



### List of New Course(s) Introduced

**Department : *Biotechnology***

**Program Name : *B.Sc.***

**Academic Year : *2017-18***

### ***List of New Course(s) Introduced***

Sr. No.	Course Code	Name of the Course
1.	LBTC 502	Animal & Plant biotechnology (core)
2.	LBTC 601	Industrial Biotechnology (core)
3.	LBTC 602	Biosafety, Bioethics & IPR (core)
4.	LBTC 603	a) Fermentation Technology (Elective)
5.	LBTC 604	b) Gene therapy (Elective)
6.	LBTC 605	Laboratory - 1
7.	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 Chairman
  - Prof.B.N.Tiwary, Professor Member
  - Prof. Ragini Gothwal, Expert
  - Ms. Alka Ekka, Assistant Professor 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 directive 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 course 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 A: Biotechnology- Chemistry-Botany

**The following new courses were introduced in the Syllabus of B. Sc.:**

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)

**गुरु घासीदास विश्वविद्यालय**  
(केन्द्रीय विश्वविद्यालय अधिनियम 2009 अ. 25 से 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 605	Laboratory - 1
LBTC 606	Dissertation on electives

The meeting ended with a vote of thanks by the chair

*Abhatt*

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



## Scheme and Syllabus

Proposed Syllabus for  
Integrated UG/PG (Hons.) based on CBCS system  
(Five years/Ten semesters)

(Biotechnology)

(To be implemented from the academic session 2017-2018)

Department of Biotechnology  
School of Life Sciences  
Guru Ghasidas Vishwavidyalaya  
Bilaspur (C. G.) 495 009

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*Aellip*  
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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 LBTC 505	Elective	a) Medical Diagnostics b) Biotechnology in Crop improvement	48	03	03
		<b>Laboratory</b>			
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
		<b>Total</b>	<b>806</b>	<b>26</b>	<b>20</b>

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 LBTC 604	Elective	a) Fermentation Technology b) Gene therapy	48	03	03
		<b>Laboratory</b>			
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
		<b>Total</b>	<b>384</b>	<b>27</b>	<b>18</b>

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
		<b>Laboratory</b>			
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
		<b>Total</b>	<b>384</b>	<b>24</b>	<b>18</b>

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Integrated UG/PG V Sem, Core-2

Course : **Animal and Plant Biotechnology**

Course Code: LBTC- 502

Course Credit: (3-0-0) 3

**Unit - 1**

Introduction to cell and tissue culture- Laboratory organization, Maintaining Aseptic environment, Cellular Totipotency, Culture media, Laminar air flow cabinet and cell culture incubator: BOD incubator, CO<sub>2</sub> incubator etc. Biosafety levels for plant and animal culture,

**Unit - 2**

Animal cells: substrate on which cells grow, feeder layer on substrate, gas phase for tissue culture, media and supplements. Sources of tissue, primary culture, differentiation of cells, growth kinetics, animal cell lines and their origin and characterization

**Unit - 3**

Cloning & Selection of specific cell types – cloning, somatic cell fusion and HAT selection, Medium suspension fusion, selection of Hybrid clone, production of monoclonal antibodies, Organ Culture - Culture of embryonic organs, whole embryo culture, culture of adult organs.

**Unit - 4**

In vitro culture: approaches & methodologies - preparation steps for tissue culture, surface sterilization of plant tissue material, basic procedure for aseptic tissue transfer, incubation of culture.

**Unit - 5**

Tissue nutrition : Growth Hormones - Plant cells (Composition of culture media, Growth hormones, Vitamins, Unidentified supplements, selection of media); Tissue culture methodologies - Plant cells Callus Culture, Cell Suspension Culture, Organ culture: anther culture, ovary culture, Somatic Embryogenesis, Micropropagation, Somaclonal variation.

**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**

**Suggested Readings**

1. Plant tissue culture : Bajaj, Y.P.S. Series.2. Plant tissue culture : Gamborg and Phillip.
3. Basic and Agricultural Biotechnology (1993) Purohit and Mathur
4. Plants, Genes, and Agriculture : Chrispeels, M. J. and Grierson, D.
5. Genetic Engineering of crop plants : Lycett, G. W. and Grierson, D.
6. Biotechnological innovation in Animal productivity: (Biotol Series)
7. Culture of Animal cell: A manual of Basic Techniques(4th ed.) (2000) Freshney

*D. Shetty*  
13.4.17

*R. Singh*  
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*B. Singh*  
13.4.17

*A. Singh*  
13.04.17

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SEMESTER - VI

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 VISEM, Core-2

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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: 0074638602.
5. Intellectual Property Right- Wattal- Oxford Publication House. (1997) ISBN: 0195905024.
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: 0028657748.
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

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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 (B<sub>12</sub> & 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 & Stan bury
2. Bioprocess Engineering Principles: Pauline Doran
3. Bioreactor Design & Product Yield, BIOTOL series: Butter worth Heinemann
4. Bioseparation & Bioprocessing: Subramaniam G
5. Product Recovery in Bioprocess Technology: BIOTOL series, Butter Worth Heinemann

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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.

Integrated UG/PG VI Sem, 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