

Outline of Syllabus of the Course:

The syllabus of the vocational (Honours) Course in Biotechnology shall be as follows:

Honors Papers:-

There shall be 21 Honors papers in all distributed in the three years of study as follows:

Year	Course Title	Total Marks	Remarks
1st Year	1. Biochemistry	100	Theory Paper
	2. Mathematics & Practical Computers	100	Theory Paper
	3. Cell Biology	100	Theory Paper
	4. Genetics	100	Theory Paper
	5. Microbiology	100	Theory Paper
	6. Biochemical Techniques	75	Practical Paper
	7. Microbiological Techniques	75	Practical Paper
	8. 1 st Summer Job Training followed by Job Training	50	Job Training
2nd Year	1. Bio-Physics	100	Theory Paper
	2. Molecular Biology	100	Theory Paper
	3. Immunology	100	Theory Paper
	4. Animal Cell Cultures	100	Theory Paper
	5. Recombinant DNA Technology	100	Theory Paper
	6. Methods in Molecular & Cellular Biology	75	Practical Paper
	7. Immunological Methods	75	Practical Paper
	8. 2nd Summer Job Training followed by job Training	50	Job Training
3rd Year	1. Animal Cell Biology	100	Theory Paper
	2. Plant Biotechnology	100	Theory Paper
	3. Environmental Biochemistry	100	Theory Paper
	4. Culture Methods	100	Practical Paper
	5. Project Report	100	Job Training
Total	21 Paper	1900	Theory- 13 Practical- 5 Job Training- 3

Subsidiary Papers:

A candidate admitted to B.Sc. (Vocational) Honours Course in Biotechnology shall be required to offer two subsidiary subjects from out to the following:

- I) Either Botany or Zoology
- II) Chemistry

Each subsidiary subject will consist of two papers, each of 100 marks paper-1 of the each subsidiary subject shall be offered and be taught in the first year of the course; while Paper-II is taught in the 2nd year.

Compulsory Paper:

A candidate admitted to B.Sc. (Vocational) Honours Course in Biotechnology shall be required to offer and be examined in one compulsory paper of **Entrepreneurship Development** in the 3rd year of study. The paper will consist of 100 marks.

Syllabus of optional subsidiary subjects

Syllabus of two optional subsidiary papers (Chemistry, Botany or Zoology) in Degree part I and part II will be similar to the syllabus of B.Sc. subsidiary syllabus of Part I & Part II of V.K.S.University, Ara.

Courses of Study
3 yrs. B.Sc. (Vocational) Honours course in
BIOTECHNOLOGY
V.K.S.University, Ara

Honours Part - III

There shall be three theory of 100 marks, one practical papers of 100 marks and Job training followed by project works of 100 marks in the third year of examination.

PAPER - I

Time: 3Hrs.

Maximum Marks 80

In all 8 questions are to be set as follows:-

Q. 1. Compulsory question multiple Choice
question covering the entire syllabus

10 X 1.5= 15 Marks

Q. 2. Compulsory Question 4 Short answer
Questions covering the entire syllabus

4 X 5 = 20 Marks

Q. 3-8. Long answered questions covering the
entire syllabus; three to be answered

3 X 15 = 45 Marks

Total = 80 Marks

Two Internal Assessments of ten marks each 2 X 10 = 20

Total = 100 Marks

PAPER - I

ANIMAL BIOTECHNOLOGY

Unit I:

Gene transfer to animal cells: chemical method, Phospholipid as a gene delivery vehicles, Electroporation, Microinjection, Plasmid vector for DNA mediated gene transfer, Retrovirus & gene transfer, Viral Vector SV-40.

Unit II:

Cryopreservation of gametes and embryos in mammals. In vitro fertilization, embryo splicing & embryo transfer, Stem cell technology production of transgenics: Insect, Birds and mammals (Mice, Sheep, Cow, Goat), Application of transgenic animals : Models for disease, oncogenes drug screening, Animal disease need help of Biotechnology : Foot & Mouth Disease, Coccidiosis Trypanosomiasis & Anthrax.

Unit III:

Special secondary metabolites: Insulin, growth hormone, Interferon, t-plasminogen activator Factor VIII, Expression of desired proteins in animal cells and its processing, Animal clones Growth factor promoting proliferation of animal cells : EFG, FGF, PGF, IL-1, IL-2, NGF & Erythroprotein.

Unit 1V:

Genetic modification in Medicine: Gene therapy, Types of gene therapy, Vector in gene therapy, Human genetic engineering Bioethics : Philosophical consideration, Principles & theories

Ethics & the Law issues: Stem cell cloning Transhumanism, Bioweapons Animal rights human cloning. DNA on the witness stand: Use of the genetic evidence in civil and criminal court cases.

PAPER - II

Time: 3Hrs.

Maximum Marks 80

In all 8 questions are to be set as follows:-

Q. 1. Compulsory question multiple Choice
question covering the entire syllabus

10 X 1.5= 15 Marks

Q. 2. Compulsory Question 4 Short answer
Questions covering the entire syllabus

4 X 5 = 20 Marks

Q. 3-8. Long answered questions covering the
entire syllabus; three to be answered

3 X 15 = 45 Marks

Total = 80 Marks

Two Internal Assessments of ten marks each 2 X 10 = 20

Total = 100 Marks

PAPER - II

PLANT BIOTECHNOLOGY

Unit-I

Introduction, Laboratory organization, Sterilization techniques of Laboratory, Explants, & Reagents. Cryo & organogenic differentiation, Types of culture : Seed, Embryo, Callus, Organ, Cell & Protoplast culture, Micropropagation Organogenesis, embryogenesis. Advantages & disadvantages of micropropagation. Nutrition media: Media composition, Inorganic nutrients, Carbon source, Vitamins, Growth regulators Gelling agents.

Unit-II

In vitro production of haploids: Androgen methods: Anther culture, Microspore culture, Androgenesis, Gynogenic methods: Ovary & Ovule culture, Factor affecting gynogenic culture, Significance and use of haploids, chromosome elimination techniques of haploid production in cereals. Endosperm culture & Triploid production.

Unit-III

Protoplasts Isolation and fusion (Physical, Chemical & Electrical), Protoplast development, Somatic hybridization, Identification & selection of hybrid cells, Cybrids, Potential of somatic Hybridization & Limitations, Somaclonal variation.

Unit-IV

In-vitro pollination & fertilization, Single cell suspension culture and their applications production of secondary metabolites.

DNA transfer into chloroplast and mitochondria: Various types of methods, Advantages & Limitations.

PAPER - III

Time: 3Hrs.

Maximum Marks 80

In all 8 questions are to be set as follows:-

Q. 1. Compulsory question multiple Choice
question covering the entire syllabus

10 X 1.5= 15 Marks

Q. 2. Compulsory Question 4 Short answer
Questions covering the entire syllabus

4 X 5 = 20 Marks

Q. 3-8. Long answered questions covering the
entire syllabus; three to be answered

3 X 15 = 45 Marks

Total = 80 Marks

Two Internal Assessments of ten marks each 2 X 10 = 20

Total = 100 Marks

PAPER - III

ENVIRONMENTAL BIOTECHNOLOGY

Unit-I

Renewable & Nonrenewable resources, what is renewable should be biodegradable? Conventional fuels and their environmental impacts: Fire wood, Plant, Animal waste, Coal, etc.

Modern fuels and their environmental impacts: Biogas, LPG, CNG, Methanogenic bacteria, Microbial hydrogen production of sugar to ethanol, Gasohol.

Unit-II

Bioremediation of soil & water contaminated with oil spills, Heavy metal & detergents: Degradation of lignin and cellulose using microbes. Phytoremediation, Degradation of pesticides and other toxic chemicals by microorganism (Aromatic, chlorinated, hydrocarbon & petroleum products)

Unit-III

Treatments of industrial effluents, Municipals & Hospitals wastes. Biofertilizer, Biopesticides. Role of symbiotic & asymbiotic Nitrogen fixing bacteria in the enrichment of soil. Bacillus thuringiensis toxin as natural pesticides.

Unit-VI

Bioleaching, Enrichment of ores by microorganism (Gold, copper & Uranium). Environmental significance of genetically modified organisms (GMOs). Microbes, Plant & Animals Arguments in favors & against herbicide resistant crop plants.

PAPER – IV

Time: 6 Hrs.

Maximum Marks 100

CULTURE METHODS

- 1) Sterilization techniques: Glassware sterilization, Media sterilization, Laboratory sterilization.
- 2) Preparation of Hanks balanced salt solution.
- 3) Preparation of Minimal Essential growth medium (For Animal Cell)
- 4) DNA isolation of animal tissues.
- 5) Quantification of isolated DNA
- 6) Resolving DNA on Agarose gel
- 7) Preparation of simple growth nutrients
- 8) Preparation of plant tissue culture media (MS Media)
- 9) To selection, Prune, sterilize and prepare on explants for culture.
- 10) Callus culture from are plant tissue.
- 11) Significance of growth hormones in plant tissue culture medium.
- 12) To demonstrate various steps of Micropropagation
- 13) Protoplast culture
- 14) Haploid culture
- 15) Embryo culture
- 16) Making of artificial seeds

PAPER - V

Maximum Marks: 100

3RD SUMMER JOB TRAINING FOLLOWED BY PROJECT REPORT.

The students will have to undergo on the job training in clinic (Hospital & Research institutes). They have to submit its report. A certificate would be issued by the department from the institution providing the training.

Compulsory Paper:

A candidate admitted to B.Sc. (Vocational) Honours Course in Biotechnology shall be required to offer and be examined in one compulsory paper of **Entrepreneurship Development** in the 3rd year of study. The paper will consist of 100 marks.

Time: 3 Hrs.

Maximum Marks 80

In all 8 questions are to be set as follows:-

Q. 1. Compulsory question multiple Choice
Question covering the entire syllabus

10 X 1.5= 15 Marks

Q. 2. Compulsory Question 4 Short answer
Questions covering the entire syllabus

4 X 5 = 20 Marks

Q. 3-8. Long answered questions covering the
Entire syllabus; three to be answered

3 X 15 = 45 Marks

Total = 80 Marks

Two Internal Assessments of ten marks each 2 X 10 = 20

Total = 100 Marks

ENTREPRENEURSHIP DEVELOPMENT

Unit-I

Introduction of entrepreneurship development, Need and Importance of entrepreneurships, Promotion of entrepreneurship, factors influencing entrepreneurship, feature of successful entrepreneurships.

Form of Business organization, Project Identification Selection of the products, Project formulation, Assessment of project feasibility.

Unit-II

Important of finance / Loans and repayments, Characteristics of business finance. Fixed capital management: Sources of fixed capital, Working capital and its sources, How to move for loans, Inventory direct and indirect raw material and its management.

Unit-III

Meaning and Important, Marketing mix product management, Product line, Product mix, Stages of product like cycle, Marketing Research and importance of survey, Physical distribution and stock Management.

Unit-IV

Meaning of international business, selection of a product, Selection of markets for international business, Export financing, Institutional support for exports.