

# DEPARTMENT OF BIOCHEMISTRY

Yadava College (Autonomous), Madurai – 625 014.

Choice Based Credit System – Blue Print – for those who joined in June 2015-16

Subject		Semester - I			Semester – II			Semester – III			Semester – IV			Semester – V			Semester - VI			Total Credits
		No	Hr	Cr	No	Hr	Cr	No	Hr	Cr	No	Hr	Cr	No	Hr	Cr	No	Hr	Cr	
Part I		1	5	3	1	5	3	1	5	3	1	5	3	-	-	-	-	-	-	12
Part II		1	5	3	1	5	3	1	5	3	1	5	3	-	-	-	-	-	-	12
Part III	Core	1	6	5	1	6	6	1	6	7	1	6	7	5	28	24	5	28	26	75
	Allied I	1	5	2	1	5	3	1	5	2	1	5	3	-	-	-	-	-	-	10
	Allied II	1	5	2	1	5	3	1	5	2	1	5	3	-	-	-	-	-	-	10
Part IV	Environmental Studies	1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	02
	Value Based Education	-	-	-	1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	02
	Non Major Elective	-	-	-	-	-	-	1	2	2	1	2	2	-	-	-	-	-	-	04
	Skill Based Elective	1	2	2	1	2	2	1	2	2	1	2	2	1	2	2	1	2	2	12
Part V	PE/NCC/NSS/EXT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	01
Total papers and hours per semester		6	30	-	7	30	-	7	30	-	7	30	-	6	30	-	6	30	-	140

**DEPARTMENT OF BIOCHEMISTRY  
YADAVA COLLEGE, MADURAI – 14.  
(AUTONOMOUS)**

**SYLLABUS FOR  
B.Sc., BIOCHEMISTRY  
(Spl. in HERBAL TECHNOLOGY)  
CBCS Pattern**

**For those who joined in June – 2015-16**

**DEPARTMENT OF BIOCHEMISTRY  
YADAVA COLLEGE, MADURAI – 14.  
(AUTONOMOUS)  
SYLLABUS FOR B.Sc., BIOCHEMISTRY (HERBAL TECHNOLOGY)  
CBCS Pattern**

**For those who joined in June – 2015-16**

***OBJECTIVE OF THE COURSE:***

Biochemistry, study of all chemical reactions in living organisms including primitive bacteria to mega blue whale, however this field of growing science is still required to grow, emerging Biochemists have many more work to develop this science. India, country having wide variety of medicinal plants in her, whose proper utilization will glorify mankind. To make students aware of herbal plants and products, Herbal Technology is specialized with Biochemistry. The entire course on B.Sc., Biochemistry (Herbal Technology) based on under mentioned syllabus, enables the learners to acquire basic knowledge in Biochemistry, which is applied in various fields, existing and emerging, from Clinical Biochemistry to Bioinformatics, sandwiching Biotechnology, it also imparts knowledge about medicinal plants and methods, techniques, technology to isolate, analyze active compounds to produce, value added products from herbal plants.

# DEPARTMENT OF BIOCHEMISTRY

**Yadava College (Autonomous), Madurai – 625014.**

**Choice Based Credit System course content - for those who joined in June 2015-16**

Semester	Part	Subject code	Title of the paper	Teaching Hours / week	Credit	Duration of Exam	Evaluation		Total
							Internal	External	
I	Part I		Tamil	5	3	3	25	75	100
	Part II		English	5	3	3	25	75	100
	Part III Core		Bio molecules	4	5	3	25	75	100
			<i>Major Practical I</i> Qualitative, Colorimetric & Enzyme analysis	2	-	-	-	-	-
	Allied I		General Chemistry	5	2	3	25	75	100
	Allied II		General Biology	5	2	3	25	75	100
	Part IV		Environmental Studies	2	2	3	25	75	100
			Skill Based Elective Communicative English I	2	2	3	25	75	100
	Part V		PE / NCC / NSS / EXT	-	-	-	-	-	-
II	Part I		Tamil	5	3	3	25	75	100
	Part II		English	5	3	3	25	75	100
	Part III Core		Enzyme and Enzyme technology	4	5	3	25	75	100
			<i>Major Practical I</i> Qualitative, Colorimetric & Enzyme analysis	2	1	3	40	60	100
	Allied I		Organic Chemistry	3	2	3	25	75	100
			<i>Chemistry Practical I</i> Volumetric Analysis	2	1	3	40	60	100
	Allied II		Cell Biology	3	2	3	25	75	100
			<i>Biology Practical I</i> General & Cell Biology	2	1	3	40	60	100
	Part IV		Value Based Education	2	2	3	25	75	100
			Skill Based Elective Communicative English II	2	2	3	25	75	100
	Part V		PE / NCC / NSS / EXT	-	-	-	-	-	-

# DEPARTMENT OF BIOCHEMISTRY

Yadava College (Autonomous), Madurai – 625014.

Choice based credit system course content for those joined in June 2015-16

Semester	Part	Subject code	Title of the paper	Teaching Hours / week	Credit	Duration of Exam	Evaluation		Total
							Internal	External	
III	Part I		Tamil	5	3	3	25	75	100
	Part II		English	5	3	3	25	75	100
	Part III Core		Metabolism	4	5	3	25	75	100
			<i>Major Practical II</i> Quantitative analysis of Bio molecules	2	2	3	40	60	100
	Allied I		Industrial Chemistry	5	2	3	25	75	100
	Allied II		Genetics	5	2	3	25	75	100
	Part IV		Non-major elective	2	2	3	25	75	100
			Skill Based Elective Communicative English III	2	2	3	25	75	100
	Part V		PE / NCC / NSS / EXT	-	-	-	-	-	-
IV	Part I		Tamil	5	3	3	25	75	100
	Part II		English	5	3	3	25	75	100
	Part III Core		Clinical Biochemistry	4	5	3	25	75	100
			<i>Major Practical III</i> Clinical Biochemistry	2	2	3	40	60	100
	Allied I		Bio-Physical Chemistry	3	2	3	25	75	100
			<i>Chemistry Practical II</i> Analysis of organic compounds	2	1	3	40	60	100
			Bio statistics	3	2	3	25	75	100
	Allied II		<i>Biology Practical I</i> Genetics & Bio statistics	2	1	3	40	60	100
			Non-Major Elective	2	2	3	25	75	100
	Part IV		Skill Based Elective Communicative English - IV	2	2	3	25	75	100
	Part V		PE / NCC / NSS / EXT	-	-	-	-	-	-

# DEPARTMENT OF BIOCHEMISTRY

Yadava College (Autonomous), Madurai – 625014.

Choice based credit system course content for those joined in June 2015-16

Semester	Part	Subject code	Title of the paper	Teaching Hours / week	Credit	Duration of Exam	Evaluation		Total
							Internal	External	
V	Part III Core		Medicinal Plants	5	5	3	25	75	100
			Microbiology & Immunology	5	5	3	25	75	100
			Bio Techniques	5	5	3	25	75	100
			Molecular Biology	5	5	3	25	75	100
			<i>Major Practical IV</i> Microbiology & Medicinal Plants	4	2	3	40	60	100
			<i>Major Practical V</i> Immunology & Biochemical Techniques	4	2	3	40	60	100
	Part IV		Skill Based Elective Soft Skills - I	2	2	3	25	75	100
	Part V		PE / NCC / NSS / EXT	-	-	-	-	-	-
VI	Part III Core		Nutrition & Dietetics	4	4	3	25	75	100
			Plant Biochemistry	4	4	3	25	75	100
			Herbal Technology	4	4	3	25	75	100
			Genetic Engineering and Industrial Biotechnology	5	5	3	25	75	100
			Bio informatics	5	5	3	25	75	100
			<i>Major Practical VI</i> Biotechnology and Bio informatics	3	2	3	40	60	100
			<i>Major Practical VII</i> Herbal Technology	3	2	3	40	60	100
	Part IV		Skill Based Elective Soft Skills - II	2	2	3	25	75	100
	Part V		PE / NCC / NSS / EXT	-	1	-	-	-	-

**DEPARTMENT OF BIOCHEMISTRY**

**Yadava College (Autonomous), Madurai – 625 014.**

**Choice Based Credit System – Blue Print – for those who joined in June 2015-16**

<b>Part</b>	<b>Total No. Of Papers</b>		<b>Hours</b>	<b>Credits</b>
Part I		04	20	12
Part II		04	20	12
Part III	Core	14	80	60
	Allied I	04	20	18
	Allied II	04	20	17
Part IV	Environmental Studies	01	02	02
	Value Education	01	02	02
	Non Major Elective	02	04	04
	Skill Based Education	06	12	12
Part V	PE/NCC/NSS/EXT	01	-	01
<b>Total Hours &amp; Credits</b>			180	140





## BIOMOLECULES

**Semester: I**

**Subject Code**

**Paper – 1**

**Credits: 5**

**Hours per Week: 4 hrs**

**Total Hours per Semester: 60 hrs**

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To enable the learners,

to have basic knowledge in the field of Biochemistry.

to know about the structures and functions of carbohydrates, proteins, lipids, nucleic acids and vitamins.

### **Unit I:**

Historical background of the origin and development of Biochemistry through the years - parallel development of instruments. Carbohydrates and polysaccharides - occurrence and general importance of carbohydrates – Basic structure of glucose, its isomers and epimers and linkages-Biologically important disaccharides like lactose, maltose and sucrose – Polysaccharides – Energy storage polysaccharides, Starch and Glycogen, Structural polysaccharides, Cellulose, Pectin, and Chitin. Heteropolysaccharides, Bacterial cell wall polysaccharides.

### **Unit II:**

Amino acids and Proteins-Common amino acids of Proteins-physical properties of amino acids-solubility, electrical properties, fundamental role of proteins in life, composition of proteins - essential amino acids. General properties of proteins. Hierarchical structure of proteins,- primary, secondary, tertiary, quaternary structures, forces stabilizing the structure of proteins, classification of proteins on the basis of their biological functions - chemical reactions of proteins.

### **Unit III:**

Lipids - Fatty Acids - Classification of some naturally occurring Fatty acids into Saturated fatty acids, Unsaturated fatty acids, Branched chain fatty acids, Hydroxy and Keto derivatives and Cyclic fatty acids — Salts, detergents and wetting agents, esters - reactions of unsaturated fatty acids - hydrogenation, halogenation and oxidation. Waxes -

Phospholipids sphingomyelins, cerebroside, gangliosides, isoprenoids, cholesterol, prostaglandins, their properties and functions.

#### **Unit IV:**

Nucleic acids-fundamental role of nucleic acids in life processes - Major DNA and RNA - structure of bases, nucleosides and nucleotides - bonds linking the various bases, Chargaff's rule, primary, secondary and three dimensional structure, properties of nucleic acids, viscosity, sedimentation behavior, conformational variants of DNA, denaturation and renaturation kinetics,  $T_m$ , hyperchromic effect.

#### **Unit V:**

Vitamins-historical development to the discovery of vitamins-fat soluble vitamins – Vitamin A, D, E and K – Water - soluble vitamins-Vitamin B complex, Vitamin C – Brief mention of sources and physiological role.

#### **TEXT BOOK:**

J.L.Jain., Sunjay Jain, Nitin Jain,(2004) Fundamental of Biochemistry, S. Chand and Co., New Delhi.

#### **REFERENCE:**

1. West E.S., Todd, W.R., Manson H.S. and Van Bruggan J.J. (1967). Textbook of Biochemistry, 4<sup>th</sup> edition The Macmillan Company, New York.
2. Lehninger, A.L. (1982). Biochemistry. 1<sup>st</sup> edition, Kalyani Publishers. India.
3. Lubert Stryer, (1988). Biochemistry. 3<sup>rd</sup> edition, W.H. Freeman and Company, New York.
4. Conn, E.E. and Stump, K. (1989). Outlines of Biochemistry, Fourth edition, Wiley Eastern Limited.

## ENZYMES AND ENZYME TECHNOLOGY

**Semester: II**

**Subject Code:**

**Paper – 2**

**Credits: 5**

**Hours per Week: 4 hrs**

**Total Hours per Semester:  
60 hrs**

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To enable the learners,

to understand the enzymes, it's activity mechanism and regulation.

to know about the enzyme immobilization techniques; it's application in various fields.

### **Unit I:**

Definition – history, nomenclature, classification, general properties, biological role of enzymes. Enzyme unit – IU – Katal, Enzyme turnover-Definitions – coenzymes, holoenzyme, apoenzyme, prosthetic group, oligomeric enzyme, metalloenzyme, isoenzyme, multienzyme, ribozyme, zymogen – enzyme assay, measurement of enzyme activity, isolation of enzyme, purification, enzyme specificity, types of enzyme reactions.

### **Unit II:**

Enzyme - substrate complex. Activation energy, active site – Fischer's lock and key model, Koshland's induced fit model. Enzyme kinetics: Michaelis Menten equation,  $K_m$ ,  $K_{cat}/V_{max}$  and its significance. Lineweaver Burke Plot, Eadie – Hofstee plot, Hans plot. Inhibitors - non-competitive, uncompetitive and competitive inhibitor. Irreversible inhibitors and its LB plot pattern. Bi-substrate reactions – Brief introduction to sequential and ping-pong mechanism.

### **Unit III:**

Factors affecting Enzyme activity –  $P^H$ , temperature, substrate and product concentration -Regulation of Enzyme activity – feedback control, allosteric enzymes - Co-operative effects – symmetry and sequential model of allosteric enzyme.

### **Unit IV:**

Enzyme Catalysis: Acid-base Catalysis, Covalent catalysis. Proximity and orientation effects, strain and distortion theory – Mechanism of action of chymotrypsin. Isoenzyme – LDH and CPK. – vitamins as coenzymes – Metal ions as cofactors.

**Unit V:** Immobilization of enzymes – Methods of Immobilization and its effects on enzyme activity. Applications of immobilised enzymes – amylase. Biosensors and its applications.

**TEXT BOOK:**

Jain. J.L., Sunjay Jain, Nitin Jain. (2004). Fundamental of Biochemistry. S. Chand and Co., New Delhi.

**REFERENCE:**

1. Alan Fersht. (1995). Enzyme Structure and Mechanism, 2<sup>nd</sup> Edition, W.H.Freeman and Company New York
2. Eric. Conn. E., Stump, P.K., Roy, G.B. and Doi, H. (2001). Outlines of Biochemistry, 5<sup>th</sup> Edition, John Wiley and Sons, New york.
3. Stryer, L. (2000). Biochemistry, 4<sup>th</sup> Edition, W.H.Freeman and Company, New York.
4. Pamela-C.Champe and Richard A. Harwey, (1994). Lippincott's Illustrated Reviews Biochemistry, 2<sup>nd</sup> Edition, 1994, J.B.Lippincott Company.
5. Voet, D., Judith G.Voet. (1995). Biochemistry, 2<sup>nd</sup> Edition, 1995, John Wiley and Sons INC, New York.

## **MAJOR PRACTICALS**

### **QUALITATIVE, COLORIMETRIC AND ENZYME ANALYSIS**

**Semester: I &II**

**Subject Code:**

**Practical Paper- I**

**Credits: 1**

**Hours per Week: 2 hrs**

**Total Hours per Semester:  
30 hrs**

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To enable the learners,

to analyze carbohydrate, proteins, lipid and enzymes.

to separate biochemical from their natural sources.

to handle instruments like  $p^H$  meter and colorimeter with an idea of analysis.

#### **1. Qualitative analysis of Bio-organic compounds:**

- i) Analysis of carbohydrates
- ii) Analysis of amino acids
- iii) Analysis of proteins
- iv) Analysis of lipids

#### **2. Biochemical preparation**

- i) Starch from potato
- ii) Casein from milk.

#### **3. Use of pH meter for the preparation of buffer.**

#### **4. Verification of Beer Lambert's law using colorimeter.**

- i) Determining the extinction co-efficient of a given coloured compound
- ii) Determining the concentration of any given coloured compound using a standard graph.

#### **5. Enzyme Analysis**

Assay of Alkaline Phosphatase activity -.

Effect of  $p^H$  & temperature on the activity of alkaline Phosphatase

## REFERENCE:

1. Jayaraman, J. (1981). Laboratory Manual in Biochemistry, 1<sup>st</sup> Edition. New Age International [p] LTD. Publisher Pune.
2. Pattabiraman, T.N. (1998). Laboratory Manual in Biochemistry, 3<sup>rd</sup> Edition. All India Publishers.
3. Sadasivam,S. and Manickam.A. (1996). Biochemical Methods, 2<sup>nd</sup> Edition. Wiley Eastern Limited.
4. Sawhney, S.K. and Randhir Singh, (2000). Introductory Practical Biochemistry, 1<sup>st</sup> Edition. Narosa Publication.
5. David. T. Plummer, (1987). An Introduction to Practical Biochemistry, 3<sup>rd</sup> Edition. McGraw – Hill Edition
6. Palanivelu, P. (2004). Labaratory Manual for Analytical Biochemistry, Separation Technique. 3<sup>rd</sup> Edition, Twenty first century publications.

## METABOLISM

**Semester: III**

**Subject Code:**

**Paper – 3**

**Credits: 5**

**Hours per Week: 4 hrs**

**Total Hours per Semester: 60 hrs**

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To enable the learners,

to have knowledge about metabolism of biomolecules in living organisms.

to understand the importance of integration of metabolism, and metabolism during starvation.

### **Unit I:**

Metabolism – introduction and definition. Carbohydrate Metabolism: Conversion of carbohydrates into Glucose, Glycolysis, TCA cycle, Energetics, HMP shunt, Glycogenolysis, Glycogenesis, Gluconeogenesis, Cori's cycle. Bioenergetics: High Energy and low energy compounds. Electron Transport Chain (ETC), reduction potential, oxidative phosphorylation, chemiosmotic theory. Microsomal electron transport chain.

### **Unit II:**

Lipid Metabolism: Oxidation of odd and even chain fatty acids, energetics, ketone body metabolism, biosynthesis of fatty acids (saturated and unsaturated) phospholipids, cholesterol biosynthesis, conversion of cholesterol into bile acids, 1,25-Dihydroxy cholecalciferol and steroidal hormones.

### **Unit III:**

Amino Acid Metabolism: A brief account of amino acid metabolism. Metabolism of glycine, &, phenylalanine. - urea cycle.

Nucleic Acid Metabolism: *de novo* and salvage biosynthesis - catabolism of purine and pyrimidine nucleotides.

#### **Unit IV:**

Metabolic and physiological importance of fat soluble vitamins, vitamin B<sub>12</sub>, calcium, phosphorus, iron, sodium, potassium.

Inter mitochondrial membrane transport: Malate aspartate shuttle & tricarboxylate shuttle.

#### **Unit V:**

Hormones: Definition, classification, secondary signaling, functions of hormones, coordinated regulation of growth.

#### **TEXT BOOK:**

Robert Murray Daryl K.Granner, Peter A Mayes, Victor W. Redwell, (2003), Harper's Illustrated Biochemistry 26<sup>th</sup> Edition M.C. Graw Hill Publications.

#### **REFERENCE:**

1. A.L.Lehninger, D.L.Nelson, M.M.Cox, (1993), Principles of Biochemistry, 2<sup>nd</sup> Edition, CBS Publishers, Delhi
2. Fred.K.Rodrigues, (1997) Carbohydrate metabolism 1<sup>st</sup> Edition, New Age International Publishers, New Delhi.
3. Donald Voet, Judith G.Voet, (1995) Biochemistry. 2<sup>nd</sup> Edition, John Wiley and Sons, INC New York.
4. V.L.Davidson, D.B.Sittman, (1994), Biochemistry, 3<sup>rd</sup> Edition, B.I.Waverly Pvt, LTD New York.
5. Trudy McKee and James R.Mckee, (1996), Biochemistry 1<sup>st</sup> Edition, W.C.B.Brown Publisher.



## QUANTITATIVE ANALYSIS

**Semester: III**

**Subject Code:**

**Practical Paper-I I**

**Credits: 2**

**Hours per Week: 2 hrs**

**Total Hours per Semester: 30 hrs**

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To enable the learners,

to state the quantity of biomolecules in natural products, which imparts proper knowledge of traditional biochemistry

### ***Analysis of Carbohydrates:***

- i) Estimation of glucose by Anthrone's method
- ii) Estimation of fructose of Selivanoff's method
- iii) Estimation of reducing sugar in a fruit by BQR method

### ***Analysis of Proteins***

- i) Protein determination – Lowry's Method
- ii) Protein determination – Bardford's Method
- iii) Protein determination – Biuret Method

### ***Analysis of Lipids:***

- i) Estimation of cholesterol –Zak's Method

### ***Analysis of Vitamins***

- i) Determination of ascorbic acid (Titrimetry)
- ii) Determination of ascorbic acid (Colorimetry)

### ***Analysis of Minerals***

- i) Estimation of calcium in milk
- ii) Estimation of iron

**REFERENCE:**

1. Jayaraman, J. (1981). Laboratory Manual in Biochemistry, 1<sup>st</sup> Edition. New Age International [p] LTD. Publisher Pune.
2. Sadasivam,S. and Manickam.A. (1996). Biochemical Methods 2<sup>nd</sup> Wiley Eastern Limited.
3. Palanivelu, P. (2004). Labaratory Manual for Analytical Biochemistry, Separation Technique. 3<sup>rd</sup> Edition, Twenty first century publications.

## CLINICAL BIOCHEMISTRY

**Semester: IV**

**Subject Code:**

**Paper – 4**

**Credits: 5**

**Hours per Week: 4 hrs**

**Total Hours per Semester: 60 hrs**

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To enable the learners.

to have knowledge of metabolic abnormalities and their diagnosis.

to know the inborn errors of metabolism, its reasons and effects.

### **Unit I:**

Introduction, Scope of clinical biochemistry, development of clinical biochemistry, techniques used in clinical assays - Investigation in clinical biochemistry, evaluation of laboratory tests, normal range, system of International units.

Clinical Hematology: Abnormal hemoglobins, anemias, disturbances in blood clotting mechanism.

### **Unit II:**

Disorders of carbohydrate Metabolism: Normal blood sugar level and its regulation– Hyper and hypoglycemia, renal threshold value, glycosuria, galactosemia, diabetes mellitus, Glucose Tolerance Test (GTT), obesity, inborn errors of carbohydrate metabolism.

### **Unit III:**

Disorders of Lipid metabolism: Hyper and hypo Lipoproteinemias, disorders of phospholipids and cholesterol metabolism. Fatty liver, steatorrhea, inborn errors of lipid metabolism.

### **Unit IV:**

Disorders of Amino Acid and protein Metabolism: Disorders of plasma proteins, urea, uric acid, creatine, and ammonia. uremia, uricemia and porphyria. Criglar-Najjar

disease, Gilbert's disease, Dubin-Johnson disease.— Disorders of nucleic acid metabolism: Gout, Lesch Nyhan Syndrome (LNS).

#### **Unit V:**

Endocrine disorders: Diseases associated with thyroid, pituitary, adrenal cortex and medulla and sex hormones – Tissue Function Tests: Biochemical tests of liver, kidney and pancreas, significances of tissue function tests – Diagnostic uses of enzymes

#### **TEXT BOOK:**

Carl A.Burtis, Edward R.Ash wood (2001), Tietz, Fundamentals of Clinical chemistry, 5<sup>th</sup> Edition, Har Court India Pvt LTD, Company New Delhi.

#### **REFERENCE:**

1. Thomas M. Devlin. (1997). Text Book of Biochemistry with Clinical Correlation, 4<sup>th</sup> Edition. Wiley Liss Publication.
2. Chatterjea and Ranashinde. (2005). Text Book of Medical Biochemistry, 6<sup>th</sup> Edition, 2005, JP Publications, Calcutta.
3. Kanai L. Mukherjee. (1998). Vol. II III Medical Laboratory Technology, 1<sup>st</sup> Edition. TATA McGraw – Hill Publishing Company LTD New Delhi.
4. Dinesh Puri. (2002). Textbook of Biochemistry, Clinically Oriented Approach. 1<sup>st</sup> Edition. B.I.Churchill Living Stone Pvt. LTD. New Delhi.
5. Allan Gaw., Robert A., Cowan., Denis St. Stewart, J. and James Shepherd. (1999). Clinical Biochemistry 2<sup>nd</sup> Edition. Churchill Living stone Company.

## CLINICAL BIOCHEMISTRY

**Semester: IV**

**Subject Code:**

**Practical Paper-II I**

**Credits: 2**

**Hours per Week: 2 hrs**

**Total Hours per Semester: 30 hrs**

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To enable the learners,

to instill knowledge of analyzing biomolecules in blood and urine.

to make a biochemist to acquire medical lab tests.

### **1. Blood Analysis:**

- |      |   |   |                        |
|------|---|---|------------------------|
| i)   | Sugar                                     | - | Folin Wu's method      |
| ii)  | Cholesterol                               | - | Ferric chloride method |
| iii) | Creatinine                                | - | Picric acid method     |
| iv)  | Serum, Calcium and Phosphorus             |   |                        |
| v)   | Total protein, albumin and globulin Ratio |   |                        |

### **2. Urine Analysis:**

- i) Collection of 24 hours urine
- ii) Colour, odour, pH, volume and density
- iii) Qualitative analysis of normal and abnormal constituents of urine
- iv) Quantitative analysis of Urea and creatinine

### **REFERENCE:**

1. Harold Varley, (1988). Practical Clinical Biochemistry, 4<sup>th</sup> Edition. CBS Publishers.
2. Pattabiraman, T.N. (1998). Laboratory Manual in Biochemistry, 3<sup>rd</sup> Edition. All India Publishers

## MEDICINAL PLANTS

**Semester: V**

**Subject Code:**

**Paper – 5**

**Credits: 5**

**Hours per Week: 5 hrs**

**Total Hours per Semester: 75 hrs**

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To enable the learners,

to have a basic wide knowledge about medicinal plants, its active compounds, their therapeutic values.

### **Unit – I**

Introduction, History of Medicinal plants and their uses in Ayurvedic, Siddha, Homeopathy, Allopathy medicines. Technical terminology and fundamentals of Pharmacology and Pharmacognosy.

### **Unit – II**

A brief account of bioactive substances, Alkaloids, Anthraquinines, Flavonoids, Glycosides, Polyphenol, Steroids, Saponins, Taninns, Volatile oils, and Terpenoids.

### **Unit – III**

Chemical constituents and therapeutic values of the drugs from the following groups.

- |                 |   |                          |
|-----------------|---|--------------------------|
| 1. Bacteria     | - | <i>Streptomyces.</i>     |
| 2. Algae        | - | <i>Gelidium</i>          |
| 3. Fungi        | - | <i>Ergot.</i>            |
| 4. Pteridophyte | - | <i>Marsilea</i>          |
| 5. Gymnosperm   | - | <i>Ephedra</i>           |
| 6. Angiosperm   |   |                          |
| Monocot         | - | <i>Acorus calamus</i>    |
|                 | - | <i>Curcuma aromatica</i> |
|                 | - | <i>Allium sativum</i>    |

- *Asparagus racemosus*
- *Alpinia galanga*

- Dicot
- *Azadirachta indica*
  - *Adathoda vasica*
  - *Cinchona officinalis*
  - *Ocimum sanctum*
  - *Withania somnifera*

#### Unit – IV

Phenology of selected plants and their cultivation.

1. *Aloe vera*
2. *Phyllanthus niruri*
3. *Catharanthus roseus*
4. *Gymnema sylvestre*
5. *Coleus aromaticus*
6. *Hibiscus rosa sinensis*
7. *Eucalyptus globulus*
8. *Gloriosa superba*
9. *Abutilon indicum*

#### Unit – V

Classification on Raw drugs of plants origin.

Organized Drugs

- |         |   |                                   |
|---------|---|-----------------------------------|
| Root    | - | <i>Rauwolfia serpentina</i>       |
| Stem    | - | <i>Zingiber officinale</i>        |
| Leaves  | - | <i>Solanum trilobatum,</i>        |
| Flowers | - | <i>Eugenia caryophyllata,</i>     |
| Fruits  | - | <i>Piper nigrum,</i>              |
| Seeds   | - | <i>Trigonella foenum graecum,</i> |

Unorganized drugs.

Latex            -        Opium

Gum resin      -        Asafoetida

Gum            -        Gum Arabic

**TEXT BOOK**

Chopra R.N., Nagr. S.L. and Chopra I – C (1956) Glossary of Indian medicinal Plants  
CSIR, New Delhi.

**REFERENCE:**

1. Nadkarni, K.M., (1982). Indian Materia Medica, Popular Prakashan (P) LTD.  
Bombay. Volume I and II
2. Albert F. Hill, (1974) Economic Botany Tata McGraw Hill. Publishing company LTD,  
New Delhi.



## **MICROBIOLOGY & IMMUNOLOGY**

**Subject Code:**

**Semester: V**

**Paper 6**

**Credits: 5**

**Hours per Week: 5 hrs  
hrs**

**Total Hours per Semester: 75**

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To enable the learners,

to have knowledge of microbes, its basics, role in various walks of life.

to get wide idea about immune system, its functions and abnormalities.

### **Unit I:**

Introduction: Microbiology as a basic and applied science – Development of microbiology through years - natural distribution of microorganism – Bergey's classification of microorganisms and their characteristics - Organization and structure of microorganisms: Prokaryotic organization – cytoplasmic membrane and their functions – mesosomes. Cell wall- Gram positive and Gram-negative, Capsule and slime layers- flagella and cilia – bacterial chromosome, plasmids, ribosomes, and reserved food – endospore.

### **Unit II**

Bacterial nutrition - autotrophic and heterotrophic nutrition - Bacterial reproduction – binary fission, other modes of reproduction, conjugation, transformation, transduction. Normal growth curve - Bacterial photosynthesis. Bacterial metabolism - E.M.P.pathway and ED pathway – Fermentation – homofermentative and heterofermentative - Industrial Microbiology – Batch and Fed batch, solid state fermentation, uses of microbes in ethanol production, organic acids (lactic and citric acid) production and antibiotics (Penicillin and Streptomycin) production.

### **Unit III:**

Food Microbiology – food spoilage, food poisoning, food borne infection – Botulism-Microorganism and Milk: Sources of microbes, fermentation of milk, sweet curdling, butyric acid fermentation. Transmission of disease through milk. Medical Microbiology – Morphology, pathogenesis and laboratory diagnosis: *Staphylococci*, *Streptococci*, *Bacillus anthrax*, Adeno virus, H.I.V.

### **Unit IV:**

Introduction – origin, scope of Immunology. Immunity, antigen, antibody, lymphocyte, APC, complement and vaccine – Immunity: Immune cells, lymphoid organs, Immunoglobulins: IgA, G, D, E and M. B-cell and T-cell activation .

### **Unit V:**

Antigen and Antibody interaction: precipitation, agglutination, affinity, avidity, cross reactivity, epitope, paratope, idiotope, immuno electrophoresis, rocket electrophoresis, Radio Immuno Assay (RIA), Enzyme Linked Immuno Sorbent Assay (ELISA), immuno fluorescent assay - Vaccine: classification, sources, methods of preparations, modes of administration. Vaccination schedule - Transplantation and Graft rejection - Hypersensitivity- Autoimmunity.

### **TEXT BOOKS:**

1. Pelczar M.J., Chan, E.C.S. and Kerig, N.R. (1986). General Microbiology, Grow Hill Company.
2. Kuby, J. (1994). Immunology, 2<sup>nd</sup> Edition. W.H. Freeman and Company, New York.

### **REFERENCE:**

1. Prescott, L.M., Harley, J.P. and Klein. (2000). Microbiology. W.M.C. Publishers Lowas USA
2. Nester, E.W., Roberts, C.V. and Nester, M.T. (1995). Microbiology-A Human Perspective. IOWA USA

3. Morag and Timbury, M.C. (1994). Medical virology 10<sup>th</sup> Edition. Churchill living Stone London.
4. Roitt, I.M. (1998). Essentials of Immunology. Blackwell Scientific Publications
5. Roit.J.M., Brostaff.J.J.and Male.J.K. (1996). Immunology 4<sup>th</sup> Edition. C.V.Moshby Publishers St.Lewis.
6. Mark Peakman and Diego Vergani. (1997). Basic and Clinical Immunology Churchill living stone.
7. Talwar.G.P.and Gupta.S.K. (1992). A Handbook of Practical Immunology (Vol. I and II) Vikas Publishing House Pvt. Ltd., New Delhi.

## BIOTECHNIQUES

**Semester: V**

**Subject Code:**

**Paper – 7**

**Credits: 5**

**Hours per Week: 5 hrs  
hrs**

**Total Hours per Semester: 75**

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To enable the learners,

to know basics of Biochemical techniques.

to apply the biochemical techniques in various field of biosciences.

### **Unit I:**

Chromatography: Definition – General principle. Types – Paper, Thin layer, Gas Liquid, Gas solid, Ion – Exchange, Gel filtration Affinity, and High-pressure Liquid Chromatography.

### **Unit II:**

Electrophoresis: Definition, factors affecting separation. Paper electrophoresis, cellulose acetate electrophoresis. Gel electrophoresis - Types of gels, modes of gel electrophoresis, column and slab, agarose, PAGE, SDS-PAGE, density gradient electrophoresis, Two-dimensional electrophoresis, pulse field electrophoresis. Iso-electric focusing, high voltage electrophoresis.

### **Unit III:**

Principles of centrifugation, Relationship between 'rpm' and 'g'. Types of rotors, types of centrifuges, preparative centrifugation – differential centrifugation and density gradient centrifugation. Analytical ultracentrifuge – molecular weight determination – sedimentation equilibrium and sedimentation velocity.

**Unit IV:**

Light spectrum, Colorimeter – principle – Instrumentation types and its application, UV/ Visible spectrophotometer – Single beam and Double beam- Spectroscopy- Infrared & NMR      Dialysis, electro dialysis, ultra filtration, reverse osmosis -Lyophilization.

**Unit V:**

Radioisotopes, Radioactive decay, Rate of radioactive decay, units of radioactivity, interaction of radiation with matter, measurement of radioactivity – Gas ionization, G.M. counter, scintillation counter. Autoradiography, tracer technique, isotopic dilution method,  $^{14}\text{C}$  dating and its application in biological science.

**TEXT BOOK:**

Boyer, R.F. (1993). Modern Experimental Biochemistry 2<sup>nd</sup> Edition. The Benjamin, Cumming Publishing Company, Inc, California.

**REFERENCE:**

1. Keith Wilson and John Walker. (1994). Practical Biochemistry [Principles and Techniques] 4<sup>th</sup> Edition. Cambridge University Press.
2. Avinash Upadhyay, Kakoli Upadhyay and Nirmale Endunath (1998). Biophysical Chemistry 3<sup>rd</sup> Edition, Himalaya Publishing House Mumbai.
3. S.K.Sawhney and Randhir Singh (2000). Introductory Practical Biochemistry 1<sup>st</sup> Edition. Narosa Publishing House, New Delhi.
4. David T.Plummer. (1998). An Introduction to Practical Biochemistry, 3<sup>rd</sup> Edition. Tata Mc Graw – Hill Publishing Company, New Delhi.
5. Phillip Sheller and Donald E.Bianchi. (1987). Cell and Molecular Biology. 3<sup>rd</sup> Edition WSE Wiley Publications.
6. Palanivelu, P. (2004). Laboratory Manual for Analytical Biochemistry, Separation Technique. 3<sup>rd</sup> Edition, Twenty first century publications.

## MOLECULAR BIOLOGY

**Semester: V**

**Subject Code:**

**PAPER – 8**

**Credits: 5**

**Hours per Week: 5 hrs  
hrs**

**Total Hours per Semester: 75**

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To enable the learners,

to understand molecular organization of prokaryotes and eukaryotes.

to know the molecular causes and mechanism of cancer.

### **Unit I:**

Prebiotic origin of biomolecules, Urey-Miller's experiments, Endosymbioiant theory, and advantages of compartmentalization of biomolecules – Prokaryotic and Eukaryotic Nuclear organization: nucleoid, plasmid structure and composition, chromatin structure and composition, euchromatin, heterochromatin & transposons.

### **Unit II:**

Nucleic Acid as Genetic Material – Griffith's experiment, Hershey and Chase's experiment, Avery and Macleod's experiment – DNA Replication: Biochemistry of replication, DNA polymerases, types, structure, and mechanism of replication, initiation, elongation and termination. Drugs and inhibitors of replication.

### **Unit III:**

Biochemistry of Transcription, RNA polymerase, structure, mechanism, initiation, elongation and termination. Eukaryotic enzymes and its complexity of transcription, post transcriptional modifications, drugs and inhibitors of transcription, concepts of operator and suppressors, *Lac* operon, *Ara* operon and *Trp* operon.

#### **Unit IV:**

Genetic code, properties of codons, Wobble hypothesis, initiation, elongation and termination processes of translation. Eukaryotic translation and post translational modifications, drugs and inhibitors of translation.

#### **Unit V:**

DNA Mutations: Spontaneous, induced, point, missense, nonsense, frame shift mutation, tautomerisation, transversion, transition, mutagenesis by nitrous acid, hydroxylamine, alkylating agents, intercalators, base analogues, and UV rays. – Oncogenes, proto-oncogenes, and tumor suppressor genes.

#### **TEXT BOOK:**

David Freifelder. (1987). Molecular Biology 2<sup>nd</sup> Edition. Narosa Publishing Home, New Delhi.

#### **REFERENCE:**

1. Lehninger, A.L., Nelson, D.L. and Cox, M.M. (1993). Principles of Biochemistry 2<sup>nd</sup> Edition. CBS Publishers, Delhi.
2. Davidson, V.L. and Sittman, D.B. (1994). Biochemistry 3<sup>rd</sup> Edition. B.I. Waverly Pvt. LTD. New Delhi.
3. Trudy MC Kee and James R. McKee. (1996). Biochemistry. 1<sup>st</sup> Edition. W.C.B. Brown Publishers.
4. James D. Watson, Tania A. Baker, Stephen P. Bell Alexander Gan, Michael Levine and Richard Losick. (2004). Molecular Biology of the Gene. 5<sup>th</sup> Edition, Pearson Education, Singapore.
5. Twyman, R.M. (1998). Advanced Molecular Biology. 1<sup>st</sup> Edition, Viva Publications, New Delhi.
6. Jermy, W. Dale and Malcolm. Von Schantz. (2003). From Genes to Genomes, Concepts and Application of DNA Technology, John Wiley and Sons Publishers

## **PRACTICALS**

### **MICROBIOLOGY AND MEDICINAL PLANTS**

**Semester: V**

**Subject Code:**

**Practical Paper-1V**

**Credits: 2**

**Hours per Week: 4 hrs**

**Total Hours per Semester: 60 hrs**

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To enable learners,

to know practical and analytical microbial techniques

to identify herbal plants and extract, active compounds from them.

1. Sterilization – knowledge of basic sterilization methods.
2. Media preparation-liquid, solid, and semi solid medium.
3. Serial dilution
4. Pure culture technique – streak plate, spread plate, pour plate.
5. Preparation of stock culture, glycerol stock.
6. Determination of bacterial mobility by hanging drops technique.
7. Staining Methods-simple, grams, acid fast
8. Bacterial Growth curve.
9. Identification of Microbial culture by using oxidase test
10. Microbial quality of milk-Methylene blue dye reduction test
11. Acidity in milk
12. Screening of antibiotic resistance in bacterial culture.
13. Collection and Identification of locally available herbal plants-  
Herbarium Preparation.
14. Herbal plant extraction methods.
15. Screening of Anti Microbial effect of Raw drug extracts



## REFERENCE:

1. Gunasekaran, P. (1995). Laboratory Manual in Microbiology, 1<sup>st</sup> Edition. New age international [P] LTD. Publishers New Delhi.
2. Kannan.N, (2000). Laboratory Manual in General Microbiology, Palani Paramount Publications. Palani.
3. Gaud, R.S., Gupta, G.D. (1999) Practical Microbiology, 1<sup>st</sup> edition Nirali Prakashan Pune.
4. David. T. Plummer, (1987). An introduction to practical Biochemistry 3<sup>rd</sup> Edition. McGraw – Hill Edition.
5. Nadkarni, K.M. (1982). Indian Materia Medica. Popular Prakashan, [P] LTD. Bombay. Volume I – II.
6. Krishnamurthy, T. (1993). Minor Forest Products of India, Oxford and IBH publishers [P] LTD, New Delhi.

## IMMUNOLOGY AND BIOTECHNIQUES

**Semester: V**

**Subject Code:**

**Practical Paper-V**

**Credits: 2**

**Hours per Week: 4 hrs**

**Total Hours per Semester: 60 hrs**

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To enable learners,

to know basics of immunological tests and biochemical techniques

1. RBC sedimentation rate
2. RBC and WBC count
3. Differential count of WBC
4. ABO Blood Grouping
5. Rh Grouping.
6. Heme agglutination
7. Rat - lymphoid organ dissection
8. Thin layer Chromatography – separation of lipids.
9. Paper chromatography- separation of amino acid from mixture

### REFERENCE:

1. Palanivelu, P. (2004). Laboratory Manual for Analytical Biochemistry, Separation Technique. 3<sup>rd</sup> Edition, Twenty first century publications.
2. David. T. Plummer, (1987). An introduction to practical Biochemistry 3<sup>rd</sup> Edition. McGraw – Hill Edition.

## NUTRITION AND DIETETICS

**Semester: VI**

**Subject Code:**

**Paper – 9**

**Credits: 4**

**Hours per Week: 4 hrs**

**Total Hours per Semester: 60 hrs**

To enable the learners,

to have knowledge nutritional importance of food and its constituents.

to apply the knowledge to formulate diet for persons under clinical treatment.

### **Unit I:**

Introduction – Definition – Food, Classification of foods, essential nutrients, analysis of food, composition, food habits, food groups, nutritional importance of carbohydrates, proteins, lipids, vitamins and minerals. Nutritive values for different foods – Water: water intake and loss of water balance, exchange of water in the body. Excess of water intake effect and dehydration. Oral rehydration therapy – Dietary fibers: types – source, role of dietary fibers in the absorption of different nutrients, in different diseased conditions.

### **Unit II:**

Energy value of food – Energy unit, Measurement of Energy value – Bomb calorimeter, Benedict's oxy method. Specific dynamic action (SDA) of food, thermogenesis. Basal Metabolic Rate (BMR) – Definition, Measurement of BMR – Direct and indirect methods, factors affecting BMR, Regulation of body temperature. Total energy requirement at different developmental stages.

### **Unit III:**

Determination of nutritive value of proteins. PER, NPR, Net protein utilization, Digestibility coefficient. Biological value, Nitrogen Balance – positive and negative nitrogen balance. Factors affecting protein utilization. Protein malnutrition – Kwashiorkor, Marasmus - Assessment of nutritional status. Balanced diet formulation.

Nutrition at various stages – infant, children, adult, pregnant woman, lactating mother and older person.

**Unit IV:**

Principles and classification of therapeutic diet. regular, light, soft fluid, parenteral and enteral feeding. Energy modification and nutritional care for obesity, underweight, infections and surgical conditions, peptic ulcer, anemia, hypertension, diabetes mellitus, jaundice, renal failure and atherosclerosis.

**Unit V:**

Interaction between drugs and nutrients. Nutritional status - Supplementary foods - Food production - Food storage - Food allergy - Food additives - Food fads & fallacies - Applied nutrition programs - Effect of cooking of food - Future protein foods - Future fat foods, Single cell protein (SCP).

**TEXT BOOK:**

Swaminathan, M., [Vol I and Vol II] Advanced Text Book in Food and Nutrition  
2<sup>nd</sup> Edition 1989, Bappco publications Bangalore.

**REFERENCE:**

1. Raheena Begum. A Text Book of foods, Nutrition and Dietetics 2<sup>nd</sup> Edition 1991 Sterling Publishers Pvt LTD. New Delhi.
2. Shubhangini A. Joshi Nutrition and Dietetics 1<sup>st</sup> Edition 1992, TATA MC Graw Hill Publishing Company New Delhi.
3. Sri Lakshmi B, Food Science, New Age International LTD, New Delhi, 1997.
4. Robinson C.H. Marilyn, R.L. Normal and Therapeutic nutrition Macmillan Publishing Company New York, 1995.
5. Eva. D.W. Katheine, H.F, Fugua, M.F, Principles of Nutrition Wiley Eastern Pvt. LTD New Delhi, 1971.

## PLANT BIOCHEMISTRY

**Semester: VI**

**Subject Code:**

**Paper – 10**

**Credits: 4**

**Hours per Week: 4 hrs**

**Total Hours per Semester: 60 hrs**

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To enable the learners,

to get an idea about biochemistry of plants.

to understand the fundamentals of plant tissue culture.

### **Unit I:**

Photosynthetic apparatus: Chloroplast, photosynthetic pigments, chlorophyll, carotenoids and phycobilins - Photosynthesis – Definition, History, light absorption region. Mechanism of photosynthesis – Light reaction. Dark reaction – C<sub>3</sub>, C<sub>4</sub>, CAM cycle. Factors affecting photosynthesis. Photorespiration - Secondary metabolism: Biosynthesis of essential oils and rubber.

### **Unit II:**

Plant hormones: Biosynthesis, occurrence, and mechanism of actions of Auxin, GA, ABA, cytokinin and ethylene, functions of synthetic hormones, Growth inhibitors.

### **Unit III:**

Nitrogen Fixation: N<sub>2</sub> cycle, symbiotic nitrogen fixation, asymbiotic nitrogen fixation. Nitrogenase enzyme complex. *Nif* gene – Nitrogen assimilation – Sulfur assimilation – Water movement, ascent of sap, Mineral absorption and metabolism - translocation of minerals. Micro and macro minerals – sources – function – deficiency.

**Unit IV:**

Phytochrome – physical and chemical properties of phytochrome, distribution and their role in seed germination, photoperiodism – Vernalisation, dormancy – Seed germination – Glyoxylate cycle – Bud dormancy – Senescence – Fruit ripening, geotropism - Circadian rhythm. Plant tissue culture – history, totipotency, organ culture, embryo culture, somoclonal variation.

**Unit V:**

Plant disease and Disease resistance: Causes of plant diseases – Entry of pathogens into plants, effect of pathogens, mechanisms of infections – Plants parasite relationship, weapons of attack, enzymes, microbial toxins, growth regulators in plant diseases, factors influencing infections. Defense mechanism, pre infectional, and post infectional defense mechanism – disease control.

**TEXT BOOK:**

Salisbury and Ross. (1986). Plant Physiology 1<sup>st</sup> Edition. CBS Publishers, New Delhi.

**REFERENCE:**

1. Devlin and Witham (1986). Plant Physiology 1<sup>st</sup> Edition. CBS Publishers New Delhi.
2. Mukherji. S. and Ghosh. A.K. (1996). Plant Physiology 1<sup>st</sup> Edition. TATA McGraw-Hill Publishing Company New Delhi.
3. Bidwell, R.G.S. (1974). Plant Physiology. MacMillan Publication.
4. Tarr S.A.J. (1972). Principles of Plant Pathology, 1<sup>st</sup> Edition. Macmillan Publishers, London.
5. Sharma P.D. (2004). Plant Pathology, 1<sup>st</sup> Edition. Rastogi Publications, Meerut.

## HERBAL TECHNOLOGY

**Semester: VI**

**Subject Code:**

**Paper – 11**

**Credits: 4**

**Hours per Week: 4 hrs**

**Total Hours per Semester: 60 hrs**

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To enable the learners,

to evaluate the drugs by extracting and analyzing them.

to instill concepts of herbal medicine formulation and preparation.

to get idea about value added products production from plants.

to instill basics of proper utilization of wide flora in a sustainable and value added manner.

### **Unit – I**

Methods of Drug evaluation, Organoleptic, Microscopic, Physical, Chemical, Biological evaluation, Active constituents tests to identify and assess the quality, purity and uses of following drugs.

1. Honey
2. Asafoetida
3. Menthol
4. Santalum.
5. Turpentine

### **Unit II**

Methods of Drug evaluation, Organoleptic, Microscopic, Physical, Chemical, Biological evaluation, Active constituents tests to identify and assess the quality, purity and uses of following drugs.

1. Lemon grass oil
2. Sesame oil
3. Castor oil
4. Clove oil
5. Eucalyptus oil

### **Unit – III**

Extraction equipments for extracting herbal products - methods of extraction-water, steam, solvent, super critical fluid extraction technology.

Types of herbal medicines, Preparation techniques of Legium, Thylam, Tablet, Choornam, Parpam, Chendooram, Tincture, Capsules, Decoction. Ointments, Hair oil, Tonic wine.

### **Unit – IV**

Production of value added products from

1. *Azadirachta indica*
2. *Aloe vera*
3. *Gymnema sylvestre*
4. *Withania somnifera*
5. *Ocimum sanctum*
6. *Santalum album*
7. *Curcuma aromatica*

### **Unit – V**

Indian drugs and cosmetics act of 1940, marketing prospectus of raw drugs, Herbal products and Medicines in National and International level, Adoption of WTO agreement its effects over herbal intellectual property rights.

### **TEXT BOOK**

1. Farooqui, A.A., Production technology of medicinal and Aromatic plants
2. Krishnamurthy, T., (1993). Minor Forest products of India. Oxford and IBH Publishers (P) LTD, New Delhi.

### **REFERENCE**

1. Sairam, T.V., Herbal Remedies – Part I, II, III, and IV.
2. Thirugnanam, S. (1995). Moolikai Maruthuvam, Selvi Pathippagam, Trichy. (in Tamil)
3. Dhanya Kumar, (2002). Indya Mooligaigal [A Dictionary of Indian Herbal Plants] Narmada pathipagam, Chennai (in Tamil).



## **GENETIC ENGINEERING AND INDUSTRIAL BIOTECHNOLOGY**

**Semester: VI**

**Subject Code:**

**PAPER – 12**

**Credits: 5**

**Hours per Week: 5 hrs**

**Total Hours per Semester: 75 hrs**

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To enable the learners,

to have fundamental knowledge on methods and application of genetic engineering.

to get in depth idea about application of genetic engineering, fermentation technology in industries.

to make aware of Intellectual property rights law oriented to the genetic engineering.

### **Unit I:**

Gene – organization and expression, cistron – restriction and modification enzymes, types, application. Construction of cloning vectors, various types of cloning vectors, plasmid, cosmid, phage DNA, YAC, pBR322, pUC 18 - Methods of vector introduction – Particle gun bombardment, electroporation, microinjection – construction of recombinant DNA.

### **Unit II:**

cDNA construction, cDNA libraries screening, expression,– transgenesis: transgenic organisms, production of novel proteins: insulin, interferon - advantages of cloning in industrial organisms like *Bacillus*, *Pseudomonas*, yeast – features of Ti. Mechanism of T–DNA transfer. Role of virulence gene, use of Ti as vector - Transgenic plant – Bt cotton - Herbicide resistance, insect resistance, virus resistance, salt tolerance,

drought tolerance, stress tolerance ACC Human genome project and current advancements .

### **Unit III:**

DNA and RNA probes and their uses in disease diagnosis and in forensics. PCR and RT-PCR, tools of genetic analysis. DNA sequencing chemical, enzymatic, automated. RFLP (Restriction Fragment Length Polymorphism) RAPD (Random Amplified Polymorphic DNA Marker), AFLP (Amplified Fragment Length Polymorphism)

### **Unit IV:**

Bioreactor: Design, parts and their functions, bioprocess control and monitoring variables such as, temperature, agitation pressure, pH and oxygen, computers in bioprocess control.

### **Unit V:**

Production of recombinant proteins, acetic acid, using bioreactors on large scale – safety in recombinant DNA research lab and industrial applications. Intellectual property Rights (IPR), patent protection in developing countries, regional development and IPR, WTO and IPR.

### **TEXT BOOKS:**

1. Old, R.W. Primrose., S.B. 1996 Principles of gene manipulation Blackwell science publication, Germany
2. Duran, P.M. (2005). Bioprocess Engineering Principles, 1<sup>st</sup> Edition. Elsevier Publications, US.

### **REFERENCE:**

1. Sandhya Mitra. (1996). Genetic Engineering 1<sup>st</sup> Edition. Mac Millan Indian LTD.
2. Winnacker, E.L. (1987). From Genes to clones - Introduction to Gene Technology, V.C.H. Publication, Federal Republic Company.
3. Brown, T.A. (1995). Gene cloning, 3<sup>rd</sup> Edition Chapman, Hall Publications USA

4. Balasubramanian, D., Bryce, C.F., Dharmalingam K, Green, J., Kunthala,J., [Eds], (1996). Concepts in Biotechnology. COSTED – IBU, University Press Hyderabad.
5. Shuler, M.L. and Kargi, F. (2002). Bioprocess Engineering Basic Concepts, 2<sup>nd</sup> Edition. PHI Publications, India.
6. Arkinson B, Mavituna, F. (1991). Biochemical Engineering and Biotechnology handbook 2<sup>nd</sup> Edition. Mac Millan.
7. Nair, K.R.G., Kumar. A., (1994). Intellectual property rights, Allied Publishers, LTD. New York.
8. Internet Access

## BIOINFORMATICS

**Semester: VI**

**Subject Code:**

**Paper – 13**

**Credits: 5**

**Hours per Week: 5 hrs**

**Total Hours per Semester: 75 hrs**

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To enable the learners,

to make aware of basic concepts and tools of Bio informatics.

to utilize “*in silico*” knowledge for elucidating biomolecules.

### **Unit I:**

Introduction, importance and applications of bioinformatics. An introduction to servers, operating systems, UNIX, World Wide Web (www). Programming in Perl.

### **Unit II :**

Search engines – finding scientific articles – Pubmed – public biological databases, Primary and secondary Protein Data Bank (PDB), Swissprot, Genbank - searching databases – depositing data to public databases.

Structure of DNA and protein – sequence analysis – pair - wise sequence comparison – sequence queries against biological databases. dot blot & global alignment.

### **Unit III:**

BLAST and FASTA – multifunctional tools for sequence analysis. Multiple sequence alignments, phylogenetic alignment – profiles and motifs. Protein structure visualization – tools, structure – classification, alignment and analysis.

### **Unit IV:**

Genomics and proteomics – sequencing genomes – sequence assembly – genomes on the web – annotating and analyzing genome sequences, model systems – *E.coli* and *Homo*

*sapiens*. Proteomics – biochemical pathway databases. Bioinformatics of herbal products and drugs, Pharmacogenomics – present status, Scope.

#### **Unit V:**

Analysis Packages – Features of a stand alone analysis package, selected popular commercial packages – GCG, EGCN, Staden, Special packages on DNA analysis, internet and intranet packages.

#### **TEXT BOOK:**

Gibas, C, Jam beck, P. Developing Bio informatics Computer Skills, Shroff Publisher Calcutta.

#### **REFERENCE:**

1. Attwood, T.K. and Parry – Smith, D.J. (1999). Introduction to Bio – Informatics, Person Education, Pvt, LTD. Singapore.
2. Lesk, A.M. (2002). Introduction to Bio informatics Oxford University Press Oxford.
3. Baxevanis, A.D. and Ouellette, B.F.F. (1998). Bio informatics a practical Guide to the Analysis of Genes, Proteins Wiley – inter science Publication, New York.
4. Smith, D.W. (1994). Bio computing Informatics, Genome Projects. Academic press, Sandiego.
5. David. W. Mount, (2003). Bioinformatics, CBS Publishers and Distributors, New Delhi.
6. Internet Access.

## BIOTECHNOLOGY AND BIOINFORMATICS

**Semester: VI**

**Subject Code:**

**Practical Paper - VI**

**Credits: 2**

**Hours per Week: 3 hrs**

**Total Hours per Semester 45 hrs**

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To enable the learners,

to capable of handling tools in biotechnology and perform molecular experiments with a hand in “*In silco*” lab,

1. Agarose gel electrophoresis
2. SDS-PAGE
3. Isolation, quantitation and quality assessment of bacterial DNA.
4. Isolation and quality assessment of plasmid DNA
5. Restriction Digestion and Ligation.
6. Transformation.
7. Retrieving DNA and Protein sequences from biological databases- Demo only
8. Computational analysis of DNA and Protein by bioinformatics tools. - Demo only

### REFERENCE:

1. Palanivelu, P. (2004). Laboratory Manual for Analytical Biochemistry, Separation Technique. 3<sup>rd</sup> Edition, School of Biotechnology, M.K.U
2. Chellam Raja Manikam, Experimental Protocol in Basic Molecular Biology ,1<sup>st</sup> Edition, OSHO Scientific Pub, Madurai.
3. David. T. Plummer. (1987). An introduction to practical Biochemistry 3<sup>rd</sup> Edition. McGraw – Hill Edition
4. Sawhney, S.K. and Randhir Singh. (2000). Introductory Practical Biochemistry 1<sup>st</sup> Edition. Narosa Publication.
5. Internet Access.

## HERBAL TECHNOLOGY

**Semester: VI**

**Subject Code:**

**Practical Paper-VII**

**Credits: 2**

**Hours per Week: 3 hrs**

**Total Hours per Semester: 45 hrs**

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To enable the learners,

to isolate, analyze active compounds from herbal plants, formulation and preparation of herbal medicine and value added plant products.

1. Analysis of Alkaloids from various medicinal plants.
- 2 Analysis of Glycosides from various medicinal plants.
- 3 Analysis of Tannins from various medicinal plants.
4. Preparation of Legium.
5. Preparation of, Thylam.
6. Preparation of Choor nam.
7. Preparation of Parpam.
8. Preparation of Ointments.
9. Preparation of Chendooram.
10. Field trip to identify drug yielding plants and on the spot screening for its constituents.
11. Visit to Siddha / Ayurvedha drug manufacturing industry.

**REFERENCE:**

1. Krishnamurthy, T (1993). Minor Forest Products of India, Oxford and IBH publishers [P] LTD, New Delhi.
2. Nadkarni K.M.. (1982). Indian Materia Medica. Popular Prakashan, Pvt, LTD. Bombay. Volume I – II.
3. Internet Access.



## QUESTION PAPER PATTERN

### THEORY EXTERNAL

**Maximum Marks – 75 Marks**

**Duration of Examinations: 3 Hrs.**

**PART – A.**

Answer Any TEN questions (10 Questions out of 15)

**10X2=20**

**PART – B.**

Answer Any FIVE questions (5 Questions out of 8)

**5X5=25**

**PART – C.**

Answer ANY THREE questions (3 Questions out of 5)

**3X10=30**

**TOTAL**

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**75 Marks**

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**DEPARTMENT OF BIOCHEMISTRY  
YADAVA COLLEGE  
(Autonomous)  
MADURAI – 625 014.**

**SELF STUDY PAPER FOR EARNING EXTRA CREDITS BY THE BRILLIANT  
STUDENTS**

**of**

**B.Sc., BIOCHEMISTRY (HERBAL TECHNOLOGY)**

**UNDER GRADUATE PROGRAMME**

**For those who joined June – 2015-16**

**B.Sc., BIOCHEMISTRY (HERBAL TECHNOLOGY)**

**UNDER GRADUATE PROGRAMME**

SELF STUDY PAPER FOR EARNING EXTRA CREDITS BY THE BRILLIANT STUDENTS.

**COURSE CONTENT**

Semester	Subject Code	Title of the paper	Credits	Teaching hours per week	Duration of Examination	Marks Allotted		Total
						Internal	External	
III		Blood Biochemistry	3	-	3	25	75	100
IV		Medical Lab Technology	3	-	3	25	75	100
V		Mushroom Cultivation	3	-	3	25	75	100
VI		Organic Farming	3	-	3	25	75	100

## **BLOOD BIOCHEMISTRY**

**Semester: III**

**Subject Code:**

**Paper – 1**

**Credits: 3**

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To enable the learners,

to know the techniques in Hematology.

to know the procedures and complications of blood transfusions.

### **Unit – I**

Basic Techniques in Hematology: Methods of blood collection, Anticoagulants, preparing blood smears, staining of blood smears, examination and interpretation of blood smears.

### **Unit – II**

Lab diagnosis of RBC disorders : Lab diagnosis of iron deficiency, megaloblastic, pernicious, folic acid deficiency, hemolytic anemias.

### **Unit – III**

Lab diagnosis of Hemoglobin disorders: Lab diagnosis of sickle cell, aplastic anemias,  $\alpha$ ,  $\beta$  – thalassemias.

### **Unit – IV**

Bleeding disorders and diagnosis: Bleeding time, Coagulation time, Prothrombin time, and Lab diagnosis of hemophilia – A & B

### **.Unit – V**

Blood banking: Antigens & Grouping system, Grouping test, Blood transfusion – Donor screening methods, Coombs' cross matching, transfusion complications.

### **Reference Books :**

1. Ramnik Sood, 2006 Medical Laboratory Technology, Methods and Interpretations, 5<sup>th</sup> Edition, Jaypee Brothers, New Delhi.

2. Kanai L. Mukherjee, 1996 Medical Laboratory Technology,

A procedure manual for routine diagnostic tests, volume I, II, III, Tata McGraw – Hill Publishing Company Limited, New Delhi.

## MEDICAL LAB TECHNOLOGY

Semester: IV

Subject Code:

Paper – II

Credits: 3

To enable the learners,

to know the techniques in Hematology.

to know the procedures and complications of blood transfusions.

### Unit – I

Histopathology: Fixation, decalcification, preparation of sections, routine and special staining methods.

### Unit – II

Stool Examination: Collection, inspection, test for blood, fat, microscopic examination, organisms seen in normal and abnormal conditions.

### Unit – III

Sputum Analysis: Collection, physical examination, physical findings along with sputum, microscopic examination, sputum culture, organisms seen in normal and abnormal conditions.

### Unit – IV

Semen Analysis: Collection, gross examination, microscopic examination, antibodies of sperm.

### Unit – V

Pregnancy test: Specimen collection and procedure, immunological tests for pregnancy – Antisera – Anti HCG dispersed card method, ELISA method.

### Reference Books:

1. Ramnik Sood, 2006 Medical Laboratory Technology, Methods and Interpretations, 5<sup>th</sup> Edition, Jaypee Brothers, New Delhi.
2. Kanai L. Mukherjee, 1996 Medical Laboratory Technology, A procedure manual for routine diagnostic tests, volume I, II, III, Tata McGraw – Hill Publishing Company Limited, New Delhi.

## MUSHROOM CULTIVATION

Semester: V

Subject Code

Paper – III

Credits: 3

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To enable the learners,

to know the basics of mycology.

to know the procedures and methods of cultivation of fungi.

### Unit – I

Fungi general characteristics – nutrition, thallus. Cell wall, nuclear status, life cycle - sexuality in fungi (asexual and sexual reproduction)

### Unit – II

Taxonomy, nomenclature and classification of fungi up to class levels, natural and artificial classification. Ascomycotina Ex. *Saccharomyces cerevisiae*, Basidiomycotina

Ex. *Agaricus campestris*

### Unit – III

Cultivation of edible mushrooms –

*Agaricus bisporus* (white button mushroom),

*Pleurotus ostereatus* (American oyster mushroom),

*Lentinus edodes* (Japanese mushroom),

*Volvariella volvaceae* (Paddy straw mushroom).

### Unit – IV

Growing conditions of mushrooms, fungal nutrition – nutritional requirements – carbon and nitrogen sources, minerals and vitamins. Storage of mushrooms and its importance.

### Unit – V

Mycotoxins and mycotoxins – Mushroom toxins – Amanitins, Cyclopeptides, Orellanine Gyromitrin and Muscarine

### Reference Books:

1. H.C.Dube, 1990, An Introduction to Fungi, Vikas Publishing house Pvt. Ltd.
2. Geoffrey Kibby , 1977, Mushroom and toad stool Chartwell books Inc Octopus book limited

## ORGANIC FARMING

Semester: VI

Subject Code

PAPER – IV

Credits: 3

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To enable the learners,

to know the basics of mycology.

to know the procedures and methods of cultivation of fungi.

### Unit – I

Compost preparation – procedure, advantages, disadvantages of organic farming

### Unit – II

Biofertilizer – types of biofertilizers, microbial inoculants, advantages of biofertilizer, production of biofertilizer.

### Unit – III

Vermiculture – preparation of vermicompost, vermicomposting using paddy straw.  
Benefits of vermi composting.

### Unit – IV

Biopesticides – characteristics of biopesticides, advantages and disadvantages of biopesticides, biopesticides production.

### Unit – V

Biofuel - Biodiesel production from *Jatropha curcas*, *Pongamia glabra*, Gobar gas production and its uses.

### Reference Books:

V.Kumaresan 2006, Plant Ecology and Applied Botany, Saras Publication

**DEPARTMENT OF BIOCHEMISTRY  
YADAVA COLLEGE, MADURAI – 14.  
(AUTONOMOUS)**

**CBCS PATTERN  
NON MAJOR ELECTIVE SYLLABUS  
FOR THOSE WHO JOINED IN  
JUNE – 2015-16**



**DEPARTMENT OF BIOCHEMISTRY**

**Yadava College (Autonomous), Madurai – 625 014.**

**Choice Based Credit System - for those who joined in June 2015-16**

**Non- Major Elective offered to Other Major Students**

<b>Semester</b>	<b>Subject code</b>	<b>Title of the paper</b>	<b>Teaching Hours / week</b>	<b>Credit</b>	<b>Duration of Exam</b>	<b><i>Evaluation</i></b>		<b>Total</b>
						<b>Interna l</b>	<b>Externa l</b>	
III		Human Diseases & Prevention	2	2	3	25	75	100
IV		Food & Nutrition	2	2	3	25	75	100

## **HUMAN DISEASES AND PREVENTION**

**Semester: III**

**Subject Code:**

**Paper – I**

**Credits: 2**

**Hours per Week: 2 hrs**

**Total Hours per Semester: 30 hrs**

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To enable the learners,

to make aware of causes, symptoms, treatment and prevention of human diseases.  
to make aware of trauma care.

### **Unit I:**

Definition- Disorder, disease, syndrome, causes, symptoms, and prevention of Hemiplegia, Arthritis, Gout.

### **Unit II:**

Causes, symptoms, and prevention of Sinusitis, Asthmas, Ulcer, Piles.

### **Unit III:**

Causes, symptoms, and prevention of Jaundice, Hepatitis, Myocardial infraction, Cardiomegaly.

### **Unit IV:**

Causes, symptoms, and prevention of Diabetes mellitus, Hyper and Hypo Thyroidism, Obesity.

### **Unit V:**

Causes, symptoms, and prevention of Urinary tract infections, Sexually transmitted diseases, Dysurea, Polycystic ovarian syndrome, Azoospermia.

**TEXT BOOK:**

Carl A. Burtis, Edward R. Ashwood (2001), Tietz, Fundamentals of Clinical chemistry, 5<sup>th</sup> Edition, Har Court India Pvt LTD, Company New Delhi.

**REFERENCE:**

1. Thomas M. Devlin. (1997). Text Book of Biochemistry with Clinical Correlation, 4<sup>th</sup> Edition. Wiley Liss Publication.
2. Chatterjea and Ranashinde. (2005). Text Book of Medical Biochemistry, 6<sup>th</sup> Edition, 2005, JP Publications, Calcutta.
3. Kanai L. Mukherjee. (1998). Vol. II III Medical Laboratory Technology, 1<sup>st</sup> Edition. TATA McGraw – Hill Publishing Company LTD New Delhi.
4. Dinesh Puri. (2002). Textbook of Biochemistry, Clinically Oriented Approach. 1<sup>st</sup> Edition. B.I. Churchill Living Stone Pvt. LTD. New Delhi.
5. Allan Gaw., Robert A., Cowan. Denis St. Stewart, J. and James Shepherd. (1999). Clinical Biochemistry 2<sup>nd</sup> Edition. Churchill Living stone

## **FOOD AND NUTRITION**

**Semester: IV**

**Subject Code:**

**Paper – II**

**Credits: 2**

**Hours per Week: 2 hrs**

**Total Hours per Semester: 30 hrs**

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To enable the learners,

to have knowledge over nutritional importance of food and its constituents.

to apply the knowledge to formulate diet for persons under clinical treatment.

### **Unit I:**

Introduction – Definition – Food, Classification of foods, essential nutrients, composition of food, , nutritional importance of carbohydrates, proteins, lipids, vitamins and minerals. Nutritive values for different foods

### **Unit II:**

Water: water intake and loss of water balance, exchange of water in the body.

Excess of water intake effect and dehydration. Oral rehydration therapy – Dietary fibers: types – source, role of dietary fibers in the absorption of different nutrients.

### **Unit III:**

Nitrogen Balance – positive and negative nitrogen balance. Factors affecting protein utilization. Protein malnutrition – Kwashiorkor, Marasmus - Balanced diet formulation. Nutrition at various stages – infant, children, adult, pregnant woman, lactating mother and older person.

### **Unit IV:**

Principles and classification of therapeutic diet. Regular, light, soft fluid, parenteral and enteral feeding. Energy modification and nutritional care for obesity, underweight, anemia, hypertension, diabetes mellitus, jaundice, renal failure and atherosclerosis.

**Unit V:**

Food fads & fallacies - Food allergy - Food additives - Food production - Food storage - Effect of cooking over food - Supplementary foods - Future protein foods - Future fat foods, Single cell protein (SCP).

**TEXT BOOK:**

Swaminathan, M., [Vol I and Vol II] Advanced Text Book in Food and Nutrition  
2<sup>nd</sup> Edition 1989, Bappco publications Bangalore.

**REFERENCE:**

1. Raheena Begum. A Text Book of foods, Nutrition and Dietetics 2<sup>nd</sup> Edition 1991 Sterling Publishers Pvt LTD. New Delhi.
2. Shubhangini A. Joshi Nutrition and Dietetics 1<sup>st</sup> Edition 1992, TATA MC Graw Hill Publishing Company New Delhi.
3. Sri Lakshmi B, Food Science, New Age International LTD, New Delhi, 1997.
4. Robinson C.H. Marilyn, R.L. Normal and Therapeutic nutrition Macmillan Publishing Company New York, 1995.
5. Eva. D.W. Katheine, H.F, Fugua, M.F, Principles of Nutrition Wiley Eastern Pvt. LTD New Delhi, 1971.



## **ALLIED – II**

### **Concepts in Biology**

**Common for B.Sc., Biochemistry & B.Sc., Microbiology (For those who  
joined in June 2015-16)**

**ALLIED – II**  
**Concepts in Biology**  
Common for B.Sc., Biochemistry & B.Sc., Microbiology  
**(For those who joined in June 2015-16)**

Sem	Code	Title of the Paper	Teach. Hours/ Week	Exam Hours	Credits	Evaluation		Total
						Internal	External	
I		General Biology	5	3	2	25	75	100
II		Cell Biology	3	3	2	25	75	100
II		Practical-I General & Cell Biology	2	3	1	40	60	100
III		Genetics	5	3	2	25	75	100
IV		Biostatistics	3	3	2	25	75	100
IV		Practical-II Genetics &Biostatistics	2	3	1	40	60	100



# GENERAL BIOLOGY

**Semester: I**

**Paper – 1**

**Hours per Week: 5 hrs**

**Subject Code:**

**Credits: 2**

**Total Hours per Semester: 75 hrs**

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To enable the learners

to have basic knowledge of classification and general characters of plants and animals

to enrich their knowledge on human physiology

## **Part A - BOTANY**

### **Unit I**

Introduction, general characters and classification of the following groups, Morphology, structure and reproduction of the following types.

**Algae** - *Sargassum*

**Fungi** - *Saccharomyces*

**Bryophytes** - *Funaria*

Economic importance of Algae and Fungi

### **Unit II**

Introduction, general characters and classification of the following groups, Morphology, structure and reproduction of the following types.

**Pteridophytes** - *Selaginella*

**Gymnosperms** - *Pinus*

Vegetative and floral characters of the following

**Angiosperms** - *Polyanthes tuberosa (Monocot)*  
*Ervatamia divaricata (Dicot)*

Economic importance of Pteridophytes and Gymnosperms.

## **PART B - HUMAN ANATOMY AND PHYSIOLOGY**

### **Unit III**

1. **Digestive system:** Organization of digestive system, movements and secretions of gastro intestinal tract, digestion and absorption of food

2. **Respiratory system:** Organization of respiratory system, respiratory pigments and process of respiration

#### **Unit IV**

3. **Circulatory system:** Organization of circulatory system, composition, components and functions of blood.
4. **Excretory system:** Organization of excretory system, maintenance of homeostasis.

#### **Unit V**

5. **Endocrine system:** Organization and functions of endocrine glands – Hypothalamus and maintenance of body temperature.
6. **Reproductive system:** Organization of male and female reproductive organs, development of primary and secondary sexual characters, menstrual cycle, pregnancy trimesters, birth control measures.

#### **Reference**

1. Dutta, A.C., Botany for degree students, Oxford University press.
2. Vashista.B.R., Sniha,A,K., Singh.V.P., Botany for Degree students. S.Chand Company LTD.
3. Pandey. B.P., Text Book of Botany Vol. I and II, S.Chand and Company. New Delhi
4. Roa, K.N., Ancillary Botany, Viswanathan. S., and Company, Chennai.
5. Srivastava. H. N., Plant Physiology, Pradeep Publications, Jalandhar
6. Taylor W.T., and Wehe. R.J. – General biology, East West Press Pvt. LTD.
7. Guyton A.C., and Hall J.E, Textbook of Medical Physiology, W.B.Saunders Company
8. Sujit. K. Chaudri., Concise Medical Physiology, New Central Book Agency, Kolkata, 4<sup>th</sup> Edition, 2002.

## CELL BIOLOGY

**Semester: II**

**Paper – II**

**Hours per Week: 3 hrs**

**Subject Code:**

**Credits: 2**

**Total Hours per Semester: 45 hrs**

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### **To enable the learners**

to have knowledge of the cell, its constituents and life cycle.

to make aware of techniques in cell biology.

### **Unit I**

1. A brief comparative study of prokaryotic and eukaryotic cell structures.
2. Ultra structure, chemistry and functions of plasma membrane.
3. Organization and chemistry of protoplasm, functions of microtubules and microfilaments.

### **Unit II**

1. Eukaryotic membrane system: ultra structure, chemistry and functions of endoplasmic reticulum (rough and smooth), Golgi bodies, lysosome, and mitochondria.
2. Nuclear organization: Prokaryotic nuclear organization (chromosomal and extra chromosomal) chemistry and structure. Eukaryotic nuclear envelope, Euchromatin and heterochromatin, nucleosomes, chromosome.

### **Unit III**

1. Plastids – types, ultra structure, chemistry and functions.
2. Cell cycle - significance of various phases of cell cycle, mitosis and meiosis.
3. Normal and cancerous cell growth, cell culture, maintenance of cell lines.

### **Unit IV**

1. Histo chemical staining - Iodine, mercuric bromophenol blue, sudan black, Schiff's reagent, toluidine blue dyes and their significance.
2. Microscopy – light, electron and fluorescent microscopes and their significance.
3. Cell fractionation – gradient and differential centrifugation.

### **Unit V**

Viruses – Classification based on structure, nucleic acid and host. Life cycle of T4 phage, TMV, adenovirus, retrovirus. Virion, Prion.

## Reference

1. Albert, B.Bray , Lewis. D., J.Raff, M. Roberts K and Watson JD, Molecular biology of the cell, Newyork, Garland 1983.
2. De Robertis, E.D.P.and De Robertis, Jr. E.M.E, Essentials of cell and molecular biology 1<sup>st</sup> Edition 1995.
3. Fawcett, D.W., The cell, its organelles and inclusions – Philadelphia W.B. Saunders 1<sup>st</sup> Edition, 1966.
4. Shukla. R.M. A Textbook of Cell Biology, Dominant Publishers & Distributors 1<sup>st</sup> Edition, 2005.
5. Carl. P. Swagon and Peter L. Wester. The Cell, Prentice-Hall India Pvt.Ltd, 1<sup>st</sup> Edition, 1989.
6. Powar. C.B., Cell Biology, Himalaya Publishing house, Mumbai, 3<sup>rd</sup> Edition, 1996.
7. Krishnasamurthy, K.V., Methods in Plant Histochemistry, Viswanathan printers and publishers, 1<sup>st</sup> Edition. 1966.
8. Dimmoth.N.J., Easton. A.J., and. Leppard K.N., Introduction to Modern Virology, Blackwell Publishers. 2001.

## GENERAL BIOLOGY AND CELL BIOLOGY

**Semester: II**  
**Practical Paper- I**  
**Hours per Week: 2 hrs**

**Subject Code:**  
**Credits: 1**  
**Total Hours per Semester: 30 hrs**

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To enable the learners

- to instill knowledge of morphological and anatomical structures of plants.
- to instill knowledge on morphological developments of various Phyla.
- to instill knowledge on various systematic organizations of insects and mammals.
- to identify various stages in somatic cell division and techniques to
- Identify chemical nature of cells.

### BOTANY

1. Vegetative and reproductive structure in *Sargassum*, *Saccharomyces*, *Funaria*, *Selaginella*, and *Pinus*, Section cutting of *Sargassum*, *Selaginella*, and *Pinus* needle.
2. Structure of Monocot flower – *Polyanthes tuberosa*
3. Structure of Dicot flower – *Ervatamia divaricata*
4. Study of cell inclusions, Cystolith and Raphides
5. Study of mitosis by smear technique of *Allium cepa* root tip

### ZOOLOGY

1. Morphology of the following spotters only - *Amoeba*, *Euglena*, *Paramecium*, *Hydra*, *Dugesia*, *Fasciola*, *Taenia*, *Ascaris*, *Pheretima*, *Penaeus*, *Pila*, *Asterias*, *Scoliodon*, *Mugil*, *Bufo*, *Calotes*, *Columbia* and *Rattus*.
2. Study of Blood Cells of Man.
3. Study of different types of muscles.
4. Demonstration of histochemical staining techniques with potassium iodide, mercuric bromo phenol blue, sudan black, Schiff's reagent, toluidine blue dyes.

**Reference:**

1. Dutta,A.C., Botany for degree students, Oxford University press.
2. Taylor, W.T., and Wehe R.J., General biology, East West Press Pvt. LTD.
3. De Robertis, E.D.P.and De Robertis, Jr. E.M.E., Essentials of cell and molecular biology.
4. Fawcett, D.W., The cell, its organelles and inclusions – Philadelphia W.B. Saunders
5. Krishnasamurthy K.V., Methods in plant Histochemistry Viswanathan printers & publishers.

## GENETICS

**Semester: III**

**Paper – III**

**Hours per Week: 3 hrs**

**Subject Code:**

**Credits: 2**

**Total Hours per Semester: 45 hrs**

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To enable the learners,

to have knowledge on Mendelian and Human genetics.

to make aware of role of genes in life and pre natal diagnosis of genetic disorders.

### **Unit I**

Mendelian genetics – Mendel's works – Mendel's methods, experiments, observations and results. Rediscovery of Mendel – Mendel's laws – Terminology, Back / Test Cross – problems. Mendel's law is not universal – Modifications – complete & incomplete dominance. Co dominance – Lethal factor – Non – allelic gene interactions – Complementary genes – Supplementary genes, Inhibitory genes, Epitasis – Biochemical aspects – Duplicating genes – Pleotrophism.

### **Unit II**

Allelic gene interaction – Multiple alleles – blood group inheritance – Rh factor. Polygenic / Multiple gene inheritance – Eye colour of Drosophila – quantitative inheritance – height in man. Genes and chromosomes linkage and crossing over – theories of crossing over – cytological basis – mapping of chromosome – single cross over and double cross over maps.

### **Unit III**

Population genetics – gene pool concept, Hardy Weinberg law – gene frequencies – calculations – factors affecting Hardy – Weinberg equilibrium.

### **Unit IV**

Human chromosomes: History and nomenclature, Banding technique, genetic map of human chromosomes, Primary and secondary Non – disjunction, in man. Autosomal syndromes : Down's, Patau's,. Sex chromosomal syndromes: Klinefelter's, Turner's

Genetic basis of thalassemia, cystic fibrosis. Genetics of cancer – types and characteristics – oncogenes and antioncogenes.

### **Unit V**

Prenatal Diagnosis of genetic diseases: Amniocentesis, Chorionic villi sampling and Ultrasonography - principle, procedure and applications.

Pedigree analysis, eugenics, positive and negative eugenics, euthenics, euphenics, treatment of genetic diseases, Genetic counseling

### **Reference**

1. Edmund. W. Sinnott., Dunn. L. C., Theodosius Dobzansky., Principles of Genetics, Tata Mc. Graw Hill Publishing Company LTD, NewDelhi. 5<sup>th</sup> Edition, 1973.
2. Alhuwalia., Genetics, Wiley publishers. 1<sup>st</sup> Edition, 1991
3. Attenburg, Genetics, Oxynol publishers.2000.
4. Sarin .C., Genetics, Tata Mc. Graw Hill Pvt. LTD. 8<sup>th</sup> Edition, 1999.
5. Strickberger. M, Genetics, Prentice Hall India Pvt. LTD.3<sup>rd</sup> Edition.,2003.



## BIOSTATISTICS

**Semester: IV**  
**Paper – 1V**  
**Hours per Week: 3 hrs**

**Subject Code:**  
**Credits: 2**  
**Total Hours per Semester: 45 hrs**

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### **To enable the learners**

to have knowledge of statistics and its application in the field of biology.

to aware about the research methods.

### **Unit I**

Introduction: Basics of statistics – Definition – Statistical Methods – Kinds of biological data. Collection, types, organization and representation of data. Sampling and sampling designs. Classification of data, grouped and ungrouped data.

Frequency distribution: Continuous – Discrete – Cumulative frequency.

Tabulation: parts of a table – advantage. Representation of the data: Diagrammatic-Simple bar, pie diagram. Graphical representation: Histogram, frequency polygon, frequency curve, cumulative frequency curve.

### **Unit II**

Measures of Central Tendency: arithmetic mean – simple and weighed arithmetic mean, median, mode. Measures of dispersion : Range, mean deviation, standard deviation and variance.

### **Unit III**

Measures of symmetry: Skew ness and kurtosis, positive and negative skew ness. Measures of kurtosis – Correlation and regression: Types of correlation. Methods of studying correlation using Karl Pearson's co-efficient. Regression line, regression equation X on Y and Y on X.

### **Unit IV**

Probability theorem – types of probability – probability measure.

Theoretical distributions – binomial - poisson – normal distribution.

### **Unit V**

Sampling hypothesis, sampling distribution, Standard error -  $\chi^2$  test (goodness of fit), character and applications. ANOVA – one way analysis.

## Reference

1. Bhaskararao, T. Methods of Biostatistics, Paras Publication. Hyderabad. 2001.
2. Daniel W.W. Biostatistics : A foundation for analysis in the Health Sciences.. John Willey and sons, New York. 7<sup>th</sup> Edition 1989.
3. Sancheti. D.C. and Kapoor V.K. Statistics. S. Chand & Sons, New Delhi. 7<sup>th</sup> Edition 1991
4. Palanichamy. S. and Manoharan. M, Stastical methods for biologist. Palani Paramount Publications, Palani. 2003..

## GENETICS AND BIOSTATISTICS

**Semester: IV**  
**Practical Paper- II**  
**Hours per Week: 2 hrs**

**Subject Code:**  
**Credits: 1**  
**Total Hours per Semester: 30 hrs**

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to know the occurrence of Mendelian laws and genetical syndromes in life.

to know the fundamental ideas of statistics to implement in biology and computer applications for the same.

1. Survey of Mendelian traits in man.
2. Use of models to illustrate Mendel's laws.
3. Determination of blood groups and Rh factor.
4. Spotters only – Down's, Patau's, Klinefelter's, Turner's syndromes.
5. Finding central tendency using biological data
6. Study of quantitative characters using neem leaves.
7. Laws of probability
8. Study of quantitative characters using coin - tossing test.
9. Computer application in Biostatistics.(demonstration only)

### Reference :

1. Alhuwalia, Genetics 1<sup>st</sup> Edition, Wiley publishers, 1991.
2. Attenburg, Genetics, Oxynol publishers, 2000.
3. Sarin. C., Genetics, Tata Mc. Grand Hill Pvt. LTD., 8<sup>th</sup> Edition, 1997.
4. Daniel W.W. Biostatistics : A foundation for analysis in the Health Sciences.. John Willey and sons, New York. 7<sup>th</sup> Edition, 1989.
5. Palanichamy. S. and Manoharan. M, Stastical methods for biologist. Palani Paramount Publications, Palani. 2003.