (Core Elective and GIC)
All subjects other than Mathematics, Computer Science & Biotechnology	104
Computer Science	119
Biotechnology	150
Mathematics	100

B) i) Under Table-III (Equivalence of Class/Division of CGPA) of Para IX,

(a) the figures shown ó7.49ô, ó5.99ô, and ó5.49ô against Sr.Nos.3, 4 & 5 in Column No.2 (CGPA) be substituted by the figures ó7.50ô, ó6.00ô, and ó5.50ôrespectively.

(b) Following sub-para be added before the para óXô.

ñ**Declaration of Merit List** :- Merit list of M.Sc. (C.B.C.S.) examination shall be prepared from the examinee who have successively cleared minimum total credits including GIC as shown in the table assigned in the first attempt.

ii) Special Explanatory note shown under Appendix-D, H, I, L and P shall be deleted.

The note No.(2) printed under Appendix-A, B, C, D, E, F & H shall be substituted as follows-

ñIf the student has not scored minimum marks or minimum grade points mentioned in column No. 8 and if the student scores minimum marks or minimum grade points in either theory or internal assessment then he/she will be declared to have cleared either of the headò.

4. In Direction No.39 of 2011, under para IX), in Table-I & II, under column No.2, i.e. ñGrade Pointsò and ñFinal Gradeò shall be substituted respectively as under.

ñO	by	AA
A+	by	AB
A	by	BB
B+	by	BC
B	by	CC
C+	by	CD
C	by	DDò

5. As the revised syllabi has been accepted by the Academic Council, for the subject Computer Science of four theory papers to each semester therefore the Scheme of Examination for M.Sc. Semester-I to IV shall be as per Appendices-A, B, C & D appended to Direction No.26 of 2010, which is to be implemented for Semester-I from Winter-2012, Semester-II from Summer-2013, Semester-III from Winter-2013 & Semester-IV from Summer-2014 respectively.

6. The students passing B.Sc. Agriculture with specialization Antomology and Fisheries shall be eligible for admission to M.Sc. Zoology with specialization Antomology and Fisheries respectively.

7. The student having Degree of M.Sc. (Computer Software) shall be eligible for directly admission to M.Sc. Part II (Semester III) (Computer Science) in the faculty of science within the jurisdiction of sant Gadge Baba Amravati University, Amravati. The average percentage of Marks of M.Sc. (Computer software) and percentage of marks of M.Sc. (Computer Science) shall be considered to award class / Grade for awarding the degree of M.Sc. (Computer Science).

Sd/-

Amravati
Date : 28/6/2012

(Mohan K.Khedkar)
Vice-Chancellor

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SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
DIRECTION

No. : 7 of 2014 Date: 07/05/2014

Subject : Corrigendum to Direction No.25 of 2012

Whereas, Direction No.25 of 2012 in respect of Corrigendum to Direction No.26/2010 and 39/2011 in the Faculty of Science is in existence in the University.

AND

Whereas, the Academic Council in its meeting held on 17.2.2014 vide item No.22 2) E) R-2 while considering the recommendations of Faculty of Science has approved the recommendation regarding award of M.Sc. (Computer Science) degree.

AND

Whereas, the matter is required to be regulated by framing the Ordinance and making of an Ordinance may likely to take some time.

AND

Whereas, the changes are to be made applicable from the Academic Session 2014-15.

Now, therefore, I, Dr.J.A.Tidke, Vice-Chancellor of Sant Gadge Baba Amravati University, Amravati in exercise of powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act, 1994, do hereby direct as under:

1) This Direction may be called, ñCorrigendum to Direction No.25 of 2012, Direction, 2014ò
2) This Direction shall come into force w.e.f. the date of its issuance.
3) In Direction No.25 of 2012, in Para 7., the lines ñThe average percentage of Marks of M.Sc. (Computer software) and percentage of marks of M.Sc. (Computer Science) shall be considered to award class / Grade for awarding the degree of M.Sc. (Computer Science)ò be substituted by the lines ñ**The class / Grade for awarding the degree of M.Sc. (Computer Science) shall be awarded on the basis of performance at M.Sc. Part-II (Computer Science) only**.

Date : 3/5/2014

Sd/-
(Dr.J.A.Tidke)
Vice-Chancellor
Sant Gadge Baba Amravati University

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
DIRECTION

No. : 8 of 2014 Date : 07/05/2014

Subject :Corrigendum to Direction No. 14 of 2009 in respect of Examinations leading to the Degree of विज्ञान पारंगत (Master of Science) (Four Semester Degree Course).

Whereas, Ordinance No.4/2008 in respect of Examinations leading to the Degree of विज्ञान पारंगत (Master of Science) (Four Semester Degree Course), Ordinance, 2008, in the Faculty of Science is in existence in the University.

AND

Whereas, Direction No. 14 of 2009 in respect of Examinations leading to the Degree of विज्ञान पारंगत (Master of Science) (Four Semester Degree Course) in the Faculty of Science is in existence in the University.

AND

Whereas, the Academic Council in its meeting held on 17.2.2014 vide item No.22 2) E) R-1 while considering the recommendations of Faculty of Science has approved the B.C.A. degree holders of this University are eligible for admission to M.Sc. (Computer Software) course.

AND

Whereas, the matter is required to be regulated by framing the Ordinance and making of an Ordinance may likely to take some time.

AND

Whereas, the changes are to be made applicable from the Academic Session 2014-15.

Now, therefore, I, Dr.J.A.Tidke, Vice-Chancellor of Sant Gadge Baba Amravati University, Amravati in exercise of powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act, 1994, do hereby direct as under:

1) This Direction may be called, ñCorrigendum to Direction No. 14 of 2009 in respect of Examinations leading to the Degree of विज्ञान पारंगत (Master of Science) (Four Semester Degree Course) Direction 2014.ò
2) This Direction shall come into force w.e.f. the date of its issuance.

3) In Direction No. 14 of 2009 in respect of Examinations leading to the Degree of विज्ञान पारंगत (Master of Science) (Four Semester Degree Course), in para 3., after the lines ñ A person who has passed the Degree of Bachelor of Science with Post Graduate Diploma in Computer Science of this University OR ñ following lines be inserted

ñThe Candidates having B.C.A. degree of this University shall be eligible to take admission to M.Sc. Part-I (Computer Software) course OR ñ

Date : 3/5/2014

Sd/-
(Dr.J.A.Tidke)
Vice-Chancellor
Sant Gadge Baba Amravati University

SYLLABUS PRESCRIBED FOR M.Sc. PART-I BOTANY

SEMESTER – I

PAPER- I: CELL BIOLOGY, CYTOLOGY AND GENETICS

Unit-I 1.1 Cell wall and Plasma membrane: Structural organization and function.

1.2 Cell organelles: Golgi bodies, Lysosomes, Endoplasmic Reticulum and Ribosomes: Structural organization and their functions

1.3 Techniques in Cell Biology: Confocal microscopy, Phase Contrast microscopy, Flow Cytometry: Principle and working.

Unit-II 2.1 Cell Cycle and Apoptosis: Mechanism of Cell division; Regulation, Roles of Cyclins and Cyclin dependent kinases, Cell Plate formation, PCD.

2.2 Cell to cell Interaction and Signal transduction : Intercellular junctures, Harmones and neurotransmitter signalling, receptors, G-proteins, kinases and messengers.

2.3 Protein sorting: Targeting of proteins to nucleus, chloroplasts and secretary pathways of leader polypeptides.

Unit-III 3.1 Chromosome Organisation : Eukaryotic chromosome structure and DNA packaging, Nucleoproteins, Organisation of centromeres and telomeres, nucleolus and r-RNA Genes, Euchromatin and heterochromatin..

3.2 Specialised Chromosomes: Polytene, Lampbrush, B-Chromosomes, Sex Chromosomes.

3.3 Structural aberrations of Chromosomes: Origin, Meiosis and breeding behaviour of duplication, deficiency, inversions and translocation- Heterozygosity.

3.4 Karyotype and Banding Patterns: Types, Evolution of Karyotype, Analysis and its significance. Application of banding techniques.

Unit-IV 4.1 Genetics of Mitochondria and Chloroplast: Semi autonomous, Genome character, size and regulation, cytoplasmic male sterility.

4.2 Mutations: Origin, Physical and Chemical mutagenic agents, Molecular basis and mutational breeding.

4.3 Transposable elements in Prokaryotes: IS elements, Composite transposons, transposition mechanisms and their effect on phenotype and genotype

4.4 Physiology of Cancer; Genetics of Cancer: C-Oncogenes, V-Oncogenes, Tumor Suppressor genes.

Unit-V 5.1 Genetic Code: Triplet nature of code, Breaking of code, Wobble Hypothesis, Properties, Evolution and Central dogma - transcription, types of RNAs, Initiation and termination signals, differences between eukaryotic and prokaryotic transcription (promoters, caps and tails, Introns, RNA editing).

5.2 Regulation of gene expression in Prokaryotes: Gene structure, Lac - operon, Trp- operon, Phage operon, transcriptional-control systems, translational control and post translational control.

5.3 Genetics of Nitrogen fixation: Organization, function and regulation of nitrogen fixing genes in klebsiella, hup genes.

Suggested Readings:

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3. Krishnamurthy, K.V.2000. Methods in Cell wall Cytochemistry, CRC Press, Boca Raton, Florida.
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11. Lewis R., 1997. Human Genetics: Concepts and Applications (2nd Edition). WCB McGraw Hill, USA.
12. Russel, P.J. 1998. Genetics (5th Edition). The Benjamin/ cummings Publishing Company Inc., USA.
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14. Gunning, B.E.S. and Steer, M.W. 1996. Plant Cell Biology: Structure and Function. Jones and Barlett Publishers, Boston, Massachusetts.
15. Hall, J.L. and Moore, A.L. 1983. Isolation of Membranes and

Organelles from Plant Cells. Academic Press, London, U.K.

16. Harris, N. and Oparka, K.J. 1994. Plant Cell Biology: A Practical Approach. IRL Press, at Oxford University Press, Oxford, U.K.
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18. Sharma, A.K. and Sharma, A. 1999. Plant Chromosomes: Analysis, Manipulation and Engineering. Harwood Academic Publishers, Australia.
19. R.S.Shukla and P.S.Chandel, 3rd Edition, 2004. Cytogenetics, Evolution and Plant Breeding.

Laboratory Exercises:

1. Squash and smear preparation; mateirals; ***Tradescantia, Colix, Allium cepa, Allium sativum; Barley, Vicia faba, Wheat, Rhoeo discolor, Aloe vera*** or any other ideal material
2. Isolation of chloroplast.
3. Demonstration of SEM and TEM.
4. Linear Differentiation of chromosomes through banding techniques, such as C-banding, O-banding and Q-banding.
5. Orcein and Feulgen staining of the salivary gland chromosomes of ***Chironomous*** and ***Drosophila.***
6. Characteristics and behaviour of B-chromosomes using maize or any other appropriate material.
7. Working out the effect of monosomy and trisomy on plant phenotype, fertility and meiotic behaviour.
8. Induction of polyploidy using colchicine; different methods of the application of colchicine.
9. Effect of induced and spontaneous polyploidy on plant phenotype, meiosis, pollen and seed fertility and fruit set.
10. Meiosis of complex translocation heterozygotes.
11. Isolation of chlorophyll mutants following irradiation and treatment with chemical mutagens.
12. Estimation of nuclear DNA content through microdensitometry and flow cytometry.
13. Isolation of mitochondria. .
14. Comparative study of normal and banded karyotype.
15. Determination of chaisma frequency in any plant species
16. Incompatibility studies in ideal plant material.
17. Problems on interaction of genes; linkage and crossing over.
18. Determination of mitotic index in any plant species.

PAPER- II: RESOURCE UTILIZATION AND CONSERVATION

UNIT I: 1.1 Concept of Biodiversity; Species diversity; Genetic diversity; Ecosystem diversity.

1.2 Origin of Biodiversity; values of Biodiversity; loss of Biodiversity.

1.3 Biodiversity and agriculture; Biodiversity and food diversity; Bioprospecting; commercial values of Biodiversity.

1.4 Conservation of Biodiversity; Implementation process in India CBD.

UNIT II: 2.1 World centers of primary diversity of domesticated plants; Indo Burmese centers.

2.2 Plant introduction and secondary centers.

2.3 Origin, evolution, botany, cultivation and uses of:

i. Food, Forage and Fodder crops.
ii. Fibre crops.
iii. Medicinal and Aromatic plants.
iv. Vegetable and Oil yielding plants.

UNIT III: 3.1 Important fire wood and timber yielding plants and non wood forest products (NWFPS) such as Bamboo, Rattam raw materials for paper making, gums, resins, tannins, dyes, fruits

3.2 Green revolution; Benefits and adverse consequences, sustainable agriculture, agroecosystem approach.

3.3 Innnovative approaches for meeting world food demands; modern agricultural approach.

3.4 Plants used as Avenue treesôfor shade, pollution control and aesthetics.

UNIT IV: 4.1 Strategies for conservation of Biodiversity, global scenario, decline of bioresources.

4.2 Protected areas concept: Sanctuaries, National parks, Biosphere reserves (Tiger reserves with reference to Melghat Tiger Project) Wildlife Management and Sacred groves.

4.3 Conservation of wild germplasm with reference to threatened species.

UNIT V : 5.1 Principles and practices for *Ex- situ* conservation, Botanical gardens, Field Gene Banks, Seed Banks.

5.2 *In-vitro* repositories, Cryobanks, Legal aspects of conservation of Biodiversity in India.

5.3 General accounts and activities of national institutes like Botanical Survey of India (BSI), National Bureau of Plant Genetic Resources (NBPGR), Indian Council of Agricultural

Research (ICAR), Council of Scientific and Industrial Research (CSIR), Department of Biotechnology (DBT), Non formal efforts, Medicinal Plant Board, Ministry of Environment and Forests.

SUGGESTED READINGS :

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2. Bewley, J.D. and Black, M. 1994. Seeds: Physiology of Development and Germination. Plenum Press, New York.
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40. Wagner, H., Hikino, H. and Farnswarth, N. 1989. Economic and Medicinal Plant Research, Vols. 1-3. Academic Press, London.
41. Walter, K.S. and Gillett, H.J. 1998. 1997 IUCN Red List of Threatned Plants. IUCN, the World Conservation Union, IUCN, Gland, Switzerland, and Cambridge, U.K.

Suggested laboratory Exercises:

The Practical course is divided into three units: (1) Laboratory work, (2) Field survey and (3) Scientific Visits.

Laboratory Work:

1. Food Crops: Wheat, Rice, Maize, Chickpea (Bengal gram), Potato, Tapioca, Sweet potato, Sugarcane. Morphology, Anatomy, Microchemical tests for stored food materials.
2. Forage / fodder crops: Study of any five important crops of the locality (for example fodder Sorghum, Bajra, Berseem, clove, guar bean, gram, ficus sp.)
3. Plant fibres :
   (a) Textile fibres : Cotton, Jute, Linen, Sunn hemp, Cannabis.
   (b) Cordage fibres : Coir.
   (d) Fibres for stuffing: Silk cotton or kapok
   Morphology, anatomy, microscopic study of whole fibers using appropriate staining procedures.
4. Medicinal and aromatic plants: Depending on the geographical location of college/ university select five medicinal and aromatic plants each from a garden crop field (or from the wild only if they are abundantly available).

   Papaver somniferum, Atropa belladonna, Catharanthus roseus, Adhatoda zeylanica (Syn A. vasica), Allium sativum, Rauvolffia serpentina, Withania somnifera, Phyllanthus amarus, (P. fraternus), Andrographis paniculata, Aloe barbadense, Mentha arvensis, Rosa sp., Pogostemon cablin, Origanum vulgare,

Vetiveria zizanioides, Jasminum grandiflorum, Cymbopogon sp., Pandanus odoratissimus,Abrus precatorius, Asparagus racemosus, Melia azhadirac, Dioscorea pentaphylla, Vitex negundo, Oscimum sanctum.

Study of live or herbarium specimens or other visual materials to become familar with these sources. (Identification, uses and products like oils).

5. Vegetable Oils: Mustard, Groundnut, Soyabean, Coconut, Sunflower and Castor. Morphology, microscopic structure of the oil-yielding tissues, tests for oil and Iodine number. (Any three)
6. Gums, resins, tannins, dyes: Perform simple tests for gums and resins. Prepare a water extract of vegetable tannins ***(Acacia, Terminalia, mangroves, tea, Cassia spp, myrobalans) and dyes (turmeric, Bixa orellana, Indigo, Butea monosperma, Lawsonia inermis)*** and perform tests to understand their chemical nature. (One from each category)
7. To prepare ombrothermic diagrams for different sites on the basis of given data and comment on climate.
8. To find out association between grassland species using chi square test.
9. To analyse plant community using Bra-curtis ordination method.
10. To determine diversity indices for protected and unprotected cropland stands.
11. To determine IVI of grassland.
12. To prove the biological spectrum of vegetation under study using Raunkiarôs life forms classification.

SEMESTER – I

PRACTICAL I: CELL BIOLOGY, CYTOLOGY, GENETICS, RESOURCE UTILIZATION & CONSERVATION.

PRACTICAL SCHEDULE

Time: 6 hrs.		**Marks - 40**
Q.1	Karyotype Analysis	06
Q.2	Isolation of any cell organelle	05
Q.3	Smear/Squash Technique/ Specialized Chromosome	04
Q.4	Problem on interaction of genes	04
Q.5	Identification and morphological description of given economically important plant	05
Q.6	Chemical Characterization of tannins, resins, dyes, fibers (any ï 2)	05

Q.7	Spotting	06
Q.8	Viva-Voce	05

PAPER – III: BIOLOGY AND DIVERSITY OF ALGAE AND BRYOPHYTES

Unit -I: General account and reproduction.

1.1 : Range of habitat and thallus organization in Algae.

1.2 : Cell structure;

i) Ultrastructure
ii) Pigments in Algae
iii) Reserve food material
iv) Flagella.

1.3 Classification by F.E. Fritsch (1935), G.M. Smith; Chapman (1938); Round (1965)

1.4 : Cyanophyta- Ultrastructure of cell,heterocyst, reproduction and affinities.

1.5 : Reproduction in Algae and alternation of generations.

Unit -II : Diversity and Phylogenenetic considerations

2.1 : Chlorophyta: Volvocales, Chlorococcales, Ulotricales, Cladophorales,Cheatophorales,Oedogoniales, Conjugales, Siphonales, Charales.

2.2 Chrysophyta:Chrysophyceae,Xanthophyceae, Bacillariophyceae

2.3 Cryptophyta:Cryptophyceae

2.4 Dinophyta: Dinophyceae

Unit- III :Diversity; Phylogeny and Importance of Algae

3.1 : Range of thallus , reproduction and life-cycle in
i) Phaeophyta, ii)Rhodophyta

3.2 : Economic importance of Algae as biofertilizer; food; feed; and use in industry.

3.3 : Algae in Symbiotic association, as pollution indicator; phytoplanktons and water blooms.

3.4 : Fossil Algae

Unit- IV: Bryophyta : General account and significance.

4.1 : Classification and distribution of Bryophytes.

4.2 : Vegetative propagation in Bryophytes.

4.3 : Fossil Bryophytes.

4.4 : Economic and ecological importance of Bryophytes.

Unit -V : Morphotaxonomy and Phylogeny of Bryophytes.

5.1 : Thallus Organization; internal structure and reproduction in i) Sphaerocarpales, ii)Marchantiales, iii)Anthocerotales,

iv) Jungermanniales.

5.2 : Thallus organization; internal structure and reproduction in i) Sphagnales, ii)Andreales, iii) Bryales

5.3 : Progressive and retrogressive evolution in Gametophytes and Sporophytes.

Suggested Readings:

1. Kumar, H.D. 1988, Introductory Phycology. Affiliated East- West Press Ltd., New Delhi.
2. Morris, I.1986. An Introduction to the Algae, Cambridge University Press, U.K.
3. Parihar, N.S. 1991, Bryophyta, Central Book Depot, Allahabad.
4. Parihar, N.S. 1996, Biology and Morphology of Pteridophytes. Central Book Depot, Allahabad.
5. Puri, P. 1980, Bryophytes. Atma Ram and Sons, Delhi.
6. Round, F.E. 1986. The Biology of Algae, Cambridge University Press, Cambridge.
7. Stewart, W.N. and Rothwell, G.W. 1993. Paleobotany and the Evolution of Plants. Cambridge University Press.
8. Prescott G.W. (1969) The Algae: A Review, Thomas Nelson and sons, London.
9. Lee,R.E. (1980) Phycology, Cambridge University Press, Cambridge.
10. Kumar, H.D. (1990) Introductory Phycology, East west Press , New Delhi.
11. Misra, J.N. (! 966) Pheaeophyceae of India, ICAR, New Delhi.
12. Kumar , H.D.(1989) Algal Cell Biology, 2nd Edition, East west Press , New Delhi.
13. Desikachary, T.V. (1959) , Cyanophyta , ICAR, New Delhi.
14. Round , F.E. (1981) The Ecology of Algae. Cambridge University Press, Cambridge.
15. Round , F.E. (1973) The Biology of Algae. 2nd Edition, Edward and Arnold , London.
16. Campbell, D.H. (1961) The evolution of Land Plants. Central Book Depot, Allahabad.
17. Smith G.M (1955) Cryptogamic Botany Vol-II. Bryophyta and Pteridophyta McGraw Hill.Book Co., New York
18. Watson, E.V. (1967) The structure and Life of Bryophytes , 2nd Edition. London, Hutchinson.
19. Ram Udar (1970) An introduction to Bryophyta , Sadashiv Malviya Prakashan, Lucknow.
20. B.R.Vashishta (Revised by A.K.Sinha), Reprint Edition 2005.

21. B.R.Vashishta : Algae

Laboratory Exercises: -

1. Morphological study of Algae :(Any 12 of the following)
   Oscillatoria, Nostoc, Anabaena, Spirullina, Gleotricha, Chlamydomonas, Eudorina, Volvox, Closterium, Hydrodictyon, Pediastrum, Cladophora, Ulva, Pithophora, Draparnaldia, Cosmarium, Chlorella, Acetabularia, Chara, Nitella, Laminaria, Sargassum, Padina, Ectocarpus, Batrachospermum, Gracillaria, Gellidium, Polysiphonia,
2. Morphological, anatomical and reproductive studies of following members: ***Targonia, Cyathodium Marchantia, Plagiochasma, Deumortiera, Anthoceros, Notothylus; Polytrichum, Pogonatum, Sphagnum,***
3. Field study: i) Collection of Algal material from water reservoirs (ii) Collection of Bryophytic material.
   Field visits: Visits to the field to study distribution of algal flora and bryophytic forms.

PAPER – IV: PLANT DEVELOPMENT AND REPRODUCTION

UNIT I: 1.1 Unique features of plant development, differences between plant and animal development.

1.2 Structure of seed, germination of seed and seedling growth and control.

1.3 Metabolism of nucleic acids, proteins and mobilization of reserve food.

1.4 Seed dormancy: types, importance and means to break the seed dormancy.

UNIT II: 2.1 Organisations of shoot apical meristem (SAM). Cytological and molecular analysis of SAM, Root apical meristem.

2.2 Types of meristem, tissue differentiation, structures, development and importance of tissue differentiation: Vascular cambium and cork cambium, evolution of Xylem.

2.3 Wood development in relation to environmental factors, secondary growth: stem and root.

2.4 Leaf development and structure, differentiation of epidermis and mesophyll. Structure and function of secretary ducts and laticifers.

UNIT III: 3.1 Plant reproduction: Means of reproduction, flower development, homeotic mutants in *Arabidopsis* and *Antirrhinum*, sex determination.

3.2 Structure of anther, microsporogenesis, and pollen development, pollen viability, male sterility, pollen germination, pollen storage, pollen embryo.

3.3 Types of ovules, ovule development and structure, megasporogenesis, embryo sac development and structure.

UNIT IV: 4.1 Flower structure and floral characteristics, mechanism of pollination, flower vectors.

4.2 Breeding system, structure, pollen pistil - interaction, sporophytic and gametophytic self-incompatibility.

4.3 Double fertilization, development of embryo, endosperm and seed development.

4.4 Dynamics of fruit growth, biology of fruit maturation.

UNIT V: 5.1 Polyembryony, apomixis, *In-vitro* plant regeneration through embryo, pollen and anther culture.

5.2 Metabolic changes associated with senescence and its regulation.

5.3 Influence of hormones and environmental factors on senescence.

Suggested Readings:

1) Bhojwani, S.S. and Bhatnagar, S.P. 2000. The Embryology of Angiosperms (4th revised and enlarged edition). Vikas Publishing House, New Delhi.
2) Fageri, K. and Van der Pol, L. 1979. The Principles of Pollination Ecology. Pergamon Press, Oxford.
3) Fahn, A. 1982. Plant Anatomy, (3rd edition). Pergamon Press, Oxford.
4) Fosket, D.E. 1994. Plant Growth and Development. A molecular Approach. Academic Press, San Diego.
5) Howell, S.H. 1998, Molecular Genetics of Plant Development. Cambridge University Press, Cambridge.
6) Leins, P., Tucker, S.C. and Endress, P.K. 1988. Aspects of Floral Development. J. Cramer, Germany.
7) Lyndon, R.F., 1990. Plant Development. The Cellular Basis. Unnin Hyman, London.
8) Murphy, T.M. and Thompson, W.F. 1988. Molecular Plant Development. Prentice Hall, New Jersey.
9) Proctor, M. and Yeo, P. 1973. The Pollination of Flowers. William Collins Sons, London.
10) Raghavan, V. 1997. Molecular Embryology of Flowering Plants. Cambridge University Press, Cambridge.
11) Raghavan, V. 1999. Developmental Biology of Flowering Plants. Springer-Verlag, New York.

12) Raven, P.H., Evert, R.F. and Eichhorn, S.E. 1992. Biology of Plants (5th Edition). worth, New York.
13) Steeves, T.A. and Sussex, I.M. 1989. Patterns in Plant Development (2nd edition). Cambridge University Press, Cambridge.
14) Sedgely, M. and Griffin, A.R. 1989. Sexual Reproduction of Tree Crops, Academic Press, London.
15) Waisel, Y., Eshel, A. and Kafkaki, U. (eds) 1996. Plant Roots: The Hidden Hall (2nd edition.) Marcel Dekker, New York.
16) Shivanna, K.R. and Sawhney, V.K. (eds) 1997. Pollen Biotechnology for Crop Production and Improvement, Cambridge University Press, Cambridge.
17) Shivana, K.R. and Rangaswamy, N.S. 1992. Pollen Biology: A Laboratory Manual. Springer-Verlag, Berlin.
18) Shivana, K.R. and Johri, B.M. 1985. The Angiosperm Pollen: Structure and Function. Wiley Eastern Ltd., New York.
19) The Plant Cell. Special issue on Reproductive Biology of Plants, Vol. 5(10) 1993. The American Society of Plant Physiologists, Rockville, Maryland, USA.

Suggested Laboratory / Field Exercises (Any 10):

1. Effect of gravity, unilateral light and plant growth regulators on the growth of young seedlings.
2. Role of dark and red light / far-red light on the expansion of cotyledons and epicotylar hook opening in pea.
3. Study of living shoot apices by dissections using aquatic plants such as *Ceratophyllum* and *Hydrilla*.
4. Study of cytohistological zonation in the shoot apical meristem (SAM) in sectioned and double-stained permanent slides of a suitable plant such as *Coleus, Kalanchoe, Tobacco.* Examination of shoot apices in a monocotyledon in both T.S. and L.S. to show the origin and arrangement of leaf primordia.
5. Study of alternate and distichous, alternate and superposed, opposite and superposed; opposite and decussate leaf arrangement. Examination of rosette plants (*Launaea, Mollugo, Raphanus, Hyoscyamus* etc) and induction of bolting under natural conditions as well as by GA treatment.
6. Microscopic examination of vertical sections of leaves such as *Cannabis, Tobacco, Nerium,* Maize and Wheat to understand the internal structure of leaf tissues and trichomes, glands etc. Also study the C3 and C4 leaf anatomy of plant.

7. Study of epidermal peels of leaves such as *Coccinia, Gallardia, Tradescantia, Notonea*, etc. to study the development and final structure of stomata and prepare stomatal index. Demonstration of the effect of ABA on stomatal closure.
8. Study of whole roots in monocots and dicots. Examination of L.S. of root. from permanent preparation to understand the organization of root apical meristem and its derivatives. (use maize, aerial roots of banyan, Pistia, Jussieua etc.). Origin of lateral roots. Study of leguminous roots with different types of nodules.
9. Study of microsporogenesis and gametogenesis in sections of anthers.
10. Examination of modes of anther dehiscence and collection of pollen grains for microscopic examination (Maize, Grasses, *Cannabis sativa, Crotolaria, Tradescantia, Brassica, Petunia, Solanum melongena*, etc.)
11. Tests for pollen viability using stains and *in vitro* germination. Pollen germination using hanging drop and sitting drop cultures, suspension culture and surface culture.
12. Estimating percentage and average pollen tube length *in vitro.*
13. Role of transcription and translation inhibitors on pollen germination and pollen tube growth.
14. Pollen storage, pollen-pistil interaction, self-incompatibilty, *in vitro* pollination.
15. Study of ovules in cleared preparations; study of monosporic, bisporic and tetrasporic types of embryo sac development through examination of permanent stained serial sections.
16. Field study of several types of flower with different pollination mechanisms (wind pollination, thrips pollination, bee/butterfly pollination, bird pollination).
17. Emasculation, bagging and hand pollination to study pollen germination, seed set and fruit development using self compatible and obligate outcrossing systems. Study of cleistogamous flowers and their adaptations.
18. Study of nuclear and cellular endosperm through dissections and staining.
19. Isolation of zygotic globular, heart-shaped, torpedo stage and mature embryos from suitable seeds and polyembryony in citrus, jamun (*Syzygium cumini*) etc. by dissections.
20. Study of seed dormancy and methods to break dormancy.

Semester – I

PRACTICAL –II: BIOLOGY AND DIVERSITY OF ALGAE AND BRYOPHYTES AND PLANT DEVELOPMENT AND REPRODUCTION

Practical schedule

Time 6 hrs. Marks: 40

Q. 1	:	Isolation and identification of any two algal forms	06
Q.2	:	Characterization and identification of given Bryophytic material.	06
Q.3	:	Setting and working of any experiment based on plant development	10
Q.4	:	Microtomy	05
Q.5	:	Spotting algal, bryophyte Plant DW; flower	08
Q.6	:	Viva-voce	05

Semester – II

PAPER –V: CYTOGENETICS AND MOLECULAR BIOLOGY

Unit I : 1.1 Cytogenetics of polyploids: Types, origin and production of polyploids; genome constitution, meiotic behaviour, analysis and evolution in major crop plants; induction and characterization of trisomics; significance in crop improvement.

1.2 Breeding of polyploids: heterosis and inbreeding depression.

1.3 Plant Breeding: Methods of breeding in self-pollinated and cross-pollinated crops, genetic variability, male sterility in plant breeding.

Unit II: 2.1 Molecular Cytogenetics: Nuclear DNA content, C-value paradox; cot curve and *in-situ* hybridization.

2.2 Physical mapping of genes on chromosomes and their analysis, problems on linkage and crossing over, single nucleotide polymorphism (SNP).

2.3 Multigene families evolution, types of multigene families and the proteins produced, chaperones.

Unit III: 3.1 Gene expression and its regulation in Eukaryotes: fine structure of gene, cis-trans test, introns, mRNA splicing, RNA editing, CAAT BOX, TATA BOX, Homeo box, role of transcription factors.

3.2 Genetic Recombinations: Molecular mechanism of crossing over, role of Rec- A, B, C, D enzymes site specific recombination, independent assortment and crossing over.

3.3 Genetics of Yeast: Yeast genome, yeast genome characterization, Yeast artificial chromosome.

Unit IV: 4.1 Genetic and Restriction Mapping: Restriction digestion of DNA, single and double digest, restriction map construction.

4.2 Molecular markers: Isozymes, proteins, RAPD, AFLP.

4.3 Techniques in genetic engineering: DNA finger printing, Southern blotting and Electrophoresis.

Unit V: 5.1 Methods of DNA sequencing: Maxam and Gilbert technique, Sangerôs Dideoxy nucleotide method, application of sequencing.

5.2 Biostatistics: Mean, mode, central tendency, standard deviation, variance, covariance, correlation, regression; sampling, chi-square test and its significance.

5.3 Molecular Biology and Bioinformatics: Overview, scope, development, introduction to databases, computers in bioinformatics, applications.

Suggested Reading:

1. Alberts, B., Bray, D., Lewis, J., Raff, M., Roberts, K., and Watson, J.D. 1999. Molecular Biology of the Cell. Garland Publishing, Inc., New York.
2. Wolfe, S.L. 1993, Molecular and Cellular Biology. Wadsworth Publishing Co., California, USA.
3. Buchanan, B.B., Gruissem, W. and Jones, R.L. 2000.Biochemistry and Molecular Biology of Plants. American Society of Plant Physiologists, Maryland, USA.
4. Kleinsmith, L.J. and Kish, V.M. 1995. Principles of Cell and Molecular Biology (2nd Edition). Harper Collins College Publishers, New York, USA.
5. Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. and Darnell, J.2000. Molecular Cell Biology (4th Edition) W.H. Freeman and Co., New York, USA.
6. Alberts, B., Bray, D., Lewis, J., RAff, M., Roberts, K. and Watson, J.D. 1989. Molecular Biology of the Cell (2nd Edition). Garland Publishing Inc., New York.
7. Atherly, A.G., Girton, J.R. and McDonald, J.F. 1999. The Science of Genetics. Saunders College Publishing, Fort Worth, USA.
8. Burnham, C.R. 1962. Discussions in Cytogenetics. Burgess Publishing Co., Minnesota.
9. Hartl, D.L. and Jones, E.W. 1998. Genetics: Principles and Analysis (4th Edition). Jones and Bartlett Publishers, Massachusetts, USA.

10. Khush, G.S. 1973. Cytogenetics of Aneuploids. Academic Press, New York, London.
11. Karp G 1999. Cell and Molecular Biology: Concepts and Experiments. John Wiley & Sons, Inc., U.S.A.
12. Lewin B., 2000. Gene VII. Oxford University Press, New York, USA.
13. Lewis R., 1997. Human Genetics: Concepts and Applications (2nd Edition). WCB McGraw Hill, USA.
14. Malacinski, G.M. and Freifelder, D., 1998. Essentials of Molecular Biology (3rd Edition). Jones and Barlet Publishers, Inc., London.
15. Russel, P.J. 1998. Genetics (5th Edition). The Benjamin/ cummings Publishing Company Inc., USA.
16. Snustad, D.P. and Simmons, M.J. 2000. Principles of Genetics (2nd Edition). John Wiley and Sons Inc., U.S.A.
17. Glick, B.R. and Thompson, J.E. 1993. Methods in Plant Molecular Biology and Biotechnology. CRC Press, Boca Raton, Florida.
18. Glover, D.M. and Hames, B.D. (Eds), 1995, DNA Cloning 1: A Practical Approach; Core Techniques, 2nd edition. PAS, IRL Press at Oxford University Press, Oxford.
19. Gunning, B.E.S. and Steer, M.W. 1996. Plant Cell Biology: Structure and Function. Jones and Barlett Publishers, Boston, Massachusetts.
20. Hackett, P.B., Fuchs, J.A. and Messing, J.W. 1988. An Introduction to Recombinant DNA Techniques: Basic Experiments in Gene Manipulation. The Benjamin /Cummings Publishing Co., Inc Menlo Park, California.
21. Harris, N. and Oparka, K.J. 1994. Plant Cell Biology: A Practical Approach. IRL Press, at Oxford University Press, Oxford, U.K.
22. Shaw, C.H. (Ed.), 1988. Plant Molecular Biology: A Practical Approach, IRL Press, Oxford.
23. Fukui, K. and Nakayama, S.1996. Plant Chromosomes: Laboratory Methods. CRC Press, Boca Raton, Florida.
24. Sharma, A.K. and Sharma, A. 1999. Plant Chromosomes: Analysis, Manipulation and Engineering. Harwood Academic Publishers, Australia.

Laboratory Exercises:

1] Isolation of mitochondria and the activity of its marker enzyme, succinate dehydrogenase (SDH).
2] Isolation of chloroplasts and SDS-PAGE profile of proteins to demarcate the two subunits of Rubisco.
3] Isolation of nuclei and identification of histones by SDS-PAGE.
4] Isolation of Plant DNA and its quantitation by a spectrophotometric method.

5] Isolation of DNA and preparation of ñcotò curve.
6] Restriction digestion of plant DNA, its separation by agarose gel electrophoresis and visualization by ethidium bromide staining.
7] Isolation of RNA and quantitative estimation by a spectrophotometric method.
8] Separation of Plant RNA by agarose gel electrophoresis and visualization by EtBr staining.
9] Southern blot analysis using a gene specific probe.
10] Fluorescence staining with FDA for cell viability and cell wall staining with calcofluor.
11] Silver banding for staining nucleolus-organizing region, where 18S and 28S rDNA are transcribed.
12] To perform plant hybridization
13] Estimation of nuclear DNA content through microdensitometry and flow cytometry.
14] Fractionation and estimation of repetitive and unique DNA sequences in nuclear DNA.
15] Study of protein profile by gel electrophoresis.
16] Determination of pollen sterility with staining techniques.
17] Statistical Analysis (standard error, standard deviation, variance, significance) of the given data.

Semester – II

PAPER –VI: BIOLOGY AND DIVERSITY OF MICROBES AND FUNGI

UNIT I: 1.1 Archaebacteria and Eubacteria- General account, nutrition, reproduction and economic importance.
1.2 Ultrastructure of Eubacteria.
1.3 Important bacterial diseases of regional crops.

UNIT II: 2.1 Viruses: characteristics and ultrastructure of Virions, chemical nature, replication, transmission of viruses.
2.2 Important viral disease of regional crops.
2.3 Phytoplasma: General account and important plant disease.

Unit III: 3.1 Classification of Fungi proposed by Ainsworth (1971)
3.2 Economic importance of Fungi.
3.3 Myxomycotina: General account.
3.4 Mastigomycotina: General account of Chytridiomycetes, Oomycetes, Plasmodiophoromycetes.
3.5 Zygomycotina: General account (studies up to order level and their respective genera.)

UNIT IV: 4.1 Ascomycotina: General, vegetative and reproductive

characters of Hemiascomycetes, Plectomycetes and Discomycetes.

4.2 Basidiomycotina: General vegetative and reproductive characters of Teliomycetes, Hymenomycetes and Gastromycetes.

4.3 Deuteromycotina: General account and importance.

UNIT V: 5.1 Heterothallism and Parasexuality in Fungi.

5.2 Mycorrhiza: Ectomycorrhizae and Endomycorrhizae, general account and VAM Fungi.

5.3 Fungi as Biological Agent.

Suggested Readings:

1) Agrios, G.N. (1980) Plant Pathology, academic Press, INC, New York.
2) Ainsworth, G.C. and A.S.Sussman (eds). The Fungi, An advance Treatise Vol.I, II, III & IV Academic Press, New York.
3) Alexopoulos, C.J. (1962). Introductory Mycology John Wiley Eastern Pvt.Ltd.
4) Alexopoulos, C.J. and Mims C.W. (1979). Introductory Mycology 3rd Edition, John Wiley and Sons, Inc. Wiley, New York.
5) Alexopoulos, C.J., Mims and Black well (1996) 4th ed. John Wiley and Sons, Inc. Wiley, New York.
6) Aneja, K.R. (1993) Experimental in Microbiology, Plant Pathology & Tissue Culture, Wiswa Prakashan, New Delhi.
7) Bessey, E.A. (1950) Morphology and Taxonomy of Fungi. The Blakiston co. Philadelphia.
8) Bharat Rai, D.K.Arora, N.K.Dube and P.D.Sharma (1994) : Fungal Ecology and Biotechnology, Rastogi Publication.
9) Bilgrami, K.S. and H.C.Dube (1985) A text Book of Modern Plant Pathology, Vikas Publication House, New Delhi.
10) Balkhande L.D. & L.V. Gangawane (2000) Production of auxins Phyollosphere mycoflora and wheat plant resource development, Saraswati Prakashan Aurangabad, P.160-165.
11) Barnett, J.H. (1968) Fundamentals of Mycology. The English Language Book Society and Edward Arnold Publication, Limited.
12) Butler E.J. and S.J.Jones (1949) Plant Pathology, Macmillan & Co. New York.
13) Buckyng Pugh G.J.F. (1971) Auxin productions by phyllosphere fungi Nature Vol. 231 P.332.
14) Dickenson and Preece Micrology of arial plant surfaces, Academic Press, New York,
15) Dube, R.C. and D.K.Maheshwari (1999) A.Text Book of microbiology, S.Chand & Co. Ltd.

16) Dube, R.C. and D.K.Maheshwari (2000) Practical Microbiology - S.Chand & Co. Ltd.
17) Gruen, H.E. (1959) The production of IAA by *Phycomyces blakesleanus* Mycol.57 683-694.
18) Gupta, V.K. and M.K.Behl (1994) Indian Plant Viruses and Mycoplasma Kalyani Publishers, 1/1, Rejinder Nagar, Ludhiana.
19) Jha, D.K. (1993) A Text Book of Seed Pathology, Vikas Publication House.
20) Manibhushan Rao, K. and A.Mahadevan - Recent Development in biocontrol of plant pathogenes. Today and Tomorrow publishers, New Delhi.
21) Mehrotra, R.S. and Aneja, K.R. (1990) An Introduction to Mycology, Willey Eastern Private Limited.
22) Mehrotra, R.S. (1989) Plant Pathology, Tata McGraw Hill.
23) Mehrotra, R.S. and K.R.Aneja (1998) An Introduction to Mycology, New Age Intermidiate Press.
24) Mukadam, D.S. (1997) The Illustrated Kingdom of fungi, Akshar Ganga Prakashan, Aurangabad.
25) Mukadam, D.S. and L.V.Gangawane (1978) Experimental Plant Pathology (edited) Marathwada University Aurangabad.
26) Pande, P.B. (1997) Plant Pathology, S.Chand & Co. New Delhi.
27) Pelzer, M.J. , Jr.Cahn, E.C.S. and N.R.Krieg (1993) Microbiology, Tata McGraw Hill.
28) Preece and Dickeson. Ecology of leaf surface microorganism Academic Press, New York.
29) Rangaswamy, G. and A.Mahadevan (1999) Diseases of Crop Plant in India, Prentice Hall of India.
30) Raychoudhari, S.P. and Nariani, T.K. (1977) Virus and Mycoplasma Diseases of Plant in India, Oxford and IBH Publication Co.
31) Reddy, S.M. *et al* (1997) Microbial Biotechnology, Scientific publishers, Jodhpur.
32) Schlegel, H.G. (1996) General Microbiology, 7th Edition, Cambridge University Press.
33) Snowdon, A.L. (1991) A colour Atlas of Post harvest diseases & disorders of fruits & vegetables Vol.I & II Wolfe Scientific, London.
34) Sing, R.S. (1994) Plant Pathology, Oxford and IBH Publication Co. New Delhi.
35) Sunder Rajan, S. (2001) Tools and Techniques of Microbiology, Anmol Publ.New Delhi.
36) Thind, T.S. (1998) Diseases of field crops and their management, National Agricultural Technology, Information Centre Ludhiana.
37) Vaidya, J.G. (1995) Biology of the fungi, Satyajeet Prakashan, Pune.

38) Walker, J.G. (1952) Diseases of Vegetables Crops. McGraw Hill, New York.

39) Walker, J.C. (1968) Plant Pathology, McGraw Hill, New York.

Laboratory Exercises:

1. Morphological Studies of Fungi (any 15 of the following)

   Stemonities, Perenospora, Phytopthora, Albugo, Mucor, Rhizopus, Yeast, Aspergillus, Penicillium, Chaetomium, Taphrina, Peziza, Erisyphe, Phyllactenia, Uncinula, , Melamosora, Uromyces, Drechslera,Ravenallia, Ustilago, Polyporus, Morchella, Cyathus, , Alternaria, Helminthosporium, Curvularia, Colletotrichum, Phoma, Plasmodiophora, Cercospora, Fusarium, Claviceps.

2. Symptomology of some diseased plants (any 10 of the following).

   White rust of Crucifers, Downy mildew, powdery mildew, Rusts, Smuts, Ergot, Groundnut leaf spot (Tikka disease), False smut of paddy, red rot of Sugarcane, Wilt disease, Citrus canker, Angular leaf spot of cotton, Leaf mosaic of bhindi/ papaya, Leaf curl of tomato/Potato/Papaya, Little leaf of brinjal.

3. Identification of Fungal cultures (Any 5)

   Rhizopus, Mucor, Aspergillus, Penicillum, Drechslera, Curvularia. Phoma, Colletotrichum, Alternaria, Helminthosporium.

Semester-II

PRACTICAL – III

(CYTOGENETICS, MOLECULAR BIOLOGY, BIOLOGY & DIVERSITY OF MICROBES AND FUNGI)

Time : 6 hrs. Marks : 40

Q. 1.	Isolation and Estimation of DNA by UV-VIS spectrophotometry.	08
Q. 2.	Experiment on Plant Breeding/Polyploids.	05
Q. 3.	Biostatistical analysis of given data	04
Q.4	Identification of given Fungal culture and plant disease material with its diagnostic characters and classification	08
Q.5.	Identify the given plant disease as per its symptoms	05
Q. 6.	Spotting.	05
Q. 7.	Viva-voce	05

Semester- II

PAPER VII: PLANT PHYSIOLOGY

Unit-I : 1.1 Energy flow: Principle of thermodynamics, kinetics, dissociation and association constants; Gibbôs free energy, redox reactions, structure and function of ATP.

1.2 Enzymology: Allosteric mechanisms, regulatory and active sites; isozymes; Michaelis- Menton Equation and its significance.

Unit-II: 2.1 Transport of water through xylem; plant water relations, SPAC.

2.2 Translocation of solutes in phloem transport, passive & active, transport; nutrient uptake through root microbe interaction; membrane transport proteins.

2.3 Stress physiology: Overview; types of stresses and plant responses, mechanism for tolerance of biotic and abiotic stresses. (Water, temperature, salinity and metal)

Unit-III: 3.1 Photochemistry: Light energy, components of electromagnetic radiation, photons, absorption spectrum, action spectrum, light harvesting complexes.

3.2 Photosynthesis: Evolution of photosynthetic apparatus, photoxidation of water, Hills reaction, two-pigment system, mechanism of electron and proton H+ transport, carbon assimilation pathways in C3, C4 and CAM plants. Photosynthetic productivity in these plants. Physiological, ecological consideration and significance.

3.3 Photobiology: Discovery, structure and properties (biochemical and photochemical) of photochromes and cryptochromes, photomorphogenesis, G-proteins, signaling.

Unit-IV: 4.1 Respiration: Mitochondrial electron transport; Glycolysis; synthesis of ATP, respiratory pathways- PPP; regulation of respiration.

4.2 Photorespiration: Glyoxylate pathway, biochemical basis of photorespiration, photorespiration and crop productivity and significance.

4.3 Senescence and PCD; Mechanism, physiology of senescence; role of hormones, biochemical aspects, significance in fruit ripening

Unit-V: 5.1 Growth Regulators and Elicitors: Physiological effect and mechanism of action of Auxins Gibberellins, Cytokinins, Ethylene, Abscissic acid, Brassinosteriods, Jasmonic acids, Polyamines, salicylic acid; receptors and expression.

5.2 Flowering Process: Photoperiodism and significance of Florigen in floral induction, development, genetic analysis, vernalization and its role in flowering.

5.3 Plant Movements: Classifications of plant movements, physiological basis of plant movements.

Suggested Reading:

1. Buchanan B.B., Gruissem, W. and Jones, R.L. 2000. Biochemistry and Molecular Biology of Plants. American Society of Plant Physiologists, Maryland, USA.
2. Galston, A.W. 1989. Life Processes in Plants. Scientific American Libray, Springer-Verlag, New York,USA.
3. Hooykaas, P.J.J., Hall, M.A. and Libbenga, K.R. (eds) 1999. Biochemistry and Molecular Biology of Plant Hormones, Elsevier, Amesterdam, The Netherilands.
4. Hopkins, W.G. 1995. Introduction to Plant Physiology. John Wiley & Sons, Inc., New York, USA.
5. Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D., and Darnell, J. 2000. Molecular Cell Biology (fourth edition). W.H. Freeman and Company, New York, USA.
6. Moore, T.C. 1989. Biochemistry and Physiology of Plant Hormones (second edition). Springer-Verlag, New York, USA.
7. Nobel, P.S., 1999. Physiochemical and Environmental Plant Physiology (second edition), Academic Press, San Diego, USA.
8. Salisbury, F.B. and Ross, C.W. 1992. Plant Physiology (4th edition). Wadsworth Publishing Co., California, USA.
9. Singhal, G.S., Renger, G., Sopory. S.K., Irrgang, K.D. and Govindejee 1999. Concepts in Photobiology. Photosynthesis and Photomorphogenesis, Narosa Publishing House, New Delhi.
10. Taiz, L. and Zeiger, E. 1998. Plant Physiology (2nd edition). Academic Press, San Diego, U.S.A. Westhoff, P. (1998) Molecular Plant Development: from Gene to Plant. OxfordUniversity Press, Oxford, UK.
11. Plummer, D.T. 1988. An Introduction to practical Biochemistry. Tata McGraw Hill Publishing Co.Ltd.New Delhi.
12. Wilson,K. and Goulding, K.H. (Eds), 1992. A Biologist Guide to Principles and Techniques
13. Practical Biochemistry (3rd Edition). Manas Saikia for Foundation Books, New Delhi.
14. Sadasivam, S. and Manickam A., 1996. Biochemical methods (2nd Edition). New Age International Publishers New Delhi
15. Sharma, J.R. 1994. Principles and Practice of Plant Breeding. Tata McGraw Hill Publishing Company Ltd. New Delhi.
16. Rubenstein, I. Gengen bach, B.Phillips, R.L. and Green C.E. (Eds), 1980. Genetic improvement of crops. University of Minnesota Press. U.S.A.

17. Chaudhary, R.C. 1986. Introduction to Plant breeding, Oxford & IBH Publishing Co., New Delhi.
18. Gupta, S.K.2000. Plant Breeding. Theory and Techniques. Agrobios (India) Jodhpur
19. Singh, P. 2001. Essentials of Plant Breeding (2nd Edition). Kalyani Publishers, New Delhi.

Laboratory Exercises:

1. Extraction of chloroplast pigments from leaves and preparation of absorption spectrum of chlorophylls and cardtenoids.
2. To determine chlorophyll a, chlorophyll b and total chlorophyll ratio in C3 & C4 plants.
3. Estimation of sodium and potassium in plant material by flame photometry.
4. Determination of Ca: Mg ratio by spectrophotometry in plant tissue.
5. Preparation of the standard curve of proteins (BSA) by Biurette method.
6. Determination of Isoelectric point of Legumin.
7. Effect of GA/IAA on plant growth.
8. Isolation of intact chloroplasts and estimation of chloroplast proteins by spot protein assay.
9. To demonstrate photophosphorylation in intact chloroplasts, resolve the phosphoproteins by SDS-PAGE & performs Western blotting.
10. Estimation of protein content in extracts of plant material by Lowryôs or Bradfordôs method.
11. Assay of the enzyme Phosphatases.
12. Assay of the enzyme nitrate reductase.
13. Principles of colorometry, spectrophotometry and fluorimetry.
14. Demonstration of an electron transport system.
15. Estimation of carbon dioxide liberated during respiration.
16. To demonstrate the process of antagonism.
17. To demonstrate the process of fermentation by Kunheôs vessel.
18. To demonstrate the process of tissue tension.
19. Detection of amino acids by chromatography.
20. Effect of various salts on the permeability of the plasma membrane.
21. Estimation of Ascorbic Acid in the given material.
22. Estimation of reducing, Non-reducing and total sugars.

Semester-II

PAPER – VIII: PLANT METABOLISM.

Unit-I : 1.1 Carbohydrates in Biosphere, properties, functions and importance

1.2 Carbohydrate Metabolism: - Biosynthesis of starch and sugars, catabolic pathways, interaction between Hexose Pentose Phosphate and Triose phosphate pools.

Unit-II: 2.1 Amino Acid Metabolism: Assimilation of inorganic nitrogen in amino acids, Biosynthesis of amino acids in plants, Proline metabolismï a target for metabolic engineering of stress tolerance.

2.2 Protein: Regulation of cystolic protein biosynthesis in eukaryotes, post-translational modification of proteins; storage proteins, degradation of proteins.

Unit-III: 3.1 Lipid Metabolism: Classification, structure and function of lipids, biosynthesis of fatty acids, membrane lipids, structural lipids and storage lipids.

3.2 Catabolism of storage lipids, phospholipids and derived lipids (steroids).

Unit-IV: 4.1 Nitrogen Metabolism: Overview of nitrogen fixation, ammonia uptake and reduction, nitrite reduction.

4.2 Sulphur Metabolism: Sulphur chemistry and fixation, uptake and transport, reductive sulphate assimilation pathways, synthesis and function of glutathione and its derivatives.

Unit-V: 5.1 Metabolism Biochemistry: Primary and secondary metabolites in plants as important natural products; types of alkaloids, phenols, flavonoids, glycosides, and their applications; distribution and localization.

5.2 Phosphate Metabolism.

5.3 Phytochemical Techniques: Quantitative and Qualitative analysis methods; TLC, HPLC, HPTLC principle and techniques.

Suggested Readings:

1. Brachet J. & Mirshy, A.E., ed., The Cell Biochemistry, Physiology, Morphology, Vol.II. Academic Press Inc. London LTD. 1961.
2. Buchanan, B.B.; Gruissem, W.; Jones, R.L.; Biochemistry & Molecular Biology of Plants, American Society of Plant Physiologists, Rockville, Maryland, 2000.
3. Daniel,M. and R.P.Purkayastha Ed., Handbook of Phytoalexin metabolism & action, Marcel Dekker, Inc., New York, 1995.
4. Davies, D.D., ed., The Biochemistry of Plants, Vol.II, Academic Press, London, 1987.
5. Duke, J.A. CRC Handbook of Phytochemical Constituents of GRAS Herbs, Foods & other Economic Plants. CRC Press, Boca Raton, FL, 1992.
6. Epstein, E., Mineral Nutrition of Plants: Principles & Perspectives. John Wiley & Sons, New York, 1972.

7. Kaufman, P.B.; L.J.Cseke; S.Warber; J.A.Duke & H.L.Brielmann. Natural products from plants. CRC Press LLC New York, 1999.
8. Marchner, H. Mineral Nutrition of Higher Plants, 2nd ed. Academic Press,, London, 1995.
9. Nishimura, S.; C.d.Vance & N.Doke, Eds. Molecular determinants of Plant diseases. Japan Scientific Press, Tokyo / Springer Verlag, Berlin, 1987.
10. Staples, R.C. Ed. Plant Disease Control, John Wiley & Sons, New York, 1981.
11. Dennis, D.T., Turpin, D.H., Lefebvre, D.D. and Layzell, D.B. (eds) 1997. Plant Metabolism (second edition), Longman, and Essex, England.
12. Hooykaas, P.J.J., Hall, M.A. and Libbenga, K.R. (eds) 1999. Biochemistry and Molecular Biology of Plant Hormones, Elsevier, Amesterdam, The Netherlands.
13. Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D., and Darnell, J. 2000. Molecular Cell Biology (fourth edition). W.H. Freeman and Company, New York, USA.
14. Alice Kurian and M. Asha, 2007. Medicinal plants. New India Publishing House, New Delhi.
15. Raaman N., 2006 Phytochemical techniques. New India Publishing House, New Delhi.
16. Van Damme J.M., Willey J. Penmans, Arpad Pustazi and Susan Bardocz Hand Book of Plant Lectins: Properties and Biomedical Applications. Jain Boooks and Pub. Distributers.

LABORATORY EXERCISES:

1. Effect of time and enzyme concentration on the rate of enzyme action (e.g. acid phosphatase, nitrate reductase).
2. Estimation of stress induced amino acid (Proline)
3. Determination of total carbohydrates by Anthrone method.
4. Extraction of seed proteins depending upon solubility.
5. Determination of succinate dehydrogenase activity, its kinetics, & sensitivity to inhibitors.
6. Separation of isozymes of esterases, peroxidases by native polyacrylamide gel electrophoresis.
7. Estimation of total fats in fatty seeds.
8. Separation of Alkaloids/Phenols by TLC.
9. Estimation of Phenols by chemical method.
10. Extraction of secondary metabolites from callus tissue.
11. Qualitative analysis of secondary metabolites.
12. Detection of secondary metabolites by TLC (any one)
13. Profile study of secondary metabolites by TLC (any one)

14. Separation of Amino acids by chromatographic techniques
15 Spectrophotometer estimation of secondary metabolites.
16 Estimation of phytoalexins.

Semester – II

PRACTICAL – IV: PLANT PHYSIOLOGY AND PLANT METABOLISM PRACTICAL SCHEDULE

Time: 6 Hours. Marks: 40

Q. 1:	Setting and working of any one major physiology experiment.	08
Q. 2:	Setting and working of one major Plant Metabolism experiment.	08
Q.3	Comment on any one minor physiology experiment.	05
Q. 4	Comment on any one minor Metabolism experiment	05
Q. 5	To perform Phytochemical tests.	04
Q. 6	Principle and working of instrument.	05
Q. 7	Viva Voce	05

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Syllabus for M.Sc. Part-II Botany

Semester – III

PAPER-IX: BIOLOGY AND DIVERSITY OF PTERIDOPHYTES AND GYMNOSPERMS.

Unit-I : General account of Pteridophyta.

1.1 Geological Time Scale & Fossilization process.
1.2 Steler organization and evolution.
1.3 Origin of leaf and telome concept.
1.4 Heterospory and seed habit.
1.5 Classification of Pteridophyta ï G.M. Smith.

Unit-II: Morphology, anatomy and reproduction.

2.1 Psilopsida : Psilophytales and Psilotales.
2.2 Lycopsida : Lycopodiales, Selaginellales, Isoetales.
2.3 Sphenopsida : Calamitales, Equisetales.
2.4 Pteropsida : Filicales.
2.5 Evolutionary trends among Pteridophytes.

Unit-III: General account of Gymnosperms.

3.1 Characteristic features of gymnosperms. Distribution and economic importance of gymnosperms.
3.2 Variations in structure of pollen grains, pollen germination.
3.3 Evolutionary trends in female gametophyte.
3.4 Classification of gymnosperms: D.D.Pant and S.V.Meyen

3.5 Contributions of Professors Birbal Sahni, D.D. Pant, K.R. Surange etc.

Unit-IV : Morphology, anatomy, reproduction and evolutionary tendencies

4.1 Pteridospermales: Lyginopteridaceae, Medullosaceac, Glossopteridales, Caytoniales.
4.2 Bennittitales:Cycadeoidaceae and Williamsoniaceae.
4.3 Cycadales: Nilssoniaceae and Cycadaceae.
4.4 Pentoxylales: Pentoxylaceae.
4.5 Cordaitales: Cordaitaceae.

Unit-V: Morphology, anatomy, reproduction and affinities:

5.1 Ginkgoales: Ginkgoaceae.
5.2 Coniferales: Araucariaceae, Podocarpaceae, Cupressaceae and Cephalotaxaceae.
5.3 Taxales: Taxaceae.
5.4 Ephedrales; Gnetales; Welwitschiales

Suggested Readings:

1. Sporne, K.R.(1976) : Morphology of Pteridophytes.
2. Stewart, W.N. and Rothwell G.W. (1993), Palaeobotany and the Evolution of Plants, Cambridge University Press.
3. Smith, G.M. (1976): Cryptogamic Botany Vol.II, Tata Mc-Graw Hill Publishing Co. Ltd., New Delhi.
4. Rashid,A (1976): An introduction to Pteridophyta, Vikas Publishing House, New Delhi.
5. Parihar N.S. (1976): The biology and morphology of the Pteridophyta, Central Book Depot, Allahabad.
6. Foster A.S. & Gifford F.M. (1967): Comparative morphology of vascular plants, Freeman Publishers, San Fransisco.
7. Eames, A.J.(1974): Morphology of Vascular Plants- lower groups, Tata Mc-Graw Hill publishing Co., New Delhi.
8. Arnold, C.A. (1947): Introduction to Palaeobotany, Mc-Graw Hill Book Co. Inc., New York and London.
9. Kubitzki K. (1990), The families and genera of vascular plants Pteridophytes and Gymnosperms, springer Verlag, New York
10. Agashe, S.N. (1995), Palaeobotany, Oxford & IBH, New Delhi.
11. Biswas, C & Johri, B.N. (2004), The Gymnosperms, Narosa Publishing House, New Delhi.
12. Coulter J.M. & Chamberlain C.J.(1978): Morphology of Gymnosperms, Central Book Depot, Allahabad.
13. Kakkar, R.K.and Kakkar, B.R. (1995), The Gymnosperms (Fossils & Living), Central Publishing House, Allahabad.
14. Sharma O.P. (2002) Gymnosperms, Pragati Prakashan, Meerut.

15. Siddiqui, K.A. (2002) Elements of Palaeobotany, Kitab Mahal, Allahabad.
16. Bhatnagar, S.P. and Moitra A. (1996), Gymnosperms, New Age International Pvt. Ltd., New Delhi.
17. Singh, H. (1978), Embryology of Gymnosperms, Encyclopedia of Plant Anatomy X, Gebryder, Bortragear, Berlin.
18. Stace, C.A. (1989) Plant Taxonomy and Biosystematics (2nd Edition) Edward Arnold Ltd., London.
19. Takhtajan, A.L.(1997): Diversity and Classification of flowering Plants. Columbia University Press, New York.
20. Woodland, D.W. (1991), Contemporary Plant Systematcs, Prentice Hall, New Jersey.
21. Khullar, S.P. (1994), An illustrated Fern Hora of west Himalayas Vol. II, International Book distributors, Rajpur Road, Dehradun
22. Pant, D.D. (2003): Cycas and allied Cycadophytes, BSIP, Publications.
23. Bierhorst D.W. (1971): Morphology of vascular plants McMillan, New York.
24. Thomas, B.A. & Spicer R.A. (1987): The Evolution and Palaeobiology of land plants. Discordies Press, Fortland, USA.
25. Spicer, R.A. & Thomas, B.A. (1986) Systematic and taxonomic approaches in Palaeobotany. Systematic Association Special Volume.
26. Chamberlain C.J. (1986); Gymnosperms, structure and Evolution, CBS publishers and distributors, New Delhi.

Laboratory Exercises:

A. Study of morphology, anatomy and reproductive structure of Pteridophytic forms.
   i.) ***Psilotum, Lycopodium, Selaginella. Isoetes, Equisetum, Gleichenia, Pteris, Ophioglossum, Azolla, Salvinia, Adiantum, Angiospteris.***
   ii) Study of fossil forms:
   Rhynia, Calamites, Calamostachys, Lepidodendron, Psaronius, Zygopteris, Stauropteris.

B. Comparative Study of vegetative and reproductive parts of ***Cycas, Zamia, Cedrus, Abies, Pinus, Cupressus, Cryptomeria, Taxodium, Podocarpus, Agathis, Thuja, Gnetum, Ephedra, Juniperus, Cephalotaxus, Taxus,*** Permanent micropreparatious to be submitted by the students.

C. *Ginkgo*: Morphology to be studied from Museum specimens & anatomy from permanent slides only.

D. Study of important fossil gymnosperms from material and permanent slides.

E. Visit to palaeobotanical Institutes, localities and collection of specimens.

F. Field visits to ecologically different localities to study living gymnosperms.

Semester- III

PAPER- X: TAXONOMY OF ANGIOSPERMS.

UNIT I : Systems of Angiosperm classification: -
Phenetic verses phylogenetic systems. Relative merits and demerits of following systems of classification. Engler and Prantls system: Hutchinsons system; Besseyôs system; Cronquistôs system.

UNIT II : Origin of intrapopulation variation. Population and Environment. Ecads & Ecotypes. Evolution and differentiation of species. Different models.

UNIT III : Taxonomic hierarchy, concept of species, genus, families and other categories (above the family and below the species rank). Principles used in assessing relationship. Salient features of international code of Botanical nomenclature.

UNIT IV : Evolutionary trends in Angiosperms with special reference to vegetative floral anatomical and chemical characters. Systematic studies of following families with emphasis on origin, evolution and interrelationship. Magnoliaceae, Ranunculaceae; Papaveraceae; Capparidaceae; Meliaceae; Leguminoceae, Myrtaceae; Cucurbitaceae;Cactaceae.

UNIT V : Gentianaceae; Rubiaceae; Asteraceae; Apocynaceae; Asclepiadaceae; Convolvulaceae, Boraginaceae. Scrophulariaceae, Acanthaceae, Lamiaceae, Polygonaceae; Nyctaginaceae; Caryophyllaceae; Loranthaceae Podostemonaceae; Poaceae; Cyperaceae Cannaceae; Orchidaceae, Arecaceae.

Suggested Readings:

1) Bhatnagar, S.P. and Moitra, A., 1996, Gymnosperm. New Age International Pvt.Ltd.New Delhi.
2) Cole,A.J., 1969, Numerical Taxonomy, Academic Press, London.
3) Davis P.H. and Heywood, V.H. 1973, Principles of Angiosperms Taxonomy, Robert, E.Kreiger, Publishing Company, New York.
4) Grant,V. 1971. Plant Speciation, Columbia University Press, New York.
5) Grant,W.F., 1984, Plant Biosystematics, Academic Press, London.

6) Harrison,H.J. 1971. New Concepts in Flowering Plant Taxonomy. Hiemn Educational Books limited, London.
7) Hislop-Harrison,J. 1967, Plant Taxonomy. English Language Book Society and Edward Arnold, Publishing Ltd. New Delhi.
8) Heywood,V.H. and Moore,D.M., 1984. Current Concepts in Plant Taxonomy, Academic Press, London
9) Jones,A.D. and Wilbins Lady, 1971. Variations and Acceptance in Plant Species. Heman and Co., Educational Books Ltd.London.
10) Jones,S.B., Jr. and Luchsinger,A.E. 1986. Plant Systematics (2nd Edition). McGraw Hill Book, Co. New York.
11) Nordenstam,B., El Gazaly and Kassas,M. 2000. Plants Systematics for 21st Century. Fortland Press, Ltd.London.
12) Radford,A.E. 1986. Fundamentals of Plant Systematics. Harper and Raw Publications, U.S.A.
13) Singh, H. 1978. Embryology of Gymnosperms Encyclopedia of Plant Anatomy X. Gebryder Bortraeger, Berlin.
14) Solbrig, O.T. 1970. Principles and Methods of Plant Biosystematics. A Macmillan Co.-Colliar Macmillan Ltd.London.
15) Solbrig, O.T. and Solbrig, D.J. 1979. Population Biology and Evolution Addison Wesley Publication Co., Inc, U.S.A.
16) Stebbins, G.L. 1974. Flowering Plant - Evolution above species Level. Edward Arnold Ltd. London.
17) Stace, C.A. 1989. Plant Taxonomy and Biosystematics (2nd Edition) Edward Arnold Ltd. London.
18) Takhtajan, A.L. 1997. Diversity and Classification of Flowering Platns. Columbia University Press, New York.
19) Woodland D.W., 1991. Contemporary Plant Systematics. Prentice Hall New Jersey.
20) Trees of Vidarbha (A field guide to flowering trees) by Dr.M.M.Dhore, Sh.P.S.Lachure, Sh.P.D.Gawande.

Laboratory Exercise:

Angiosperms :

1) Technical description of plant species available locally and identification upto family.
2) Study of species belonging to single genus and preparation of key at genus level.
3) Preparation of herbarium specimens following standard techniques. At least 100 specimens should be presented collectively by the class of locally abundant species.

Frequent field trips should be arranged to get acquainted with local flora. One tour within state and one outside the state should be arranged to study the biodiversity of gymnosperms and angiosperms. Field tour reports should be supported by exhaustive field notes and photographic representations of plant species studied.

SEMESTER-III

PRACTICAL – V: PTERIDOPHYTA, GYMNOSPERMS AND TAXONOMY OF ANGIOSPERMS.

PRACTICAL SCHEDULE

Time : 6 Hrs. Max. Marks: 40

Q.1. Identify and describe the given pteridophytic material 06 Marks

Q.2. Identify, describe and make a double stained permanent micropreparation of gymnosperm material 07 Marks

Q.3. Systematic description of a given angiospermic two plant species. 14 Marks

Q.4. Spotting: 08 Marks
- i) Pteridophyte- 2
- ii) Gymnosperm- 2
- iii) Fossil Specimen- 2
- iv) Angiosperm- 2

Q.5. Viva-voce 05 Marks

Semester- III (Elective)

PAPER-XI: PLANT TISSUE CULTURE-I

Unit-I : Concept and Scope

1.1 Introduction, definition and scope of plant tissue culture.
1.2 Historical Developments.
1.3 Laboratory structure, instruments, requirement and general techniques, Designing of green house, Polyhouse for hardening, maintenance and multiplication.
1.4 Cellular totipotency; role of growth hormones in differentiation.
1.5 Role of photoperiod, humidity and temperature for *in-vitro* cultures.

Unit II: Media composition and sterilization.

2.1 Media constituents (inorganic & organic); growth hormones; gelling agents, media preparation and maintenance, autoclaving of media, Different media compositions.
2.2 Sterilization: dry and wet heat sterilization, sterilization of glasswares, steel material.

2.3 Surface sterilization of explants; selection of explant, size of explant.

2.4 Differentiation: Organogenic differentiations, Cytodifferentiation.

Unit III : Cell and suspension culture

3.1 Cell culture, isolation of single cell, techniques; factors affecting single cell culture, Induction of callus.

3.2 Cell suspension culture: techniques and maintenance of suspension culture.

3.3 Preparation of cloning of single cell and and its regeneration to whole plant

Unit IV: Variability and Micropropagation :

4.1 Nuclear and genetical variation; factors affecting variation.

4.2 Role of variability in selection and improvement of plant; somaclonal and gametoclonal variations.

4.3 Practical application of variability in tissue culture.

4.4 Techniques of micropropagation ; factors affecting *in-vitro* stages of micropropagation; technical problems in micropropagation techniques.

Unit V: *In-vitro* selection and Application.

5.1 Commercial exploitation of micropropagation technique in horticultural and agronomical crops.

5.2 In-vitro selection for abiotic and biotic stresses, Isolation of useful nutrients at cellular level,Single cell proteins.

Semester –III

PAPER XII: PLANT TISSUE CULTUR-II (Elective)

Unit I : Somatic Embryogenesis:

1.1 Concept and mechanism of somatic embryogenesis; difference in zygotic and somatic embryos.

1.2 Factors affecting somatic embryogenesis.

1.3 Production of synthetic seeds, application of synthetic seeds in cryopreservation, maintenance of germplasm in storage.

Unit II : Haploid and Triploid Culture:

2.1 Haploid production and its significance.

2.2 Anther and pollen culture technique, monoploid and polyploid culture *in-vitro*.

2.3 Factors affecting Morphogenesis, Role of haploid and polyploids in plant improvement.

2.4 Gynogenesis: Ovule and ovary culture, *in-vitro* pollination and fertilization; Embryo rescue technique, Haploid production through distant hybridization, Triploid production (Endosperm culture).

Unit III: Protoplast Culture

3.1 Isolation and purification of protoplast, culture of protoplast and regeneration of protoplast.

3.2 Somatic Hybridization; culture and selection system for hybrids.

3.3 Cybridization and production of cybrids.

3.4 Role of somatic hybrids and cybrids in plant improvement, application of protoplast culture.

Unit IV: Genetic Transformation:

4.1 Methods of genetic transformation.

i) Agrobacterium tumefaciens mediated gene transfer.

ii) A. rhizogenes mediated transformation.

iii) Virus mediated transformation.

iv) Direct Gene transfer.

4.2 Selection and identification of transformed cells. Recovery of transformed plants. Transgenic plants; its production, prospects and problems.

4.3 Production of pathogen free plants, virus- elimination through *in-vitro* technique.

Unit V : Secondary metabolites and Cryobiology.

5.1 Production of secondary metabolites from cultured cells, strategies for induction of secondary metabolite production through suspension, hairy root culture, shoot organ culture for alkaloids, pigments, perfumes, flavours, insecticides, anticancerous agents and pharmaceutically important compounds.

5.2 Germplasm Storage: Cryobiology of plant cell culture; plant banks; freeze preservation technology; Role of Cryopreservation and future prospects.

5.3 Industrial applications of plant Biotechnology.

a) Pharmaceuticals b) Food additives, c) Speciality chemicals, d) Quality oils, e) Molecular farming, f) Edible vaccines.

Suggested Readings:

1) Amirato, P.Y.D.A. Evans, W.P.Sharp and Bajaj Y.P.S. (1990) Hand book of plant cell culture volumes I-V. McGraw Hill publishing Co. New York.

2) Bhojwani S.S. and Rajdan M.K. (1983) Plant Tissue Culture, Theory and Practice.
3) Reinert J. and Bajaj Y.P.S. (1977) Applied and Fundamental aspects of plant cell, Tissue and Organ culture, by Springer Verlag, Berling.
4) Gupta P.K. (1995) Elements of Biotechnology, Rastogi and Company.
5) S.Narayan Swamy (1994) Plant Cell and tissue culture. Tata McGraw Hill Publishing Company Limited New Delhi.
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9) Kalyan Kumar De (1992) Plant Tissue Culture. New Central Book Agency P. Ltd.
10) M.K.Razdan (1993) An Introduction to plant Tissue Culture. Oxford and IBH Publishing Co.Pvt. (LTD)
11) Surendra Prasad and L.K.Pareek (1996) Impact of Plant Biotechnology on Horticulture. Agro Botanical Publishers (India).
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13) Philip V.Ammirato, David A.Evans, William R.Sharp, Yasuyuki Yamaha, (1984) Hand Book of Plant Cell culture. Macmillan Publishing Company, New York.
14) Dr.Ning-sun Yang, Dr.Paul Christoce, (1994) Practical Bombardment Technology for Gene Transfer. Oxford University Press.
15) S.B.Primrose (1987) Molecular Biotechnology Blackwell Scientific Publications London Edinburgh Boston.
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17) Reinert J. and M.M.Yeoman, (1982) Narosa Publishing House.
18) Rehert D.Hall (1999) Plant Cell Culture Practicals - Humana Press.
19) Chanela, H.B. (2000), Introduction to Plant Biotechnology, Oxford & IBH Publishing Co.Pvt.Ltd.
20) Vasil I.K. and Thorpe T.A. (1994), Plant Cell and Tissue culture, Kluwer Academic Publishers, Netherland

Laboratory Exercises:

1) Preparation of media.
2) Surface sterilization.
3) Isolation of explant, induction of callus, establishment and maintenance of callus.

4) Organogenesis and plant regeneration through clonal propagation.
5) Embryogenesis in cultured cell from different explants.
6) Micropropagation of banana, citrus, papaya, sugarcane etc.
7) Cell suspension culture from different tissues.
8) Embryo culture and embryo rescue of different plant species.
9) Effect of various growth hormones on cell divisions and cell proliferation.
10) Isolation, purification and culture of protoplast.
11) Anther culture, pollen culture and production of haploids.
12) Artificial seed preparation.
13) Cytological examination of regenerated plants.
14) Agrobacterium culture and selection of transformants.
15) Selection of salt tolerance, amino acids analogous resistance through cell cultures.
16) Hardening of tissue culture raised plants.
17) Visit to forest area to study important plant species and preparation of field diary.
18) Visit to plant tissue culture laboratories in state & preparation of report.

Semester III

Plant Tissue Culture : Practical-VI (Elective)

PRACTICAL SCHEDULE

Time : 8 Hrs.		Max. Marks: 40
Q.1.	Setting and working of one major experiment	12 Marks.
Q.2.	Two Minor experiments.	08 Marks.
Q.3	Preparation of any one specific media for tissue culture.	10 Marks.
Q. 4	Comment on spots.	05 Marks.
Q. 5	Viva voce	05 Marks.

Semester- III

PAPER-XI: BIOINFORMATICS-I (Elective)

UNIT I: 1.1 Computer system: Overview functions input devices output devices, storage devices, Softwares and Hardwares.
1.2 Main circuits: Chips, Ports, Expansion slots.
1.3 Real time, offline and online processing.
1.4 Operating systems: Concepts, windows 2003/XP, VISTA, UNIX, LINUX.
1.5 Computer Virus: Overview, Transmission and Precautions.

UNIT II: 2.1 Types of computers- Latest Models.

2.2 Internet: Resources, World Wide Web, Tools associated, terminologies.

2.3 Data communication, links and Data Mining

2.4 LAN, WAN, MAN, Search Engines.

2.5 Data Models: Network and Hierarchial data model and concepts.

UNIT III: 3.1 Computer application in Bioinformatics.

3.2 Databases: Primary, Secondary; Relational and Non relational; Redundant and Non Redundant

3.3 Introduction to Oracle and Perl.

3.4 Database design and management (DBMS & RDBMS).

3.5 Bioinformatics Resources: NCBI, EBI, ExPASY, EMBL and DDBJ.

UNIT IV: 4.1 Biological Databanks: PDB, SRS, BRENDA, TREMBL, UniProt, KEGG.

4.2 Derived, Databases: PROSITE, Pfam, PRINTS, CATH, SCOP, DSSP, FSSP, DALI.

4.3 Genomic Databases.

4.4 Repositories for high throughput genomic sequences: EST, STS, GSS.

4.5 Nuclei Acid databases and Protein databases.

UNIT V: 5.1 Sequence Analysis: Overview, Concepts and tools.

5.2 Similarity Searches: BLAST, FASTA, PSI-BLAST and PHI-BLAST.

5.3 Scoring Matrices: PAM, BLOSSUM and PSSM.

5.4 Pairwise Sequence Analysis: Needleman and Wunch; Smith and Waterman.

5.5 Dynamic Programming.

Semester-III

PAPER XII : BIOINFORMATICS II (Elective)

Unit I: 1.1 Multiple sequence Alignment (MSA); Basic concepts,Progressive and Hierarchial approaches CLUSTAL-W, GENEDOC.

1.2 Sequence patterns, profiles and motifs (Profilescan) Prosite type.

1.3 Phylogenetic tree: Basic concepts, methods, types of trees, Analysis algorithm UPGMA, NJ, NR, MP and its interpretation.

1.4 Comparative genomic: Full genome alignment concepts and applications, Algorithm MUMmer, BLAST-2

Unit II: 2.1 Gene Prediction: Gen Scan and Neural Network, HMM concepts and Applications.

2.2 Genomic: Genome analysis coding region (CpG Island, GC content, SNPs, ESTs) non-coding regions: LINES, SINES, LTRs, Tandem repeats.

2.3 Structural Genomics and Primer designing

2.4 Functional genomics: DNA Microarray.

Unit III: 3.1 Protein structure Prediction: ab-initio method, GOR, Fold recognition (PHD, PSI- Prediction method)

3.2 Protein structure with respect to helix, sheets and coils, Ramchandran Plot.

3.3 Protein modelling and simulations: Techniques, MD Monte Carlo, docking strategies.

3.4 Protein optimisation techniques.

3.5 To study protein characteristics by using peptools.

Unit IV: 4.1 Protein Array: Concept tools

4.2 Protein -Protein interaction: Molecular design.

4.3 Protein Validation/Homology and Resources for virologyô

4.4 Virtual Lab. concept

4.5 Allergic proteins and their studies by using bioinformatic tools.

Unit V: 5.1 Biodiversity Informatics: Overview, concept, Databases (Species 2000, tree of life, ATCC, NBTI) and Softwares (delta, Metro IS, AVIS, ICTV)

5.2 Bioinformatics in Agriculture for Crop Improvement.

5.2 Drug Design: Role of bioinformatics, target identification and Model organisms (*Arabidopsis thaliana, C. elegans, Drosophila melanogaster*)

5.4 Chemo informatics: Concepts and Dynamics of biomolecular drugs.

5.1 Emerging areas in bioinformatics: Genechip, Forest informatics, Ontology, Phylogenetic study, Drug target identification.

Suggested Readings:

1. Hanery Korth & Abraham Database system concept Tata McGraw Hill Publication.
2. Martin J.M. Database system roganisation ï Prentice Hall.
3. Stephen Misener and Stephen A. Krawetz, 1999 Bioinformatics: Methods and Protocols (Methods in Molecular Biology, Vol 132), , Humana Press.
4. Stanley Letovsky, 1999 Bioinformatics: Databases and Systems, Kluwer Academic Publishers.

5. P. Green, 1998,Computational Molecular Biology, Blackwell Science Inc.
6. Introduction to Computational Molecular Biology, Joao Meidanis, Joao C. Setabal, 1997, PWS Pub. Co.
7. Dan Gusfield, 1997Algorithms on Strings, Trees, and Sequences: Computer Science and Computational Biology, Cambridge University Press.
8. Simon R. Swindell, 1997 Sequence Data Analysis Guidebook, Humana Press.
9. Tieng K. Yap, Ophir Frieder, Robert L. Martino, 1996, High Performance Computational Methods for Biological Sequence Analysis, Kluwer Academic Pub.
10. Russell F. Doolittle, 1996 Computer Methods for Macromolecular Sequence Analysis, Methods in Enzymology, volume 266, , Academic Press.
11. Molecular Bioinformatics: Algorithms and Applications, Steffen Schulze-Kremer, 1995, Walter De Gruyter.
12. Michael S. Waterman, 1995, Introduction to Computational Biology ï Maps, Sequences and genomes, Chapman & Hall.
13. Annette M. Griffin and Hugh G. Griffin, 1994, Human Press.Computer Analysis of Sequence Data,
14. S. G. Gindikin, 1992, Mathematical Methods of Analysis of Biopolymer Sequences (Dimacs Series in, Discrete Mathematics and Theoretical Computer Science; Volume 8), American Mathematical Society.
15. Michael S. Waterman, 1989 Mathematical Methods for DNA Sequences, CRC Press.
16. James D. Tisdall, 2003 Mastering Perl for Bioinformatics, OôReilly.
17. Cynthia Gibas, Per Jambeck, 2001 Developing Bioinformatics Computer Skills, OôReilly.
18. Jeffrey D. Ullman, Jennifer D. Widom, 2001,Database Systems: The Complete Book, Hector Garcia-Molina, and Prentice Hall.
19. Eric S. Roberts, 1998, Programming Abwstractions in C: A Second Course in Computer Science, Addison-Wesley.
20. Larry Wall, Tom Christiansen, Jon Orwant, 2000 Programming Perl (3rd Edition), OôReilly.
21. Jerry Peek, Tim OôReilly, Mike Loukide s, 2nd Edition, 1997UNIX Power Tools, 2nd Edition, OôReilly.
22. James Callahan, Harriet Pollatsek, Lester Senechal, and 1995 Calculus in Context: The Five College Calculus Project, Freeman.
23. Gilbert Strang, 1998, Introduction to Linear Algebra, Wellesley Cambridge Press.
24. Erwin Kreyszig, 1999, Advanced Engineering Mathematics, John Wiley & Sons.

25. Christian Schlotterer, 1999, The Elements of Statistical Learning: Oxford University Press.
26. Kenneth Lange, 1997, Mathematical and Statistical Methods for Genetic Analysis, Springer Verlag.
27. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Cliff Stein, 2001,Introduction to Algorithms, 2nd Edition, MIT Press.
28. Charles Staben, 2001,Bioinformatics: A Primer, Jones & Bartlett Pub.
29. Arun Jagota, 2000 Data Analysis and Classification for Bioinformatics, AKJ Academics.
30. Stuart M. Brown, 2000, Bioinformatics: A Biologistôs Guide to Biocomputing and the Internet, Eaton Pub. Co.
31. Des Higgins, Willie Taylor, 2000, Bioinformatics: Sequence, Structure and Databanks: A Practical Approach (The Practical Approach Series, 236), Oxford Univ. Press.
32. Neural Networks and Genome Informatics, Cathy H. Wu, Jerry W. McLarty, 2000, Elsevier Science.
33. Peter Clote and Rolf Backofen, 2000, Computational Molecular Biology: An Introduction (Wiley Series in Mathematical and Computational Biology), John Wiley & Sons.
34. Chrystopher L. Nehaniv, 1999, Mathematical and Computational Biology: Computational Morphogenesis, Hierarchical Complexity, and Digital Evolution American Mathematical Society.
35. Jason T.L. Wang, Bruce A. Shapiro, Dennis Elliott Shasha , 1999, Pattern Discovery in Biomolecular Data: Tools, Techniques, and Applications, Oxford Univ. Press.
36. Dan E. Krane, Michael L. Raymer, Michaeel L. Raymer, Elaine Nicpon Marieb, 2002, Fundamental Concepts of Bioinformatics, Benjamin/Cummings.
37. Tao Jiang, Ying Xu, Michael Zhang, 2002 Current Topics in Computational Molecular Biology (Computational Molecular Biology), MIT Press.
38. Warren Ewens, Gregory Grant, 2001,Statistical Methods in Bioinformatics: An Introduction (Statistics for Biology and Health), Springer Verlag.
39. Pierre Baldi, Soren Brunak, Sren Brunak, 2001,Bioinformatics: The Machine Learning Approach, Second Edition (Adaptive Computation and Machine Learning), MIT Press.
40. Pankhurst (1991): Practical Toxonomic Computing
41. A.R. Leach, Molecular Modelling Principles and Applications
42. Creighton T.E. Protein Folding
43. Creighton T.E. Protein Structure Prediction.

44. Brendam Wren, Nick Dorrell, 2003,Functional Microbial Genomics (Volume 33), Academic Press.
45. John E. Antonopoulos, 2000,Genomics, Xlibris Corporation
46. Sandor Suhai, 2000,Genomics and Proteomics: Functional and Computational Aspects, Plenum Pub Corp.
47. David L Spector, Robert D. Goldman, Leslie A. Leinwand, 1998, Cells: A Laboratory Manual, 3 volumes, Cold Spring Harbor Laboratory Press
48. Bruce Birren, etal., 1997, Genome Analysis: A Laboratory Manual, 4 volumes Cold Spring Harbor Laboratory Press.
49. Cecillia Sacone, Graziano Pesole, 2003, Handbook of Comparative Genomic: Principles and Methodology, Wiley-Liss
50. David Sankoff and Joseph H Nadeau, 2000,Comparative Genomics - Empirical and Analytical Approaches to Gene Order Dynamics, Map Alignment and the Evolution of Gene families, Kluwer Academic Pub
51. Melody Clark (Editor), 2000Comparative Genomics, Kluwer Academic Pub.
52. T. Rabilloud, 2000, Proteome Research: Two-Dimensional Gel Electrophoresis and Detection Methods (Principles and Practice), Springer Verlag.
53. R.M. Kamp, D. Kyriakidis, the Choli-Papadopoulou, 1999,Proteome and Protein Analysis, Springer Veriag.
54. M.R. Wilkins, et al. (Editors), 1997, Proteome Research: New Frontiers in Functional Genomics Springer Verlag.
55. I.F. Tsigelny, 2002, Protein Structure Prediction: Bioinformatic Approach, International University Line.
56. Arthur M. Lesk, 2001, Introduction to Protein Architecture: The Structural Biology of Proteins, Oxford University Press.
57. David M. Webster, 2000, Protein Structure Prediction: Methods and Protocols, Humana Press.
58. Carilvar Branden, John Tooze, 1999, Introduction to Protein Structure, Gariand Publishing.
59. Alan Fersht, 1999, Structure and Mechanism in Protein Science: A Guide to Enzyme Catalysis and Protein Folding, Freeman
60. Mark A. Rothstein, 2003, Pharmacogenomics: Social, Ethical, and Clinical Dimensions, Wiley-Liss.
61. Meyer, Rachel Tyndale, 2001Pharmacogenomics, Werner Kalow, , Marcel Dekker.
62. Elliot S Vesell, 2000,Pharmacogenetics and Pharmcogenomics : Recent Conceptual and Technical Advances(Pharmacology, Volume 61, Number 3, 2000), S. Karger Publishing.

63. Wendell Weber, 1997, Pharmacogenetic, Oxford University Press.
64. Helen C. auston, John Quackenbush, Alvis Brazma, 2003, Microarray Gene Expression Data Analysis: A Beginnerôs Guide, Blackwell Publishers.
65. G. Parmigiani, E.S. Garrett, R.A. Irizarry, S. Zeger, Graeme Clark, 2003The Analysis of Gene Expression Data (Statistics for Biology and Health), Springer Verlag.
66. Daniel P. Berrar, Werner Dubitzky, Martin Granzow, 2002, A Practical Approach to Microarray Data Analysis, Kluwer Academic Publishers
67. Pierre Baldi, G. Wesley Hatfield, 2002, DNA Microarrays and Gene Expression: From Experiments to Data Analysis and Modeling, Cambridge University Press.
68. David Bowtell, Joseph Sambrook, 2002,DNA Microarrays: A Molecular Cloning Manual, Cold Spring Harbor Laboratory.
69. Steen Knudsen, 2002, A Biologistôs Guide to Analysis of DNA Microarray Data, John Wiley & Sons.
70. Bertrand Jordan, 2001,DNA Microarrays: Gene Expression Applications, Springer Verlag.
71. Jang B. Rampal, 2001,DNA Arraysm: Methods and Protocols (Methods in Molecular Biology, Volume 170), Humana Press.
72. Elena V, Grigorenko, 2001,DNA Arrays: Technologies and Experimental Strategies, CRC Press.
73. Mark Schena, 2000, Microarray Biochip Technnology, Eaton Pub.
74. Mark Schjena, 1999, DNA Microarrays: A practical Approach (Practical Approach Series 205), Oxford Univ Press.
75. Eric H. Davidson, 2001, Genomic Regulatory Systems: development and Evolution, Academic Press.
76. Erica Golemis, 2001, Protein-Protein Interactions: A Molecular Cloning Manual, Cold Spring Harbor Laboratory.
77. Luke Alphey, 1997, DNA Sequencing: From Experimental Methods to Bioinformatics (Introduction to Biotechniques Series), Springer Verlag.
78. Adams M.D. Fields C., Venter J.C.), 1994, Automated DNA sequencing and analysis, Academic Press.
79. Marco Salemi, Anne-Mieke Vandamme, 2003The Phylogenetic Handbook: A Practical Approach to DNA and Protein Phylogeny, Cambridge University Press.
80. Barry G. Hall, 2001, Phylogenetics Trees Made Easy: A How- To Manual for Moleculzar Biologists, Sinauer Associates.
81. Masatoshi Nei, Sudhir Kumar, 2000Molecular Evolution and Phylogenetics, Oxford Univ Press.

82. Roderic D.M. Page, Edward C. Holmes, 1998,Molecular Evolution: A Phylogenetic Approach, Blackwell Science Inc.
83. R Scott Hawley, Michele Y Walker, 2003,Advanced Genetic Analysis: Finding Meaning in the Genome, Blackwell Publishers.
84. Pui-Yan Kwok, Carolyn T. Williford, 2003, Single Mucleotide Polymorphisms: Methods and Protocols (Methods in Molecular Biology (Clifton, N, J.), V. 212), Humana Press.
85. Daniel Sorensen, Dani Gianola, 2002, Likelihood, Bayesian and MCMC Methods in Quantitative Genetics, Springer Verlag.
86. Ali Hajeer, Jane Worthington, Sally John, 2000, Snp and Microsatellite Genotyping: Markers for Genetic Analysis Biotechniques Molecular Laboratory Methods Series Eaton Pub.
87. David B. Goldstein. Microsatellites: Evolution and Applications,

Laboratory Exercises:

1. Hands on experience and Regular Usage: Windows XP, Internet Browsers (I.E. Netscape), Search Engines, E-mail, Web, mail and ftp.
2. Downloading and installing Software/plugs in on Windows XP.
3. Spreadsheet Applications: Database Management (sorting records, Finding, adding, deleting).
4. Creation of Computer Presentations with graphics (P.P.), Slides, Wizards, inserting graphs & charts, build and animated effect.
5. Database search, NCBI, DDBJ, EMBL, BRENDA, KEGG, UniProt.
6. Pair wise Sequence Alignment-FASTA, BLAST.
7. Websites for Bioinformatics.
8. To prepare the inventory of websites.
9. To develop a phylogeny tree of at least 5 plant species.
10. To search allergic fragments of proteins in fruits / pollen grains.
11. To study Protein characteristics by using different boinformatic tools.
12. Protein database searching GCG package or EMBOSS.
13. 3D Motif recognition.
14. 3D structure viewing tools.
15. Method of gene Annotation.
16. Assembly of full genome from sequenced fragments.
17. Blast analysis of DNA sequence.
18. Blast analysis of Protein sequence.
19. Primer designing using computers.
20. Protein prediction using DNA as template.
21. RNA prediction using DNA as template.

22. Genome analysis (Prokaryotes)
23. Genome analysis (Eukaryotes)
24. Identification of MUMs (Maximum unique matches)
25. Identification of Unique Sequences for organism.
26. DNA extraction from plants.
27. Protein Molecular weight determination by electrophoresis.
28. Effect of PAM on sequence Analysis.
29. Effect of BLOSSUM on sequence Analysis.
30. Effect of PSSM on protein sequence Analysis.
31. Prediction of Function for unknown sequence.
32. CpG Island identification in Genome Sequence.
33. GC content of sequence and validation of Chargaffôs rule.
34. Study of types of genome sequencing.
35. Study of sequencing techniques.
36. Phylogenetic analysis multiple sequence by root tree method.
37. Phylogenetic analysis multiple sequence by non-root tree method.
38. Calculation of distances between two sequences.
39. Study of LINES in genomes.
40. Study of SINES in genomes.
41. Study of LTRS in genomes.
42. Study of tandem repeats.
43. Study of telomeres sequences in organisms..

Semester -III

PRACTICAL -VI

ELECTIVE PAPER BIOINFORMATICS

PRACTICAL SCHEDULE

Time: 8 Hrs.		Marks: 40
Q. 1	Setting and Working of one major experiment	12 Marks
Q. 2	Perform two minor experiments	12 Marks
Q. 3	Problem on Matrices	06 Marks
Q. 4	Spotting	05 Marks
Q. 5	Viva voce	05 Marks

Semester –III

Paper-XI: Angiosperm Taxonomy, Phytochemistry and Pharmacognosy-I (Elective)

UNIT I : Basic principles of phytochemical techniques ï UV-Visible and Infra Red Spectroscopy, Nuclear Magnetic Resonance (NMR); Chromatographic techniques- Paper chromatograp hy, Thin Layer Chromatography (TLC), High Performance Liquid Chromatography(HPLC), Gas Liquid Chromatography (GLC), Gel Electrophoresis.

UNIT II : Study of following secondary plant metabolites with respect to their chemistry and biological activity- F l a v o n o i d s , Simple Phenolics, Phenolic Glycosides, Tannins, Anthroquinones, Saponins, Steroids, Alkaloids, Pigments (anthocyanin and betacyanin), Resins, Gums and Volatile oils.

UNIT III : Basic aims and concepts of taxonomy. Principles of systematics; concept of character. Monophyly and Polyphyly, Parallelism and convergence, Homology and analogy. Taxonomic literature- keys, floras, monographs and icons.

UNIT IV : International code of Botanical Nomenclature Type method, valid publication, Rule of priority, Author citation, conservation of names and rejection of names, Time and place of origin of Angiosperms. Probable ancestors of angiosperms (different theories of origin of angiosperms).

UNIT V : Pharmacognostic studies of following drug plants: (Nomenclature, Morphology, Anatomy, Chemistry, Uses and Adultrants)

Datura metel, Solanum surattense, Zingiber officinale, Ocimum sanctum, Swertia chirata, Asparagus racemosus Commiphora weightii, Citrulus colocynthis, Digitalis purpurea; Gloriosa superba, Withania somnifera.

Ethnobotany: Dynamism in ethnobotany.

Semester – III

Paper-XII: Angiosperm Taxonomy, Phytochemistry and Pharmacognosy-II (Elective)

UNIT I : History of classification. Brief account of Pre-Darwinian Classification. Post-Darwinian developments in classification. Artificial, Natural, Phylogenetic and Evolutionary classification systems. Study of Modern systems ï Takhtajan; Dahlgren and Thorneôs system of classification, assorted Phylogenetic systems.

UNIT II : Taxonomic evidence: Vegetative and floral anatomy, palynology; embryology, cytology, Phytochemical systematics and molecular systematics. Numerical taxonomy, Biosystematics

UNIT III : Living fossils of Angiosperms: Winteraceae, Degeneriaceae, Astrobaileyaceae, Ambrorellaceae, Tetracentraceae, Trochodendraceae, Eupomatiaceae. Comparative account of vegetative and floral morphology, inter-relationships; phylogeny and distribution of plant families belonging to following subclasses as per Cronquistôs system (As illustrated by following orders and families).

a) Magnoliidae: Ranunculaceae, Berberidaceae, Lardizabalaceae, Menispermaceae.

b) Hamamelideae: Urticales- Ulmaceae, Moraceae, Cannabaceae, Urticaceae.

UNIT IV: c) Caryophyllidae: Caryophyllales-Phytolaccaceae, Nyctaginaceae, Didiereaceae,Cactaceae, Aizoaceae, Molluginaceae, Chenopodiaceae, Amaranthaceae.

d) Dillenidae- Malvales- Elaeocarpaceae, Scytopetalaceae, Tiliaceae, Sterculiaceae, Bombacaceae, Malvaceae.

e) Rosidae: Geraniales- Oxalidaceae, Geraniaceae, Tropoaeolaceae, Balsaminaceae.

f) Asteridae ï Asterales- Asteraceae.

UNIT V: g) Alismatidae-Alismatales-Butomaceae, Limnocharitaceae, Alismataceae.

h) Commelinidae- Zinziberales- Sterilitziaceae, Lowiaceae, Heliconiaceae, Musaceae, Zingiberaceae, Costaceae, Cannaceae, Marantaceae.

i) Liliidae- Liliales- Liliaceae, Amaryllidaceae, Iridaceae, Agavaceae, Dioscoreaceae.

Suggested Readings :

1) Comparative Phytochemistry - Swain, T., Academic Press.
2) Chemistry in Botanical classification - Nobel symposia medicine and natural science, Benz, G. and J.Santesson, Academic Press.
3) Pharmacognosy - Kokate C.K., A.P.Purohit and S.B.Gokhale, Nirali Prakashan.
4) Trease and Evanôs Pharmacognosy : W.C.Evans, Saunders.
5) Plant systematics, a phylogenetic approach - Jude, Campell, Kellog & Stevans, Sionaur Association Inc.USA.
6) Biochemical systematics: Alston, R.E. & B.L.Turner, Prentice Hall.
7) Origin and Early Evolution of Angiosperms, Breek C.B. (Ed), Columbia University Press.
8) The Seeds of Dicotyledons Vols. I & II, Corner, E.J.H., Cambridge University Press.
9) Morphology of the Angiosperms, Eames, A.J., MC Graw Hill.

10) Plant Chemototaxonomy: Harborne J.B. and B.L.Turner, Academic Press.
11) Pollen Morphology & Taxonomy of Angiosperms: Eradtman, G., Almvist & Wiksei Stoekholm.
12) Taxonomy of Vascular Plants, Lawrence: H.M., MC Millan.
13) Taxonomy of Angiosperms, Naik: V.N., Tata McGraw Hill.
14) The families of flowering plants Vol. I & II: Hutchinson, J., Hutchinsu London.
15) Principles of Angiosperms Taxonomy : Davis H. & V.H, Heywood, Von Nostrand.
16) International Code of Botanical Nomenclature, Voss.E.C.(Ed.), Regnum Vegetable utrecht.
17) A Punched card key to the Dicot Families of South India: Saldhana C. & C.K.Rao, Arvind Publishers, Bangalore.
18) Phytochemistry and Angiosperm Phylogeny: Young D.J., & Siegler, Prager.
19) An Integrated System of Classification of flowering Plants: Cronguist, A., Columbia University Press.
20) Flowering Plants Origin & Dispersal: Takhtajan, A., Oliver & Boyd.
21) Evolution and Phylogeny of flowering plants: Hutchinson, J., Academic Press.
22) Evolution and Systematics: Solbrig, O.T., McMillan.
23) Morphology of Angiosperms: Sporne, K.R., Hutchinson, London.
24) Origin and Early Evolution of Angiosperms: Beck, C.G. (Ed.), Columbia University Press.
25) Palaeobiology of Angiosperms Origin: Hughes, N.H., Cambridge University Press.
26) Chromosome Atlas of the Flowering Plants of the Indian Sub-continent: Kumar, International Book.
27) Anatomy of the Dicotyledons, Second edition: Vol. I & II, Metcalfe, C.R. & L.Chalk, Oxford Science Distributors.
28) Taxonomy & Ecology: Heywood, V.H.Ed., Acadenue Press.
29) Numerical Taxonomy: Sneath, P.H.A. & R.R.Sokal, W.H.Freeman & Co.San Fransisco.
30) Manual of Cultivated Plants: 2nd Ed., Baily, L.H., Macmillan.

Laboratory Exercises :

1) Description of locally available dicot and monocot species. Identification upto species level with the help of flora.
2) Use of cytological data in Taxonomic studies - Karyotype analysis. Preparation of Karyograms; and Idiograms (to be done with the help of permanent preparation / diagram / photoplate).

3) Comparison of different species of a family to calculate similarity coefficient and preparation of dendrograms (numerical taxonomy).
4) Study of different taxonomic features like stomatal types, pollen types, trichome types, crystals etc.
5) Detection of secondary metabolites in plant material by quick tests. Detection of flavonoids, irridoids; leucoanthogenins, anthroquinones, alkaloids, saponins, differentiating anthocyanins from bactacyanins. Chemically differentiating angiosperm wood from gymnosperms wood.
6) Pharmacognostic studies of any 3 of the locally available medicinal plants.
7) Frequent field visits to study local flora are expected. One short tour within state and one long tour to other state to study the vegetation and biodiversity of angiosperms. Students should submit atleast 100 herbarium specimens (collectively) prepared according to international norms. Excursion report should be supported by field diary and photographic presentation of the flora.

Semester -III

Elective Practical VI – Angiosperm Taxonomy, Phytochemistry and Pharmacognosy.

Practical Schedule

Time : 6 Hrs — Full Marks: 40

Q.1)	Systematic description of two angiospermic plants (one from dicotyledons and one from Monocotyledons)	10 Marks.
Q.2)	Preparation of artificial key	04 Marks.
Q.3)	Karyotype studies	04 Marks.
Q.4)	Detection of secondary plant metabolites of given plant material.	03 Marks.
Q.5)	Morphological and analytical characterization of given drug plant material	06 Marks.
Q.6)	Spotting	08 Marks.
Q.7)	Viva voce	05 Marks.

Semester III

ELECTIVE PAPER XI: ADVANCED PLANT PHYSIOLOGY AND BIOCHEMISTRY-I

UNIT I: 1.1 Membrane transport ï Structure and organization of membrane, Glucoconjugates and protein membrane systems; Channels, pumps and carriers of membrane.

1.2 Aquaporines ï Structure and functions; Model membranes.

1.3 Mineral nutrition ï Deficiency symptoms in plants, Regulation of K+ Phosphoporus nutrition and transport; Micronutrient acquisition; Plant response to mineral toxicity; Nutritional status of plants.

UNIT II: 2.1 Plant movementsï Overview; phototropism, phototropic signal perception, transduction of signal.

2.2 Gravitropism ï signal perception and its mechanism, growth response, Role of calcium in gravitropism.

2.3 Nastic movements ï Mechanism of Nyctynasty and Seismonasty.

2.4 Sensory photobiology ï Phytochromes and Cryptochromes ï Phytochemical and biochemical properties; Photophysiology of light induced responses; molecular mechanism of photomorphogenic receptors; signaling and gene expression.

UNIT III: 3.1 Plastids ï Chemical composition, structure and transport functions of plastid membranes.

3.2 Biosynthesis of Chorophylls, Carotenoids and fatty acids.

3.3 Thylakoid membrane network; protein synthesis, nuclear proteins for photosynthesis.

3.4 Mitochondria ï Chemical composition, Transport across the membrane; Proteins synthesis; nuclear proteins for respiration.

UNIT IV: 4.1 Energy Metabolism ï Thermodynamic principles in biology. Artificial photosynthesis for energy harvestation; National Hydrogen Programme.

4.2 Primary and Secondary metabolites ï Coordinated control of metabolism; Metabolites as important natural products.

4.3 Types, biosynthesis and applications of terpens, alkaloids, phenolic compounds, lignins, flavonoids, glycosides, caumarines, stilbenes, styrylopyrones and amylopyrones.

UNIT V: 5.1 Spectroscopy ï Principles and applications of X-ray diffraction, Fluorescence, UV-visible, IR and NMR Mass spectroscopy.

5.2 Chromatography- Principle and applications of paper, ion exchange, affinity, and thin layer chromatography.

5.3 Flame photometry ï Principle and its applications.

Semester III

PAPER XII: ADVANCED PLANT PHYSIOLOGY AND BIOCHEMISTRY-II (ELECTIVE)

UNIT I: 1.1 Carbohydrates- Chemical Structure, Types and functions of cabohydrates. Biosynthesis and degradation of starch and sucrose, Modulation of gene expression by carbohydrates.

1.2 Amino acid- Chemical properties; Overview of amino acid biosynthesis in plants.

1.3 Signal transduction ï Overview, receptors and G-proteins, phospolipid signaling, role of cyclic nucleotides, Calcium-Calmodulin cascade, diversity in protein kinases and phosphatases, Specific signaling mechanisms- Two compartment sensor regulator system in bacteria and plants. Sucrose sensing mechanism.

UNIT II: 2.1 Plant defence systems ï Overview of plant pathogens and plant diseases; Phytoalexins and their host specificity.

2.2 Molecular basis of phytoalexin elicitation; R- genes; mode of action and its role.

2.3 Post infectional compounds of some economically important plants.

2.4 Control of pathogens by Genetic Engineering.

UNIT III: 3.1 Regulation and mode of secondary metabolites ï Bioseperation of compounds, Regulation of metabolite synthesis in plants, Mode of action of target sites; Synergy principle at work in plants, pathogens, insects, herbivores and humans.

3.2 Transgenic production of secondary metabolites.

UNIT IV: 4.1 Senescence and programmed cell death ï Types of cell death observed in plants. Overview of senescence, pigment and protein metabolism during senescence.

4.2 Impact of senescence on Photosynthesis and oxidative metabolism.

4.3 Degradation of nucleic acid during senescence.

4.4 Endogenous plant growth regulators and senescence, Environmental influence on senescence.

UNIT V: 5.1 Stress Physiology ï Plant responses to biotic and abiotic stress, Mechanism of biotic and abiotic stress tolerance, HR and SAR.

5.2 Water deficit and draught resistance; salinity stress, metal toxicity, freezing and heat stress and oxidative stress.

Suggested Readings:

1. DNA and Protein Sequence Analysis: A Practical Approach (Practical Approach Series, No. 171), 1996, M.J. Bishop and C.J. Rawlings (Editors), 1996, IRL Press.

2. Sequence Analysis Primer, Michael Gribskov and John Devereux (Editors), 1992, Oxford University Press..
3. Approaches to gene Mapping in Complex Human Diseases, Jonathan L. Haines, Margaret A. Pericak-Vance (Editors), 1998, John Wiley & Sons.
4. Essentials of Genomics and Bioinformatics, C.W. Sensen (Editor), 2002, John Wiley and Sons.
5. Hidden Markov Models for Bioinformatics, Timo Koski, Timo Koskinen, 2001, Kluwer Academic Publishers.
6. Albert, B; Bray, D; Lewin, J; Raff, M; Roberts, K; Watson, J.D.; Molecular Biology of the Cell. Garland, New York, 1994.
7. Brachet J. & Mirshy, A.E., ed., The Cell Biochemistry, Physiology, Morphology, Vol.II. Academic Press Inc. London LTD. 1961.
8. Buchanan, B.B.; Gruissem, W.; Jones, R.L.; Biochemistry & Molecular Biology of Plants, American Society of Plant Physiologists, Rockville, Maryland, 2000.
9. Charalambous, G., Ed., Spices, Herbs & Edible Fungi, Elsevier, New York 1944.
10. Clayton, R.K., Photosynthesis : Physical mechanism & Chemical patterns. Cambridge University Press, Cambridge. 1980.
11. Dangi, J.L.; Bacterial Pathogenesis of Plants & Animals, Molecular & Cellular Mechanism. Springer-Verlag, Berlin, 1995.
12. Daniel,M. and R.P.Purkayastha Ed., Handbook of Phytoalexin metabolism & action, Marcel Dekker, Inc., New York, 1995.
13. Davies, D.D., ed., The Biochemistry of Plants, Vol.II, Academic Press, London, 1987.
14. Duke, J.A. CRC Handbook of Phytochemical Constituents of GRAS Herbs, Foods & other Economic Plants. CRC Press, Boca Raton, FL, 1992.
15. Epstein, E., Mineral Nutrition of Plants : Principles & Perspectives. John Wiley & Sons, New York, 1972.
16. Hopkins, W.G. Introduction to Plant Physiology. John Wiley & Sons, Inc., New York, USA, 1995.
17. Jones & Bartlett, Plant Cell Biology : Structure & Function, Sudbury, M.A., 1996.
18. Kaufman, P.B.; L.J.Cseke; S.Warber; J.A.Duke & H.L.Brielmann. Natural products rom plants. CRC Press LLC New York, 1999.
19. Llyoid, C.W. ed, Plant Cell biology : Structure and function, Academic Press, London, 1982.
20. Llyoid, C.W. ed, The cytoskeletal Basis of Plant Growth & Form, Academic Press, London, 1991.

21. Lodish, H: Berk, A.; Zipursky, S.L.; Matsudaira, P. : Baltimore, D., and Damell, J. Molecular Cell biology. 4th ed. W.H.Freeman & Co., New York, USA, 2000.
22. Marchner, H. Mineral Nutrition of Higher Plants, 2nd ed. Academic Press,, London, 1995.
23. Moller, T.M.; Gardestom P., Glimelin, K.; Glaser, E. Plant Mitochondria : From Genes to function. Backhuys Publishers, 1998.
24. Nishimura, S.; C.d.Vance & N.Doke, Eds. Molecular determinants of Plant diseases. Japan Scientific Press, Tokyo / Springer Verlag, Berlin, 1987.
25. Noggle, G.R. & G.J.Fritz. Introductory Plant Physiology. 2nd ed. Prentice-Hall, Inc., Englewood cliffs, N.J. U.S.A., 1992.
26. Plummer, D.T. An Introduction to Practical Biochemistry, 3rd ed. Tata Mc Graw Hill, Delhi.
27. Rochaix, J.D. Goldschmidt-Cleronont,M., Merchant, S., Kluwer. The molecular biology of chloroplast & mitochondria in Chlamydomonas, Academic Publishers, Dordrecht, The Netherlands, 1998.
28. Staples, R.C. Ed. Plant Disease Control, John Wiley & Sons, New York, 1981.
29. Taiz, L. & Zeiger, E. Plant Physiology 2nd ed. Academic Press, Sandiago, U.S.A. 1998.
30. Tobin, A.K., ed. Plant Organelles. Cambridge University Press. Cambridge, UK, 1992.
31. Westhoff, P. Molecular Plant Development : from Gene to Plant. Oxford University Press, Oxford, UK, 1998.

Laboratory Exercies :

1) The separation of leaf pigments by adsorption chromatography.
2) The separation of amino acids by two dimensional chromatography.
3) The identification of sugar in Fruit juices by TLC.
4) Seperation of Lipids by TLC.
5) SDS - PAGE for soluble proteins extracted from given plant material.
6) Extraction of Essential oils from plant material.
7) Separation of esters and perioxidases by native PAGE.
8) Determination of Chl- a, Chl-b & total chlorophyll in C3 & C4 plants by spectrophotometry.
9) Determination of isoelectric point of legumin.
10) The quantitative estimation of amino aids by using the ninhydrin reaction.
11) Estimation of total carbohydrates by anthrone reagent.

12) The determination of acid value of fats.
13) The determination of saponification value of fats.
14) The determination of activity of enzyme a - amylase.
15) Isolation of Chloroplast from spinach leaves.
16) The evaluation of oxygen by isolated chloroplast using Hill Oxidants.
17) Preparation of absorption spectrum of chlorophylls & carotenoids.
18) Estimation of stress induced amino acids (proline)
19) Demonstration of phototropism, geotropism, hydrotropism & seismonasty.
20) Determination of water potential by tissue weight change method.
21) Estimation of Sodium, Potassium & Calcium in plant material by Flame-photometry.
22) Estimation of peroxidase activity.
23) Detection of secondary metabolites by TLC (any one)
24) Profile study of secondary metabolites by TLC (any one)
25) Spectrophotometric estimation of secondary metabolites.
26) Estimation of phytoalexins.
27) PR- protein (b - 1,3 glucanase, chitinase, PAL) assay.

Semester III

Elective Practical – VI

Advanced Plant Physiology and Biochemistry

PRACTICAL SCHEDULE

Time: 6 Hrs Full Marks: 40

Q. 1 Setting and working of any one Plant Physiology experiment. 08 Marks

Q. 2 Setting and working of any one biochemistry experiment. 08 Marks

Q. 3 Comment on two experiments based on plant physiology and biochemistry that are set up. 10 Marks

Q. 4 Comment on principle and working of analytical instrument. 04 Marks

Q. 5 Perform phytochemical / biochemical test. 05 Marks

Q. 6 Viva voce 05 Marks

Semester – III

PAPER- XI: MOLECULAR BIOLOGY, BIOTECHNOLOGY AND PLANT BREEDING-I (Elective)

UNIT I: 1.1 Chemical basis of life- Covalent bonds, Non-covalent bonds, Vander Waalôs forces, Acids, Bases and Buffers.

1.2 Protein structure and function ï Hierarchial; structure of protein (Primary, Secondary, Tertiary, Quaternary and domain structure).

1.3 Modification and degradation of proteins. Molecular chaperons.

1.4 Membrane proteins-Integral and peripheral membrane proteins and its Interaction.

1.5 Methods of separation of cell proteins ï Detergents, Differential and Rate zonal centrifugation, SDS-Polyacrylamide gel electrophoresis and isoelectric focusing.

UNIT II: 2.1 Nuclear genome organization ï Genome size, Kinetics of DNA denaturation and renaturation, the law of DNA constancy and C- value paradox.

2.2 Kinetic classes of DNA ï Repetitive and Unique DNA sequences and its significance.

2.3 Transcription in prokaryotes ï Transcription unit, optimal prokaryotic promoter, Bacterial RNA polymerase, Transcription process.

2.4 Transcription in eukaryotes ï RNA polymerase, transcription factors, promoters, enhancer, transcription process.

2.5 Modification in RNA ï 5ô Cap formation, Transcription termination, 3ôend processing and polyadynalation, Splicing, Editing, nuclear export of mRNA and mRNA stability.

UNIT III: 3.1 Plant tissue culture- Laboratory structure and requirements, Different types of culture media, Importance of organic, inorganic nutrients in cell differentiations. Role of growth regulators in cell differentiation.

3.2 Anther and pollen culture techniques.

3.3 Protoplast culture and somatic hybridization ï Isolation of protoplasts, culture, and fusion methods.

3.4 Techniques of Bacterial culture and selection.

UNIT IV: 4.1 Cloning techniques for *E.coli.* ï Mechanical shearing, Restriction endonucleases, Synthetic linkers and adapters.

4.2 Vector systems ï Plasmid, Cosmid, and Bacteriophages.

4.3 Construction of gene libraries ï Genomic and c-DNA libraries.

4.4 Gene Technology in plants ï Agrobacterium mediated gene transfer.

4.5 Transgenic plants ï Production of transgenic plants for herbicide, insect / pest tolerance through recombinant DNA technique. Production of transgenic tomato plants with longer shelf life and better taste.

UNIT V: 5.1 Plant genetic resources- Centres of origin of food plants, concept of parallel variation, Importance of genetic diversity and conservation.

5.2 Utilization of wild species in crop improvement ï Tobacco, Tomato, pearlmillet, Brassica.

5.3 Techniques of producing hybrid seeds; Barriers to interspecific hybridization; Cytoplasmic basis of sterility.

5.4 Cytoplasmic and genetic male sterility systems in hybrid seed production ï Methods, Sources, Advantages and difficulties and future prospects.

Semester – III

PAPER-XII: MOLECULAR BIOLOGY, BIOTECHNOLOGY AND PLANT BREEDING-II (Elective)

UNIT I: 1.1 Chemical structure and functions of Biomolecules- Nucleic acids, Carbohydrates and lipids.

1.2 Principle, working and applications of various techniques.

1.3 Gel-filtration, ion exchange and affinity chromatography.

1.4 Thin layer and gas chromatography.

1.5 High-pressure liquid chromatography.

UNIT II: 2.1 Organisation of eukaryotic genes ï Features of split genes; Pseudogenes; Exons and Introns.

2.2 Genetic code ï Properties of code; Biochemical elucidation of code; suppressor, non-sense, missense and frameshift mutations.

2.3 Translation in prokaryotes and eukaryotes.

2.4 Regulation of gene expression in eukaryotes ï Position effect, paramutation, Genetic imprinting.

2.5 Regulation of transcription, Transcriptional and post transcriptional gene silencing.

UNIT III: 3.1 Tools in biotechnology ï Principle, techniques and application of nucleic acid hybridization; Southern, Northern and Western; Microarray and PCR.

3.2 Genomic stability ï Molecular characteristics, properties and significance of eukaryotic mobile genetic elements ï Ty elements in Yeast; Copia elements in Drsophila, Ac-Ds, Spm ï dSpm elements in maize. Role of mobile genetic elements in evolution.

UNIT IV: 4.1 Plant viruses as gene vectors ï RNA viruses, DNA viruses, Gemini viruses, and caulimovirus.

4.2 Agrobacterium mediated gene transfer ï Agroinfection, vectorless gene transfer.

4.3 Directed genetic engineering of plant cells ï Role of antisense RNA technology and Ribozyme in inactivation of resistance gene. Role of antisense RNA in AIDS controls.

4.4 Plant as a Bioreactor ï Production of High value of protein, new or modified carbohydrates in transgenic plants. Stability of proteins and RNA produced from genes introduced into transgenic plants.

UNIT V: 5.1 Molecular plant breeding ï Molecular marker systems. Importance of molecular marker assisted breeding. Molecular markers in genome analysis: RFLP and RAPD.

5.2 Radiation biology ï Radioactive isotopes, half-life of isotopes, Role of radiations in plant improvement.

5.3 Mutation breeding ï Mutagens, treatment methods and its applications in crop Improvement.

5.4 Principle and application of Biometrical genetics in plant Breeding.

Suggested Readings :

1) Karp, G. 1999. Cell and Molecular Biology Concepts and Experiments (2nd edition). John Wiley & Sons, Inc.USA.

2) Lewin, B. 2000. Gene VII. Oxford University Press, New York, London.

3) Lewis, R. 1997. Human Genetics : Concepts and Applications (2nd edition). WCB McGraw Hill U.S.A.

4) Malacinski, G.M. and Freifelder, D. 1998. Essential of Molecular Biology (3rd edition). Jones and Bartlet, Publishers, Inc. London.

5) Russel P.J. 1998. Genetics (5th Edition). The Benjamin / cummings publishing company Inc. USA.

6) Snustad D.P. and Simmons, M.J. 2000. Principles of Genetics (2nd edition) John Wiley & Sons Inc. USA.

8) Buchanan, B.B., Gruissem, W., and Jones,R.L., 2000. Biochemistry and Molecular Biology of Plants. American Society of Plant Physiologists, Maryland, USA.

9) Lodish, H., Berk,A., Zipursky,S.L., Matsundaira,P., Baltimore,D., and Darnell, J.2000. Molecular Cell Biology (4th Edition). W.H.Freeman and Co., New York., USA.

10) Fukuik and Nakayama, S. 1996. Plant Chromosomes. Laboratory Methods, CRC Press. Boca Raton, Florida.

11) Sharma, A.K. and Sharma, A. 1999. Plant Chromosomes, Manipulation and Engineering. Harwood Academic Publishers, Australia.

12) Brown, T.A. 1999. Genomes, John Wiley & Sons (Asia) Pvt.Ltd.Singapore.

13) Old, R.W. and Primrose,S.B. 1989. Principles of Gene Manipulation. Blackwell Scientific Publications, Oxford U.K.

14) Primose, S.B. 1995. Principles of Genome Analysis. Blackwell Scientific Publications, Ltd.Oxford, U.K.

15) Shantharam, S. and Montgomery, J.F. 1999. Biotechnology, Biosafety and Biodiversity, Oxford & IBH publishing Pvt.Ltd., New Delhi.

16) Hall, R.D. (Ed.) 1999. Plant Cell Culture Protocols. Humana Press, Inc.New Jersey U.S.A.

17) Butenko, R.G. 2000. Plant Cell Culture. University Press of Pacific.

18) Shaw, C.H. (Ed.) 1988. Plant Molecular Biology. A Practical Approch, IRL Press, Oxord.

19) Smith, R.H. 2000. Plant Tissue Culture Techniques and Experiments. Academic Press, New York.

20) Chopra V.L.2001. Plant breeding. Theory and Practice. Oxford IBH Pvt.Ltd., New Delhi.

21) Chopra V.L.2001. Plant breeding. Field Crops. Oxford IBH Pvt.Ltd., New Delhi.

22) Atherly A.G., Girten, J.R. and McDonald, J.F. 1999. The Science of Genetics, Saunder College Publishing, Fort Worth, USA.

23) Plummer, D.T. 1988. An Introduction to practical Biochemistry. Tata McGraw Hill Publishing Co.Ltd.New Delhi.

24) Wilson,K. and Goulding, K.H. (Eds), 1992. A Biologist Guide to Principles and Techniques & Practical Biochemistry (3rd Edition). Manas Saikia for Foundation Books, New Delhi.

25) Sadasivam, S. and Manickam A., 1996. Biochemical methods (2nd Edition). New Age International Publishers New Delhi.

26) Hans-Walter Heldt. 1997. Plant Biochemistry & Molecular Biology. Oxford University Press, New York.

27) Sharma, J.R. 1994. Principles and Practice of Plant Breeding. Tata McGraw Hill Publishing Company Ltd. New Delhi.

28) Rubenstein, I. Gengen bach, B.Phillips, R.L. and Green C.E. (Eds), 1980. Genetic improvement of crops. University of Minnesota Press. U.S.A.

29) Elliott, W.H. and Elliot, D.C. 1997. Biochemistry and Molecular Biology. Oxford University Press. New York.

30) Freifelder D. 1995. Molecular Biology (2nd Edition). Narosa Publishing House, New Delhi.

31) Satyanarayana, U. 1999. Biochemistry (1st Edition). Arunabha Sen Book & Allied (P) Ltd. Calcutta.

32) Madigan, M.T., Martinko, J.M. and Parker, J. 1997. Brock Biology of Microorganisms (8th Edition) Prentice Hall International (UK) Limited, London.

33) Gardner, E.J, Simmons, M.J., and Snustad, D.P. 1991. Principles of Genetics (8th Edition). John Wiley & Sons, Inc. New York.

34) Chaudhary, R.C. 1986. Introduction to Plant breeding, Oxford & IBH Publishing Co., New Delhi.

35) Gupta, S.K.2000. Plant Breeding. Theory and Techniques. Agrobios (India) Jodhpur.

36) Singh, P. 2001. Essentials of Plant Breeding (2nd Edition). Kalyani Publishers, New Delhi.

37) Watson, J.D., Hopkins, N.H., Roberts, J.W., Steitz, J.A., and Weiner, A.M. 1987. Molecular Biology of the Gene. (4th Edition). The Benjamin / cummings Publishing Company. Inc. California.

38) Chopra, V.L., Malik,V.S. and Bhat, S.R. 1999. Applied Plant Biotechnology. Oxford & IBH Publishing Co.Pvt.Ltd. New Delhi.

39) De Robertis, E.D.P. and De Robertis, Jr.EM.P. 1999. Cell and Molecular Biology (8th Edition) B.I.Publication Pvt.Ltd. New Delhi.

40) Jahier, J. (Ed.) 1996. Techniques of Plant cytogenetics. Oxford & IBH Publishing Co.Pvt.Ltd. New Delhi.

Laboratory exercises:

1. To extract genomic DNA from leaves and to analyse the extracted DNA by Agarose Gel Electrophoresis.
2. Estimation of protein by Bradfordôs Method.
3. Western Blotting- Protein profiling.
4. SDS ï PAGE.
5 Estimation of amino acids by Thin Layer Chromatography.
6 Estimation of fatty acids by paper chromatography.
7 Restriction Digestion.
8 Mechanical isolation of mesophyll protoplasts.

9 Protoplast fusion using polyethylene glycol solution.
10 DNA Fingerprinting.
11 Plasmid preparation.
12 Isolation of genomic DNA from Bacteria.
13 Establishment of callus culture from carrot cambial explant.
14 Effect of ionizing radiations/chemical mutagen on growth and mitotic Chromosome.
15 Establishment of callus from important medicinal/ ornamental/ oil yielding/ wild and endangered/ vegetatively propagated plants.
16 Detection of anomalies in chromosome pairing and disjunction caused by mutant genes and structural alteration of chromosomes.
17 Preparation of chromosome maps from Three point test cross data.
18 Identification of mutant genotype in Drosophila and Arabidopsis stocks maintained by the department.
19 Field exploration for detection of male sterile plants and estimation of their pollen fertility in locally grown plants (Tomato, Brassica, Linum).
20 Emasculation and bagging of flowers of Brasicaceae, Malvaceae, and liliaceae, pollinating them manually and estimating fruit and seed set.
21 Lay out of field experiment: Randomised block design, Latin square design.
22 Statistics:- Central value: mode median, mean; Dispersion: range, mean deviation, standard deviation; Frequency distribution: frequency curve, frequency histogram.
23 Use of different softwares for determination of chromosome length.
24 Use of CCD camera for microphotography.
25 To study the DNA denaturation and renaturation kinetic study by UV-VIS spectrophotometer.

Semester III

Elective Practical –VI:Molecular Biology, Biotechnology and Plant Breeding

PRACTICAL SCHEDULE

Time : 8 Hrs. Full Marks : 40

Q. 1. Setting and working of any one major Molecular Biology experiment. 08 Marks
Q. 2. Perform one major Biotechnology experiment. 08 Marks
Q. 3. Perform one Plant breeding experiment. 10 Marks
Q. 4. Comment on principle and working of analytical instrument. 04 Marks

Q. 5. Spotting. 05 Marks
Q. 6. Viva-Voce 05 Marks

Semester-III

PAPER –XI: PALAEOBOTANY

(EVOLUTIONARY BOTANY)-I (Elective)

Unit I : Palaeobotany as Evolutionary Science.

1.1 Basic concepts and scope of palaeobotany as evolutionary science.
1.2 Emergence of palaeobotany in world and India.
1.3 Basic principles of fossilization, fossils as an evidence of past life, methods of preservation, methods for study of different preservation types of plant fossils.
1.4 Geological time scale; stratigraphic importance of plant fossils.
1.5 Origin of life, Theory of Panspermia.
1.6 Classification of fossil plants, nomenclature and reconstruction.

Unit II: Diversification of life forms:

2.1 Algal forms like A*nimikiea, Kakabekia,Gunflintia, Eostrion* and *Stromatolite.* Dinoflagellete nano-fossils, Cyanobacteria in Archaeozoic era.
2.2 Fossil fungi.
2.3 Fossil Chlorophyta, Chrysophyta, and Phaeophyta.
2.4 Non-vascular cyrptogams like *Thallites, Marchantiolites, Naiadita, Sporogonits,* fossil mosses.
2.5 Phylogenetic significance of fossil record.

Unit III : Early Vascular land plants:

3.1 Evidence of first vascular plant.
3.2 Rhyniopsida form Rhynie chart.
3.3 Aldanophyton, Cooksonia, Baragwanathia, Rhynia, Psilophyton, Asteroxylon, Horneophyton, Yarravia, Lycopods like *Leclerquia, Lopidodendrons, Lepidophlois, Lepidostrobus.*
3.4 Origin of Isoetales, Equisetales, *Azolla, Salvinia* with special reference of Indian forms.

Unit IV: Progymnosperms: Structure and Evolution.

4.1 Aneurophytales: *Aneurophyton,Protopteridium, Tetraxylopteris*.
4.2 Archaeopteridales: *Archaeopteris.*
4.3 Origin of Progymnosperms and inter relationships.

Unit V: Fossil Gymnosperms:

5.1 Evolution of early seed.

5.2 Calamopityales: *Calamopitys, Stenomylon Chapelia*.

5.3 Callistophytales: *Callistophyton, Idanothekion, Callospermarion, Vesicaspora.*

5.4 Evolutionary significance of the order.

5.5 Cycadophyta and Coniferophyta: Past distribution and evolutionary significance of different orders.

Semester-III

PAPER –XII: PALAEOBOTANY

(EVOLUTIONARY BOTANY)-II (Elective)

Unit I : Pre-angiosperm fossil forms.

1.1 : Pre- Cretaceous angiosperms: *i) Sanmiguelia, ii) Fercula, iii) Sahanioxylon, iv) Acaciaphyllum, v) Sahanipupshpam, vi) Ficophyllum, vii) Proteaphyllum, viii) Eucomidites, ix) Rogersia.*

1.2 : Early evidence of flowers, fruits and seeds with reference to Indian flora.

1.3 : Diversification of angiosperms in Cretaceous periods.

1.4 : Modern concept of origin of Angiosperms, concept of punctuated equilibrium, cladistics concept.

Unit II : Biodiversity in Geologic past.

2.1 : Glossopteris flora; Euramerican flora, Cathyasian flora and Angara flora.

2.2 : Indian floras : Glossopteris, flora, Dicroidium flora, Ptilophyllum flora, (Rajmahal flora), Deccan Intertrappean flora.

2.3 : Palaeogeographic and palaeoecological significance of floras.

2.4 : Modern concepts of Gondwana with reference to its limits and extension, Karewa beds.

2.5 : Concept of Archeobotany, Palaeoethno and Taphonomical concepts, Mass extinction

Unit III : Microfossil Evidences:

3.1: Definition of spore, pollen, meiospores; prepollen; morphology and dispersal of important pollen types, presentation of pollen, ornamentaton of pollen wall.

3.2 : Study of pollen kit, ubisch bodies; Role of pollen and spore in stratigraphy; classification of isolated spores and pollen.

3.3: Dispersed megaspores; primitive seeds,

3.4 : Significance of palynology is coal and oil industry, Role of pollen grains in industrial honey production with reference to Indian work.

Unit - IV : Applied Palaeobotanical aspects :

4.1 : Fossil fuels; Biodiagenesis of coal, (Process of Coalification) conditions of coal formation).

4.2 : Microlithotypes found in coal viz : *Vitrinites, Resinites* etc.

4.3 : Coal as an indicator of palaeoclimate, Resources of coal and its present status.

4.4 : Origin of oil forming beds, source material for oil reserves of India, Formation of diatomaceous earth in marine environment, Bombay High, Present status of oil reserves.

Unit - V: Applied Aspects:

5.1 : Radiometric dating of rocks, half life period; K-Ar dating, Fission track dating.

5.2 : Continental Drift theory, plate tectonic model,

5.3 : Palaeogeographical implications, Reconstruction of past vegetation.

5.4 : Aero-allergens and its significance.

List of Books and Journals :

1. Andrews,H.N. (1961) Studies in Palaeobotany John Wiley & Sons London.
2. Darrah, W.C. (1960) Principles of Palaeobotany.
3. Delevoryas, T. (1962) Morphology & Evolution of Plants.
4. Sahni, B. (1920) Revision of Indian Fossil Plants, GSI Publication.
5. Meyen S.V. (1987) Fundamentals of Palaeobotany, Chapman & Hall, London.
6. Pant D.D. (2003) Cycas and allied cycadophytes, B.S.I.P., Publication.
7. Sporne, K.R. (1975) The Morphology of Pteridophytes, Hutchinson, London.
8. Sporne, K.R. (1965) Morphology of Gymnosperms, Hutchinson, London.
9. Sporne, K.R. (1974) Morphology of Angiosperms Hutchinson, London.
10. Seward, A.C. (1898) Fossil Plants Vol.-I-IV 1919
11. Stewart, W.N. (1983) Palaeobotany & Evolution of Plants Cambridge University Press.
12. Scott D.N. (1923) Studies in Fossil Botany
13. Taylor, T.N. (1981) Introduction to Palaeobotany; a Fossil Plant Biology McGraw Hill, New York.

14. Wadia, D.N.Geology of India
15. Tappan, H. (1980) The Palaeobiology of Plant protist Freeman, Oxford.
16. Thomas B.A. Spicer, R.A.(1987) The Evolution & Palaeobiology of land Plants. Discordies Press, Fort land U.S.A.
17. Spicer, R.A & Thomas B.A.(1986) Systematic & Taxonomic approaches Association in Palaeobotany Systematic Special Volume - 31.
18. Arnold C.A. (1947) An Introduction to Palaeobotany.
19. Sarjeant, W.A.S.(1974) dinoflagellates. Fossil & living ,Academic Press, London.
20. Chaloner, W.G. Mac Donald 1980 Plant Invade the land. Royal Scottish Museum, Edinberg.
21. Chandra, S. & Surange, K.R.!979 Revision of sps. of Glossopteris, BSIP publication.
22. Brook, J. (1971) ñSporopolleninò. Academic Press, London.
23. Bold, H.C. (1980) Morphology of Plants & Fungi. Harper & Raw, New York.
24. Chamberlain, C.J. 1935 Gymnosperms, Structure and Evolution University of .Chicago.
25. Erdtman G. Introduction to Pollen analysis.
26. Erdtman G. Pollen Morphology & Plant Taxonomy
27. Faegri, K. Vander Pijil. 1979The Principles of Pollination Ecology, Pergamon Press, Oxford
28. Harris, T.M.1961 The Yorkshire Jurasic Flora; I, Trustees of British Museum
29. Harris, T.M. 1964 The Yorkshire Jurasic Flora; II, Trustees of British Museum
30. Harris, T.M. 1969 The Yorkshire Jurasic Flora; III & IV, Trustees of British Museum
31. Nair, P.K.K. 1969 Essential of Palynology
32. Pianka, E.R. 1978 Evolutionary Ecology Hagers, New York.
33. Cronquist, A., 1968 Evolution and Classification of Flowering plants Houghton Mifflin, Boston.
34. Bierhorst, D.W. 1971 Morphology of Vascular Plants MacMillan, New York.
35. Stanley, R.G. & Linskens, H.F. 1974 Pollen Springer Verlag, New York.
36. Becks, C.B. 1976 Origin and Early Evolution of Angiosperms Columbia University Press.
37. Takhtajan, A.L. 1969 Flowering Plants, Origin & Dispersal. Edinberg, Oliver.

38. Takhtajan, A.L. 1954 Essays on Evolutionary Morphology of Plants Lieningrad University, Leningrad.

Journals:

1. The Palaeobotanist	:	BSIP, Publication, Lucknow
2. Geophytology	:	The Palaeobotanical Soceity, Lucknow.
3. Palaeontographica	:	Stuttgradt, Germany.
4. Review of Palaeobotany & Palynology	:	Elsevier, Publication.
5. Pollen et Spores	:	Elsevier, Publication.
6. Palaeobiology	:	Elsevier, Publication.
7. Botanical Review	:	Elsevier, Publication.

Laboratory Exercises :

1. Study of preservation types.
2. Techniques involved in study of different preservation.
   i.) Maceration ii) Ground sections iii) Acetolysis etc.
3. Study of type specimens of plant fossil; with complete monograph, sketching, etc.
4. Study of Geological time scale.
5. Preparation of slides and study of cuticular characters.
6. Study of palynomorphs, typical of each age.
7. Plant life through the ages. Drawing of representative forms of geological periods.
8. Study of reconstruction of vegetation, floras.
9. Study of peat, lignite and coal samples.
10. Study of marine microfossils, especially of oil and natural gas implications.
    i) Visit to fossil localities for collection.
    ii) Visit to National Laboratories.
    iii) Submission of practical record, micropreparations, collection of fossil specimens
    iv) Field notebook, geological data.
    v) Visit to palaeobotanical museums.

Semester – III

ELECTIVE PRACTICAL-VI: PALAEOBOTANY (EVOLUTIONARY BOTANY)-I

PRACTICAL SCHEDULE

Time: 6 hrs. Max.marks 40

1. Study of fossil specimens ..... 08 Marks
2. Application of technique for isolation..... 08 Marks

3. Identification of specimens & slides ..... 10 Marks
4. Study of Geological time-scale ..... 04 Marks
5. Identification of pre-angiosperm fossil forms with evolutionary Implications 05 Marks
6. Viva-voce 05 Marks

Semester – III

PAPER – XI: REPRODUCTIVE BIOLOGY OF ANGIOSPERMS-I (Elective)

Unit-I 1.1: Means of reproduction in flowering plants, flower structure and development.

1.2 : Anther structure : Biochemical and Ultrastructural aspects, structure and function of tapetum.

1.3: Microsporogenesis : Cytoplasmic reorganization, pollen tetrad development and types, pollen wall morphogenesis, biochemical, physiological and genetic events involved in pollen development.

Unit-II :2.1: Pollen morphology : pollen wall sculpturing, Ultra structure.

2.2: Pollen apertural types, Techniques for morphological preparations: Acetolysis, NPC.

2.3: Light and scanning election microscopic studies of pollen.

Unit-III 3.1: Pollen: Physiological and biochemical aspects, viability, assessment of pollen viability.

3.2 : Pollen germination *in-vivo* and *in-vitro*, pollen tube development and nuclear migration.

3.3 : Pollen storage, pollen bank, cryopreservation .

Unit-IV:4.1 : Pistil : Structure and function of stigma and style.

4.2 : Types of stigma, stigma receptivity and its importance, biochemical aspects. Stylar tissue.

4.3 : Pollen adhesion and germination on stigma, molecular basis, pollen reorganization, Incompatibility and its significance.

Unit-V:5.1 : Male sterility : genetic and cytoplasmic male sterility, male sterile lines.

5.2 : Male sterility through recombinant DNA technology.

5.3 : Sperm dimorphism and hybrid seed production.

Semester – III

PAPER – XII: REPRODUCTIVE BIOLOGY OF ANGIOSPERMS-II (Elective)

Unit-I 1.1 : Historic review of pollination studies.

1.2 : Pollination : Pollination mechanism and syndromes, pre-pollination events: anther dehiscence and pollen release.

1.3 : Biotic and abiotic pollination, agencies concerned in pollination, Floral attractants and rewards, floral biogeny, blossom types.

Unit-II 2.1 : Fertilization : Pollen tube development through stylar tissue, biochemical events, pollen tube entry in ovule,

2.2 : Heterospermy, differential behavior of male gametes, discharge and movement of sperms.

2.3 : Syngamy and triple fission, significance of double fertilization and triple fusion.

Unit-III:3.1 : Structure and a types of ovule.

3.2 : Megasprogenesis, structure and types of embryo sac.

3.3 : Ultra structure of zygote, embryo development and classification, polyembryony.

Unit-IV :4.1 : Structure, development and types of endosperm.

4.2 : Ruminate endosperm, chemical composition of endosperm. Storage proteins.

4.3 : Food reserve of endosperm and endosperm culture.

Unit-V 5.1 : Anther/pollen culture, pollen embryo genesis, androgenic haploids, biochemical aspects.

5.2 : Somatic embryogonesis, biochemical aspects of somatic embryo genesis.

5.3 : Aeropalynology : Survey of air borne pollen analysis of aerospore.

5.4 : Mellitopalynology : Pollen analysis of honey, role of apiary in crop production.

Suggested readings:

1) Pande, A.K. and M.R.Dhakae (2003). Advances in Plant Reproductive Biology. Vol.II Narendra Delhi.
2) Chawhan, Y.S. and A.K.Pande (1995). Advances in plant Reproductive Biology. Vedamse Book, Pvt.Ltd. New Delhi.
3) Malik, C.P. (1996). Advances in Pollen spore Research : Emerging Strategies. VolXXI Vedamse Book (P) Ltd. New Delhi.
4) Clement, C. (1999). Anther and Pollen : From Biology to Biotechnology. Springer-Verlag New York.
5) Shukla, A.K., M.R.Vijayraghwan and B.Chaudhari (1998). Biology of pollen vedamse Book (P) Ltd. New Delhi.
6) Harley, M.M. (2003). Pollen and Spores : Morphology and Biology. Royal Botanic Garden kew.
7) Raghavan, V. (2000). Developmental Biology of Flowering Plant. Springer-Verlag.
8) Batygina, T.B. (2002) Embryology of Flowering Plants : Terminology and Concepts. Science Publishers, INC (USA)

9) Cresti,M., Cai,G., Moscatelli,A. (1999). Fertilization in higher plants : Molecular and cytological Aspects. Springer-Verlag.
10) Nattancourt, D.de (2001). Incompatibility and Incongruity in Wild and Cultivated Plants. Springer-Verlag.
11) Mahapatra, S.S. and Bruee knox (1995) Pollen Biotechnology : Gene expression and Allergen Characterization. Kluwer Academic Publishers, Boston.
12) Dafni,A., Herse,M., Pacini,E. (2000) Pollen and Pollination. Springer-Verlag Heidelburg.
13) Shivanna,K.R. (2003) Pollen Biology and Biotechnology. Science Publishers, INC (USA)
14) Hesse,M., Enrendorper, F. (1990). Morphology, Development and Systematic Relevance of Pollen and Spores. Springer-Verlag.
15) Lars Chittka and James, J. Thomson (2001) Cognitive Ecology of Pollination. Cambridge University Press.
16) Chupeau, Y., Caboche,M. Henry, Y (1998). Androgenesis and Haploid Plants. Springer-Verlag.
17) Yeo,P.F. (1993) Secondary Pollen Presentation : Form, Function and Evolution Springer-Verlag.
18) Shivanna, K.R., Johri,B.M., Sastri,D.C. (1979) : Development and Physiology of Angiosperm pollen. Today and Tomorrows printers and publishers, New Delhi.
19) Moore, P.D., Webb,J.A. and Collinson, M.E. (1991) Pollen Analysis. 2nd Ed. Blackwell Scientific Publications. Boston.
20) Barth, F.G. (1991) Insects and Flowers. Princeton University, Press, Princeton.
21) Faegri, K. and Van der Piji,L. (1979) The Principles of Pollination Ecology. Pergmon Press. Oxford.
22) Howell,S.H. (1998) Molecular Genetics of plants Development. Cambridge University Press, Cambridge.
23) Scot R.J., and Anthony D.Sted (1994) Molecular and Cellular Aspects of Plant Reproduction, Cambridge Uni. Press.
24) Shivanna, K.R. and Rangaswamy,N.S. (1992). Pollen Biology. A Laboratory mannual.
25) Bhojwani, S.S. and Batnagar, S.P. (2000). The Embryology of Angiosperms (4th revised and enlarged edition). Vikas Publishing House, New Delhi.
26) Fahn,A (1982) Plant Anatomy, (3rd edition). Pergamon Press, Oxford.
27) Fosket, D.E. (1994) Plant Growth and Development. A Moleclar Approach. Academic Press, San Diego.
28) Leins,P., Tucker,S.C. and Endress,P.K. (1988). Aspects of Floral Development. J.Cramer, Germany.

29) Lyndon, R.F., (1990). Plant Development. The Cellular Basis. Unnin Hyman, London.
30) Murphy, T.M. and Thompson, W.F. (1988). Molecular Plant Development. Prentice Hall, New Jersy.
31) Proctor,M. and Yeo,P. (1973). The Pollination of Flowers. William Collins Sons, London.
32) Raghavan, V. (1999) Developmental Biology of Flowering Plants. Springer-Verlag, New York.
33) Shivanna,K.R. and Sawhney,V.K. (eds) (1997). Pollen Biotechnology for crop production and Improvement, Cambridge University Press, Cambridge.
34) Shivanna,K.R. and Johri,B.M. 1985. The Angiosperm Pollen : Structure and Function. Wiley Eastern Ltd., New York.
35) The Plant Cell. Special issue on Reproductive biology of plants, Vol.5 (10) 1993. The American Society of Plant Physiologists, Rockville, Maryland, USA.
36) Weberling, F. (1989). Morphology of Flowers and Inflorescence, Cambridge University Press, Cambridge.
37) Ende, H.V.D. (1976) Sexual Interactions in Plants : The Role of Specific Substances in Sexual Reproduction. Academic Press, London.
38) Cresti,M. Tiezzi,A. (1992). Sexual Plant Reproduction, Springer-Verlag, Barlin.
39) Chailakyan,M.K. and Khrianin,V.N. (1989). Sexuality in plants and its Hormonal Regulation. Springer-Verlag, Barlin.
40) Meeuse,B.J.D. (1961). Story of Pollination. Renold Press Company, New York.
41) Faegri,K and Iverson, J. (1989). Text Book of Pollen Analysis. John Wiley & Sons, New York.
42) Bajaj, Y.P.S. (Ed.) (1989). Plant Protoplast and Genetic Engineering-II. Springer-Verlag, Barlin.
43) Wilson, M.F. (1983). Plant Reproductive Ecology. John Wiley and Sons, New York.
44) Richards, A.J. (1978). Pollintion of Flowers by Insects. Academic Press Inc.London.
45) Heslop Harrison, J. (1971) Pollen Development and Physiology. Butterworth and Co. London.
46) Barth,F.G. (1991). Insects and Flowers. The Biology of Partnership. Princeton Uni.Press.
47) Malik, C.P. (1992) Pollen Physiology and Biotechnology. Vedams e Book Pvt.Ltd., New Delhi.

48) Dafui, A, Kevan, P.G. and Husband, B.C. (2005), Practical Pollination Biology, Enviroquest Ltd., Cambridge.
49) Daroy, The anther: Form, Function and Phylogeny, Cambridge University Press.
50) Crosby. The poisoned weed: Plants toxic to skin, Oxford University Press.
51) Lovett-Doust. Plant Reproductive Ecology : Patterns and strategies. Oxford University Press.
52) De Netancourt, D. (1977), Incompatibility in Angiosperms Springer Verlag, New York.
53) Shivanna, K.R. (2002), Pollen Biology and Biotechnology Oxford and IBH Publishing Co. Pvt. Ltd.
54) Johri, B.M. (1984). Embryology of Angiosperm. Springer-Verlag, Berlin Heidel berg, New York.
55) Agashe S.N. (2005) Palynology and its Applications, Oxford and IBH Publ. Co. Pvt.Ltd. New Delhi.
56) Bhattacharya, K. S. Mujumdar & Bhattacharya (2006) : A Text Boook of Palynology, New Central Book Agency, Kolkata.
57) Nair P.K.K. (1970) Pollen Morphology of Angiosperms, Scholar Publi, Lucknow.
58) Tilak, S.T. (1982) : Aerobiology, Vaijayanti Prakashan, Aurangabad.

Laboratory Exercises:

1. Estimation of pollen protein concentration.
2. Separation of amino acids by TLC from pollen.
3. Separation of fats and lipids from pollen grains.
4. Study the effect of mutagens on pollen germination.
5. Induction of polyploidy in pollen grain.
6. Isolation of DNA from pollen grains.
7. DNA estimation in Pollen grains.
8. Plant regeneration through anther/pollen culture.
9. Analysis of honey for pollen spectrum.
10. Study of in- vitro pollen germination using different culture media.
11. Studies on databases pertaining to plant reproduction/Pollination/ Pollen studies.
12. Preparation of Power Point Programme on any aspect of plant reproduction.
13. Studies on e-Journals access
14. Visit to Institutes with electron microscope facilities.
15. Study of pollen wall development by preparation of anther sections.
16. Examination of reproductive mode and means.

17. Pollination experiments to demonstrate self and cross-pollination.
18. Field study on different pollination mechanism.
19. Estimation of pollen load carried out by bees / pollinator.
20. Field observations on pollinator visit, diversity and behaviour.
21. Estimation of pollen production and viability and its statistical analysis.
22. Study of in- vivo and in- vitro pollen germination.
23. Pollen preparation by acetolysis method and NPC examinations.
24. SEM studies and visits to Research laboratory having SEM facilities.
25. Observations on types of stigma and its structure.
26. Study of ovules from permanent preparations.
27. The study of microsporogenesis by section cutting.
28. Air monitoring by air sampler to assess pollen aerospora.
29. Chemical nature of allergenic pollen and test for allergy.
30. Regeneration of androgenic haploids.
31. Protoplast isolation
32. Histochemical analysis of pollen tube.
33. Estimation of pollen / ovule ratio in self and cross pollinated plants.
34. Study of protein profile in pollen / pollen tube by Gel - Electrophoresis.
35. Effect of Biochemical inhibitors on pollen tube growth.
36. Estimation of pollen tube length by computer loaded measurement softwares (Sigmascan by Jandel Scientific, Electronic digital pad).

Semester –III

PRACTICAL VI: REPRODUCTIVE BIOLOGY OF ANGIOSPERMS

PRACTICAL SCHEDULE

Time : 6 hrs. Max. marks. 40

Q.1 : Perform the major experiment on pollen preparation for morphological studies 08 Marks

Q.2 : Perform the minor experiment on pollen physiology 08 Marks

Q.3 : Perform the minor experiment on pollen release/ Production/ monitoring 05 Marks

Q.4 : Comment on the experiment based on anther/pollen culture.. 04 Marks

Q.5 : Spotting (Pollen morphology slide, floral reward, blossom type, pollinator, ovule types) 10 Marks

Q.6 : Viva-Voce 05 Marks

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Semester III

PAPER XI: APPLIED MYCOLOGY-I (Elective)

Unit - I: Fungal Symbiosis

1.1: Mycorrhizae Ectotrophic, endotrophic and Ectendotrophic mycorrhizae.

1.2 : Morphology and structure of Arbuscular mycorrhizal fungi.

1.3 : Phosphorus uptake of AM fungi.

1.4 : Role and importance of AM fungi in agriculture.

1.5: Rhizosphere and phyllosphere General account and importance of rhizosphere and phyllosphere mycoflora.

Unit II: Medical mycology

2.1 : General account of dermatophytic fungi.

2.2 : Human diseases caused by dermatophytes viz. *Tinea pedis, Tinea capitis, Tinea barbae, Tinea corporis and Tinea manum.*

2.3: Birds and Animal dermatophytic fungi and the diseases caused by them.

Unit- III: Industrial mycology

3.1: Antibiotics - Penicillium, Cephalosposin & Griseofulvin.

3.2 : Industrial production of Penicillin.

3.3 : Organic acids - Citric acid, Gluconic acid, Lactic acid.

Unit -IV: Industrial and Nonindustrial fungal metabolites

4.1: Enzymes - Amylases, Proteases, Lipases, Pectinases, Cellulases.

4.2: Phytoalexins : General account, types and importance.

4.3: Mycotoxins _ General acount, types and importance.

4.4: Aflatoxins - General account, types & Importance.

Unit V: Fungi in Human Welfare

5.1: Role of microorganisms in Biodegradation of organic wastes.

5.2: Biodeterioration of noncellulosic and cellulosic materials.

5.3: Fungi in medicine-Mycoproteins & Food processing- Fungus fermented foods, fungi in cheese production.

5.4: Edible mushrooms and their cultivation practices.

Semester III

PAPER XII: PLANT PATHOLOGY-II (Elective)

Unit - I: Principles and Mechanism of Plant diseases.

1.1 : History, Classification and importance of plant pathology.

1.2 : Host parasite relationship, interaction and mechanism of infection.

1.3: Defence mechanism in plants - Biochemical defence mechanism of phenolic compounds, enzymes and toxins.

1.4: Kochôs Postulate - Principles and method.

Unit - II: Disease management and Forecasting.

2.1: Chemical and Biological management of Plant disease control.

2.2: Integrated Pest management (IPM)

2.3: The Forms of epidemic conditions for decline of epidemics.

2.4: Methods used in disease Forecasting.

2.5: Forest Pathology and itôs impact (General account)

Unit-III: Fungal diseases of cereals and oil seed crops.

3.1: Diseases of cereals - Rust and smuts of wheat, Blast and blight of rice, smuts and leaf spot of Jowar. Ergot, Green ear and downy mildew of Bajra.

3.2: Important diseases of oil seed crops -Soyabean, Groundnut, Sunflower, Safflower and Mustard.

3.3: General knowledge and importance of seed pathology.

Unit - IV: Important fungal diseases of vegetables & Fruits.

4.1: Diseases of vegetables - Brinjal, Tomato, Potato, Chilli, Bhindi, Cabbage and cucurbits.

4.2: Diseases of Fruit crops - Citrus, Papaya, Banana, Mango and grapes.

4.3: General account of post harvest diseases of vegetables and fruits and itôs control.

Unit -V: Bacterial and Viral diseases.

5.1: Bacterial diseases, Blight of rice, Tundu disease of wheat, Angular leaf spot of cotton, soft rot of fruits and vegetables.

5.2: Viral diseases - Mosaic and leaf curl of Papaya, Yellow vein mosaic of Bhindi, Viral diseases of Tomato and Potato.

5.3: Phytoplasmal diseases - little leaf of Brinjal, Grassy shoot of sugarcane, & Sesamum Phyllody.

Suggested readings:

1) Agrios, G.N. (1980) Plant Pathology, academic Press, INC, New York.

2) Ainsworth, G.C. and A.S.Sussman (eds). The Fungi, An advance Treatise Vol.I, II, III & IV Academic Press, New York.

3) Alexopoulos, C.J. (1962). Introductory Mycology John Wiley Eastern Pvt.Ltd.

4) Alexopoulos, C.J. and Mims C.W. (1979). Introductory Mycology 3rd Edition, John Wiley and Sons, Inc. Wiley, New York.

5) Alexopoulos, C.J., Mims and Black well (1996) 4th ed. John Wiley and Sons, Inc. Wiley, New York.

6) Aneja, K.R. (1993) Experimental in Microbiology, Plant Pathology & Tissue Culture, Wiswa Prakashan, New Delhi.

7) Bessey, E.A. (1950) Morphology and Taxonomy of Fungi. The Blakiston co. Philadelphia.

8) Bharat Rai, D.K.Arora, N.K.Dube and P.D.Sharma (1994) : Fungal Ecology and Biotechnology, Rastogi Publication.

9) Bilgrami, K.S. and H.C.Dube (1985) A text Book of Modern Plant Pathology, Vikas Publication House, New Delhi.

10) Balkhande L.D. & L.V. Gangawane (2000) Production of auxins Phyollosphere mycoflora and wheat plant resource development, Saraswati Prakashan Aurangabad, P.160-165.

11) Barnett, J.H. (1968) Fundamentals of Mycology. The English Language Book Society and Edward Arnold Publication, Limited.

12) Butler E.J. and S.J.Jones (1949) Plant Pathology, Macmillan & Co. New York.

13) Buckyng Pugh G.J.F. (1971) Auxin productions by phyllosphere fungi Nature Vol. 231 P.332.

14) Dickenson and Preece Mycology of aerial plant surfaces, Academic Press, New York,

15) Dube, R.C. and D.K.Maheshwari (1999) A.Text Book of microbiology, S.Chand & Co. Ltd.

16) Dube, R.C. and D.K.Maheshwari (2000) Practical Microbiology - S.Chand & Co. Ltd.

17) Gruen, H.E. (1959) The production of IAA by *Phycomyces blakesleanus* Mycol.57 683-694.

18) Gupta, V.K. and M.K.Behl (1994) Indian Plant Viruses and Mycoplasma Kalyani Publishers, 1/1, Rejinder Nagar, Ludhiana.

19) Jha, D.K. (1993) A Text Book of Seed Pathology, Vikas Publication House.

20) Manibhushan Rao, K. and A.Mahadevan - Recent Development in biocontrol of plant pathogenes. Today and Tomorrow publishers, New Delhi.

21) Mehrotra, R.S. and Aneja, K.R. (1990) An Introduction to Mycology, Willey Eastern Private Limited.

22) Mehrotra, R.S. (1989) Plant Pathology, Tata McGraw Hill.

23) Mehrotra, R.S. and K.R.Aneja (1998) An Introduction to Mycology, New Age Intermidiate Press.

24) Mukadam, D.S. (1997) The Illustrated Kingdom of fungi, Akshar Ganga Prakashan, Aurangabad.

25) Mukadam, D.S. and L.V.Gangawane (1978) Experimental Plant Pathology (edited) Marathwada University Aurangabad.

26) Pande, P.B. (1997) Plant Pathology, S.Chand & Co. New Delhi.

27) Pelzer, M.J., Jr.Cahn, E.C.S. and N.R.Krieg (1993) Microbiology, Tata McGraw Hill.

28) Preece and Dickeson. Ecology of leaf surface microorganism Academic Press, New York.

29) Rangaswamy, G. and A.Mahadevan (1999) Diseases of Crop Plant in India, Prentice Hall of India.

30) Raychoudhari, S.P. and Nariani, T.K. (1977) Virus and Mycoplasma Diseases of Plant in India, Oxford and IBH Publication Co.

31) Reddy, S.M. *et al* (1997) Microbial Biotechnology, Scientific publishers, Jodhpur.

32) Schlegel, H.G. (1996) General Microbiology, 7th Edition, Cambridge University Press.

33) Snowdon, A.L. (1991) A colour Atlas of Post harvest diseases & disorders of fruits & vegetables Vol.I & II Wolfe Scientific, London.

34) Sing, R.S. (1994) Plant Pathology, Oxford and IBH Publication Co. New Delhi.

35) Sunder Rajan, S. (2001) Tools and Techniques of Microbiology, Anmol Publ.New Delhi.

36) Thind, T.S. (1998) Diseases of field crops and their management, National Agricultural Technology, Information Centre, Ludhiana.

37) Vaidya, J.G. (1995) Biology of the fungi, Satyajeet Prakashan, Pune.

38) Walker, J.G. (1952) Diseases of Vegetables Crops. McGraw Hill, New York.

39) Walker, J.C. (1968) Plant Pathology, McGraw Hill, New York.

40) Geeta Sumbali (1998) and B.M. Johari, Narosa Publishing House, New Delhi

41) Eggins, H.O.W. and Allsop (1975) The Filamentous Fungi Vol. I Industrial Mycology (Biodetoriation and Biodegradation by Fungi) Eds. J.E. Smith and D.R. Berry Edward Arnold, London.

42) D.J. Bagyaraj (1992) Vesicular Arbuscular Mycorhiza application in Agriculture.

43) Emmons, C. W., C. H. Bin ford, J.P. Utz and Know Chung (1977) Medical Mycology, Lea and Febigo, Philadelphia.

44) Holliday, P. Fungus disease of tropical plants (1980), Cambridge University Press, Cambridge.

45) Booth C. (1972) Fusarium (lab guide to identification of major species C.M.I. Kew, Surrrey, England

46) Spencer D. M. (1972) The Powdery Mildew, Academic Press, London

47) Rose, A.H. (1981) Economic Microbiology Microbial biodetoriation Vol.6, Academic press, London and New York.

48) Dikison, C.H. and G.J.F. Pugh (1974) Biology of Plant Litter decomposition. Academic Press, London.

49) A.C. Gaur (1999) Microbial Technology for composition of Agricultural residues by improved methods, I.C.A.R., New Delhi.

Laboratory Exercises:

1. Principles & working of tools, equipments and other requirements in the Mycology & Plant Pathology laboratory.
2. Micrometry and measurement of organisms.
3. Sterilization Processes viz. moist heat, dry heat, chemical and radiation.
4. Drawing of Camera Lucida diagrams and knowledge of computer-based photomicrography and image processing.
5. Preparation of different cultural media for cultivation of Fungi and Bacteria.
6. Monitoring and analysis of Aeromycoflora.
7. Isolation & identification of Phyllosphere mycoflora.
8. Demonstration of dermatophytic Fungi.
9. Isolation of AM Fungi from rhizosphere 500%.
10. Demonstrate antifungal activities of different antibiotics and leaf, flower and root extract.
11. Study of hydrolytic enzymes of different fungi.
12. Study of toxicity of fungi in relation to seed germination, and seedling abnormality.
13. Cultivation of Mushroom.
14. Demonstration on biodegradation of organic waste.
15. Visit to Mushroom industry, Pharmaceutical industries & Pathological study center.
16. Isolation of Soil fungi by soil plate (War cup) and serial dilution (Walkman) method.
17. Isolation and identification of Rizosphere mycoflora.
18. Isolation of external and internal seed borne mycoflora by blotter and Agar Plate method. Cereals, pulses, oil seeds, fruit seeds.
19. Monographic study of locally available plant diseases caused by fungi (atleast 10).
20. Study of locally available crop plant diseases caused by Bacteria (Five)
21. Study of locally available plant diseases caused by viruses & Phytoplasma (Five)
22. Demonstration of morphological & physiological changes in disease plants.
23. Demonstration of Kochôs Postulate.

24. Preparation and presentation of herbarium of pathological specimens available in the region (Atleast 30)
25. Preparation of Fungal spore atlas.
26. Field visit to different localities
27. Visit to Agriculture University, Plant Pathological research centers

Semester – III

ELECTIVE PRACTICAL -VI: APPLIED MYCOLOGY AND PLANT PATHOLOGY

PRACTICAL SCHEDULED

Time: 06 hrs. Maximum Marks: 40

Q.1) Identify and describe any two fungal plant diseases..... 08 Marks

Q.2) Identify and give salient features of two fungi from the mix culture. 08 Marks

Q.3) Identify, classify and describe any two fungi. from given seed borne mycoflora/soil mycoflora/Rhizosphere mycoflora..... 05 Marks

Q.4) Demonstrate Kochôs postulate/pure culture technique..... 04 Marks

Q.5) Spotting (Specimen/Slide)
(01 - bacterial disease; 01-viral diseases, 01- Phytoplasmal disease; 01-Fungal disease, 01- Spore slide).....10 Mraks

Q.6) Viva-Voce 05 Marks

M.Sc. PART-II BOTANY

Semester – IV

PAPER - XIII: PLANT ECOLOGY

Unit I : Basic concepts and scope.

1.1 Concept, Classification and scope of ecology; Holocoenotic Environment.

1.2 Ecological factors: Climatic, Edaphic, Biotic; Law of limiting factors.

1.3 El -Nino and global warming.

1.4 Ozone layer, Ozone Depletion and its consequences.

Unit II: Population and Community Dynamics

2.1 Population characteristics; population dynamics, carrying capacity, various parameters and measurements.

2.2 Community concept; characteristic features of communities, analysis of communities (analytical and synthetic characters.)

2.3 Community coefficients; Ecotone and edge effects; ecological niche.

Unit III: Vegetation Development

3.1 Types and mechanism of ecological succession.

3.2 Plant Formation; Association, Consociation and Society.

3.3 Evolution of Ecosystem and oxygenic development.

Unit IV: Ecosystem Organization.

4.1 Structure and Functions of Ecosystem.

4.2 Abiotic and biotic components; decomposers role in ecosystem.

4.3 Primary productivity (methods of measurements, global pattern and controlling factors)

4.4 Energy Dynamics; Energy flow in Ecosystem, Trophic organization, ecological efficiencies; Ecomodelling.

Unit V: Ecosystem Functional aspects.

5.1 Biogeochemical cycles C, N, P, S; mineral cycles (Pathways, processes and budgets)

5.2 Ecosystem stability concepts, natural and anthropogenic disturbances.

5.3 Major Biomes of the world.

5.4 Terrestrial Biodiversity; Vegetation types of world and India, hot spots.

Suggested readings:

1) Krebs, C.J. 1989. Ecological Methodology. Harper and Raw, New York, USA.
2) Ludwig, J.A. and Reynolds, J.F. 1988. Statistical Ecology, Wiley, New York.
3) Magurran, A.E. 1988. Ecological Diversity and Its Measurement, Chapman and Hall, London.
4) Pielou, E.C. 1984. The Interpretation of Ecological Data, Wiley, New York.
5) Sokal, R.R. and Rohit, F.J. 1995. Biometry , W.H.Freeman & Co. San Francisco.
6) Murray P.W. and Chapman, S.B. 1986. Methods in Plant Ecology, Blackewell Scientific Publication.
7) Misra, R. 1968. Ecology Work Book, Oxford and IBH New Delhi.
8) APHA - Standard Methods for Examination of Water and Waste Water, American Public Health Association, Washington, D.C.
9) Smith, R.L. 1996. Ecology and Field Biology. Harper Colins New York.

10) Mular - Dombuis, D. and Ellenberg, H. 1974. Aims and Methods of Vegetation Ecology, Wiley, New York.
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12) Smith, R.L. 1996. Ecology and Field biology, Harper Collins, New York.
13) Begon, M., Harper, J.L. and Townsend, C.R. 1996. Ecology, Blackwell Science, Cambridge, U.S.A.
14) Odum, E.P. 1971. Fundamentals of Ecology. Saunders, Philadelphia.
15) Odum, E.P. 1983. Basic Ecology, Saunders, Philadelphia.
16) Barbour, M.G., Burk, J.H. and Pitts, W.D. 1987. Terrestrial Plant Ecology. Benjamin / cummings Publication Company, California.
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19) Moldan, B. and Billharz,S. 1997. Sustainability indicators. John Wiley & Sons, New York.
20) Treshow, M. 1985. Air Pollution and Plant Life. Wiley Interscience.
21) Heywood, V.H. and Watson, R.T. 1995. Global Biodiversity Assessment. Cambridge University Press.
22) Brady, N.C. 1990. The Nature and Properties of Soils, MacMillan.
23) Chandel, K.P.S., Shukla, G. and Sharma, N. 1996 - Biodiversity in Medicinal and Aromatic Plants in India : Conservation and Utilization. National Bureau of Plant Genetic Resources, New Delhi.
24) Walter, K.S. and Gillett H.J., 1998. 1997 IUCN Redlist of Threatened Plants. IUCN, The World Conservation Union, IUCN, Gland, Switzerland and Cambridge, UK.
25) Eldon, D. Enger and Bradley F. Smith (1995) Environmental sciences WBC Publishers, Boston.
26) K.C. Agrawal; (1993); Environmental Biology, Agro-botanical publishers, Bikaner.
27) P.S. Varma and V.K. Agrawal (1995) Environmental Ecology, WBC publishers, Boston

Laboratory exercises:

1) To measure rainfall.
2) To measure transparency of water.
3) To study the light intensity by lux meter.
4) To determine pH of water & soil.
5) To measure the total dissolved solids in water.
6) To evaluate the soil texture.
7) To determine the bulk density or apparent density (or value weight) and porosity (or pore space) of soil.

8) To determine water holding capacity of soil by rapid spot tests.
9) To analyze the chemical properties of soil by rapid spot tests.
10) To estimate exchangeable bases (Na, K, Ca) in soil.
11) To determine organic matter in soil by Walkley & Blackôs rapid titration method.
12) To assess the trophic status of aquatic habitat through algal count method.
13) To study bioindicators of polluted water.
14) To study the morphological, anatomical adaptations in Hydrophytes, Xerophytes, Halophytes, Epiphytes.
15) To determine the importance value Index IVI) of grassland species.
16) To prove the Biological spectrum of vegetation under study using Raunkiars life forms classification.
17) To study indices of similarity & dissimilarity in a community.
18) To determine P, S, K, Ca, Na in plants by chemical methods.
19) Study of freshwater plant communities.
20) Survey of key stone species.
21) Determination of minimum size of quadrat by species curve method.
22) Determination of minimum number of quadrat by curve methods.
23) Determination of quantitative characters of plant community by Random sampling method (Abundance, Density, frequency, basal cover, canopy cover etc) and determination of quantitative characters by belt transect, line transect method and study of biological spectrum.
24) Field Survey- A survey of a part of the town or city should be carried out by the entire class in batches. Individual students will select one avenue / road and locate the tree planted on a graph paper. They will identify the trees, mention their size, canopy shape, blossoming and fruiting period and their status (healthy, diseased, infected, mutilated, misused or dyeing) and report whether or not the conditions in which they are surviving are satisfactory. The individual reports will be combined to prepare a large map of the area, which can be used for subsequent monitoring either by the next batch of students / teachers / local communities / NGOôs / or civic authorities.
25) The purpose is to make the students aware of the kinds of trees and value in urban ecosystem and ecological services.
26) To prepare ombrothermic diagram for different sites on the basis of given data set and to comment on climate.
27) To find out the relationship between two ecological variables using correlation and regression analysis.

28) To determine minimum size and number of quadrats required for reliable estimate of biomass in grasslands.
29) To find out association between grassland species using Chi-square test.
30) To compare protected and unprotected grassland stands using community coefficient (similarity indices).
31) To analyze plant community using Bra-Curtis ordination method.
32) To determine diversity indices (Shannon, Wiever, concentration of dominance, species richness, equitability and B-diversity) for protected and unprotected grassland stands.
33) To estimate IVI of the species in woodland using a point centered quarter method.
34) To determine grass and net phytoplankton productivity by light and dark bottle method.
35) To determine soil moisture content, porosity and bulk density of soils collected from varying depths at different locations.
36) To determine the water holding capacity of soils collected from different locations.
37) To determine present organic carbon and organic matter in the soil of cropland, grassland and forest.
38) To estimate the dissolved oxygen contained in eutrophic and oligotropic water samples by azide modification of Winklerôs method.
39) To estimate chlorophyll content in SO2, fumigated and unfumigated plant leaves.
40) To estimate rate of carbon dioxide-evolution from different soils using soda lime or alkali absorption method.
41) To study environmental impact of a given developmental activity using checklist as a EIA method.
42) Visit to different forest areas to study ecosystem, bio diversity and biocomplexity. Visit to Molecular Biology laboratories.

Semester – IV

PAPER –XIV: ENVIRONMENTAL ECOLOGY

Unit I: Basic Concepts

1.1 Concept of Environment and its Scope; Lithosphere, Hydrosphere, Biosphere.
1.2 Energy resources; (i) Renewable and non-renewable (ii) Forest types in India and Maharashtra.
1.3 Environmental impact assessment.
1.4 Green House gases; their sources, trend and role.
1.5 Consequences of climate change.

Unit II: Environmental pollution

2.1 Definition types and sources.

2.3 Air pollution; Natural and man made sources of air pollution, primary and secondary pollutants, toxicity and its impact on environment.

2.4 Soil Pollution: courses of soil pollution, impacts of soil pollution on quality and soil biota.

2.5 Effect of solid waste disposal on soil.

Unit III: Water Pollution.

3.1 Distribution of water and water scarcity.

3.2 Major water pollutants

3.3 Sources of water pollution

3.4 Consequences of water pollution

3.5 Water pollution indicators.

3.6 Bioaccumulation and Biomagnifications of toxic elements in food chain.

Unit IV: Conservation strategies

4.1 Principles of conservation; extinction, environmental status of plants based on IUCN.

4.2 Strategies for conservation, International efforts and Indian initiation.

4.3 Wetlands, Mangrove and coral reefs with respect to conservation of biodiversity.

4.4 Disaster management.

Unit V: Sustainable Management.

5.1 Concept of sustainable development.

5.2 Impact of urbanization; Wasteland development.

5.3 General account of legislative measures for sustainable development and management

(i) Water Act, Prevention and control 1976.

(ii) Environmental Protection Act, 1985

(iii) Wildlife Protection Act, 1972; WWF.

SUGGESTED READINGS:

1. Eldon D. Enger and Bradley F Smith (1995), Environmental Sciences, WBC publishers Boston.
2. Daniel Botkin and Edward Keller (1997), Environmental Sciences, John Wiley & Sons, Ne York.
3. R.K. Dixit, (1997), Environment, Forest Ecology and Man, Rastogi Publication.
4. Jorgeson S.E. *et al*. (1995), Handbook of Environmental and Ecological modeling, Levis publications, New York.

5. William P. Cunningham and Masy Ann Cunninghan, Principle of Environmental Science. Inquisity and applications, Tata McGraw Hill Pub. Co.Ltd., New Delhi.
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9. Begon, M., Harper, J.L. and Townsend, C.R. 1996. Ecology, Blackwell Science, Cambridge, U.S.A.
10. Ludwig, J. and Reynolds, J.F. 198. Statistical Ecology, John Wiley & Sons.
11. Odum, E.P. 1971. Fundamentals of Ecology. Saunders, Philadelphia.
12. Odum, E.P. 1983. Basic Ecology, Saunders, Philadelphia.
13. Barbour, M.G., Burk, J.H. and Pitts, W.D. 1987. Terrestrial Plant Ecology. Benjamin / cummings Publication Company, California.
14. Karmondy, E.J. 1996. Concepts of Ecology. Prentice Hall of India Pvt.Ltd., New Delhi.
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17. Treshow, M. 1985. Air Pollution and Plant Life. Wiley Interscience.
18. Mason, C.F. 1991. Biology of Freshwater Pollution, Longman.
19. Hill, M.K. 1997. Understanding Environmental Pollution. Cambridge University Press.
20. Brady, N.C. 1990. The Nature and Properties of Soils, MacMillan

Laboratory Exercises:

1. Study of rainguage and measurement of rainfall
2. To study hygrometer and measurement of relative humidity.
3. Measurement of minimum and maximum temperature.
4. Measurement of Soil temp by dry wet bulb method.
5. To study pH meter and estimation of pH of water and soil.
6. To determine soil moisture content.
7. Study of Phytoplankton from pond water.
8. Study of Zooplankton from pond/river.
9. Study of biomass from grassland ecosystem.
10. Study of species dominance by Quadrat method.
11. Study of plant biodiversity on Hill slopes by line transact method.
12. To study the pH of rainwater during pre monsoon and monsoon season.

13. To determine interaction between grassland species by chi-square test.
14. Comparative study of plant diversity indices.
15. Study of mean, variance, standard deviation, standard error, coefficient of variation and t-test for ecological data.

Semester – IV

PAPER – XV : PLANT BIOTECHNOLOGY

Unit- I: **Biotechnology: Basic concepts, Principle and scope.**

1.1 Cellular differentiation and totipotency

1.2 Plant Cell and tissue culture, Cell Clones, Callus culture.

1.4 Organogenesis and adventitive embryogenesis: Fundamental aspects of morphogenesis, Somatic embryogenesis and its applications.

1.4 Androgenesis: Mechanism, techniques and applications.

Unit-II : Somatic Hybridization:

2.1 Protoplast isolation, Protoplast fusion and protoplast culture limitation , achievement in protoplast research.

2.2 Cybrids and Hybrids, Selection of hybrids and regeneration, Somaclones.

2.3 Clonal propagation: Techniques and significance of artificial seeds.

2.4 Secondary metabolites: Production in tissue/s, enhancing the secondary metabolites by use of elicitors, hairy root cultures and types of elicitors (biotic and abiotic elicitors)

2.5 Cryopreservation : Germplasm storage, methods, merits and demerits.

Unit-III: Plant transformation technology.

3.1 Mechanism of DNA transfers, role of virulence genes, use of Ti and Ri plasmid as binary vectors, features of Ti and Ri plasmid.

3.2 Vector less DNA transfer - Particle Bombardment, Electroporation, and microinjection.

3.3 Genetically modified organisms in the Environment

Unit-IV: Environmental Biotechnology

4.1 Heavy metals environmental modification, Bioleaching and Microbial leaching.

4.2 Bioremediation- General idea of Xenobiotics, Biodegradation of Xenobiotics and applications.

4.3 Phytoremediation: Needs, Metal and organic phytoremediation.

Unit –V: Applications

5.1. Microbial genetic manipulation.

5.2 Importance and application of microbes in Biotechnology

5.3 Vermicomposting

Suggested Readings:

1. Bhojwani, S.S. and Razdan, M.K. 1996. Plant Tissue Culture: Theory and Practice (a revised edition). Elsevier Science Publishers, New York, USA.
2. Bhojwani, S.S. 1990. Plant Tissue Culture: Applications and Limitations. Elsevier Science Publishers, New York, U.S.A.
3. Collins, H.A. and Edwards, S., 1998. Plant Cell Culture. Bios Scientific Publishers, Oxford, UK.
4. Jain, S.M., Sopory, S.K. and Veilleux, R.E. 1996. *In Vitro* Haploid Production in Higher Plants, Vols. 1-, Fundamental Aspects and Methods. Kluwer Academic Publishers, Dordrecht, The Netherlands.
5. Kartha, K.K. 1985. Cryopreservation of Plant Cells and Organs. CRC Press, Boca Raton, Florida, USA.
6. Old, R.W. and Primrose, S.B. 1989. Principles of Gene Manipulation. Blackwell Scientific Publications, Oxford, U.K.
7. Primrose, S.B. 1995. Principles of Genome Analysis. Blackwell Science Ltd., Oxford, UK.
8. Raghavan, V. 1986. Embryogenesis in Angiosperms: A Developmental and Experimental Study. Cambridge University Press, New York. USA.
9. Raghavan, V. 1997. Molecular Biology of Flowering Plants. Cambridge University Press. New York, USA.
10. Shantharam, S. and Montgomery, J.F. 1999. Biotechnology, Biosafety, and Biodiversity. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
11. Vasil, I.K. and Thorpe, T.A. 1994. Plant Cell and Tissue Culture. Kluwer Academic Publishers. The Netherlands.
12. Butanco, R.G. 2000. Plant Cell Culture, University Press of Pacific.
13. Collin, H.A. and Edward S., 1998. Plant Cell Culture. Bios-Scientific Publishers, Oxford, UK.
14. Dixon, R.A. (Ed.) 1987. Plant Cell Culture: A Practical approach. IRL Press, Oxford.
15. George, E.F. 1993. Plant Propagation by Tissue Culture. Part-I. The Technology, 2nd Edition, Exegetics Ltd., Edington, UK.
16. George, E.F. 1993. Plant Propagation by Tissue Culture. Part-II in practice, 2nd Edition, Exegetics Ltd., Edington, UK.
17. Hall, R.D. (Ed) 1999. Plant Cell Culture Protocols. Humana Press, Inc. New Jersy, U.S.A.

18. Smith R.H. 2000. Plant Tissue Culture: Techniques & Experiments. Academic Press, New York.
19. Butanco, R.G. 2000. Plant Cell Culture, University Press of Pacific.
20. Collin, H.A. and Edward S., 1998. Plant Cell Culture. BioScientific Publishers, Oxford, UK.
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25. Glick, B.R. and Thompson, J.E. 1993. Methods in Plant Molecular Biology and Plant Biotechnology. CRC Press, Boca Raton, Florida.
26. Glover, D.M. and Hames, B.D. (Eds) 1995. DNA
27. Cloning 1: A Practical Approach; Core techniques, 2nd Edition, PAS, IRL Press at Oxford University Press, Oxford.
28. Hackett, P.B., Fuchs, J.A. and Messing, J.W. 1988. An Introduction to recombinant DNA Techniques. Basic Experiment in gene manipulation. The Benjamin / Cummings Publishing Company. Inc Menio Park, California.
29. Hall, R.D. (Ed) 1999. Plant Cell Culture Protocols. Humana Press, Inc. New Jersy, U.S.A.
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32. Friberg L. 1974 Cadmium in the Environment CRC press, Cleveland, Ohio.
33. Nriagu,J.O. Nickel in the Environment ,John Wiley and Sons , New York.
34. Piver,W.T. 1983 Mobilization of Arsenic in the natural by industrial processes, in Biological and Environmental Effects of Arsenic,Vol.6FowlerB.A., Elsevier Science Publisher, Amsterdam.
35. Anderson L. 1999 Genetic Engineering, Food and Environment , Bristol:J.W.Arrowsmith Ltd.

Laboratory Exercises:

1. Preparation of stock solution and culture media.
2. Sterilization techniques
3. Preparation of Aseptic plant

4. Measurement of callus growth (fresh and dry)
5. Organogenesis via callus formation in any plant species.
6. Establishment and proliferation of axillary bud from different plant materials.
7. Isolation of protoplasts from various plant tissues.
8. Effect of physical (e.g. temperature) and chemical (e.g.osmoticum) factors on protoplast yield.
9. Demonstration of protoplast fusion employing PEG.
10. To check protoplast viability using Evanôs Blue dye,Flourescent diacetate and phenosafranin
11. Isolation of protoplast from fungi.
12. Organogenesis and somatic embryogenesis using appropriate explants and preparation of artificial seed.
13. Demonstration of androgenesis in any plant species.
14. Electroporation of protoplasts and checking of transient expression of the reporter gene.
15. Co-cultivation of the plant material (e.g. leaf discs) with Agrobacterium and study GUS activity histochemically.
16. Embryogenesis in any plant material.
17. Preparation of artificial seeds.

Semester- IV

PAPER – XVI: GENETIC ENGINEERING

Unit-I :
- 1.1 Structure of Microbes: E.coli, Bacteriophage, Viruses
- 1.2 Genetic Recombination in Bacteria: Transduction, Transformation and Conjugation.
- 1.3 Bacterial cultures and maintenance of Cell lines.
- 1.4 Genetic improvement of industrial microbes and nitrogen fixers.
- 1.5 Fermentation Technology.

Unit-II :
- 2.1 Methods of gene cloning; selection of markers, reporter genes, expression vectors.
- 2.2 Isolation of gene.
- 2.3 Construction of genomic/ cDNA libraries.
- 2.4 Factors affecting foreign gene expression.
- 2.5 DNA Synthesis and Automated. Sequencing; PCR

Unit-III :
- 3.1 Aims and strategies for transgenic development.
- 3.2 Agrobacterium mediated gene transfer.
- 3.3 T- transposon mediated gene tagging.
- 3.4 Chloroplast transformation.
- 3.5 Transgenic- ethical concerns and ecological risk.

Unit-IV : 4.1 Enzymes used in Recombinant Technology.

4.2 Types of vectors, their properties, choice of vectors.

4.3 Alien gene transfer: Whole genomic transfer eg. Wheat, Arachis, Brassica

4.4 Transfer of individual chromosome or chromosome segment.

Unit-V: 5.1 High throughput sequences and assembly.

5.2 Human Genome Project

5.3 Tools used in genetic Engineering, Blotting techniques, SSRôs, VNTRôs,STRôs.

5.4 Gene Knockout Technologies.

5.5 Gene Therapy - Strategies, gene editing, silencing.

Suggested Reading:

1. Brown, T.A 1999. Genomes. John Wiley & Sons (Asia) Pvt.Ltd., Singapore.
2. Callow, J.A., Ford-Lloyd, B.V. and Newbury, H.J. 1997. Biotechnology and Plant Genetic Resources Conservation and Use. CAB International, Oxon, UK.
3. Chrispeels, M.J. and Sadava, D.E. 1994. Plants, Genes and Agriculture. Jones & Bartlett Publishers, Boston, USA.
4. Glazer, A.N. and Nikaido, H. 1995. Microbial Biotechnology. W.H.Freeman and Company, New York, USA.
5. Gustafson, J.P. 2000. Genomes. Kluwer Academic Plenum Publishers, New York, USA.
6. Henry, R.J. 1997. Practical Applications of Plant Molecular Biology. Chapman & Hall, London, UK.
7. Jain, S.M., Sopory, S.K. and Veilleux, R.E. 1996. *In Vitro* Haploid Production in Higher Plants, Vols. 1-5, Fundamental Aspects and Methods. Kluwer Academic Publishers, Dordrecht, The Netherlands.
8. Jolles, O. and Jornvall, H. (eds.) 2000. Proteomics in Functional Genomics, Birkhauser Verlag, Basel, Switzerland.
9. Old, R.W. and Primrose, S.B. 1989. Principles of Gene Manipulation. Blackwell Scientific Publications, Oxford, U.K.
10. Primrose, S.B. 1995. Principles of Genome Analysis. Blackwell Science Ltd., Oxford, UK.
11. Raghavan, V. 1997. Molecular Biology of Flowering Plants. Cambridge University Press. New York, USA.
12. Gelvin, S.B. and Schilperoort, R.A. (Eds.) (1994) Plant Molecular Biology, Manual, 2nd Edition, Kluwer Academic Publishers, Dordrecht, The Netherlands.

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17. Shaw, C.H. (Ed.) 1998. Plant Molecular Biology: A Practical Approach. IRL Press, Oxford.

Laboratory Exercises:

1. Preparation of Bacterial Cultivation media
2. Bacterial cultivation and growth characteristics by streak and spread plate method
3. Isolation and estimation of Bacterial genomic DNA
4. Isolation and estimation of Onion DNA.
5. Isolation of Plasmid from E. coli strain DH5-a
6. Restriction enzyme digestion and analysis on Agarose Gel.
7. Isolation and estimation of Plant DNA.
8. Preparation of competent cells for transformation.
9. DNA ligation
10. RAPD Analysis.
11. Electro elution of DNA from Agarose Gels.
12. Test for antibiotics against bacteria.
13. Total proteins detection on Blotting Membranes.
14. Oligonucleotide purification from Metaphor R Agarose gel.
15. Alkaline Gel electrophoresis.
16. Purification of DNA for PCR amplification.
17. DNA fingerprinting of plant genomic DNA.
18. Transfer of Proteins from SDS PAGE to Nitrocellulose Membrane.
19. Detecting DNA with Acridine Orange or methylene Blue.
20. ELISA
21. Immunoassay
22. Antimicrobial sensitivity testing

23 PCR

24 Preparation of insert DNA

SEMESTER-IV

PRACTICAL - VII: PLANT ECOLOGY, ENVIRONMENTAL ECOLOGY, BIOTECHNOLOGY AND GENETIC ENGINEERING.

PRACTICAL SCHEDULE

Time : 8 hrs. Marks 40

Q.1. Setting and working of any of major plant Ecology Expt. ð 08 Marks

Q.2. Setting and working of major Experiment on Biotechnology ð 08 Marks

Q.3. Working of major experiment on Environmental Ecology ð 07 Marks

Q.4. Major Experiment on Genetic Engineering ð 07 Marks

Q.5. Comment on one minor Experiment on genetic Engineering/ Biotechnology. ð 05 Marks

Q.6. Viva-Voce ð 05 Marks

Important note: -

One long and two short Botanical Excursions and visits to Scientific Laboratories /Institutions /Universities/Botanical Gardens/ Forests within and out of state are compulsory for students of M.Sc. Botany.

PARCTICAL-VIII :

Project to the students will be distributed at the beginning of third Semester with the consent of HOD and shall be examined during the period of practical examination in IV Semester

Project	40 marks
Int. Assessment	10 Marks

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M.I.R.P.M. Prospectus No.2012157

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INDEX

SANT GADGE BABA AMRAVATI UNIVERSITY AMRAVATI

SPECIAL NOTE FOR INFORMATION OF THE STUDENTS

(1) Notwithstanding anything to the contrary, it is notified for general information and guidance of all concerned that a person, who has passed the qualifying examination and is eligible for admission only to the corresponding next higher examination as an ex-student or an external candidate, shall be examined in accordance with the syllabus of such next higher examination in force at the time of such examination in such subjects papers or combination of papers in which students from University Departments or Colleges are to be examined by the University.

(2) Be it known to all the students desirous to take examination/s for which this prospectus has been prescribed should, if found necessary for any other information regarding examinations etc., refer the University Ordinances Booklet the various conditions/provisions pertaining to examination as prescribed in the following Ordinances.

Ordinance No. 1	:	Enrolment of Students.
Ordinance No. 2	:	Admission of Students
Ordinance No. 4	:	National cadet corps
Ordinance No. 6	:	Examinations in General (relevent extracts)
Ordinance No. 18/2001	:	An Ordinance to provide grace marks for passing in a Head of passing and Inprovement of Division (Higher Class) and getting Distinction in the subject and condonation of defficiency of marks in a subject in all the faculties prescribed by the Statute NO.18, Ordinance 2001.
Ordinance No. 9	:	Conduct of Examinations (relevent extracts)
Ordinance No. 10	:	Providing for Exemptions and Compartments
Ordinance No. 19	:	Admission of Candidates to Degrees.

Ordinance No. 109	:	Recording of a change of name of a University student in the records of the University.
Ordinance No. 6/2008	:	For improvement of Division/Grade.
Ordinance No.19/2001	:	An Ordinance for Central Assessment Programme, Scheme of Evaluation and Moderation of answerbooks and preparation of results of the examinations, conducted by the University, Ordinance 2001.

Dineshkumar Joshi
Registrar
Sant Gadge Baba Amravati University

PATTERN OF QUESTION PAPER ON THE UNIT SYSTEM

The pattern of question paper as per unit system will be broadly based on the following pattern.

(1) Syllabus has been divided into units equal to the number of question to be answered in the paper. On each unit there will be a question either a long answer type or a short answer type.

(2) Number of question will be in accordance with the unit prescribed in the syllabi for each paper i.e. there will be one question on each unit.

(3) For every question long answer type or short answer type there will be an alternative choice from the same unit. However, there will be no internal choice in a question.

(4) Division of marks between long answer and short answer type question will be in the ratio of 40 and 60.

(5) Each short answer type question shall Contain 4 to 8 short sub question with no internal choice.

SANT GADGE BABA AMRAVATI UNIVERSITY

***Ordinance No. 11 of 2001.**

Examinations leading to the Degree of (औद्योगिक संबंध व कार्मीक प्रबंधन पारंगत)Master of Industrial Relations & Personnel Management (Semester Pattern-Two Years Degree Course) Ordinance, 2001.

Where as it is expedient to frame an Ordinance leading to the Degree of Master of Industrial Relations and Personnel Management (Semester Pattern..Two Year Degree Course) the Management Council is hereby pleased to make the following Ordinance.

1. This Ordinance may be called Examinations leading to the Degree of Master of (औद्योगिक संबंध व कार्मीक प्रबंधन पारंगत) Industrial Relations and Personnel Management (Semester Pattern...Two year Degree Course)Ordinance, 2001.
2. This Ordinance shall come into force from the date of its approval by the Management Council.
3. I. The Examinations leading to the Master of Industrial Relations and Personnel Management Course shall be held at such places and on such dates as may be appointed by the Board of Examinations.
   II. Subject to the compliance with the provisions of this Ordinance and of any other Ordinance in force from time to time, an applicant for admission to the M.I.R.P.M. Semester-I. Examination shall have-
      i) Passed the Bachellor's Degree of this University or any other Satutory University.
      ii) Prosecuted a regular course of study for not less than one academic year in a college or department recognised for this purpose by the University.
   III. The applicant for M.I.R.P.M. Semester-II course shall have been the regular students of M.I.R.P.M. Semester-I course.
   IV. The applicant for M.I.R.P.M. Semester-III course shall have been the regular students of M.I.R.P.M. Semester-II course.
   V. The applicant for M.I.R.P.M. Semester-IV course shall have been the regular students of M.I.R.P.M. Semester-III course.

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* Approved by Management Council dt. 20.9.2001 & As amended by Ord. No.11 of 2010.

4 Without prejudice to the other provisions of Ordinance No.6 relating to examinations in general, the provisions of Paragraphs 5,8,10,27 and 32 of the said Ordinance shall apply to every candidate.

5. I. The fees for each semister examinations shall be Rs.140.
   II. The fees for desertation shall be Rs.150
   III. Fees are subject to change by the Management Council from time to time.
6. An applicant for the examination prosecuting a regular course of study to the Degree of Master of Industrial Relations and Personnel Management shall not seek admission to any other academic course in this or any other University.
7. Eligibility for admission's to consequent Semesters of M.I.R.P.M. is as follows.

For Admission to	Eligibility.
M.I.R.P.M. Semester II	Appeared for M.I.R.P.M. Semester-I.
M.I.R.P.M. Semester III	Appeared for M.I.R.P.M. Semester II. (Cleared all papers of Semester-I)
M.I.R.P.M. IV-	Appeared for M.I.R.P.M. Semester III (cleared all papers of Semester II.)

8. I. The Scope of the Subjects shall be as indicated in the Syllabus.
   II. Schemes for the Examinations shall be as indicated in Appendices appended with the Ordinance.
   III. Medium of Instructions and examination shall be English.
9. In order to pass at the Semester I,II,III & IV Examinations, an Examinee shall obtain not less than 40% Marks in each paper, that is to say, separately in the Written Examination and in sessional and not less than 50% of the aggregate Marks in the Examination as a whole. The Examinee shall have to obtain not less than 50% Marks separately in Dissertation and Viva-Voce.
10. An Examinee who is unsuccessful at the examination shall be eligible for admission to the Examination on payment of a fresh Fee prescribed for the Examination together with an Ex-Student Fee.

11. An Examinee who has failed at the sessional Examination, Dissertation or Viva-Voce only shall be required to register himself afresh for the same in the Department/college in the subject or subjects in which he so failed on payment of a fresh annual sessional Fee of Rs.25/- for each head of passing. Such registration shall be done on or before the 16th August, of the Academic Year. The Head of the Department/College shall, on being satisfied about the completion of the sessional work of such a candidate, send the fresh sessional Marks to the University.

12. i) There shall be no classification of successful examinees at the Semester-II Examination.

    ii) Successful examinees obtaining 60% or more Marks in the aggregate of Semester I,II,III & IV Examinations taken together shall be placed in the First Division,those who have obtaining less than 60% but not less than 55% marks in Higher Second Division and those obtaining less than 55% marks in the Second Division.

13. Provisions of Ordinance No.7-A, relating to the Condonation of Deficiency of Marks for passing an Examination.

14. Notwithstanding anything to the contrary in this Ordinance, no person shall be admitted to this Examination, if he has already passed the same Examination or an equivalent Examination of any other statutory University.

15. Examinees successful at the M.I.R.P.M. Semester IV Examination, shall on payment of the prescribed fee, receive Degree in the prescribed form signed by the Vice-Chancellor.

APPENDIX-A

M.I.R.P.M.Semester-I Examination.

Sr. No.	Paper No.	Subject	Theory/ Sessional	Maximum Marks.	Minimum Marks.
1.	101	Principles and Practice of Management.	Theory/ Sessional	80 20	32 10
2.	102	Personnel Management	Theory/ Sessional	80 20	32 10
3.	103	Human Resource Development-.I	Theory/ Sessional	80 20	32 10
4.	104	Organisational Behaviour	Theory/ Sessional	80 20	32 10
5.	105	Managerial Communication	Theory/ Sessional	80 20	32 10
	Total			500	250

INTERNAL ASSESSMENT

6.	106	Managerial Economics	

NOTE: I Minimum marks for passing & exemption in paper including theory & sessional shall be 50%.

II. Sessional marks shall be awarded by the Head of the Department in consultation with the subject teacher & shall be based on

		Max. Marks	Min. Marks
(i)	Terminal Examination & Class Room Test.	08	4
(ii)	Home Assignment & Field Visits.	08	4
(iii)	Attendance	04	2
	Total	20	10

III Marks for attendance shall be calculated as follows.

Attendance less than 75% marks - NIL

Attendance between 75% to 80% marks - 02

Attendance between 81% to 90% marks - 03

Attendance above 90% - 04

IV To pass in internal assessment paper candidate must obtain minimum C grade.

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APPENDIX-B

M.I.R.P.M.Semester-II Examination.

Sr. No.	Paper No.	Subject	Theory/ Sessional	Maximum Marks.	Minimum Marks.
1.	201	Work Study & Job Evaluation	Theory/ Sessional	80 20	32 10
2.	202	Human Resource Development II (Training Devpt.)	Theory/ Sessional	80 20	32 10
3.	203	Social Security & Labour Welfare	Theory/ Sessional	80 20	32 10
4.	204	Industrial Psychology & Sociology	Theory/ Sessional	80 20	32 10
		TOTAL		400	200
		INTERNAL ASSESSMENT			
5.	205	Strategic Management			
6.	206	Computer Applications in Management.			

NOTE: I Minimum marks for passing & exemption in paper including theory & sessional shall be 50%.

II. Sessional marks shall be awarded by the Head of the Department in consultation with the subject teacher & shall be based on

		Max. Marks	Min. Marks
(i)	Terminal Examination & Class Room Test.	08	4
(ii)	Home Assignment & Field Visits.	08	4
(iii)	Attendance	04	2
	Total	20	10

III Marks for attendance shall be calculated as follows.

Attendance less than 75% marks - NIL

Attendance between 75% to 80% marks - 02

Attendance between 81% to 90% marks - 03

Attendance above 90% marks - 04

IV To pass in internal assessment paper candidate must obtain minimum C grade.

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APPENDIX-C

M.I.R.P.M. Semester-III Examination.

Sr. No.	Paper No.	Subject	Theory/ Sessional	Maximum Marks.	Minimum Marks.
1.	301	Industrial Relations	Theory Sessional	80 20	32 10
2.	302	Functional Areas of Management	Theory Sessional	80 20	32 10
3.	303	Labour Legislation-I	Theory Sessional	80 20	32 10
4.	304	Economics of labour	Theory Sessional	80 20	32 10
		Total		400	200

INTERNAL ASSESSMENT

5.	305	Research Methodology
6.	306	Dissertation

NOTE: I. Minimum marks for passing & exemption in paper including theory & sessional shall be 50%.

II. Sessional marks shall be awarded by the Head of the Department in consultation with the subject teacher & shall be based on

		Max. Marks	Min. Marks
(i)	Terminal Examination & Class Room Test.	08	4
(ii)	Home Assignment & Field Visits.	08	4
(iii)	Attendance	04	2
	Total	20	10

III Marks for attendance shall be calculated as follows.

Attendance less than 75%	marks	-	NIL
Attendance between 75% to 80%	marks	-	02
Attendance between 81% to 90%	marks	-	03
Attendance above 90%	marks	-	04

IV To pass in internal assessment paper candidate must obtain minimum C grade.

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APPENDIX-D

M.I.R.P.M. Semester-IV Examination.

Sr. No.	Paper No.	Subject	Theory/ Sessional	Maximum Marks.	Minimum Marks.
1.	401	Trade Unionism & Collective Bargaining.	Theory	80	32
			Sessional	20	10
2.	402	Regulation of Industrial Disputes	Theory	80	32
			Sessional	20	10
3.	403	Wage and Salary Administration	Theory	80	32
			Sessional	20	10
4.	404	Labour Legislation -2	Theory	80	32
			Sessional	20	10
		Total		400	200

INTERNAL ASSESSMENT

5.	405	Corporate Planning
6.	406	Dissertation

NOTE : I Minimum marks for passing & exemption in paper including theory & sessional shall be 50%.

II Sessional marks shall be awarded by the Head of the Department in consultation with the subject teacher & shall be based on

		Max. Marks	Min. Marks
(i)	Terminal Examination & Class Room Test.	08	4
(ii)	Home Assignment & Field Visits.	08	4
(iii)	Attendance	04	2
	Total	20	10

III Marks for attendance shall be calculated as follows.

Attendance less than 75%	marks	-	NIL
Attendance between 75% to 80%	marks	-	02
Attendance between 81% to 90%	marks	-	03
Attendance above 90%	marks	-	04

IV To pass in internal assessment paper candidate must obtain minimum C grade.

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APPENDIX-'E'

M.I.R.P.M.Semester Examination

* Internally assessed papers shall be assessed on the basis of 10 assignments at least 4 of which should be classroom Tests.

Grading for internal assessment paper shall be as follows.

Marks	Grade.
80% and above	O
70% and above but below 80%	A
60% and above but below 70%	B
50% and above but below 60%	C
40% and above but below 50%	D

NOTE: I Sessional marks shall be awarded by the Head of the Department in consultation with the subject teacher & shall be based on

	Marks	Max. Marks	Min. Marks
(i)	Terminal Examination & Class Room Test.	08	04
(ii)	Home Assignment & Field Visits.	08	04
(iii)	Attendance	04	02
	Total	20	10

II Marks for attendance shall be calculated as follows.

Attendance less than 75%	marks	-	NIL
Attendance between 75% to 80%	marks	-	02
Attendance between 81% to 90%	marks	-	03
Attendance above 90%	marks	-	04

III To pass in internal assessment paper candidate must obtain minimum C grade.

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M.I.R.P.M.
FIRST SEMESTER

101 PRINCIPLES AND PRACTICE OF MANAGEMENT

Unit-I : BASIC CONCEPTS :* 1 Basic Concepts of Management *2 Role and Importance of Management in Modern Society *3 Management as a Social System *4 The Operational Concept of Management' Other Approaches to Management.

Unit-II : MANAGEMENT DEVELOPMENT : *5 The Development of Management *6 Management in Antiquity *7 Industrial Revolution and its impact *8 Emergence of Scientific Management Movement *9 Contribution of Taylor, Fayol and Bernard to Management Science,Emergence of Modern Management ThoughtsandContribution of Behavioural Science.

Unit-III : THE PROCESS OF MANAGEMENT :*10 The Process of Management, Planning, Organizing Staffing, Directing, Controlling *11 Nature, Purpose and Principles of Management *12 Decision-making, Managerial Development Leading, Control Techniques.

Unit-IV : MANAGEMENT CONCEPTS :*13 Important Concepts in Management, 14*Co-Operation and co-Ordination. *15 Managerial Authority and Responsibility *16 Delegation and Decentralization *17 Line and Staff concepts. *18 Committees, policies and Strategies *19 Performance Appraisal.

Unit-V : PROFESSIONAL MANAGEMENT :*20 Management as Profession Practice and Need *21 Social Responsibility of Business *22 Management by objectives *23 Top Management Functions.

REFERENCE BOOKS :

Tripathy, Reddy.	Principles of Management.
Mrityanjay Banerjee	Business Administration.
Koontz & O;Donnel	Management A contingency and Systems analysis.
James A.F.Stoner	Management.
Monday,Sharplin, Holmes & Filippo	Management Concept & practices.

102 PERSONNEL MANAGEMENT.

Unit-I : Personnel Management-

Definition, Nature, Scope & Functions, Qualities of Personnel Manager, Status of personnel Manager & his functions, Organizational Structure of Personnel Department

Unit-II : Employment Functions-

Manpower Planning, Meaning & definition, Objectives of Manpower Plan, Need for Human Resource planning, Manpower planning process, job analysis, job description, job specifications, performance standards.

Unit-III : Operative functions.

Recruitment, selection, training, development, Promotion & transfer.

Unit-IV : Computer Applications in Human Resources Management, Computer applications in personnel training & EDP - Types of applications— Some specific applications— Managing data- Personnel and Systems management.

Unit-V : Personnel Research & Audit.

Personnel Research, Purpose & Need, Approaches to Personnel Research. Process of Personnel Research.

Personnel Audit.

Concept & Need, Process of Personnel Audit & Reporting Recent trends in Personnel function.

REFERENCE BOOKS :

Dale,Yoder	Personnel Management & Industrial Relations.
Northcott	Personnel Management Principles & Practices.
Filippo	Personnel Management.
Sen-Gupta & others	Personnel Management & Industrial relations.
Strauss & Sayle	Personnel Management & Industrial Relations.
Indian Institute of	Personnel Management in India. Personnel Management.
Charles Myer	Industrial Relations in India.
Rudra Basavraj	Personnel Administration practices in India.

R.S.Davar	Personnel Management & Industrial Relations.
C.B.Mamoria	Personnel Management & Industrial Relations.
P.C.Shejwalkar	Personnel Management & Industrial Relations.

103. HUMAN RESOURCE DEVELOPMENT-I

Unit-I : Recruitment-

Meaning & Definition, Recruitment Policy, Sources of Recruitment, Methods of Recruitment, recruitment Practices in Private & Public Sector of India.

Unit-II : Selection-I

Scientific Selection- Rightman on Right job, Selection Policy, Determining nature of job to be filled nature of personnel required, nature & sources of recruitment, Selection Process. Essentials of Selection Procedures, Steps in Selection Procedure, Application Blank-Bio-data.

Unit-III : Selection-II:

Psychological tests-Purposes, Characteristics, Types, Advantages, Interviews- Objectives & types,interview techniques or procedures, Qualities of good Interview, limitation of Interview techniques. * Placement and Induction.

Unit-IV : Performance Appraisal-I

Meaning, Importance & Purpose, Methods of Performance Appraisal, Essentials of Appraisal system Limitations and Problems in Appraisal Techniques, Appraisal Interview, Appraisal in M.B.O.

Unit-V : Internal Mobility.

(a) Promotion-Meaning, Objectives, Bases of Promotion, Promotion Policy.

(b) Transfer-Meaning, Reasons of Personnel transfer, Reasons of company initiated transfer, Transfer Policy, Procedure for transfer.

(C) Demotion- Meaning, Causes, Demotion Policy.

REFERENCE BOOKS :

Dale,Yoder	Personnel Management & Industrial Relation.
Northcott	Personnel Management Principles & Practices.
Filippo	Personnel Management.
Sen-Gupta & others	Personnel Management & Industrial Relations.

Strauss & Style	Personnel Management & Industrial Relations.
Indian Institute of Personnel Mgt.	Personnel Management in India.
Charles Myer	Industrial Relations in India.
Rudra Basavraj	Personnel Administration practices in India.
R.S.Davar	Personnel Management & Industrial Relations.
C.B.mamoria	Personnel Management & Industrial Relations.
P.G.Shejwalkar	Personnel Management & Industrial Relations.

104. ORGANIZATIONAL BEHAVIOUR

Unit-I : Understanding Organisation, Significance of Scientific study of Human Behaviour, Hawthorn Studies it's importance & implication, Approaches-cognitive, Behaviourstic & Social learning framework Human Need, theory, Maslows & Herzberg Motivation Process.

Unit-II : Perspectives of Organisation, Perception & Impression, Personality & Attitudes, Learning Values.

Unit-III : Group Dynamics, Group formation, Group interaction, Conflict Management, Team Management "Morale"

Unit-IV : Leadership-What is leadership? Managerial styles Managerial effectiveness, Indian Manager & His effectiveness, Delegation, Decision Making.

Unit-V : Organisation Change & Development, Process of Organisation change, Approaches to planned change. Lewis three step model, O.D. Values & Interventions.

REFERENCE BOOKS :

Keith Devis	Human Behaviour at Work.
Kundson & Fleeror	Management of Organizational Behaviour.
Korman A.K.	Organizational Behaviour.
Prasad	Organisation Theory & Behaviour.
Uma Sekharan	Organizational Behaviour.
K.Aswathappa,Himalaya	Organizational.

105. MANAGERIAL COMMUNICATION

Unit-I : Nature, Scope, Functions & Limitations. Communication Process, Principles of Communication. Objectives.

Unit-II : Organizational communication, Informal communication oral & Written communication, Transmission of Informal Massages, Systems of Direction of communication Vertical, Downward, Upward, Horizontal, Lateral,

Extra-organisational Communication, Media of Communication.

Unit-III : Personal Communication. Inter-Personal Communication Telephonic & net communication and group communication, Board and union meetings. Leadership Qualities. Body language, Kinescis and clothes.

Unit-IV : Mass Communication Public speaking, Effective Presentation, Art of listening, Barriess in communication.

Unit-V : Written communication - Preparation Analysis & Interpretation of reports, Business letter writting.

REFERENCE BOOKS :

A.C.Leyton The art of communication
M.Balsubramanyam Business Communication
R.C.Sharma Business Correspondence & Report Writing.
R.Pal & Korlahalli Essentials of business communication.

106. MANAGERIAL ECONOMICS

Unit-I : Introduction to Managerial Economics, Nature, Scope, Defination of Managerial Economics, Relationship of Managerial Economics with applied Economics and Sciences, Significance of Managerial Economics Fundamentals Concepts-Demand, Supply, Price, Competition Monopoly, Production, Cost, Distribution, Consumption, Profit-Total, Average & Marginal.

Unit-II : Demand Define, characteristics of Demand, schedule, Law of Demand, Exceptions, Elasticity of Demand Forecasting the Demand.

Unit-III : Price Theory: Price Determination Under Perfect competition, Pricing under monopoly, pricing under monopolistic Compition & Oligopoly.

Unit-IV : Cost Anaylysis & B.E.P. Fixed cost & variable cost, Direct cost indirect cost, Past & future cost, short run & long run cost, book & cash cost, controllable & sunk cost Urgent & postponable cost Explicit & implicit cost, Private & social cost, Break even Analysis-

Unit-V : Economic Fluctutions and Pricing Policies-

Trade cycle, Meaning, features, implications. National Income , Concepts & Importance, Industrial Policies Since, 1991.

REFERENCE BOOKS:

Joel Dean Managerial Economics.
William Hyness & other Managerial Economics.
P.L.Mehta Managerial Economics.
V.M.Sultanchan Managerial Economics.
Publication
New Delhi.

SECOND SEMESTER

201. WORK STUDY AND JOB EVALUATION

Unit-I : Concept of Ergonomics, Work design, Work Study, Motion Studies, time study, Fatigue study, Work simplification, Principles & Rules of motion study.

Unit-II : Job Evaluation-Definition, Objectives, Principles, Advantage, Limitation, Different Methods of job evaluation.

Unit-III : The Indian Worker-Background of Industrial workers Rural-or-Urban Caste structure, education & skills. Commitment & Adjustment to industrial life, Privatised worker, Absenteeism, work organisation, Unionization.

Unit-IV : Computer Application in Human Resource Management.

Unit-V : Working Condition, Meaning & Scope of working condition, Provisions of the factory Act, Hours of work. Need for controlling Hours of work.

REFERENCE BOOKS :

Dale,Yoder Personnel Management & Industrial Relations.
Northcott-Filippo Personnel Management Principles & Practices.
Sen-Gupta & Others. Personnel Management.
Strauss & Sayle Personnel Management & Industrial Relations.
Indian Institute of Personnel Mgt. Personnel Management & Industrial Relations.
Govt. of India. Personnel Management in India.
Report of the National Commission on Labour.

202. HUMAN RESOURCE DEVELOPMENT-II (TRAINING DEVELOPMENT)

Unit-I : Traing-Definition, Need, Objectives, Advantages Assessment of Training needs, Setting of training objectives.

Unit-II : Training Programme-Training for Special Groups, Supervisors, Middle Managers, Senior Executives and workers, Design of training Programmes. Training of trainers.

Unit-III : Training Aids & Methods-Simulation, Apprenticship on the job training, Lectures, Case studies. Role Playing, T- Group training, seminar, conference, vestibule training, training by supervisor & experienced persons.

Unit-IV : Executive Development- Managerial function, knowledge & Skills of Manager, Management Development Need & Importance, Aims, Pedagogical Approaches and techniques of Management Development on the job and off the job training.

Unit-V : Administration of Management Development Programme. career planning, Need, Objectives, Courses for management development, administration of management development programme, Organizational Development- Concept, Characteristics, goals, Process of Organisational Development Programme.

REFERENCE BOOKS :

Dale, Yoder	Personnel Management & Industrial Relations.
Northcott	Personnel Management Principles & Practices.
Filippo	Personnel Management.
Sen-Gupta & Others.	Personnel Management & Industrial.
Strauss & Sayle	Personnel Management & Industrial Relations.
Indian Institute of Personnel Mgt.	Personnel Management in India.
Govt. of India.	Report of the National Commission on Labour.

203. SOCIAL SECURITY & LABOUR WELFARE

Unit-I : Labour Welfare-Concept, Definition, Scope, Aims and objectives, Necessity, principles of labour Welfare Histroy of Labour Welfare in India, Effects of Welfare work on Industrial Relations, Welfare Officer.

Unit-II : Social Security- Definition, Social Assistance, Social Insurance, I.L.O. and Social Security in Different countries. Brief Introduction to maternity Benefit Act-1961. Employees state Insurance Act- Provident Fund Act-& Payment of Gratuity Act.

Unit-III : Welfare Provision. Statutory Provisions, Voluntary Provisions, Labour Welfare funds.

Unit-IV : Industrial Safety Health & Hygiene- Accidents, Trends causes, Prevention of accidents, Safety officer Recommendation of National Commission on Labour for safety. I.L.O. Deliberation. Statutory Health Provisions & Industrial Medical Officer. Mental health in Industry Importance of Industrial Hygien, Occupational Hazards , Occupational Desseases, Recommendations of National Commission on labour. Statutory provisions Related to Hygiene.

Unit-V : International labour : Organisation & Labour Welfare-Membership of I.L.O. Structure, Function, Workers Education Scheme. Objectives, training programme Welfare for Special Categories of labour child labour, Women labour, Contract labour, handicapped & disabled labour. Agricultural & rural labour.

REFERENCE BOOK :

Dale, Yoder	Personnel Management & Industrial Relations.
Northcott	Personnel Management Principles & Practices.
Filippo	Personnel Management.
Sen-Gupta & Others	Personnel Management & Industrial Relations.
Strauss & Sayle	Personnel Management & Industrial Relations.
Indian Institute of Personnel Management.	Personnel Management in India.
Charles Myer	Industrial Relations in India.
Rudra Basavraj	Personnel Administration Practices in India.
R.S.Davar	Personnel Management & Industrial Relations.
C.B.Memoria	Personnel Management & Industrial Relations.
P.G. Shejwalkar	Personnel Management & Industrial Relations.

204. INDUSTRIAL PSYCHOLOGY & SOCIOLOGY

Unit-I : Introduction : Definition, Nature Scope, Hurdles, Concepts. Group phenomena in Industry- Organisation Moral & Leadership Industrial Psychology in India.

Unit-II : Business Ethics :Principles, ethics in Practice, Unethical practices, Indian Manager's attitude towards Business ethics good ethics is good business. code of business ethics. Business codes of conduct.

Unit-III : Social Responsibility of Business :Doctrine/Concept. Rational, changing trends in social Responsibilities of Business, Area/Dimenssion, Assumption Tools of social Responsibility of business

Unit-IV : Social Audit:Concept features, Benefits, Approaches.

Unit-V : Social Responsibilities of Indian Businessmen.

205. STRATEGIC MANAGEMENT

Unit-I : Strategic Management-Concept, Feature, Need Corporate Strategy- Components, Functions & Significance, Basic Foundation of strategic Management. Different Phases in formulation of corporate strategy.

Unit-II : External Environment-features of business external environmental, scanning of external environment. Features of environmental search and analysis. Appraising corporates compitency of a firm. Setting corporate objectives. Choice of Corporate strategy.

Unit-III : Types of strategic Decision: Stability Strategy, growth stratagy, Diversification strategy, International Business strategy Retrenchment strategy.

Unit-IV : Functional Strategies - Marketing, Manufacturing, Financial, R & D Strategies.

Unit-V : Implementation of strategy and corporate organisation structure corporate strategy and social responsibility. Relationship between corporate strategy and corporate culture, Impact of personal values on corporate strategy.Role and responsibility of leader in designing and implementing strategy.

REFERENCE BOOK:

Corporate Strategic Management by R.M. Srivastava, Pragati Prakashan, Meerut.
Business Policy and Strategic Management by Lawrence R. Jauch by McGraw-Hill.

Business environment for strategic Management by Dr.K.Aswathappa, Himalaya Publishing House.
Strategic Analysis and Action by J.N. Fry, Prentice- Hall.

206. COMPUTER APPLICATIONS IN MANAGEMENT

Unit-I : Computers in Management, Role of computers in Management. Introduction to computers. Personal Computer and its Uses. Spreadsheet Software, lan application, Managerial Applications.

Unit-II : Managerial Application of Computers,Computer and Management Functions, Computer Based Financial Systems. Computer Based Inventory Systems. Computersin Human Resource Management, Role of Computer in Marketing & Sale (Maruti Udyog.)

Unit-III : Computers and Decisional Techniques. Operations Research and Management Decision making. Linear Programming- Problem Formulation and Graphical method.

Unit-IV : Managing Corporate Data Resources. Organising Data. Relational data base Management Sddystems. Query language. DBS- Implementation and Future Trends.

Unit-V : Systems Analysis and Computer languages. System Analysis and Design. Computer Programming. Unix-C. FOXPRO/DBASE-RDBMS.

THIRD SEMESTER

301. INDUSTRIAL RELATIONS

Unit-I : Definition, Nature, Scope Objectives Importance. Functions, Limitations of I.R. in India.

Unit-II : Historical Perspective : Industrial Relation in India. Three Actors in Industrial relation. Approaches to Industrial Relations. Role of Government in Industrial Relations. Role of Management & trade unions.

Unit-III : Recommendation of national commission on labour. Employee discipline, Indiscipline, suspention dismissal & retrenchment. Disciplinary Procedure. Domestic enquiry.

Unit-IV : Industrial Relations, Public sector. Public Sector-Objectives, working of public sector, workers in public sector, Industrial Disputes & their causes in public sector. Trade unionism in Public Sector. Labour Problems in Public sector.

Unit-V : Industrial Relations in India, Industrial unrest-before, Independence, After Independence, State and Industrial relations policy.

REFERENCE BOOKS :

Dale ,Yoder	Personnel Management & Industrial Relations.
Northcott	Personnel Management Principles & Practices.
Filippo	Personnel Management.
Sen-Gupta & Other	Personnel Management & Industrial Relations.
Strauss & Sayle	Personnel Management & Industrial Relations.
Indian Institute of Personnel Mgt.	Personnel Management in India.
Charles Myer	Industrial Relations in India.
Rudra Basavraj	Personnel Administration Practices in India.
R.S.Davar	Personnel Management & Industrial Relations.
C.B.Memoria	Personnel Management & Industrial Relations.
P.G.Shejwalkar	Personnel Management & Industrial Relations.

302. FUNCTIONAL AREAS OF MANAGEMENT

Unit-I : Introduction to Marketing. Approaches to Marketing. Marketing Planning & Mix. Marketing Research. Channels of Distribution, Consumer Behaviour.

Unit-II : Product Management, Product Management Process Branding & Packaging decisions. Advertising Planning & Execution.

Unit-III : Fundamentals of financial Accounting, Goals & Functions. Financial Analysis & Profit Planning (a) Ratio Analysis (b) Fund flow Statement. Financial Planning.

Unit-IV : Capital Structure Theory & planning of capital structure. Types & Characteristics of corporate scripts. leverages.

Unit-V : Production/Operation Management Introduction. Demand Forecasting. PERT/CPM Materials Management Maintenance Management.

303. LABOUR LEGISLATIONS-I

Unit-I : Trade Union Act 1926. The trade union bill-1950.

Unit-II : Industrial Disputes Act-1997. with Amendments of 1976, 1984 .

Unit-III : Payment of Wages Act-1936 Minimum wages Act-1948, Industrial Employment (Standing orders) Act-1957.

Unit-IV : Factories Act-1984 with Amendments of 1987.

Unit-V : Contract Labour (Regulations & Abolition) Act 1970. Mines Act-1952. Plantation labour Act-1951.

REFERENCE BOOKS :

18. Deivasigamani Road. Madras	Labour Law journal.
N.D.Kapoor	Handbook of Industrial Law.
P.L. Malik	Industrial Law.

304. ECONOMICS OF LABOUR

Unit-I : Nature and Scope: *1 Nature and Scope of Labour Economics *2 Peculiarities of Labour. *3 Labour as a Factor of Production *4 Labour Force. *5 Labour Supply. *6 Labour Demand. *7 Labour Supply Overtime.

Unit-II : Labour Market : *8 Concept of Labour Market *9 Commodity Market and Labour Market. *10 Imperfection in Labour Market *11 Labour Market Equilibrium. *12 Labour Discrimination.

Unit-III : Labour and Change : *13 Labour and Technological Change *14 Impact of Rationalisation, Automation, Modernization and Computerisation. *15 Labour Mobility. *16 Human Capital Education and earning *16 On the job Training and the Wages.

Unit-IV : Labour in India. *17 Labour and Trade Union *18 Labour Market Contract and work Incentives. *19 Unemployment.

Unit-V : Labour in India : *20 Labour in Indian context *21 Organised labour *22 Unorganized Labour *23 Labour from Agriculture Industry and Service Sector.

REFERENCE BOOKS :

Dr.R.Singh & I.C. Singhal	Labour Problems.
A.N.Agrawal	Labour Problems.
R.A.Lester	Economics of Labours.
T.N.Rastogi	Indian Industrial Labour.
Bhagoliwal	Industrial Relations & Economics of Labour.
R.C.Saxena	Labour Problems.

305. RESEARCH METHODOLOGY

Unit-I : Introduction to Research Methodology. Meaning and purpose of Research. Importance of Research. Types of Research, Research Problem Selection & Formulation. Hypothesis.

Unit-II : Data Collection-Review of literature, Methods and techniques of Data collection, Sampling and sampling Designs. Attitude Measurement and scales.

Unit-III : Presentation and Analysis of Data. Data Processing, Statistical Analysis and Interpretation of data. Model Building and Decision Making.

Unit-IV : Presentation of Report, formats of reports, report writting substance of report.

Unit-V : Research Paper-Concept, Importance, Preparation and Presentation of Research paper.

REFERENCE BOOKS:

M.R.Cohen & E.Nagar	An Introduction to Logic & Scientific Methods.
A.K.Das Gupta	Methodology of Economic Research.
Yong Pauline	Scientific Social Surveys and Research.
W.J.Good	Methods in Social Research.
Wilkinson & Bhandarkar	Methodology & Techniques of Social Research.

306 DISSERTATION

The paper No. MIRPM-306 shall be assessed at the end of 4th semester Internally and Externally as it is part of Paper No. 406.

*****

FOURTH SEMESTER

401. TRADE UNIONISM & COLLECTIVE BARGAINING

Unit-I : Trade Unionism - Meaning & concept Emergence of trade unionism, History of trade union movement in India,

Functions of trade unions.

Unit-II : Principles of trade Unions. Registration of trade union. Rights of Registered trade unions. Cancellation of Registration. Recognition of trade unions.

Unit-III : Problems of trade unions, Types & structure of trade unions.

Unit-IV : Collective Bargaining, Meaning & Concept, Need,Importance, Principles of collective Bargaining, Collective Bargaining Agreement at plant level, Industry level & national level.

Unit-V : Methodology for Bargaing Developing a Bargaining relationship. Process of Negotiation during Bargaining, Economic, Psychological & other factors, influencing collective Bargaining. Collective Bargaining in India. Prerequisites of successful collective Bargaing.

REFERENCE BOOKS :

Dale, Yoder	Personnel Management & Industrial Relations.
Northcott	Personnel Management Principles & Practices.
Filippo	Personnel Management.
Sen Gupta & Others	Personnel Management & Industrial Relations.
Strauss & Sayle	Personnel Management & Industrial Relations.
Indian Institute of Personnel Mgt.	Personnel Management in India.
Charles Myer	Industrial Relations in India.
Rudra Basavraj	Personnel Administration Practices in India.
R.S.Davar	Personnel Management & Industrial Relations.
C.B.Mamoria	Personnel Management * Industrial Relations.
P.G.Shejwalkar	Personnel Management & Industrial Relations.

402. REGULATION OF INDUSTRIAL DISPUTES

Unit-I : Industrial Disputes-Definition, forms of disputes, causes of disputes, Labour Welfare Officer, Need,functions and duties.

Unit-II : Preventive Measures. Works Committee, Joint Management Councils Standing orders, Grievance, Grievance Procedure. Misconduct, Disciplinary action.

Unit-III : Preventive Measures-Code of Discipline, workers participation in Management-concept, meaning, aims and objectives. Forms and levels of participation. Wage Poliy & wage boards.

Unit-IV : Settlements Machinery-Conciliation- functions and process of Mediation, concilliation Machinery, concilliation officer, Arbitration- concept, Advantages, Limitations, type, Arbitrator, Adjudication, importance, Types, labour court, Industrial tribunal. National Tribunal. Procedure for settlement of Disputes.

Unit-V : Tripartite bodies for prevention of Disputes, Indian labour conference and standing labour committee.National commission on labour.

REFERENCE BOOKS :

Dale, Yoder	Personnel Management & Industrial Relations.
Northcott	Personnel Management Principles & Practice.
Filippo	Personnel Management.
Sen-Gupta & others	Personnel Management & Industrial Relations.
Strauss & Sayle	Personnel Management & Industrial Relations.
Indian Institute of Personnel Mgt.	Personnel Management in India.
Charles Myer	Industrial Relations in India.
Rudra Basavraj	Personnel Administration Practices in India.
R.S.Davar	Personnel Management & Industrial Relations.
C.B.Mamoria	Personnel Management & Industrial Relations.
P.G.Shejwalkar	Personnel Management & Industrial Relations.

403. WAGE AND SALARY ADMINISTRATION

Unit-I : Concepts and Theories *1 Terminology and Concepts *2 Need, Objective and Principles of Wage Salary Administration. *3 Mechanism *4 Wage Theories *5 Types of Wages *6 Wage Fixation institutions in India.

Unit-II : Wage Differentials :*7 Wage Differentials as Corollary of Factor Differentials *8 Basic for Differentials-Occupation, Industry Region *9 Causes of Wage Inequality *10 Organisational Wage Structure. *11 Wage Differential *12 Social Programming of Wages.

Unit-III : Wage Determination :*13 Need for Rational Wage Structure *14 Prerequisite for wage Standardisation *15 Wage Board-Constitution, Function and Critical Study *16 Wage Determination. *17 Determining the Wage Rate *18 Role of Trade Union.

Unit-IV : Wage Incentives :*19 Incentives *20 Incentive Wage System *21 Individual and Group incentives *22 Financial and Nonfinancial Incentives *23 Proft Sharing. *24 Participation in Management. *25 Performance Appraisal. *26 Merit rating. *27 Attitudes of Workers Union.

Unit-V : Bonus and fringe benefits :*28 Bonus *29 Provisions Under Bonus Act *30 Frienge Benefits- Meaning and Need. *31 Objectives of Frienge Benefit. *32 Types of Frenge Benefit. *33 Utilization of Staff and Productivity.

REFERENCE BOOKS :

Dale, Yoder	Personnel Management & Industrial Relations.
Northcott	Personnel Management Principles & Practices.
Filippo	Personnel Management.
Sen Gupta & Others	Personnel Management & Industrial Relations.
Strauss & Sayle	Personnel Management & Industrial Relations.
Indian Institute of Personnel Mgt.	Personnel Management in India.
Charles Myer	Industrial Relations in India.
Rudra Basavraj	Personnel Administration Practices in India.
R.S.Davar	Personnel Management & Industrial Relations.
C.B.Mamoria	Personnel Management & Industrial Relations.
P.G.Shejwalkar	Personnel Management & Industrial Relations.

404. LABOUR LEGISLATION-2

Unit-I : Employees State Insurance Act-1948.

Unit-II : Workmen Compensation Act-1923 with amendments of 1984

Unit-III : Payment of gratuity Act-1972 with Amendment- 1984 Maternity Benefit Act-1961.

Unit-IV : Employees Provident fund & Miscellaneous Provisions Act-1952. Provident fund Act-1925.

Unit-V : Payment of Bonus Act 1965, Employees family Pension Scheme 1971. Employees Deposit linked Insurance Scheme 1976.

REFERENCE BOOKS :

18.Deivasigamani Road Madras	Labour Law Journal.
N.D.Kapoor	Handbook of Industrial Law.
P.L.Malik	Industrial Law.

405. CORPORATE PLANNING

Unit-I : Scope of strategic planning-Definition & Examples Environmental Scanning & Scenario development-corporate planning-system & Practices.

Unit-II : Corporate planning in public sector enterprises, preparation of corporate plan contents & focus, identification of action choices, Distribution of the corporate plan & constraints.

Unit-III : Syndicate execuse in preparation of corporate plan Managerial Approaches to corporate planning.

Unit-IV : Dissemination of corporate plan for its Implementation. Role clarity & Implementation.

Unit-V : Conference in public sector enterprises. Review of progress- Annual activities plan. Changing role of corporate planning Department.

406. DISSERTATION

Assessment of Paper at Sr. No. MIRPM 306/406 Dissertation shall be done by Internal and External Examiners, Out of 100 Marks to be distributed as follows:

65 Marks for Dissertation and

35 Marks for Viva-voce.

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M.C.A.
First Year

Prospectus No. 111722

संत गाडगे बाबा अमरावती विद्यापीठ

SANT GADGE BABA AMRAVATI UNIVERSITY

(FACULTY OF ENGINEERING & TECHNOLOGY)

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SYLLABUS
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1 MCA 1/ 1 CS 1 COMPUTER ORGANIZATION

Unit I — Chapter Objectives, Evaluation of Computers and computer generations, Technological trends, Measuring performance, speed up, Amdahl's law, Von Neumann machine architecture, Functional units and components in computer organization, Program development tools, Operating systems.

Unit II — From Electron to Bits, Binary representation of positive integers, Negative integers, Fixed point arithmetic operations on positive and signed (Negative) integers, Floating-Point numbers (IEEE 754 standard) and operations, BCD arithmetic operation, Design of ALU, Bit slice processors.

Unit III — Concept of instruction formats and instruction set, instruction set types, types of operands and operations, Generation of memory addresses and addressing modes, Subroutine nesting using stacks to implement subroutine calls and calling conventions, Processor organizations, Register organization, Stack based organizations, Encoding of machine instructions, General features of RISC and CISC instruction sets, modern processors convergence of RISK with CISC, Processor microarchitecture-I - Fundamental concepts for data path implementation,Processor microarchitecture-II - Data path implementation, microprogrammed execution, recent innovations in execution unit design.

Unit IV — Instruction pipeline, instruction pipeline hazards, overcoming hazards using a pipeline with forwarding paths, instruction set design influence on pipelining, example of pipelined CISC processor, example of pipelined RISC processor, VLIW (Very Long Instruction Word) processors, Vector processors, Multithreaded processors, Compilation techniques support to instruction level parallelism, Extracting parallelism.

Unit V — Some basic concepts, memory hierarchy, internal organization of semiconductor main memory chips - RAM and ROM, semiconductor main memories - RAM, semiconductor Read - Only memories - ROMs, speed, size and cost, secondary storage magnetic ferrite core memories, optical disks CD-ROM

memories, data caches, instruction caches, and unified cache, features describing a cache, cache implementations, multilevel caches.

Unit VI — Virtual memory organization, mapping functions for translating the program pages in virtual to physical addresses space, partitioning, segmentation (superpages or page blocks) partitioning of virtual address space in to segment and page address, demand paging and swapping, cache and virtual swapping, cache and virtual memory, inverted page tables concept, protection between programs running on the same system, accessing I/O devices, programmed I/O, interrupts, direct memory access DMA, bus arbitration, interface circuits, I/O interfaces, I/O processors, external I/O devices.

Text Book : Computer Architecture by Micholus Carter & Rajkamal, Schaum Series Pub.

1 MCA 2 / 1 CS 2 PROBLEM SOLVING USING C++

Unit I. — Objects & Classes in C++ : Declaring & using classes, Constructors, Objects as functions arguments, Copy Constructor, Static class data. Arrays of objects, C++ String class.

Unit II. — Operator overloading : Overloading unary & binary operators. Data conversion. Pitfalls of operator overloading. Pointers & arrays. Pointers & functions. new & delete operators. Pointers for objects.

Unit III. — Inheritance in C++ : Derived class & base class, Derived class constructors, Function overloading, class hierarchies, Public and private inheritance, Multiple inheritance. Containership : classes within classes.

Unit IV. — Virtual functions concepts, Abstracts classes & pure virtual functions. Virtual base classes, Friend functions, Static functions, Assignment and copy initialization, the this pointer. Dynamic type information.

Unit V. — Streams & Files in C++ : Stream classes, stream errors, disk file I/O with streams, File pointers, Error handling in file I/O. File I/O with members functions, overloading the extractions & insertion operators, Memory as a stream object, command-line arguments. Multifile programs.

Unit VI. Function Template, Class templates, Exception syntax, Multiple exceptions, exception with arguments. Introduction to the Standard Template Library. Algorithms, Sequential Containers, Iterates, Specialized iterates, Associative containers. Function objects.

Text-Book :

1. Savitch: Problem Solving using C++ (Addison Wesley) Low-Priced Edition.

References :

1. Robert Lafore Object-Oriented Programming in C++ (Galgotia)
2. Herbert Schildt C++ : Complete Reference (TMH)
3. Bjarne Stroustrupe C++ Programming Language (Addison-Wesley)
4. Venugopal Mastering C++ (TMH)
5. Lipmann C++ Primer (Addison-Wesley)

1MCA3 / 1 CS 3 COMPUTER ORIENTED STATISTICAL METHODS

UNIT-I : Introduction

Definitions : Websters, secrists, Gronton and Cowden definitions of statistics

Improtance of statistics

Scope of statistics : Industry, Economy, Planning, medical science, Computer Science etc.

Limitations of statistics.

General principles of classification of data.

Construction of Frequency distribution, cummulative frequency distribution, relative frequency distribution. Graphical representation of frequency distribution.

Diagrammatic representation : Simple bar, subdivided bar, pie diagram.

Numerical Problems.

UNIT-II : Measures of central Tendency & Measures of dispersion:

Concept of central tendency, criteria for good measures of central tendency.

Arithmetic mean for grouped and ungrouped date, properties of a.m., combined mean, weighted mean, merits and demerits.

Median, mode, G.M., H.M. for grouped & ungrouped data with its merits & demerits.

Partition values : quartiles, deciles, percentiles

Numerical problems on central tendency.

Concept of dispersion criteria for good measures of dispecrsion.

Measures of dispersion : Range, quartile deviation, mean deviation, S.D. for grouped & ungrouped data with its merits & demerits Variance : Definition for grouped & ungrouped data, combined variance, co-efficient of Dispersion, co-efficient of variation. Numerical problems on measures of dispersion.

UNIT-III : Moments, measures of Skewness and Kurtosis correlation

Raw & Central moments : for grouped & ungrouped data (upto first four moments) & their relationships. Skewness, measures of skewness, co-efficient of skewness, bempirical relation between mean, mode, median. Pearson's & Bowley's co-efficient of Skewness. Kurtosis & types of kurtic curves, co-efficient at Kurtosis based on moments.

Numerical problems on moments, co-efficient of skenmen & co-efficient of Kurtosis.

Unit-IV Corelation : Concept of correlation for bivariate data, scatter diagram, positive, negative & no correlation, cause and effect relationship.

Karl pearson's co-efficient of correlation(r), limits at r and interpretation of r, assumption on r.

Effect of change of origin & scale on r, independence of variables.

Spearman's Rank correlation, repeated rank correlation.

Numerical problems on karl pearsons & spearman's rank correlation co-efficient.

UNIT-V : Regression :

Concept of regression & linear regression

Derivation of regression lines by method of least squares.

Properties of regression co-efficients.

Linear and Non-linear regression : Fitting of second degree curve & curve y=abx by least square method.

Numerical problems on linear & non-linear regression.

Multiple regression by yule's notations (for tri-variat data)

Multiple correlation & partial correlation.

UNIT-VI : Time series :

Definition of Time series & uses of time series

Components of Time series, Additive & multiplicative models.

Methods of estimating treand by moving average method graphical method, semiavarage method & by least square methods.

Numerical problems on Time Series.

Text Books:

J.N. Kapoor : Mathematical Statistics (MCG)

Trivedi : Probability and Statistics with Computer Science Applica tions (TMH)

References:

1. Statistical Methods (An Introductory Text) : J. Medhi
2. Modern Elementary Statisics : J.E. Freund
3. Statistical Methods : S.P. Gupta
4. Fundamentals of Statistics : Goon, Gupta, Dasgupta

1MCA4 / 1 CS 4 PRINCIPLES OF MANAGEMENT

(8 hours/unit)

UNIT I Introduction : Definition and concepts of management, Importance of management .Various management functions & control, responsibilities. Human resources planning , Decision-making, Trade unions & collective bargaining.

UNIT II Organization planning, design and development: Production resources, Production planning, types of production system, production systems, production control.

UNIT III Product design & development : Introduction, design of the product, New product development; Material planning and control. Inventory control technique .

UNIT IV Maintenance and system reliability: Concepts and Objectives of maintenance. Failure analysis,Reliability Maintenance system & Classification. Maintenance planning, TQM ISO 9000 and Quality audit.

UNIT V Marketing management : Introduction, marketing planning . Consumer behavior, product management, Pricing & promotion decision.Financial planning. Source of finance.

UNIT VI Project Management: Concepts and importance of project, Project implementation, MIS.MIS meaning and objectives. Types of data, methods of data collection, analysis and presentation of data. Editing, reporting and presentation of data, Decision options.

Text book :

A.K.Gupta,J.K. Sharma : Management of Systems (Macmillan)

Referances :

1.Appleby : Modern Business Administration, 6/e (Macmillan)

2.Tritaphy & Reddy : Principals of Management, 2/e (TMH)

3.Gupta, Sharma et : Principales of Practices of Management (Kalyani)

1MCA5 / 1 CS 5 COMMUNICATION SKILLS

Unit I: Comprehension - word study :-

Synonym, antonym, meanings, matching words, adjectives, adverbs, prefix and suffix, correct forms of commonly misspelled words, understanding of the given passage.

Skimming for general ideas, Contextual vocabulary, Error detection, Note making and Location of argument from text, Ability to answer inferential, factual and personal response.

Unit-II Comprehension - - Structure study :-

Simple and compound sentences, types of conjunctions, singular and plural, tenses and their effect on verb forms. Use of - not only - but also, if clause, since, may, can, could, would, too etc. Active and passive forms, negative and interrogative, punctuation and capitalization.

Unit III Theoretical background - importance of communication, its process, model of communication its components & barriers. Types of written communication, organization of a text (Titles, summaries, headings, sequencing, signaling, cueing etc.), Important text factors (length of paragraph, sentences, words, clarification and text difficulty). Evaluation of written communication for its effectivity and subject content.

Unit IV Specific formats for written communication like - business correspondence, formal reports, technical proposals, research papers and articles, advertising and graphics. Format for day-to-day written communication like applications, notices, minutes, quotations, orders, enquiries etc. Letter writing, Preparation of Curriculum – Vitae,Composing messages-telegrams, telex,fax and e-mail Writing memos, agendas and notices of meetings, Preparing advertisements.

Unit-V Oral communications - Important objectives of interpersonal skills, Verbal communication, its significance, face to face communications, group discussion and personal interviews. Voice modulation and logical argument, Comprehension of text at normal reading speed. Listening skill and timely response, Participation and contribution to discussion, Command over language Formal and informal style of communication, Body language.

BOOKS Recommended :

1) Krishna Mohan, Meera Banerjee : Developing Communication Skills, MacMillan India Limited.

2) Chrissie Wright (Editor) : Handbook of Practical Communication Skills, Jaico Publishing House.
3) Curriculum Development Centre, TTTI WR, Bhopal : A Course in Technical English, Somaiya Publication Pvt. Ltd.
4) F.Frank Candlin : General English for Technical Students, University of London Press Ltd.

1 MCA 6 / 1 CS 6 PROBLEM SOLVING USING C++

LAB: LIST OF PROGRAMS

The sample list of program is given below. This list can be used as guide line for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

1 Write a C++ program to implement a stack with its constructor and two member functions PUSH and POP

2 Write a C++ program to find product of two same numbers from 0 to 9 stored in an object array of 10 objects and then free the memory space occupied by an object array

3 Write a C++ program to overload minus operator as an unary and binary operator

4 Write a C++ program using friend operator function to overload plus binary operator

5 Write a C++ program to calculate the circumference of an earth (subclass) after getting distance of it measured from sun from planet (super class)

6 Write a C++ program for an inventory that stores the name of an item, the number on hand, and its cost. Include an inserter and an extractor for this class

7 Write a C++ program that creates an output file, writes information to it, closes the file and open it again as an input file and read the information from the file

8 Write a C++ program that counts number of words in a file

9 Write a C++ program to create an abstract class area having an abstract function get Area which will find an area of derived classes rectangle and triangle

10 Write a C++ program to create a generic function that swaps the values of the two variables it is called with"

1MCA7 / 1 CS 7 COMPUTER ORIENTED STATISTICAL METHODS

Practicals on Statistical Methods:

Minimum 12 practicles to be performed throughout the semester based on following (using C or C++ language).

1. Construction of frequency distribution, graphical methods & diagrammatic representation.
2. Problems on measures of Central Tendency.
3. Problems on measures of disperssion.
4. Problems on moments, measures of Shewmen and Kurtosis.
5. Computation of correlation co-efficient for bivariate data.
6. Fitting of linear & non linear regression lines
7. Computation of rank correlation co-efficient
8. Problems on time series .

1MCA8 / 1 CS 8 COMMUNICATION SKILLS LABORATORY

Objective :

On completion of this laboratory the candidate should be able to demonstrate adequate skills in oral and written communication for technical English language, actively participate in group discussions and interviews and exhibit the evidence of vocabulary building. Candidates should be assessed through continuous monitoring and evaluation.

The sample list of experiments is given below. This list can be used as guideline for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

1. Assignments and tests for vocabulary building
2. Technical report writing
3. Group discussions
4. Interview techniques
5. Projects and tasks such as class news letter
6. Writing daily diaries and letters
7. Interactive language laboratory experiments.

Text Book : Norman Lewis : Word Power Made Easy

http://www.teachingenglish.org.uk

1MCA 9/1 CS 9 COMPUTER LABORATORY-I

This laboratory is based on the study of following software

1. The study of Windows/Linux operating systems :
   The topics to be covered include
   1) The study of basic commands handling files, directories, system configuration and system calls

2) Shell programming,
3) General purpose utilities & editors
4) Seeting/resetting file attributes/ modes, sharing files,
5) TCP/IP networking

2. The study of spreadsheets : Creating Worksheets, Formatting cells, conditional formatting of cells and data, Use of functions, Creating Macros, Creating different types of charts. (At least 6 exercises covering above mentioned features) Use MS-Excel or Calc from Open Office Under Linux.
3. The study of DBMS : Creating Database, Tables, Views, Queries, Creating Reports (At least 6 exercises covering above mentioned features)

*****

SEMESTER : SECOND

2 MCA 1 / 2 CS 1 DATA STRUCTURES & ALGORITHMS

Unit-I Data structures basics, Mathematical/algorithmic notations & functions, Complexity of algorithms, Subalgorithms. String processing: storing strings, character data type, string operations, word processing, and pattern matching algorithms.

Unit-II Linear arrays and their representation in memory, traversing linear arrays, inserting & deleting operations, Bubble sort, Linear search and Binary search algorithms. Multidimensional arrays, Pointer arrays. Record structures and their memory representation. Matrices and sparse matrices.

Unit III Linked lists and their representation in memory, traversing a linked list, searching a linked list. Memory allocation & garbage collection. Insertion deletion operations on linked lists. Header linked lists, Two-way linked lists.

Unit-IV Stacks and their array representation. Arithmetic expressions: Polish notation. Quick sort, an application of stacks, Recursion. Tower of Hanoi problem. Implementation of recursive procedures by stacks, Queues. Deques. Priority queues.

Unit-V Trees, Binary trees & and their representation in memory, Traversing binary trees. Traversal algorithms using stacks, Header nodes: threads. Binary search trees, searching, inserting and deleting in binary trees. Heap and heapsort. Path length & Huffman's' algorithm. General trees.

Unit-VI Graph theory, sequential representation of graphs, Warshalls' algorithm, Linked representation, operations & traversing the graphs. Posets & Topological sorting. Insertion Sort, Selection Sort. Merging & Merge-sort, Radix sort, Hashing.

Text Book:

Seymour Lipschutz: "Theory & Problems of Data Structures" (TMH)

References:

1. Horowitz & Sahni "Data Structures" (Galgotia)
2. Trembley & Sorenson "Data Structures" (TMH)
3. Standish "Data Structures in JAVA" (Pearson)
4. Bhagat Singh & Naps "Data Structures" (TMH)

*****

2 MCA 2 / 2 CS 2 OBJECT ORIENTED PROGRAMMING

Unit-I Introduction, Software development, life-cycle approach, Software requirement specifications, Algorithms, VB Net projects, Designing objects, classes & applications, object relationships, Class design examples, class code in VB Net

Unit-II VB Net language, CLR, variables, expressions, statements, blocks, structured variables & enumerations. Classes, object orientation & variables, control structures, selection structures, repetitions, Subs, functions & parameters, errors & exception handling, scope.

Unit-III Data & object structures, organizing the data, arrays, other data structures, collections, inheritance in VB, code inheritance, interface inheritance, inheriting the data structures, Visual inheritance, polymorphism.

Uint-IV Winform applications : Structure of application, Winform basics, user interface code & the form designer, tools for creating a user interface, dialog boxes & the other user interface options, other form styles, control collection, delegates and event handlers, visual inheritance.

Unit-V Windows controls, accessing controls, command control, Simple input controls, list controls, manipulating the controls at runtime. Graphics in Winform programs, object modeling : application structure, real worlds object modeling with object relationships, software patterns.

Unit-VI Storing application data, computer files, Windows registry, file storage, structured data, Serialization. Databases in Visual Basic. Net Object oriented database systems, Net support for relational database systems, data access in a three tiered system, reading & writing data.

Text Books:

Alisstair McMonnies : Object Oriented Programming in Visual Basic.NET, Pearson Education.

References:

1. Hamilton J.P. : OOP with Visual Basic.NET, O'Reilly Media Inc.
2. Reynolds-Haertle R.A. : OOP with Visual Basic.NET & Visual C#.NET, Microsoft Press.
3. Michael Halvorson : Microsoft Visual Basic.NET Step by Step, Microsoft Press.
4. Francesco Balena : Programming Microsoft Visual Basic.NET, Microsoft Press.

2 MCA 3 / 2 CS 3 SYSTEM ANALYSIS & DESIGN

UNIT I. Introduction : System Analysis & Design concepts. Role of system analyst. Review of System DLC. Organization as systems. Levels of management culture. Project fundamentals. Feasibility study. Activity planning & control. Managing analysis & design activities.

UNIT II. Sampling and investigating hard data. Interviewing. Planning & conducting interview & reporting. Joint application design. Using questionnaries. Planning designing and administering the questionnaire.

UNIT III. Coservation of a decision-makers behavior and office environment. Prototyping : User reactions. Approaches to prototyping & developing prototype. Data flow aproach to requirements. Developing DFDs. Logical & Physical DFDs. Examples of DFDs.

UNIT IV. Data dictionary concept. Data repository. Creating & using data dictionary. Overview of process specifications. Structured English, Decision tables/trees. Decision support system & decision making concepts relevant to DSS. Semi structured decisions. Multiple-criteria decision-making.

UNIT V. System Proposal : Ascertaining hardware/software needs. Identifying & forecasting cost/benefit & comparing cost/benefit. Writing and presenting the systems proposals. Principles of Delivery.

UNIT VI. Output Design Objectives. Designing printed output, Screen output. Input Design objectives. Form Design. Screen Design for input. Introduction to OOSAD. : Object-Oriented Analysis. Object-Oriented Design.

Text-book :

Kenneth E.Kendall & Julie E.Kendall : "System Analysis and Design" (Pearson Education) 3/e

References :

1. Yeates "System Analysis & Design" (Macmillan)
2. J.Fitgerald & A.Fitgerald. "Fundamentals of System Analysis & Design" (John-Wiley) 3/e
3. Edward "System Analysis & Design" (McGraw-Hill)
4. Whilten, Bentley, Barlow "System Analysis & Design Methods" (Galgotia) 2/e.

2MCA 4 / 2 CS 4 DATA COMMUNICATIONS

Unit-I : Data communication concepts, uses and applications. Telephone : Voice communication networks, Switches, PBX cellular technologies, Fax. IVR, Voice Mail.

Unit-II : Hardware; network architecture, Hosts, Clients, Circuits, Special purpose Communication Devices, FEP, Multiplexers, Protocol Coverters, Line adapters.

Unit-III : Data transmission : Coding, Transmission modes, Band width, Modulation, Modem : Types and Standards, PAM & PCM techniques, Connector cables.

Unit-IV : OSI model, MAC protocol; Controlled & contention-based, Error control in networks, Data link Protocols : asynchronous & synchronous Transmission effeciency.

Unit-V : Network Layer : Topologies. Network routing, Network Standards and network protocols : TCP/IP, IPX/SPX, X.25 & GOSIP protocols.

Unit-VI : LANs : uses and types, LAN components. Ethernet : topology, MAC, types, Token rings : topology, MAC, types, Other types of LANs, MAP (IEEE 802.4)., ArcNet, Apple Talk.LAN performance improvement, selecting a LAN.

Text Book :

1. J.Fitzgerald & A Denis Business Data Communication & Networking, (5/e) (John Wiley & Sons)

References:

1. Schweber: Data Communication (McGrawHill)
2. Miller : Digital & Data Communication (Jaico)

*****

2 MCA 5 BUSINESS SYSTEMS

Unit-I Introduction : Nature of business, objectives, components of business, environment of business system, business system and its sub-systems, forms of legal ownership : sole proprietership, partnership organisation, company form of organisation. Social responsibilities of business.

Unit-II Company Management : Structure of company management, patterns and problems of company management, company meetings & resolutions, company office - its organisation and management. Business combinations, Government & business.

Unit-III Production functions : Plant location, factory planning, production control and cost control, Budgets and budgetory control, purchasing and storekeeping.

Unit-IV Personnel functions : Personnel management; definition, role of personnel manager, job evaluation, merit rating. Industrial relations, Trade Unionism, employee remunerations, wage payments, incentives & wage policies.

Unit-V Financial functions : Financial planning, various sources of finance, institutions of industrial finance. Securities market.

Unit-VI Marketing functions : Marketing & its function, transport, selling or distributions of goods, channels of distribution, salesmanship, advertising and promotion.

Text Book :

M.C.Shukla : Business Organisation & Management, S. Chand & Company.

References:

1. P. Gopalkrishnan : Materials Management, PHI.
2. Reddy & Gulshan : Business Organisation & Management, S. Chand & Company.
3. R.C.Appleby : Modern Business Administration, 6/e, Macmillan.

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2 MCA 6/2CS6 DATA STRUCTURES & ALGORITHMS - LABORATORY

The sample list of program is given below. This list can be used as guideline for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected out comes. Further, C,C++ or Java may be used as the programming language.

1. Write an application to implement Tower of Hanoi Problem Algorithm.
2. Write an application to implement Abstract data type stack
3. Write an program to evaluate Post fix expression using stack
4. Write a program to implement Abstract data type queue.
5. Write a program to implement singly linked list that performs various operation such as insertion, deletion, searching a node in linear linked list.
6. Write a program to implement Preorder Traversal of a binary tree.
7. Write a Program to search a given element using Binary Search.
8. Write a Program to implement Selection Sort.
9. Write a Program to implement Merge Sort.
10. Write a Program to Perform insertion or search in a specified level of a stack implemented tree- structured symbol table.

*****

2 MCA 7 / 2 CS 7 Object Oriented Programming Labs:

Minimum ten programming assignments should be completed based on above syllabus.

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2MCA 8 / 2 CS 8 SYSTEM ANALYSIS & DESIGN LAB.

8 to 10 Examples of SAD from text book covering each unit of syllabus, using any available SAD tool, as from one available with text book.

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2MCA 9 COMPUTER LABORATORY-II

In this lab, the students have to develop a mini project based on any technology they have learnt. They have to properly follow and practice the system development life cycle. They will have to prepare a project report and submit it as a completion of this lab.

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APPENDIX-A
THREE YEAR POST GRADUATE DEGREE COURSE IN MASTER IN COMPUTER APPLICATION
SEMESTER PATTERN
CREDIT GRADE SYSTEM
FIRST YEAR SEMESTER-I

Sr.No.	Subject Code		Teaching Scheme					Examination Scheme							
			Hours/Week					Theory				Practical			
			Lecture	Tutorial	P/D	Total Hours/ Week	**Credits**	Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assessment	Total	Min.Passing Marks	Max.Marks External	Max.Marks Internal	Total	Min. Passing Marks
1	1MCA1	Computer Organization	4	0	0	4	4	3	80	20	100	40	_	_	_	_
2	1MCA2	Problem Solving Using C++	4	0	0	4	4	3	80	20	100	40	_	_	_	_
3	1MCA3	Computer Oriented Statistical Methods	4	0	0	4	4	3	80	20	100	40	_	_	_	_
4	1MCA4	Principles of Management	4	0	0	4	4	3	80	20	100	40	_	_	_	_
5	1MCA5	Communication Skills	4	0	0	4	4	3	80	20	100	40	_	_	_	_
6	1MCA6	Problem Solving Using C++-Lab.	0	0	2	2	1	_	_	_	_	_	25	25	50	25
7	1MCA7	Computer Oriented Statistical Methods-Lab	0	0	2	2	1	_	_	_	_	_	25	25	50	25
8	1MCA8	Communication Skills-Lab.	0	0	2	2	1	_	_	_	_	_	25	25	50	25
9	1MCA9	Computer Lab-I	0	0	4	4	2	_	_	_	_	_	50	50	50	50
	TOTAL		20	0	10	30	25				500				250	

TOTAL : 750

APPENDIX-A
THREE YEAR POST GRADUATE DEGREE COURSE IN MASTER IN COMPUTER APPLICATION
SEMESTER PATTERN
CREDIT GRADE SYSTEM
FIRST YEAR SEMESTER-II

Sr.No.	Subject Code		Teaching Scheme					Examination Scheme							
			Hours/Week					Theory			Practical				
			Lecture	Tutorial	P/D	Total Hours/ Week	**Credits**	Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assessment	Total	Min.Passing Marks	Max.Marks External	Max.Marks Internal	Total	Min. Passing Marks
1	2MCA1	Data Structure & Algorithms	4	0	0	4	4	3	80	20	100	40	_	_	_	_
2	2MCA2	Object Oriented Programming	4	0	0	4	4	3	80	20	100	40	_	_	_	_
3	2MCA3	System Analysis & Design	4	0	0	4	4	3	80	20	100	40	_	_	_	_
4	2MCA4	Data Communication	4	0	0	4	4	3	80	20	100	40	_	_	_	_
5	2MCA5	Business Systems	4	0	0	4	4	3	80	20	100	40	_	_	_	_
6	2MCA6	Data Structure & Algorithms-Lab.	0	0	2	2	1	_	_	_	_	_	25	25	50	25
7	2MCA7	Object Oriented Programming-Lab.	0	0	2	2	1	_	_	_	_	_	25	25	50	25
8	2MCA8	System Analysis & Design-Lab.	0	0	2	2	1	_	_	_	_	_	25	25	50	25
9	2MCA9	Computer Lab-II	0	0	4	4	2	_	_	_	_	_	50	50	100	50
	TOTAL		20	0	10	30	25				500				250	
															TOTAL :	**750**

APPENDIX-A
THREE YEAR POST GRADUATE DEGREE COURSE IN MASTER IN COMPUTER APPLICATION
SEMESTER PATTERN
CREDIT GRADE SYSTEM
SECOND YEAR SEMESTER-I

Sr.No.	Subject Code		Teaching Scheme					Examination Scheme							
			Hours/Week					Theory				Practical			
			Lecture	Tutorial	P/D	Total Hours/ Week	**Credits**	Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assessment	Total	Min.Passing Marks	Max.Marks External	Max.Marks Internal	Total	Min. Passing Marks
1	3MCA1	Operating Systems	4	0	0	4	4	3	80	20	100	40	_	_	_	_
2	3MCA2	File Structure & Data Processing	4	0	0	4	4	3	80	20	100	40	_	_	_	_
3	3MCA3	Java Programming	4	0	0	4	4	3	80	20	100	40	_	_	_	_
4	3MCA4	Computer Networks	4	0	0	4	4	3	80	20	100	40	_	_	_	_
5	3MCA5	Computer Oriented Optimization Techniques	4	0	0	4	4	3	80	20	100	40	_	_	_	_
6	3MCA6	File Structure & Data Processing-Lab.	0	0	2	2	1	_	_	_	_	_	25	25	50	25
7	3MCA7	Java Programming-Lab.	0	0	2	2	1	_	_	_	_	_	25	25	50	25
8	3MCA8	Computer Oriented Optimization Techniques-Lab.	0	0	2	2	1	_	_	_	_	_	25	25	50	25
9	3MCA9	Computer Lab-III	0	0	4	4	2	_	_	_	_	_	50	50	100	50
	TOTAL		20	0	10	30	25				500				250	

TOTAL : 750

APPENDIX-A
THREE YEAR POST GRADUATE DEGREE COURSE IN MASTER IN COMPUTER APPLICATION
SEMESTER PATTERN
CREDIT GRADE SYSTEM
SECOND YEAR SEMESTER-II

Sr.No.	Subject Code		Teaching Scheme					Examination Scheme								
			Hours/Week							Theory			Practical			
			Lecture	Tutorial	P/D	Total Hours/ Week	**Credits**	Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assessment	Total	Min.Passing Marks	Max.Marks External	Max.Marks Internal	Total	Min. Passing Marks
1	4MCA1	Database Management Systems	4	0	0	4	4	3	80	20	100	40	_	_	_	_
2	4MCA2	Client Server Computing	4	0	0	4	4	3	80	20	100	40	_	_	_	_
3	4MCA3	Multimedia Technologies	4	0	0	4	4	3	80	20	100	40	_	_	_	_
4	4MCA4	Electronic Commerce	4	0	0	4	4	3	80	20	100	40	_	_	_	_
5	4MCA5	Elective-I	4	0	0	4	4	3	80	20	100	40	_	_	_	_
6	4MCA6	Database Management Systems-Lab.	0	0	2	2	1	_	_	_	_	_	25	25	50	25
7	4MCA7	Client Server Computing-Lab.	0	0	2	2	1	_	_	_	_	_	25	25	50	25
8	4MCA8	Multimedia Technologies-Lab.	0	0	2	2	1	_	_	_	_	_	25	25	50	25
9	4MCA9	Electronic Commerce-Lab.	0	0	2	2	1	_	_	_	_	_	25	25	50	25
10	4MCA10	Seminar	2	0	0	2	1	_	_	_	_	_	--	50	50	25
	TOTAL		22	0	8	30	25				500				250	
															TOTAL :	**750**

Elective-I : 1) Computer Graphics 2) Modelling & Simulation

APPENDIX-A
THREE YEAR POST GRADUATE DEGREE COURSE IN MASTER IN COMPUTER APPLICATION
SEMESTER PATTERN
CREDIT GRADE SYSTEM
THIRD YEAR SEMESTER-I

Sr.No.	Subject Code		Teaching Scheme					Examination Scheme								
			Hours/Week					Theory				Practical				
			Lecture	Tutorial	P/D	Total Hours/ Week	**Credits**	Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assessment	Total	Min.Passing Marks	Max.Marks External	Max.Marks Internal	Total	Min. Passing Marks
1	5MCA1	Artificial Intelligence	4	0	0	4	4	3	80	20	100	40	_	_	_	_
2	5MCA2	Software Project Management	4	0	0	4	4	3	80	20	100	40	_	_	_	_
3	5MCA3	System Administration & Security	4	0	0	4	4	3	80	20	100	40	_	_	_	_
4	5MCA4	Management Information System	4	0	0	4	4	3	80	20	100	40	_	_	_	_
5	5MCA5	Elective-II	4	0	0	4	4	3	80	20	100	40	_	_	_	_
6	5MCA6	Artificial Intelligence-Lab.	0	0	2	2	1	_	_	_	_	_	25	25	50	25
7	5MCA7	Software Project Management-Lab.	0	0	2	2	1	_	_	_	_	_	25	25	50	25
8	5MCA8	System Administration & Security-Lab.	0	0	2	2	1	_	_	_	_	_	25	25	50	25
9	5MCA9	Mini Project	0	0	4	4	2	_	_	_	_	_	25	25	50	25
	TOTAL		20	0	10	30	25				500				250	
															TOTAL :	**750**

Elective-II : 1) Data Warehousing 2) Bioinformatics

APPENDIX-A
THREE YEAR POST GRADUATE DEGREE COURSE IN MASTER IN COMPUTER APPLICATION
SEMESTER PATTERN
CREDIT GRADE SYSTEM
THIRD YEAR SEMESTER-II

Sr.No.	Subject Code	Subject	Teaching Scheme				Examination Scheme									
			Hours/Week						Theory				Practical			
			Lecture	Tutorial	P/D	Total Hours/ Week	**Credits**	Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assessment	Total	Min.Passing Marks	Max.Marks External	Max.Marks Internal	Total	Min. Passing Marks
1	6MCA1	PROJECT & DISSERTATION	FULL TIME				25	--	_	_	_	_	150	100	250	150

TOTAL : 250

DIRECTION

No. 33/2010 Date : 24/6 /2010

Subject : Examinations leading to the Degree of Master in Computer Application (Three Year Course .... Bi-Annual Pattern .... Credit Grade System)

Whereas the schemes of teaching & examinations of Master in Computer Application course has been accepted by the Academic Council vide Item No. 49 (J) in its meeting held on 28-05-2010 as per the Credit Grade System for its implementation from the Academic Session 2010-2011,

AND

Whereas admissions to the First Year of Master in Computer Application course are to be made in the Academic Session 2010-2011,

AND

Whereas the matter for admission of the students at the examinations is required to be regulated by an Ordinance,

AND

Whereas the schemes of teaching & examinations of I and II Semesters of Master in Computer Application course are to be implemented from the academic session 2010-2011,

AND

Whereas the schemes of teaching & examinations are required to be regulated by the Regulation,

AND

Whereas the process of making an Ordinance and the Regulation is likely to take some time,

AND

Whereas syllabus for I and II Semesters of Master in Computer Application course is to be sent for printing.

Now, therefore, I, Dr.Ku.Kamal Singh, Vice-Chancellor of Sant Gadge Baba Amravati University in exercise of powers confirmed upon me under sub section (8) of Section 14 of the Maharashtra Universities Act, 1994, hereby direct as under :

1. This Direction may be called "Examinations leading to the Degree of Master in Computer Application (Three Year Course .... Bi-Annual Pattern .... Credit Grade System) Direction, 2010.
2. This Direction shall come into force w.e.f. the session :-
   - i) 2010-2011 for First Year,
   - ii) 2011-2012 for Second Year, and
   - iii) 2012-2013 for Third Year

3. Subject to their compliance with the provisions of this Direction and other ordinances in force from time to time, the following person shall be eligible for admission to MCA.
   - (a) Graduate in any Discipline with minimum 50% marks and Math upto 10+2 level (5% Relaxation for B.C.)
   - (b) A person passing a PGDCS Exam. of Sant Gadge Baba Amravati University, satisfying the condition given in "a" above are eligible to take admission directly at second year of MCA (subject to condition of availability of seats, in total intake capacity) subject to condition that he will pass the subject heads of 1st MCA not covered at PGDCS level.
4. (i) Duration of the course shall be three academic years.
   - (ii) Courses of First year MCA, Second year MCA and Third year MCA are divided into two parts every year i.e. part-I and part-II and the University shall held Examination in Winter and in Summer every year for both the Part-I & II.
   - (iii) The main Examination of Part-I shall be held in Winter & the Main Examination of Part-II shall be held in Summer every year. The Supplementary examination for Part-I shall be held in Summer and the Supplementary Examination for Part-II shall be held in Winter every year.
5. For purposes of instruction and examination the student shall study sequentially.
6. The period of academic session/term shall be such as may be notified by the University.
7. The Examinations shall be held at such places and on such dates as may be notified by the University.
8. Subject to his/her compliance with the provisions of this Direction and of other Ordinances (Pertaining to Examinations in General) in force from time to time, the applicant for admission, at the end of the course of study of a particular term shall be eligible to appear at it, if,
   - i) He/She satisfied the condition in the table and the provision thereunder.
   - ii) He/She was prosecuted a regular course of study in the University/College affiliated to the University.
   - iii) He/She has in the opinion of the Head of the Department/Principal shown satisfactory progress in his/her studies.

Name of Exam	The student should have passed the examination of	The student should have completed the session / term satisfactorily
1.	2.	3.
First Year MCA Part-I	The qualifying Examination mentioned in para-3	First Yr. MCA Part-I
First Year MCA Part-II		First Yr. MCA Part-I & II
Second Year MCA Part-I		Second Year MCA Part-I
Second Year MCA Part-II		Second Year MCA Part I & II
Third Year MCA Part - I	Shall have cleared Ist of MCA & qualified for admission to Third Year as per para-4	Third year MCA Part-I
Third Year MCA Part - II		Third Year MCA Part-I & II

9. The schemes of teaching & examinations shall be as provided under "Appendix-A" appended with this Direction.

10. i) The scope of the subject is as indicated in the syllabus.
    ii) The medium of instruction and examination shall be English.

11. The fees for each M.C.A. Examinations (Theory & Practical) shall be as prescribed by University from time to time.

12. The computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA) of an examinee shall be as given below :-

The marks will be given in all examinations which will include college assessment marks and the total marks for each Theory / Practical shall be converted into Grades as per Table II.

SGPA shall be calculated based on Grade Points corresponding to Grade as given in Table II and the Credits allotted to respective Theory / Practical shown in the scheme for respective semester.

SGPA shall be computed for First Year (Part I & II), Second Year (Part I & II) and Third Year (Part I & II) and CGPA shall be computed in Third Year (Part II) based on SGPAs of First Year (Part I & II), Second Year (Part I & II) and Third Year (Part I & II). :-

$$SGPA = \frac{C_1 \times G_1 + C_2 \times G_2 + ... + C_n \times G_n}{C_1 + C_2 + ... + C_n}$$

Where C_1 = Credit of individual Theory / Practial

G_1 = Corresponding Grade Point obtained in the respective Theory / Practical

$$CGPA = \frac{(SGPA)_{\text{First Year Part-I}} \times (Cr)_{\text{First Year Part-I}} + ... + (SGPA)_{\text{Third Year Part-II}} \times (Cr)_{\text{Third Year Part-II}}}{(Cr)_{\text{First Year Part-I}} + ... + (Cr)_{\text{Third Year Part-II}}}$$

Where $(SGPA)_{\text{First Year Part-I to Third Year Part-II}}$ = SGPA of First Year Part-I to Third Year Part-II

$(Cr)_{\text{First Year Part-I to Third Year Part-II}}$ = Total Credits for First Year Part-I to Third Year Part-II

CGPA equal to 6.00 and above shall be considered as equivalent to First Class which shall be mentioned on Grade Card of Third Year Part-II as a foot note.**TABLE II**

THEORY

Grade	Percentage of Marks	Grade Points
AA	80 ≤ Marks ≤ 100	10
AB	70 ≤ Marks < 80	9
BB	60 ≤ Marks < 70	8
BC	55 ≤ Marks < 60	7
CC	50 ≤ Marks < 55	6
CD	45 ≤ Marks < 50	5
DD	40 ≤ Marks < 45	4
FF	00 ≤ Marks < 40	0
ZZ	Absent in Examination	—

PRACTICAL

Grade	Percentage of Marks	Grade Points
AA	85 ≤ Marks ≤ 100	10
AB	80 ≤ Marks < 85	9
BB	75 ≤ Marks < 80	8
BC	70 ≤ Marks < 75	7
CC	65 ≤ Marks < 70	6
CD	60 ≤ Marks < 65	5
DD	50 ≤ Marks < 60	4
FF	00 ≤ Marks < 50	0
ZZ	Absent in Examination	—

13. Provisions of Ordinance No.18 of 2001 in respect of an Ordinance to provide grace marks for passing in a Head of passing and improvement of Division (Higher Class) and getting distinction in the subject and condonation of deficiency of marks in a subject in all the faculties prescribed by the Statute No.18, Ordinance, 2001 shall apply to each examination under this Direction.

14. An examinee who does not pass or who fails to present himself/ herself for the examination shall be eligible for readmission to the same examination, on payment of fresh fees and such other fees as may be prescribed.

15. As soon as possible after the examination, the Board of Examinations shall publish a result of the examinees. The result of final MCA Examination shall be classified as above and meritlist shall be notified as per Ordinance No.6.

16. Notwithstanding anything to the contrary in this Direction, no person shall be admitted to an examination under this Direction, if he/she has already passed the same examination or an equivalent examination of any statutory University.

17. i) The examinees who have passed in all the subjects prescribed for all the examinations shall be eligible for award of the Degree of Master in Computer Application.

    ii) An examinee successful at the examination shall on payment of prescribed fees receive a degree in prescribed form signed by the Vice-Chancellor.

Sd/-
Dr. Kamal Singh
Vice-Chancellor

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SANT GADGE BABA AMRAVATI UNIVERSITY.

SPECIAL NOTE FOR INFORMATION OF THE STUDENTS

(1) Notwithstanding anything to the contrary, it is notified for general information and guidance of all concerned that a person, who has passed the qualifying examination and is eligible for admission only to the corresponding next higher examination as an ex-student or an external candidate, shall be examined in accordance with the syllabus of such next higher examination in force at the time of such examination in such subjects papers or combination of papers in which students from University Departments or Colleges are to be examined by the University.

(2) Be it known to all the students desirous to take examination/s for which this prospectus has been prescribed should, if found necessary for any other information regarding examinations etc., refer the University Ordinances Booklet the various conditions/provisions pertaining to examination as prescribed in the following Ordinances.

Ordinance No. 1	:	Enrolment of Students.
Ordinance No. 2	:	Admission of Students
Ordinance No. 4	:	National cadet corps
Ordinance No. 6	:	Examinations in General (relevent extracts)
Ordinance No. 18/2001	:	An Ordinance to provide grace marks for passing in a Head of passing and Inprovement of Division (Higher Class) and getting Distinction in the subject and condonation of defficiency of marks in a subject in all the faculties prescribed by the Statute, No.18, Ordinance, 2001.
Ordinance No. 9	:	Conduct of Examinations (relevent extracts)
Ordinance No. 10	:	Providing for Exemptions and Compartments
Ordinance No. 19	:	Admission of Candidates to Degrees.

Ordinance No. 109	:	Recording of a change of name of a University student in the records of the University.
Ordinance No. 6/2008	:	For improvement of Division/Grade.
Ordinance No.19/2001	:	An Ordinance for Central Assessment Programme, Scheme of Evaluation and Moderation of answerbooks and preparation of results of the examinations, conducted by the University, Ordinance 2001.

Dineshkumar Joshi
Registrar
Sant Gadge Baba
Amravati University.