



List of Revised Courses

Department : *Biotechnology*

Program Name : *B.Sc.*

Academic Year : *2017-18*

List of Revised Courses

Sr. No.	Course Code	Name of the Course
1.	LBTC 402	Paper-2 Biophysical Techniques
2.	LBTC 502	Animal & Plant biotechnology (core)
3.	LBTC 503	Bioinformatics (Core)
4.	LBTC 504	a) Medical Diagnostics (Elective)
5.	LBTC 505	b) Biotechnology in Crop improvement (Elective)
6.	LBTC 506	Laboratory – 1
7.	LBTC 507	Laboratory - 2
8.	LBTC 601	Industrial Biotechnology (core)
9.	LBTC 602	Biosafety, Bioethics & IPR (core)
10.	LBTC 603	a) Fermentation Technology (Elective)
11.	LBTC 604	b) Gene therapy (Elective)
12.	LBTC 605	Laboratory - 1
13.	LBTC 606	Dissertation on electives



Minutes of Meetings (MoM) of Board of Studies (BoS)

Academic Year : 2017-18

School : School of Studies of Interdisciplinary Education and Research

Department : Biotechnology

Date and Time : 13-04-2017 - 12:00 Noon

Venue : Room of Head, Department of Biotechnology

MINUTES OF THE MEETING OF BOARD OF STUDIES IN BIOTECHNOLOGY
HELD ON 13/04/2017

A Meeting of the BOS was held on 13/04/2017 at 12:00 Noon to discuss the following:

- To discuss and approve the course structure and scheme of examination of Int. UG/PG, M.Sc. and Ph. D courses in Biotechnology and following members were present:
- Any other matter by permission of the Chair.
 - Dr. Renu Bhatt, Head
 - Prof. B.N. Tiwary, Professor
 - Prof. Ragini Gothwal,
 - Ms. Alka Ekka, Assistant Professor

Chairman
Member
Expert
Member

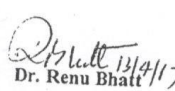
At the very outset the HOD and Chairman of BOS welcomed all the esteemed members and placed the draft prepared to revise course structure and scheme of examination in the light of UGC directives as per CBCS scheme to be implemented from 2017-18. The Syllabus of M.Sc Biotechnology and Pre Ph.D course work was also updated and placed before the committee.

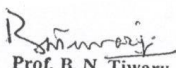
The course structure and scheme of examination was discussed and approved by all the members.

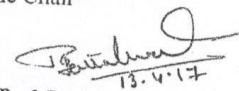
The chairman categorically pointed out that in the UG courses only 03 core subjects have to be defined and the student shall have to opt for honors subject in Ist semester only.

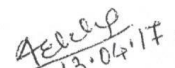
Group A: Biotechnology-Chemistry-Zoology
Group B: Biotechnology-Chemistry-Botany

The meeting ended with a vote of thanks by the Chair


Dr. Renu Bhatt
Chairman


Prof. B. N. Tiwary
Member


Prof. Ragini Gothwal
Expert


Ms. Alka Ekka
Member



In the meeting of BOS-Biotechnology held on 13-40-2017, the following courses were revised in the of Syllabus of B. Sc. and M.Sc. Ph.D. Course work:

Sr. No.	Course Code	Name of the Course
1.	LBTC 402	Paper-2 Biophysical Techniques
2.	LBTC 502	Animal & Plant biotechnology (core)
3.	LBTC 503	Bioinformatics (Core)
4.	LBTC 504	a) Medical Diagnostics (Elective)
5.	LBTC 505	b) Biotechnology in Crop improvement (Elective)
6.	LBTC 506	Laboratory – 1
7.	LBTC 507	Laboratory - 2
8.	LBTC 601	Industrial Biotechnology (core)
9.	LBTC 602	Biosafety, Bioethics & IPR (core)
10.	LBTC 603	a) Fermentation Technology (Elective)
11.	LBTC 604	b) Gene therapy (Elective)
12.	LBTC 605	Laboratory - 1
13.	LBTC 606	Dissertation on electives
14.	LBTC 701	Cell Biology
15.	LBTC 702	Microbiology
16.	LBTC 705	Laboratory - 1
17.	LBTC 801	Molecular Biology
18.	LBTC 802	Immunology
19.	LBTC 803	Bio techniques
20.	LBTC 804	Enzymology and Enzyme Technology
21.	LBTC 805	Laboratory– 1
22.	LBTC 806	Laboratory -2
23.	LBTC 902	Microbial Biotechnology (Core)
24.	LBTC 903	Animal Biotechnology (Core)



25.	LBTC 904	a) Bioprocess Technology (Elective)
26.	LBTC 905	b) Genomics & Proteomics (Elective)
27.	LBTC 906	c) Molecular Diagnostics (Elective)
28.	LBTC 907	d) Food Technology (Elective)
29.	LBTC 908	Laboratory -1
30.	LBTC 909	Laboratory -2
31.	LBTC 1001	Bioinformatics & Statistics (Core)
32.	LBTC 1002	a) Plant metabolic Engineering (Elective)
33.	LBTC 1003	b) Gene Therapy & Nanomedicine (Elective)
34.	LBTC 1004	c) Industrial & Fermentation Technology (Elective)
35.	LBTC 1005	d) Immunotechniques (Elective)
36.	LBTC 1006	e) Entrepreneurship Management in Biotechnology (Elective)
37.	Paper2	Analytical and Separation Techniques

The following new courses were introduced in the Syllabus of B. Sc. and M.Sc. Ph.D. Course work:

Course Code	Course Name
LBTC 502	Animal & Plant biotechnology (core)
LBTC 601	Industrial Biotechnology (core)
LBTC 602	Biosafety, Bioethics & IPR (core)
LBTC 603	a) Fermentation Technology (Elective)
LBTC 604	b) Gene therapy (Elective)
LBTC 605	Laboratory - 1
LBTC 606	Dissertation on electives
LBTC 701	Cell Biology
LBTC 702	Microbiology
LBTC 705	Laboratory - 1
LBTC 801	Molecular Biology

गुरु घासीदास विश्वविद्यालय
(केन्द्रीय विश्वविद्यालय अधिनियम 2009 क्र. 25 के अंतर्गत स्थापित केन्द्रीय विश्वविद्यालय)
कोनी, बिलासपुर - 495009 (छ.ग.)



Guru Ghasidas Vishwavidyalaya
(A Central University Established by the Central Universities Act 2009 No. 25 of 2009)
Koni, Bilaspur - 495009 (C.G.)

LBTC 803	Bio techniques
LBTC 902	Microbial Biotechnology (Core)
LBTC 904	a) Bioprocess Technology (Elective)
LBTC 905	b) Genomics & Proteomics (Elective)
LBTC 907	d) Food Technology (Elective)
LBTC 1001	Bioinformatics & Statistics (Core)
LBTC 1002	a) Plant metabolic Engineering (Elective)
LBTC 1004	c) Industrial & Fermentation Technology (Elective)
LBTC 1005	d) Immunotechniques (Elective)

Signature & Seal of HoD

विभागाध्यक्ष, जैव प्रौद्योगिकी विभाग
Head, Department of Biotechnology
गुरु घासीदास विश्वविद्यालय, बिलासपुर (छ.ग.)
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)



Scheme and Syllabus

Integrated UG/PGSemester - IV					
Code	Course Opted	Subject	Hours/ Semester	Hours/ Week	Credits
LBTC 401	Core-1	Paper-1 Immunology	32	2	2
LBTC 402		Paper-2 Biophysical Techniques	32	2	2
	Core-2	Zoology/Botany Paper-1	32	2	2
		Zoology/Botany Paper-2	32	2	2
	Core-3	Chemistry Paper-1	32	2	2
		Chemistry Paper-2	32	2	2
	Skill Enhancement Course-1				
		Environmental Sciences-II	32	2	2
		Disaster Management (incorporate only if common syllabus or Academic council decision)	32	2	2
LBTC 403	Lab - 1	Laboratory - 1 (Based on Core - 1)	64	4	2
	Lab - 2	Laboratory - 2 (Based on Core - 2)	64	4	2
	Lab - 3	Laboratory - 3 (Based on Core - 3)	64	4	2
		Total	448	32	22

*Student can opt any one out of the three core papers (Biotechnology, Botany/Zoology and Chemistry) as the honours (Subject to the availability of the seats as approved by the Academic Council)

*The decision of the Dean of the school and the Head of the respective Department will be final



Integrated UG/PG V Semester					
Code	Course opted	Subjects	Hours/ semester	Hours/ week	Credits
LBTC 501	Core -1	Genetic Engineering	48	03	03
LBTC 502	Core -2	Animal & Plant biotechnology	48	03	03
LBTC 503	Core -3	Bioinformatics	48	03	03
LBTC 504	Elective	a) Medical Diagnostics	48	03	03
LBTC 505		b) Biotechnology in Crop improvement			
		Laboratory			
LBTC 506	Lab 01	Laboratory - 1 (based on Core -1 & Core -2)	96	06	03
LBTC 507	Lab 02	Laboratory - 2 (based on Core -3 & Elective)	96	06	03
LBTC 508	Seminar	Seminar based on elective	32	02	02
		Total	806	26	20

Integrated UG/PG VI Semester					
Code	Course opted	Subjects	Hours/ semester	Hours/ week	Credits
LBTC 601	Core -1	Industrial Biotechnology	48	03	03
LBTC 602	Core -2	Biosafety, Bioethics & IPR	48	03	03
LBTC 603	Elective	a) Fermentation Technology	48	03	03
LBTC 604		b) Gene therapy			
		Laboratory			
LBTC 605	Lab 01	Laboratory - 1 (based on Core -1 & Core -2)	96	06	03
LBTC 606	Lab 02	Dissertation on electives	192	12	06
		Total	384	27	18

PG I Semester/ Integ. UG/PG VII Semester					
code	Course opted	Subjects	Hours/ semester	Hours/ week	Credits
LBTC 701	Core -1	Cell Biology	48	03	03
LBTC 702	Core -2	Microbiology	48	03	03
LBTC 703	Core -3	Biochemistry (Regulation & Metabolism)	48	03	03
LBTC 704	Core -4	Recombinant DNA Technology	48	03	03
		Laboratory			
LBTC 705	Lab 01	Laboratory - 1 (based on Core -1 & Core -2)	96	06	03
LBTC 706	Lab 02	Laboratory - 2 (based on Core -3 & Core -4)	96	06	03
		Total	384	24	18

Shakti
13/04/17

Prakash
13.4.17

Ashok
13.04.17



Integ. UG/PG IV Semester, Core - 1
Course: Biophysical Techniques
Course Code: LBTC 402
Course Credit: (2-0-0) 2

Unit - 1

General biophysical methods – Measurement of pH, buffers, Henderson – Hasselbalch equation, isoelectric point

Unit - 2

Separation & identification of biomolecules - concept of chromatography their types and applications, electrophoresis- types and application

Unit - 3

Centrifugation – Basic principle of centrifugation, types and application, instrumentation of ultracentrifuge and application

Unit - 4

Microscopy – light microscopy, bright & dark field microscopy, fluorescence microscopy, phase contrast microscopy, TEM, SEM

Unit - 5

Spectroscopy: Principle, types and instrumentation, (colorimeter, UV-Visible spectrophotometer, InfraRed spectrophotometer), Techniques of radioactivity and radioactivelabeling, Counting- Scintillation counters, Geiger-Muller counter, autoradiography.

Evaluation Scheme:

S.No.	Examination	Duration	% of Marks
1	Internal Assessment I	1 hour	15
2	Internal Assessment II	1 hour	15
3	End Semester	3 hours	30
4	Attendance/Assignment/Class performance	Each semester	5

Note: The best one out of two Internal Assessment will be taken into consideration.

Suggested Readings

1. Biochemical Techniques theory and practice: White R
2. Analytical Chemistry: Christian GD
3. An Introduction to Practical Biochemistry: Plummer DT
4. Undergraduate Instrumental Analysis: Robinsan, JW
5. Essentials of Biophysics: Narayanan, P
6. A Text Book of Biophysics: Roy RN
7. Biophysical chemistry: Upadhy and Nath

Patel
13.6.12

Ashish
13.04.17



Integrated UG/PG V Sem, Elective
Course: a) Medical Diagnostics
Course Code: LBTC 504
Course Credit: (3-0-0) 3

Unit-1

Introduction to medical diagnostics, methods of separation of molecule and cells, Methods of cell counting, Assays for estimation of biomolecules.

Unit-2

Analysis of body fluids, methods of body fluid collection, Process and investigation of basic hematology, blood transfusion, Blood banking, Urine analysis, Feces and sputum analysis,

Unit-3

Diagnostics methods for genetic disorders, chromosomal abnormalities: structural and numerical, karyotyping.

Dr. Mittal
13.4.17

J. Prasad
13.4.17

A. K. Singh
13.04.17

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Unit-4

Methods of diagnostic imaging: X-Ray, USG, CT, MRI, SPECT, targeted imaging.

Unit-5

Introduction to histopathology, preparation of histological slides and analysis, cytological investigations. Kit-based methods for diagnosis of hepatitis, blood Sugar Level etc.



Integrated UG/PG V Sem, Elective

Course: b) Biotechnology in Crop improvement
Course Code: LBTC 505
Course Credit: (3-0-0) 3

Unit-1

Basic techniques and tools of plant tissue culture: Establishment of plant tissue culture lab: equipment, culture vessels, Composition of various tissue culture media and their preparation surface sterilization of various explants, pretreatment of explant, subculture and repeated transfer of explants and cultures, Hardening.

Unit-2

Culture techniques: Meristem tip culture, anther, embryo and ovule culture, callus culture, suspension cultures, Single cell culture, organogenesis and embryogenesis, Artificial seed (synthetic seed)

Unit-3

Tissue culture in crop improvement: Somaclonal variation, Somatic hybridization, Haploids in plant breeding Protoplast culture: Importance, Isolation of protoplasts, method of protoplast culture, culture media, Growth and division of protoplast, regeneration of plants, Production of virus-free plants

Unit-4

Transgenic plant: features of Ti and Ri plasmids, mechanisms of transformation, vectors and promoters, genetic markers, reporter genes, transformation, Herbicide and insect resistance transgenic plant, gene silencing

Amk
13-4-17

Parul
13-6-17

Abhishek
13-04-17

17

Unit-5

Biofertilizers, Plant growth promoting rhizobacteria, Biological control, Biopesticides- types and application, Integrated Pest Management (IPM)



Integrated UG/PG V Sem, Lab - 1

Course: Laboratory -1(Based on Core -1 & Core -2)

Course Code: LBTC 506

Course Credit: (0-0-6) 3

Evaluation Scheme:

S.No.	Examination	Duration	% of Marks
1	Internal Assessment I	3 hour	15
2	Internal Assessment II	3 hour	15
3	End Semester	6 hours	30
4	Attendance/Assignment/Class performance	Each semester	5

Note: The best one out of two Internal Assessments will be taken

Integrated UG/PG V Sem, Lab - 2

Course: Laboratory -1(Based on Core -3 & Elective)

Course Code: LBTC 507

Course Credit: (0-0-6) 3

Evaluation Scheme:

S.No.	Examination	Duration	% of Marks
1	Internal Assessment I	3 hour	15
2	Internal Assessment II	3 hour	15
3	End Semester	6 hours	30
4	Attendance/Assignment/Class performance	Each semester	5

Note: The best one out of two Internal Assessments will be taken

Integrated UG/PG V Sem, Seminar

Pratik
13.4.17

J. Prakash
13.4.17

A. K. Upadhyay
13.04.17



Integrated UG/PG VI Sem, Core-1
Course: Industrial Biotechnology
Course Code: LBTC 601
Course Credit: (3-0-0) 3

Unit - 1

Bioreactor / Fermenter – types and working of Fermenters (Stirred tank, bubble columns, airlift, Bioreactors, Static, Submerged and agitated fermentation),

Unit - 2

Solid substrate fermentation & submerged fermentations, Raw materials for fermentation, microbial Biomass production, principles of malt and brewing industry

Unit - 3

Enzyme technology – nature of enzymes, Industrial applications of enzyme, immobilized enzymes, limitations of microbial cells used as catalysts in fermentation, multi-enzyme reactors, protein engineering of enzymes

Unit - 4

Upstream processing (Strain selection, Sterilization), Downstream processing – extraction, separation, concentration, recovery & purification, operations of fermentation products.

Unit - 5

Production of recombinant proteins having therapeutic and diagnostic applications, vaccines. Bioprocess strategies in Plant Cell and Animal Cell culture

Evaluation Scheme:

S.No.	Examination	Duration	% of Marks
1	Internal Assessment I	1 hour	15
2	Internal Assessment II	1 hour	15
3	End Semester	3 hours	30
4	Attendance/Assignment/Class performance	Each semester	5

Note: The best one out of two Internal Assessments will be taken into consideration.

Suggested Readings

1. Frontiers in Microbial Technology: Bisen PS
2. Industrial Microbiology: Prescott and Dunn
3. A text of Industrial Microbiology: Crueger W and Crueger A
4. Principles of Fermentation Technology: Stanbury PF, Ehitaker H, Hall SJ
5. Fermentation Biotechnology: Mansi
6. Principle of fermentation technology: Stanbury PF

Integrated UG/PG VI Sem, Core-2

Abhijit
13.4.17

Pratishtha
13.4.17

Ashish
13.04.17



Course: Biosafety, IPR & Bioethics
Course Code: LBTC 602
Course Credit: (3-0-0) 3

Unit - 1

Biosafety-Good Lab Practices, Introduction to Biological Safety Cabinets, GMOs and LMOs and their environmental impact, Roles of Institutional Biosafety Committee, RCGM, GEAC, etc. Hazardous Materials used in Biotechnology, their Handling and Disposal.

Unit- 2

Introduction to Intellectual Property: Concept of Intellectual Property Kinds of Intellectual Property Patents, Copyrights, Designs, Trademarks, Geographical Indication, Infringement of IPR, protection and Remedies, Licensing and its types.

Unit-3

Introduction to the leading International instruments concerning intellectual property rights, The Berne Convention, GATT, WTO, Universal Copyright Convention, The Paris Convention, TRIPS, The World Intellectual Property Rights Organization (WIPO), Budapest treaty, Patent infringement, Biological Patentability, Patenting Living Organisms.

Unit-4

Patents: Requirement of patentable novelty, Inventive step, Prior art Classifying products as patentable and non-patentable, Procedure for applying for patent, Indian Patent Act, Traditional Knowledge, Commercial Exploitation, and Protection, Biopiracy and Bioprospecting.

Unit-5

Introduction to Bioethics, Legal and Socio-economic impacts of Biotechnology, Ethical, Legal and Social Implications of Human Genome Project, Bioethics in Biodiversity, Resource Management and Genetically Modified Organisms

Evaluation Scheme:

S.No.	Examination	Duration	% of Marks
1	Internal Assessment I	1 hour	15
2	Internal Assessment II	1 hour	15
3	End Semester	3 hours	30
4	Attendance/Assignment/Class performance	Each semester	5

Note: The best one out of two Internal Assessments will be taken into consideration.

Suggested Readings

1. Fleming, D.A., Hunt, D.L. (2000). Biotechnology and Safety Assessment (3rd Ed) Academic press. ISBN-1555811804, 9781555811808.
2. Thomas, J.A., Fuch, R.L. (1999). Biotechnology and safety assessment (3rd Ed). CRC press, Washington. ISBN: 1560327219, 9781560327219
3. Law and Strategy of biotechnological patents by Sibley. Butterworth publication. (2007) ISBN: 075069440, 9780750694445.
4. Intellectual property rights- Ganguli-Tat McGrawhill. (2001) ISBN-10: 0074838602.
5. Intellectual Property Right- Wattal- Oxford Publication House (1997) ISBN: 0195605024
6. Biotechnology - A comprehensive treatise (Vol. 12). Legal economic and ethical dimensions VCH. (2nd ed) ISBN-10 3527304320.
7. Encyclopedia of Bioethics 5 vol set, (2003) ISBN-10: 0029657748.
8. Thomas, J.A., Fuch, R.L. (2002). Biotechnology and safety Assessment (3rd Ed) Academic press.
9. B.D. Singh. Biotechnology expanding horizons.
10. H.K.Das. Text book of biotechnology 3rd edition

13-4-17

13-4-17

13-04-17 20



Integrated UG/PG VI Sem, Elective
Course: a) Fermentation Technology
Course Code: LBTC 603
Course Credit: (3-0-0) 3

Unit - 1

Introduction to fermentation: aerobic and anaerobic fermentations; Kinetics of growth and product formation - chemically structured models, mass transfer diffusion, membrane transport

Unit - 2

Fermenter design - operation, measurement and control in fermentation; Aeration and agitation in fermentation: Oxygen requirement, measurement of adsorption coefficients, bubble aeration, mechanical agitation, correlation between mass-transfer coefficient and operating variables, hollow fibre reactors, immobilized cell reactors

Unit - 3

Strain development: General aspects mutation selection of mutants, recombination, regulation gene technology and use of genetic methods, In brief genetic engineering for strain improvements and applications in medicine, agriculture and industry

Unit - 4

Microbial Biotransformation: types, methods and processes, analysis and isolation of products; applications in waste management, medicine and agriculture; Biogas production - pathways, regulation/modulation, advanced biomethanation systems and their applications

Unit - 5

Microbial & Bioprocess technology: Down stream processing in brief -Methods for vitamins (B₁₂ & Riboflavin), amino acids (L-glutamic acid & L Lysine), organic acids (Citric acid & Gluconic acid), enzymes (Amylases & pectinases), antibiotics (Beta Lactam antibiotics & amino acid and peptide antibiotics), microbes as biocontrol agents

Evaluation Scheme:

S.No.	Examination	Duration	% of Marks
1	Internal Assessment I	1 hour	15
2	Internal Assessment II	1 hour	15
3	End Semester	3 hours	30
4	Attendance/Assignment/Class performance	Each semester	5

Note: The best one out of two Internal Assessments will be taken into consideration,

Suggested Readings

1. Principles of Fermentation Technology: Whittaker & Stanbury
2. Bioprocess Engineering Principles: Pauline Doran
3. Bioreactor Design & Product Yield, BIOTOL series: Butterworth Heinemann
4. Bioseparation & Bioprocessing: Subramaniam G
5. Product Recovery in Bioprocess Technology: BIOTOL series, Butter Worth Heinemann

Q. Shukla
13-04-17

P. K. S. S. S.
13-04-17

A. K. S. S. S.
13-04-17



Integrated UG/PG VI Sem, Elective
Course: b) Gene Therapy
Course Code: LBTC 604
Course Credit: (3-0-0) 3

Unit-1

Gene Therapy: Background, Introduction, Types: Somatic, Germ line, strategies: Gene Augmentation therapy, Targeted killing of specific cells, Targeted inhibition of gene expression, Targeted gene mutation correction, different approaches: Classical and non classical, Methods of gene therapy: Ex-vivo, in-vivo

Unit-2

Target site for gene therapy, Vectors in gene therapy: Viruses – Retroviruses, Adenoviruses, Adeno-associated viruses, advantages and disadvantages, other viral vectors: HSV-1, Baculovirus, SV40

Unit-3

Non-viral methods – Naked DNA, Oligodeoxynucleotides, Liposome, Electroporation, Hybrid methods: RNA-DNA chimera, Receptor mediated Endocytosis

Unit 4

Gene therapy in the treatment of disease: Introduction, SCID, Cancer, Muscular dystrophy, Respiratory disease,

Unit 5

Advantages and recent developments in gene therapy, Problems and ethics, challenges and future of gene therapy

Evaluation Scheme:

S.No.	Examination	Duration	% of Marks
1	Internal Assessment I	1 hour	15
2	Internal Assessment II	1 hour	15
3	End Semester	3 hours	30
4	Attendance/Assignment/Class performance	Each semester	5

Note: The best one out of two Internal Assessments will be taken into consideration.

Signature
13.04.17

Signature
13.04.17

Signature
13.04.17

Integrated UG/PG VISEM, Lab -1



Abstract
13.4.17

Integrated UG/PG VISEm, Lab -1
Course: Laboratory -1(based on Core -1 & Core -2)
Course Code: LBTC 605

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Course Credit: (3-0-6) 3

Evaluation Scheme:

S.No.	Examination	Duration	% of Marks
1	Internal Assessment I	3 hour	15
2	Internal Assessment II	3 hour	15
3	End Semester	6 hours	30
4	Attendance/Assignment/Class performance	Each semester	5

Note: The best one out of two Internal Assessments will be taken

Integrated UG/PG VISEm, Dissertation on electives

Course: Dissertation
Course Code: LBTC 606
Course Credit: (3-0-6) 3

Evaluation Scheme:

S.No.	Examination	Duration	% of Marks
1	Internal Assessment	2 hour	60
2	End Semester	3 hours	90