

# SHAHEED BENAZIR BHUTTO WOMEN UNIVERSITY PESHAWAR



**RECTIFIED COPY OF CURRICULUM  
DEPARTMENT OF BIOCHEMISTRY**



**SHAHEED BENAZIR BHUTTO WOMEN UNIVERSITY PESHAWAR**  
**DEPARTMENT OF BIOCHEMISTRY**

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# SHAHEED BENAZIR BHUTTO WOMEN UNIVERSITY PESHAWAR

## **Vision and Mission Statement of University**

### **Vision:**

Shaheed Benazir Bhutto Women University aspires for excellence in learning, education, creativity, research and innovation.

### **Mission:**

The mission of Shaheed Benazir Bhutto Women University is to contribute to the society through transformative power of education and research with a focus on diversity, linkages, entrepreneurship, creativity and innovation. We aim to prepare individuals with problem solving attitude, humanistic outlook, critical thinking and the ability to respond to socio-economic challenges.

## **Introduction to Department of Biochemistry**

Biochemistry takes the practices of general chemistry one step further by focusing on this chemistry makeup of and reactions within, living things. By specializing the chemical nature of living systems, biochemists develop skills that have broad applications within a variety of industries. The Undergraduate programme of Biochemistry at the University is committed to the professional and personal growth of undergraduate students through the development of new scientific knowledge, critical thinking, problem-solving strategies, active learning, self-realization and participation in research discoveries. It is our mission to create a stimulating and personal growth that environment for our students. We strive to provide ample opportunities for professional and personal growth that will allow our graduates to excel in future endeavor, such as industrial work in medicine and pharmacy.

## **Vision and Mission Statement of Department**

### **Vision**

The Department of Biochemistry envisions itself to be the leading department of KPK, by providing theoretical knowledge in physical and life sciences, with quality research & practical hands on skills to develop professionals and researchers in the demanding fields of pharmaceutical and medical sciences and to become a working and sustainable component of the university in teaching, research, and community services.

### **Mission**

To provide quality education and learning experience for female students through:

- the application of innovative teaching methods and emphasis on the development of critical thinking and problem-solving skills;
- the provision of a stimulating, exciting and collaborative scientific environment;
- To make a research atmosphere that will equip our graduates with transferable skills and an awareness of research ethics.
- Effective teaching, quality research, and relevant community service and to develop them into well-rounded responsible individuals.
- To mold its students into competent professionals in the field of Biochemistry with provision of opportunities for career development for both students and staff.
- To contribute to the public understanding of the life-sciences and molecular medicine.



# **SHAHEED BENAZIR BHUTTO WOMEN UNIVERSITY PESHAWAR**

## **COURSE CODE ACCORDING TO SBBWU NEW CODES POLICY**

- a) **BS Course codes**
- b) **MS/M.PHIL Course codes**

**SCHEME AND COURSES OF STUDIES FOR  
BS IN BIOCHEMISTRY**



**DEPARTMENT OF BIOCHEMISTRY  
2018 AND ONWARD**

**SCHEME OF STUDIES FOR BS(4YEAR) IN BIOCHEMISTRY (2018 & ONWARD)**

SEMESTER	COURSE TITLE	COURSE CODE	Theor y	Practical	CREDIT HOURS
1 <sup>st</sup>	English-I		3	0	3
	Pakistan Studies		2	0	2
	Mathematics(calculus)		3	0	3
	Social Science I		3	0	3
	Inorganic Chemistry		2	1	3
	Introductory Biochemistry	BCHM311	3	1	4
<b>Total Credit Hours</b>			<b>16</b>	<b>2</b>	<b>18</b>
SEMESTER	COURSE TITLE	COURSE CODE			CREDIT HOURS
2 <sup>nd</sup>	English-II		3	0	3
	Islamic studies		2	0	2
	Organic Chemistry		2	1	3
	Intro. to information and communication technology		3	0	3
	Cell Biology	BCHM 312	2	1	3
	Carbohydrates & Lipids	BCHM 313	3	1	4
<b>Total Credit Hours</b>			<b>15</b>	<b>3</b>	<b>18</b>
SEMESTER	COURSE TITLE	COURSE CODE			CREDIT HOURS
3 <sup>rd</sup>	English-III Writing & Comm.		3	0	3
	Social Science II		2	1	3
	Amino Acids & Proteins	BCHM401	3	1	4
	Physical Chemistry		2	1	3
	Biosafety & ethics	BCHM411	2	0	2
	Fundamentals of Genetics	BCHM402	2	1	3
<b>Total Credit Hours</b>			<b>14</b>	<b>4</b>	<b>18</b>
SEMESTER	COURSE TITLE	COURSE CODE			CREDIT HOURS
4 <sup>th</sup>	Human Physiology	BCHM 403	3	0	3
	Biophysics/Analytical Chemistry		2	1	3
	Microbiology		3	1	4
	Enzymes	BCHM 404	2	1	3
	Bioenergetics	BCHM 412	2	0	2
<b>Total Credit Hours</b>			<b>12</b>	<b>3</b>	<b>15</b>
SEMESTER	COURSE TITLE	COURSE CODE			CREDIT HOURS
5 <sup>th</sup>	Metabolism I	BCHM 501	2	0	4
	Molecular Biology	BCHM 502	2	1	3
	Biochemical Techniques	BCHM 511	2	1	3
	Immunology	BCHM 512	2	1	3
	Plant Biochemistry	BCHM 513	2	1	3
	Biotechnology	BCHM 514	3	0	3

			<b>Total Credit Hours</b>	<b>12</b>	<b>4</b>	<b>16</b>
<b>SEMESTER</b>	<b>COURSE TITLE</b>	<b>COURSE CODE</b>				<b>CREDIT HOURS</b>
<b>6<sup>th</sup></b>	Clinical Biochemistry	BCHM 515	2	1	3	
	Methods in Molecular Biology	BCHM 516	2	1	3	
	Bioinformatics		2	1	3	
	Metabolism II	BCHM 503	3	0	3	
	Biostatistics		3	0	3	
	Industrial biochemistry	BCHM 517	2	1	3	
			<b>Total Credit Hours</b>	<b>14</b>	<b>4</b>	<b>18</b>
<b>SEMESTER</b>	<b>COURSE TITLE</b>	<b>COURSE CODE</b>				<b>CREDIT HOURS</b>
<b>7<sup>th</sup></b>	Research Planning & Report Writing (English-IV)	BCHM 611	2	1	3	
	Biomembranes & Cell Signaling	BCHM 612	3	0	3	
	Marketing & Management (Social Sciences-III)		3	0	3	
	Vitamins & Hormones	BCHM 613	3	0	3	
	Nutritional Biochemistry	BCHM 614	3	0	3	
	Research/Internships/elec. Course	BCHM 699/689/*	3	0	3	
			<b>Total Credit Hours</b>	<b>17</b>	<b>1</b>	<b>18</b>
<b>SEMESTER</b>	<b>COURSE TITLE</b>	<b>COURSE CODE</b>				<b>CREDIT HOURS</b>
<b>8<sup>th</sup></b>	Current Trends in Biochemistry	BCHM615	3	0	3	
	Elective III	*	3	0	3	
	Elective IV	*	2	1	3	
	Research/Internship + 1 course of 3 credit hours each	BCHM699/ BCHM698/*	6	0	6	
				<b>Total Credit Hours</b>	<b>14</b>	<b>1</b>
			<b>Total</b>	<b>111</b>	<b>22</b>	<b>133</b>

**Course Code for other Departments (Microbiology) offering Biochemistry (with different contents)**

**Biochemistry I      BCHM 301**  
**Biochemistry II     BCHM 302**



## LIST OF OPTIONAL SUBJECTS

COURSE TITLE	CREDIT HOURS
Cancer Biology	3
Genomics	3
Proteomics	3
General Virology	3
Cell and tissue culture	2+1
Pharmacology	3
Antimicrobials and Chemotherapeutics	3
Functional Genomics	3
Structural Biology	3
Drug Development	3
Fermentation Biotechnology	3
Neurochemistry	3
Toxicology	3

*Note: In addition to the above, the university can offer any elective which they feel necessary subject to the availability of resources.*

## LIST OF SOCIAL SCIENCE SUBJECTS

COURSE TITLE	CREDIT HOURS	COURSE CODE
Sociology	3	From Concerned Dept.
Psychology	3	
Philosophy of Science	3	
Ethics	3	
Clinical Psychology	3	

*Note: In addition to the above, the university can offer any other which they feel necessary subject to the availability of resources.*

**SCHEME AND COURSES OF STUDIES FOR  
MS/M.Phil. IN BIOCHEMISTRY**



**DEPARTMENT OF BIOCHEMISTRY  
SHAHEED BENAZIR BHUTTO WOMEN UNIVERSITY  
PESHAWAR**



# SHAHEED BENAZIR BHUTTO WOMEN UNIVERSITY PESHAWAR

Codes for program are classified as:

**1<sup>st</sup> Semester**

S.NO	SEMESTER	COURSE TITLE	COURSE CODE	Theory	Practical	CREDIT HOURS
1.	1 <sup>st</sup>	Advances in Biochemistry	BCHM 721	3	0	3
2.		Advanced Biostatistics	BCHM 722	2	0	2
3.		Elective I	BCHM 7*	2	0	2
4.		Molecular Biology & Biochemistry Lab	BCHM 723	2	1	3
		Elective II	BCHM 7*	3	0	3
<b>Total Credit Hours</b>				<b>12</b>	<b>1</b>	<b>13</b>

**2<sup>nd</sup> Semester**

S.N O	SEMESTER	COURSE TITLE	COURSE CODE	Theory	Practical	CREDIT HOURS
1.	2 <sup>nd</sup>	Advances in Molecular Biology	BCHM724	3	0	3
2.		Elective III	BCHM 7*	2	1	3
3.		Research Methodology/ Advanced Bioinformatics	BCHM725/ BCHM726	3	0	3
4.		Elective IV	BCHM 7*	3	0	3
<b>Total Credit Hours</b>				<b>11</b>	<b>1</b>	<b>12</b>

3<sup>rd</sup> and 4<sup>th</sup> semester will comprise of Research Project and Thesis of 06 credit hours with course code BCHM899.

\*Course and code will be assigned from list of major subject.

## **List of Subject:**

Advanced Molecular Genetics  
Advances in Clinical Biochemistry  
Advances in Endocrinology  
Advances in Biotechnology  
Recent Trends in Immunology  
Application of Techniques to Biomolecules  
Community Nutrition  
Protein Structure, Function and Engineering  
Enzymes - Mechanism & Kinetics  
Biostatistics and Biomathematics  
DNA Techniques and Clinical Applications  
Project Planning, Monitoring and Evaluation  
Signal Transduction  
Biochemistry of Metabolic Disorders  
Natural Products Biochemistry  
Nutrition for health promotion and  
disease prevention  
Recombinant DNA Technology  
Chemistry of Biomolecules  
Bio analytical Techniques  
Research Methodology 1 & II  
Research Methods in Biochemistry  
Advanced Biochemical Techniques  
Numerical problems in Biochemistry  
Genomics, Proteomics and Metabolomics  
Regulation of Gene Expression  
Molecular Biology & Biochemistry Lab  
Food Biochemistry  
Vegetables Oil Technology  
Directed Enzyme evolution  
Renewable bioenergy Resources  
Molecular Mechanism of Diseases  
Molecular Evolution  
Directed Studies in Bimolecular structure and Functions  
Pharmaceutical Biochemistry  
Pathogens and Pathogenicity  
Graduate Seminar-I  
Graduate Seminar with Special Problems-II  
Drug Designing and metabolism  
Medical Biochemistry  
Forensic Biochemistry and Molecular Biology  
Special topics  
Current trends

*Note: In addition to the above, the university can offer any other which they feel necessary subject to the availability of resources.*



**SHAHEED BENAZIR BHUTTO WOMEN UNIVERSITY  
PESHAWAR**

**CURRICULUM OF BS BIOCHEMISTRY PROGRAM (2018 AND ONWARD)**



**DEPARTMENT OF BIOCHEMISTRY**

**FOUR-YEAR CURRICULA FOR POSTGRADUATE DEGREE IN BIOCHEMISTRY**

**STRUCTURE**

S.NO	CATEGORIES	NO. OF COURSES	CREDIT HOURS
1	Compulsory Requirement (No Choice)	8	22
2	General Courses to be chosen from other departments	9	27
3	Discipline Specific foundation courses	7	25
4	Major courses (including Research Project/internship)	17	47
5	Electives within the Major	4	12
TOTAL		45	133

- Total numbers of credit hours 133
- Duration 4 years
- Semester duration 16-18 weeks
- Course load per semester 15-18 Credit hours
- Number of courses per semester 5-6

Enlightenment Through Knowledge

## LAYOUT FOR BS (4 YEARS) IN BIOCHEMISTRY

Compulsory Courses (student has no choice)		General and Foundation Courses (to be chosen from other Departments)	
<b>8 courses</b>		<b>9 courses</b>	
<b>22 Credit hours</b>		<b>27 Credit hours</b>	
Subjects	Cr. hr	Subjects	Cr. hr
1. English -I	3	1. Social Sciences I	3+0
2. English- II	3	2. Social Sciences II	3+0
3. English -III (Writing & Comm.)	3	3. Marketing & Management	3+0
4. Pakistan studies	2	4. Organic Chemistry	2+1
5. Islamic studies	2	5. Inorganic Chemistry	2+1
6. Mathematics	3	6. Physical Chemistry	2+1
7. Biostatistics	3	7. Biophysics/Analytical Chemistry	2+1
8. Introduction to computer Sciences	3	8. Genetics	3+0
		9. Microbiology	2+1
	22		27

Discipline-specific Foundation Courses		Major Courses		Elective courses within the Major		
<b>7 courses</b>		<b>17 courses</b>		<b>4 courses</b>		
<b>25 Credit hours</b>		<b>47 Credit hours</b>		<b>12 Credit hours</b>		
Subject	Cr. hr	Subject	Cr. Hr	Subject	Cr. hr	
1. Introductory Biochemistry	3+1	1. Cell biology	2+1	Elective-I	3+0	
2. Carbohydrates & Lipids	3+1	2. Biochemical techniques	1+2	Elective-II	3+0	
3. Amino Acids & Proteins	3+1	3. Biosafety & ethics	2+0	Elective-III	3+0	
4. Human Physiology	3+0	4. Plant Biochemistry	2+1	Elective-IV	3+0	
5. Enzymes	3+0	5. Clinical Biochemistry	2+1	<b>Note:</b> Elective courses are to be chosen from the given list  OR Any other course Depending upon the expertise available		
6. Molecular Biology	2+1	6. Biomembranes & cell Signaling	3+0			
7. Metabolism	4+0	7. Bioenergetics	2+0			
		8. Research Planning & report Writing (Eng-IV)	2+1			
		9. Nutritional biochemistry	2+1			
		10. Bioinformatics	2+1			
		11. Industrial Biochemistry	2+1			
		12. Biotechnology	3+0			
		13. Immunology	3+0			
		14. Current Trends in Biochemistry	3+0			
		15. Methods in Molecular Biology	2+1			
		16. Environmental Biochemistry	2+0			
		17. Seminar	1+0			
	25		46			12



# SHAHEED BENAZIR BHUTTO WOMEN UNIVERSITY PESHAWAR

## DETAILED COURSE OUTLINE OF BIOCHEMISTRY (4 YEARS PROGRAM)

### SEMESTER – I

<b>Course Name:</b> English – I (Functional English)	<b>Course Code:</b>
<b>Course Structure:</b> Lectures: 3	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> None	
<b>Objectives:</b> Enhance language skills and develop critical thinking.	
<b>Course Contents</b> <ul style="list-style-type: none"><li>• Basics of Grammar</li><li>• Parts of speech and use of articles</li><li>• Sentence structure, active and passive voice</li><li>• Practice in unified sentence</li><li>• Analysis of phrase, clause and sentence structure</li><li>• Transitive and intransitive verbs</li><li>• Punctuation and spelling</li></ul>	
<b>Comprehension</b> <ul style="list-style-type: none"><li>• Answers to questions on a given text.</li></ul>	
<b>Discussion</b> <ul style="list-style-type: none"><li>• General topics and every-day conversation (topics for discussion to be at the discretion of the teacher keeping in view the level of students)</li></ul>	
<b>Listening</b> <ul style="list-style-type: none"><li>• To be improved by showing documentaries/films carefully selected by subject teachers</li></ul>	
<b>Translation skills</b>	
<b>Urdu to English</b>	
<b>Paragraph writing</b> <ul style="list-style-type: none"><li>• Topics to be chosen at the discretion of the teacher</li></ul>	
<b>Presentation skills</b> <ul style="list-style-type: none"><li>• Introduction</li></ul>	
<i>Note: Extensive reading is required for vocabulary building</i>	
<b><u>Recommended Books:</u></b> <ol style="list-style-type: none"><li>1. Practical English Grammar by A. J. Thomson and A. V. Martinet. Exercises 2. Third edition. Oxford University Press. 1997. ISBN 0194313492.</li><li>2. Practical English Grammar by A. J. Thomson and A. V. Martinet. Exercises 2. Third edition. Oxford University Press. 1997. ISBN 0194313506</li><li>3. Writing. Intermediate by marie-Christine Boutin, Suzanne Brinand and Francoise Grellet. Oxford supplementary skills Fourth Impression 1993. ISBN 0 19 435405-27 and 7-41 Pages. 35 20</li><li>4. Reading. Upper Intermediate. Brain Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 453402 2.</li></ol>	



<b>Course Name:</b> Pakistan Studies	<b>Course Code:</b>
<b>Course Structure:</b> Lectures: 2	<b>Credit Hours:</b> 2
<b>Prerequisites:</b> None	
<b>Introduction/Objectives</b>	
<ul style="list-style-type: none"> <li>• Develop vision of historical perspective, government, politics, contemporary Pakistan, ideological background of Pakistan.</li> <li>• Study the process of governance, national development, issues arising in the modern age and posing challenges to Pakistan.</li> </ul>	
<b>Course Outline</b>	
1) <b>Historical Perspective</b>	
<ul style="list-style-type: none"> <li>a. Ideological rationale with special reference to Sir Syed Ahmed Khan, Allama Muhammad Iqbal and Quaid-e-Azam Muhammad Ali Jinnah.</li> <li>b. Factors leading to Muslim separatism</li> <li>c. People and Land</li> </ul>	
i. Indus Civilization	
ii. Muslim advent	
iii. Location and geo-physical features.	
2) <b>Government and Politics in Pakistan</b>	
Political and constitutional phases:	
a. 1947-58	
b. 1958-71	
c. 1971-77	
d. 1977-88	
e. 1988-99	
f. 1999 onward	
3) <b>Contemporary Pakistan</b>	
a. Economic institutions and issues	
b. Society and social structure	
c. Ethnicity	
d. Foreign policy of Pakistan and challenges	
e. Futuristic outlook of Pakistan	
<b>Text Books:</b>	
1) Burki, Shahid Javed. <i>State &amp; Society in Pakistan</i> , The Macmillan Press Ltd 1980.	
2) Akbar, S. Zaidi. <i>Issue in Pakistan's Economy</i> . Karachi: Oxford University Press, 2000.	
3) S.M. Burke and Lawrence Ziring. <i>Pakistan's Foreign policy: An Historical analysis</i> . Karachi: Oxford University Press, 1993.	

- 4) Mehmood, Safdar. *Pakistan Political Roots & Development*. Lahore, 1994.
- 5) Wilcox, Wayne. *The Emergence of Banglades.*, Washington: American Enterprise, Institute of Public Policy Research, 1972.
- 6) Mehmood, Safdar. *Pakistan Kayyun Toota*, Lahore: Idara-e-Saqafat-e-Islamia, Club Road, nd.
- 7) Amin, Tahir. *Ethno - National Movement in Pakistan*, Islamabad: Institute of Policy Studies, Islamabad.
- 8) Ziring, Lawrence. *Enigma of Political Development*. Kent England: WmDawson & sons Ltd, 1980.
- 9) Zahid, Ansar. *History & Culture of Sindh*. Karachi: Royal Book Company, 1980.
- 10) Afzal, M. Rafique. *Political Parties in Pakistan*, Vol. I, II & III. Islamabad: National Institute of Historical and cultural Research, 1998.
- 11) Sayeed, Khalid Bin. *The Political System of Pakistan*. Boston: Houghton Mifflin, 1967.
- 12) Aziz, K. K. *Party, Politics in Pakistan*, Islamabad: National Commission on Historical and Cultural Research, 1976.
- 13) Muhammad Waseem, *Pakistan Under Martial Law*, Lahore: Vanguard, 1987.
- 14) Haq, Noor ul. *Making of Pakistan: The Military Perspective*. Islamabad: National Commission on Historical and Cultural Research, 1993.

<b>Course Name:</b> Mathematics	<b>Course Code:</b>
<b>Course Structure:</b> Lectures: 3	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> None	
<p><b>Aims:</b> To give the basic knowledge of Mathematics and prepare the students not majoring in mathematics.</p> <p><b>Objectives:</b> After completion of this course the student should be able to:</p> <ul style="list-style-type: none"> <li>➤ Understand the use of the essential tools of basic mathematics;</li> <li>➤ Apply the concepts and the techniques in their respective disciplines;</li> <li>➤ Model the effects non-isothermal problems through different domains;</li> </ul> <p><b>Contents:</b> <b>Algebra:</b> Preliminaries: Real and complex numbers, Introduction to sets, set operations, functions, types of functions. Matrices: Introduction to matrices, types of matrices, inverse of matrices, determinants, system of linear equations, Cramer's rule. Quadratic equations: Solution of quadratic equations, nature of roots of quadratic equations, equations reducible to quadratic equations. Sequence and Series: Arithmetic, geometric and harmonic progressions. Permutation and combinations: Introduction to permutation and combinations, Binomial Theorem: Introduction to binomial theorem. Trigonometry: Fundamentals of trigonometry, trigonometric identities. Graphs: Graph of straight line, circle and trigonometric functions.</p>	

**Statistics:**

Introduction: Meaning and definition of statistics, relationship of statistics with social science, characteristics of statistics, limitations of statistics and main division of statistics. *Frequency distribution*: Organization of data, array, ungrouped and grouped data, types of frequency series, individual, discrete and continuous series, tally sheet method, graphic presentation of the frequency distribution, bar frequency diagram histogram, frequency polygon, cumulative frequency curve. *Measures of central tendency*: Mean, median and modes, quartiles, deciles and percentiles. *Measures of dispersion*: Range, inter quartile deviation, mean deviation, standard deviation, variance, moments, skewness and kurtosis.

**Recommended Books:**

1. Swokowski. E. W., '*Fundamentals of Algebra and Trigonometry*', Latest Edition.
2. Kaufmann. J. E., '*College Algebra and Trigonometry*', PWS-Kent Company, Boston, Latest Edition.
3. Walpole, R. E., '*Introduction of Statistics*', Prentice Hall, Latest Edition.
4. Wilcox, R. R., '*Statistics for the Social Sciences*'.

<b>Course Name:</b> Social Science I	<b>Course Code:</b>
<b>Course Structure:</b> Lectures: 3	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> None	
<ul style="list-style-type: none"> <li>• Subject will be taken from list of Social Sciences and course contents will be designed by the subject teacher at the time of teaching according to the need and requirement of discipline.</li> </ul>	

<b>Course Name:</b> Inorganic Chemistry	<b>Course Code:</b>
<b>Course Structure:</b> Theory: 2, practical: 1	<b>Credit Hours:</b> 3 (2+1)
<b>Prerequisites:</b> None	
<b>COURSE OBJECTIVES:</b>	
Students will acquire knowledge about the key introductory concepts of chemical bonding, acid-base chemistry, and properties of p-block elements as well as use this knowledge for qualitative and quantitative analysis of inorganic compounds during laboratory work.	
<b>COURSE CONTENTS:</b>	
<ul style="list-style-type: none"> <li>• <b>Chemical Bonding:</b> Types of chemical bonding, ionic and covalent bonding, localized bond approach, theories of chemical bonding, valence bond theory (VBT), hybridization and resonance, prediction of molecular shapes using Valence Shell Electron Pair Repulsion (VSEPR) model, molecular orbital theory (MOT) applied to diatomic molecules, delocalized approach to bonding, bonding in electron deficient compounds, hydrogen bonding.</li> <li>• <b>Acids and Bases:</b> Brief concepts of chemical equilibrium, acids and bases</li> </ul>	

including soft and hard acids and bases (SHAB), relative strength of acids and bases, significance of pH, pKa, pKb and buffer solutions, theory of indicators, solubility, solubility product, common ion effect and their industrial applications.

- **p-Block Elements:** Physical and chemical properties of p-block elements with emphasis on some representative compounds, inter-halogens, pseudo-halogens and polyamides.

#### **PRACTICAL:**

Lab safety and good laboratory practices, knowledge about material safety data sheets (MSD), disposal of chemical waste and first-aid practices, qualitative analysis of salt mixtures, quantitative analysis, acid- base titrations, preparation and standardization of acid and alkali solutions, redox titrations, preparation and standardization of potassium permanganate solution and its use for the determination of purity of commercial potassium oxalate or oxalic acid, preparation and standardization of sodium thiosulfate solution and its use in determination of copper in a given sample, gravimetric analysis, determination of barium in a given sample, determination of chloride in a given solution.

#### **Recommended Books:**

1. Shriver, D. F., Atkins, P. W., Langford, C. H., *Inorganic Chemistry*, 2<sup>nd</sup>ed., Oxford University Press, (1994).
2. Cotton, F. A. and Wilkinson, G., *Advanced Inorganic Chemistry*, 6th ed., John-Wiley & Sons, New York, (2007).
3. Huheey, J. E., *Inorganic Chemistry: Principles of Structure and Reactivity*, 3rd ed., Harper International SI Edition, (2006).
4. House, J. E., *Inorganic Chemistry*, Academic Press. USA, (2008).
5. Lee, J. D., *Concise Inorganic Chemistry*, 5th ed., Chapman and Hall, (1996).
6. Miessler, G. L., Tarr, D. A., *Inorganic Chemistry*, 3rd ed., Pearson Education, India, (2008).
7. Huheey, J. E., Keiter E. A., Keiter L. R., *Inorganic Chemistry: Principles of Structure and Reactivity*, 4th ed., Benjamin-Cummings Pub Co., (1993).
8. Sharpe, A. G., *Inorganic chemistry*, 3rd ed., Pearson Education India, (1981).
9. Chaudhary S. U., *Ilmi Textbook of Inorganic Chemistry*, Ilmi Kitab Khana, Lahore, (2013).
10. Catherine E. Housecroft, Alan G. Sharpe, *Inorganic Chemistry*, 3rd ed., Prentice Hall, (2008).
11. Kathleen A. H., James E. H., *Descriptive Inorganic Chemistry*, 2nd ed., Brooks Cole, (2010).
12. Wulfsberg G., *Principles of Descriptive Inorganic Chemistry*, 1st ed., University Science Books, (1991).
13. Hill, R. H. JR and Fister, D. C., *Laboratory Safety for Chemistry Students*, John-Wiley & Sons, Inc., (2010).
14. Mendham, J., Denny, R. C., Barnes, J. D., Thomas, M. and Sivasankar, B., *Vogel's Textbook of Quantitative Chemical Analysis*, 6th ed., Pearson Education, Ltd., (2000).
15. Svehla, G., *Vogel's Qualitative Inorganic Analysis*, 7th ed., (7th imp.), Pearson Education, Ltd., (2009).

<b>Course Name:</b> Introductory Biochemistry	<b>Course Code:</b> BCHM301
<b>Course Structure:</b> Lectures: 4 (3+1)	<b>Credit Hours:</b> 4 (3+1)
<b>Prerequisites:</b> None	
<b>COURSE OBJECTIVES:</b> This course provides fundamental concepts in biochemistry, which focuses upon the major macromolecules and chemical properties of living systems. Primary topics include the structure, properties and functions of amino acids, proteins, carbohydrates, lipids and nucleic acids.	
<b>COURSE OUTLINE:</b> A general introduction to the science of biochemistry; importance and the scope of biochemistry; forms, functions and brief classification of prokaryotes; cellular architecture and diversity of eukaryotes; structure, physical properties and importance of water; unique properties of carbon and other elements found in biological molecules; nature of organic matter; isomerism; general reactions of different functional groups; biologically important organic compounds/solvents; overview of biological molecule and their structures including proteins, carbohydrates, lipids and nucleic acids; prebiotic molecular evolution and rise of living systems; review of the variety and ecology of the living world; evolution of life; use and significance of radioisotopes in biochemistry.	
<b>PRACTICAL:</b> Safety measures in laboratory; preparation of solutions routinely used in biochemical experiments (e.g., percent, normal and molar solutions); pH determination using various methods; preparation of buffers.	
<b>RECOMMENDED BOOKS:</b> 1. Fundamentals of Biochemistry. (2008) 3rd Ed. by D. J. Voet, G.J. Voet and C. W. Pratt. J. Wiley & Sons Inc. 2. Text Book of Biochemistry (1970) by E. West & W. Todd Macmillan. 3. Biochemistry. (1999) 3rd Ed. by C. K. Mathews, K. E. Van Holde, & K.G. Ahern. Prentice Hall. 4. Harper's Illustrated Biochemistry, 27th Ed. by R.K. Murray, D.K. Grannar, V. W. Rodwell. McGraw-Hill. 5. Lehninger Principles of Biochemistry (2008) 5th Ed. by D. L. Nelson, M. M. Cox. W. H. Freeman Publishers.	



# SHAHEED BENAZIR BHUTTO WOMEN UNIVERSITY PESHAWAR

## DETAILED COURSE OUTLINE OF BIOCHEMISTRY (4 YEARS PROGRAM)

### SEMESTER – II

<b>Course Name:</b> English – II	<b>Course Code:</b>
<b>Course Structure:</b> Lectures: 3	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> None	
<b>Objectives:</b> Enable the students to meet their real life communication needs.	
<b>Course Contents</b>	
<b>Paragraph writing</b> Practice in writing a good, unified and coherent paragraph	
<b>Essay writing</b> Introduction	
<b>CV and job application</b> Translation skills Urdu to English	
<b>Study skills</b> Skimming and scanning, intensive and extensive, and speed reading, summary and précis writing and comprehension	
<b>Academic skills</b> Letter/memo writing, minutes of meetings, use of library and internet	
<b>Presentation skills</b> Personality development (emphasis on content, style and pronunciation)	
<i>Note: documentaries to be shown for discussion and review</i>	
<b>Recommended Books:</b>	
<b>Communication Skills</b>	
<b>a) Grammar</b>	
1. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 2. Third edition. Oxford University Press 1986. ISBN 0 19 431350 6.	
<b>b) Writing</b>	
1. Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Françoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 019 435405 7 Pages 45-53 (note taking).	
2. Writing. Upper-Intermediate by Rob Nolasco. Oxford Supplementary Skills. Fourth Impression 1992. ISBN 0 19 435406 5 (particularly good for writing memos, introduction to presentations, descriptive and argumentative writing).	
<b>c) Reading</b>	
1. Reading. Advanced. Brian Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1991. ISBN 0 19 453403 0.	
2. Reading and Study Skills by John Langan	
3. Study Skills by Richard York.	

<b>Course Name:</b> Islamic Studies	<b>Course Code:</b>
<b>Course Structure:</b> Lectures: 2	<b>Credit Hours:</b> 2
<b>Prerequisites:</b> None	
<p><b>Objectives:</b>  This course is aimed at:</p> <ol style="list-style-type: none"> <li>1 To provide Basic information about Islamic Studies</li> <li>2 To enhance understanding of the students regarding Islamic Civilization</li> <li>3 To improve Students skill to perform prayers and other worships</li> <li>4 To enhance the skill of the students for understanding of issues related to faith and religious life.</li> </ol> <p><b>Detail of Courses</b></p> <p><b>Introduction to Quranic Studies</b></p> <ol style="list-style-type: none"> <li>1) Basic Concepts of Quran</li> <li>2) History of Quran</li> <li>3) Uloom-ul -Quran</li> </ol> <p><b>Study of Selected Text of Holly Quran</b></p> <ol style="list-style-type: none"> <li>1) Verses of Surah Al-Baqra Related to Faith(Verse No-284-286)</li> <li>2) Verses of Surah Al-Hujrat Related to Adab Al-Nabi (Verse No-1-18)</li> <li>3) Verses of Surah Al-Mumanoon Related to Characteristics of faithful (Verse No-1-11)</li> <li>4) Verses of Surah al-Furqan Related to Social Ethics (Verse No.63-77)</li> <li>5) Verses of Surah Al-Inam Related to Ihkam(Verse No-152-154)</li> </ol> <p><b>Study of Selected Text of Holly Quran</b></p> <ol style="list-style-type: none"> <li>1) Verses of Surah Al-Ihzab Related to Adab al-Nabi (Verse No.6,21,40,56,57,58.)</li> <li>2) Verses of Surah Al-Hashar (18,19,20) Related to thinking, Day of Judgment</li> <li>3) Verses of Surah Al-Saf Related to Tafakar,Tadabar (Verse No-1,14)</li> </ol> <p><b>Seerat of Holy Prophet (S.A.W) I</b></p> <ol style="list-style-type: none"> <li>1) Life of Muhammad Bin Abdullah (Before Prophet Hood)</li> <li>2) Life of Holy Prophet (S.A.W) in Makkah</li> <li>3) Important Lessons Derived from the life of Holy Prophet in Makkah</li> </ol> <p><b>Seerat of Holy Prophet (S.A.W) II</b></p> <ol style="list-style-type: none"> <li>1) Life of Holy Prophet (S.A.W) in Madina</li> <li>2) Important Events of Life Holy Prophet in Madina</li> <li>3) Important Lessons Derived from the life of Holy Prophet in Madina</li> </ol> <p><b>Introduction To Sunnah</b></p> <ol style="list-style-type: none"> <li>1) Basic Concepts of Hadith</li> <li>2) History of Hadith</li> <li>3) Kinds of Hadith</li> <li>4) Uloom-ul-Hadith</li> <li>5) Sunnah &amp; Hadith</li> <li>6) Legal Position of Sunnah</li> </ol> <p><b>Selected Study from Text of Hadith</b></p>	

**Introduction To Islamic Law & Jurisprudence**

- 1) Basic Concepts of Islamic Law & Jurisprudence
- 2) History & Importance of Islamic Law & Jurisprudence
- 3) Sources of Islamic Law & Jurisprudence
- 4) Nature of Differences in Islamic Law
- 5) Islam and Sectarianism

**Islamic Culture & Civilization**

- 1) Basic Concepts of Islamic Culture & Civilization
- 2) Historical Development of Islamic Culture & Civilization
- 3) Characteristics of Islamic Culture & Civilization
- 4) Islamic Culture & Civilization and Contemporary Issues

**Islam & Science**

- 1) Basic Concepts of Islam & Science
- 2) Contributions of Muslims in the Development of Science
- 3) Quran & Science

**Islamic Economic System**

- 1) Basic Concepts of Islamic Economic System
- 2) Means of Distribution of wealth in Islamic Economics
- 3) Islamic Concept of Riba
- 4) Islamic Ways of Trade & Commerce

**Political System of Islam**

- 1) Basic Concepts of Islamic Political System
- 2) Islamic Concept of Sovereignty
- 3) Basic Institutions of Govt. in Islam

**Islamic History**

- 1) Period of Khlaft-E-Rashida
- 2) Period of Ummayyads
- 3) Period of Abbasids

**Social System of Islam**

- 1) Basic Concepts Of Social System Of Islam
- 2) Elements Of Family
- 3) Ethical Values Of Islam

**Recommended Books:**

1. Hameed ullah Muhammad, "Emergence of Islam", IRI, Islamabad.
2. Hameed ullah Muhammad, "Muslim Conduct of State".
3. Hameed ullah Muhammad, „Introduction to Islam.
4. Mulana Muhammad Yousaf Islahi,„
5. Hussain Hamid Hassan, "An Introduction to the Study of Islamic Law" leaf



Publication Islamabad, Pakistan.

- Ahmad Hasan, "Principles of Islamic Jurisprudence" Islamic Research Institute, International Islamic University, Islamabad (1993).
- Mir Waliullah, "Muslim Jurisprudence and the Quranic Law of Crimes" Islamic Book Service (1982).
- H.S. Bhatia, "Studies in Islamic Law, Religion and Society" Deep & Deep Publications New Delhi (1989).
- Dr. Muhammad Zia-ul-Haq, "Introduction to Al Sharia Al Islamia" Allama Iqbal Open University, Islamabad (2001).

<b>Course Name:</b> Organic Chemistry	<b>Course Code:</b>
<b>Course Structure:</b> Lectures: 2+1	<b>Credit Hours:</b> 3 (2+1)
<b>Prerequisites:</b> None	
<b>COURSE OBJECTIVES:</b> Students will acquire knowledge about basic concepts of organic chemistry, chemistry of hydrocarbons and functional groups and the mechanism of organic reactions. Such information will be useful for qualitative analysis and synthesis of organic compounds.	
<b>COURSE CONTENTS:</b>	
<ul style="list-style-type: none"> <li>Basic Concepts of Organic Chemistry: Bonding and hybridization, localized and delocalized bonding, structure-aromaticity, inductive effect, dipole moment, resonance and its rules, hyper conjugation, classification and nomenclature of organic compounds including IUPAC system, types of organic reactions (an overview).</li> <li>Chemistry of Hydrocarbons: Saturated and unsaturated hydrocarbons with emphasis on free radical, electrophilic addition and electrophilic substitution reactions.</li> <li>Chemistry of Functional Groups: preparation and properties of alcohols, phenols, ethers, and amines with focus on reaction mechanism and applications, preparations and reaction mechanism of aldehydes and ketones and their applications, carboxylic acids and their derivatives, acidity of carboxylic acids and effect of substituents on their acidity, preparation and reactions of carboxylic acids and their derivatives including esters, amides, acid halides and acid anhydrides.</li> </ul>	
<b>PRACTICAL:</b> Qualitative analysis of compounds with different functional groups, synthesis of organic compounds using as a tool for understanding techniques like reflux, distillation, filtration, recrystallization and yield calculation, organic syntheses may include preparation of benzanilide from benzoyl chloride, succinic anhydride from succinic acid, phthalimide from phthalic anhydride, oximes and hydrazones from carbonyl compounds, and an ester from a carboxylic acid and alcohol etc.	
<b>RECOMMENDED BOOKS:</b>	
1. Brown, W. and Poon, T., <i>Introduction to Organic Chemistry</i> , 3rd Ed., John-Wiley &	

- Sons, Inc., (2005).
2. John, E. M. *Organic Chemistry*, 8th ed., Brooks/Cole Publishing Co, USA,(2012).
  3. Robert, T. M. and Robert, N. B., *Organic Chemistry*, 6th ed., Prentice Hall,New Jersey, (1992).
  4. Younus, M., *A Textbook of Organic Chemistry*, Ilmi Kitab Khana, UrduBazar, Lahore, Pakistan, (2006).
  5. Sykes, P., *A Guide Book to Mechanism in Organic Chemistry*, 6th ed.,Pearson Education Limited, England, (1986).
  6. Solomons, T. W. G. and Fryhle, C. B., *Organic Chemistry*, 10th ed., John-Wiley & Sons, Inc., (2011).
  7. Furniss, B. S., Hannaford , A. J., Smith, P. W. G., Tatchell, A. R., *Vogel's Textbook of Practical Organic Chemistry*, 5th ed., Longman, UK, (1989).
  8. Pavia, D. L., Kriz, G. S., Lampman, G. M and Engel, R. G., *A Microscale Approach to Organic Laboratory Techniques*, 5th ed., Brooks/ ColeCengage Learning, (2013).
  9. Mayo, D. W., Pike, R. M. and Forbes, D. C., *Microscale Organic toLaboratory with Multistep and Multisacle Syntheses*, 5th ed., John-Wiley & Sons, Inc., (2011).
  10. Gilbert, J. C. and Martin, S. F., *Experimental Organic Chemistry: A Miniscale and Microscale Approach*, 5th ed., Brooks/ Cole Cengage Learning, (2010).
  11. Brown, W. H., Fotte, C. S., Iverson, B. L. and Anslyn, E. V., *Organic Chemistry*, 6th ed., Brooks/ Cole Cengage Learning, (2012).

<b>Course Name:</b> Introduction to Information and Communication Technologies	<b>Course Code:</b> CSC301
<b>Course Structure:</b> Lectures: 2, Labs: 1	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> None	
<p><b>Course Objectives:</b></p> <p>This is an introductory course on Information and Communication Technologies. The topics include ICT terminologies, hardware and software components, the internet and world wide web, and ICT based applications.</p>	
<p><b>Intended Learning Outcomes:</b></p> <p>After the completion of this course, the student will be able to:</p> <ul style="list-style-type: none"> <li>- Understand different terms associated with ICT</li> <li>- Identify various components of a computer system</li> <li>- Identify the various categories of software and their usage</li> <li>- Understand different terms associated with the Internet and World Wide Web.</li> <li>- Use various web tools including Web Browsers, E-mail clients and search utilities.</li> <li>- Use text processing, spreadsheets and presentation tools</li> <li>- Understand the enabling/pervasive features of ICT</li> </ul>	
<p><b>Course Outline:</b></p> <ul style="list-style-type: none"> <li>- Introducing Computer Systems, Types of computer and history of computer</li> <li>- Basic Definitions &amp; Concepts, Hardware: Computer Systems &amp; Components. Interacting with the Computer, input and output devices</li> <li>- Storage Devices, Number Systems, Software: Operating Systems, Programming and Application Software, Introduction to Programming, Databases and Information Systems, Database, Introduction to RDBMS, Uses of Databases, Management information systems</li> <li>- Computer Programmes, hardware software interaction, compilers and interpreters, Input-Processing-Output charts, algorithms, flowcharts, generations of language</li> <li>- Networks, uses of networks, Types of networks, network topologies and protocols</li> </ul>	

- Networks, Data Communication, The Internet, Browsers and Search Engines, The Internet: Email, Collaborative Computing and Social Networking, The Internet: E-Commerce, IT Security and other issues, threats, identity theft, online spying tools, threats to hardware hacking
- Taking protective measures
- Project Week, Review Week

**Reference Material:**

1. Norton, P.(7<sup>th</sup> ed.). *Introduction to Computers* .McGraw Hill .
2. Williams, S.(6<sup>th</sup> ed.). *Using Information Technology: A Practical Introduction to Computer & Communications* .McGraw Hill.
3. Sarah ,E., Hutchinson., Stacey, C., Sawyer.(6<sup>th</sup> ed.).*Computers, Communications & information: A user's introduction*.
4. Leon,A., Leon.M. *Fundamentals of Information Technology*. Leon press

<b>Course Name:</b> Cell Biology	<b>Course Code:</b> BCHM302
<b>Course Structure:</b> Theory: 2, Practical: 1	<b>Credit Hours:</b> 3 (2+1)
<b>Prerequisites:</b> None	
<p><b>COURSE OBJECTIVES</b></p> <p>To acquaint students with features of eukaryotic cells, functions of different compartments and the overall structure/ultra-structure of cells as visualized by electron microscopy.</p> <p><b>COURSE CONTENTS:</b></p> <p>Introduction to cell theory including historical perspective; prokaryotic and eukaryotic cell differences including cell wall, membrane structure and chemical constituents of the cell; function, isolation and molecular organization of cellular organelles specifically the endoplasmic reticulum, Golgi bodies, ribosomes, lysosome, micro-bodies, mitochondrial ultrastructure and function, chloroplast ultra-structure and the mechanism of photosynthesis; membrane receptors and transport mechanisms; cell movement - structure and function of cytoskeleton, centriole, cilia and flagella; nucleus; structure and function of chromosomes; cell cycle, mitosis and meiosis, cell death.</p> <p><b>PRACTICAL:</b></p> <p>Microscopy and staining techniques; study of prokaryotic, eukaryotic, plant and animal cells; cell structure in the staminal hair of <i>Tradescantia</i>; study of different types of plastids; cellular reproduction; Mitosis: smear/squash preparation of onion roots.</p>	

**RECOMMENDED BOOKS:**

1. Alberts B and Johnson A, 2006. Molecular Biology of the Cell. 4th Edition; Garland Publishers, New York. (available at [www.ncbi.nlm.nih.gov](http://www.ncbi.nlm.nih.gov))
2. Karp, 2002. Cell and Molecular Biology. 3rd Edition; John Wiley and Sons, New York.
3. Alberts et al., 2009. Essential Cell Biology. 3rd Edition; Garland Publishers, New York.
4. Lodish et al., 2007. Molecular Cell Biology. 6th Edition; Freeman and Company, New York. (available at [www.ncbi.nlm.nih.gov](http://www.ncbi.nlm.nih.gov))
5. Cooper GM and Hausman RE, 2009. The Cell, a molecular approach. 5<sup>th</sup> Edition; Sinauer Associates, Inc.

**Course Name:** Carbohydrates & Lipids**Course Code:** BCHM303**Course Structure:** Theory: 3, Practical: 1**Credit Hours:** 4 (3+1)**Prerequisites:** None**COURSE OBJECTIVES:**

To understand the principles and concepts concerning the chemical, physical, and biological properties of carbohydrates and lipid in biological processes including signal transduction.

**COURSE OUTLINE:**

Introduction and historical background; occurrence, distribution in biosphere, and importance in life processes; structure, nomenclature and classification; general properties, synthesis and breakdown of monosaccharides, oligosaccharides and polysaccharides. Lipids: Structure, classification and their biological role.

**Fatty acids:** Structure, classification, nomenclature and properties of fatty acids. Prostaglandins, thromboxanes and leukotrienes. Triacylglycerols:

Nomenclature, physical and chemical properties including hydrolysis, saponification value, rancidity, acid value, iodine value and Reichert – Meissl number. Reactions of glycerol. Phospholipids: Glycerophospholipids, Sphingomyelins and glycolipids; their properties and functions. Steroids: Structure, classification, nomenclature and their biological role. Lipids as signals, cofactors and pigments.

**PRACTICAL:**

- Qualitative Analysis of known carbohydrates (e.g., Glucose, galactose, fructose, maltose, lactose, sucrose, starch glycogen and cellulose).
- Qualitative Analysis of carbohydrates of given unknown samples
- Extraction of starch from plant sources and its confirmative tests (e.g., Potato, Wheat, Rice, Pulses, Barely, Maize etc).
- Extraction of Glycogen from animal sources (e.g., liver, muscle, etc) & its confirmative tests.
- Qualitative tests for lipids and fatty acids;
- Extraction of lipids from animal and plant sources.

**RECOMMENDED BOOKS:**

1. Harpers Illustrated Biochemistry. (2012). 29th Ed. By Robert Murray, David Bender, Kathleen M. Botham, Peter J. Kennelly, Victor Rodwell, P. Anthony Weil. McGraw-Hill Medical.
2. Biochemistry. 7th Ed. By Jeremy M. Berg, John L. Tymoczko and Lubert Stryer. Publisher:Palgrave MacMillan; 7th revised international ed edition (April 1, 2011).
3. Fundamentals of Biochemistry (2008) 3rd Ed. by D. J. Voet, G.J. Voet and C. W. Pratt. J. Wiley & Sons Inc.
4. Lehninger Principles of Biochemistry. (2012) 6th Ed. By David L. Nelson, Michael M. Cox . W.H. Freeman; 6th Edition (November 21, 2012).



**SHAHEED BENAZIR BHUTTO WOMEN UNIVERSITY**  
**PESHAWAR**  
**DETAILED COURSE OUTLINE OF BIOCHEMISTRY (4 YEARS PROGRAM)**

**SEMESTER – III**

<b>Course Name: English – III</b>	<b>Course Code:</b>
<b>Course Structure: Lectures: 3</b>	<b>Credit Hours: 3</b>
<b>Prerequisites:</b> English I & II	
<b>Objectives:</b> Enhance language skills and develop critical thinking	
<b>Course Contents:</b> <ul style="list-style-type: none"><li>• <b>Presentation skills</b></li><li>• <b>Essay writing:</b> Descriptive, narrative, discursive, argumentative</li><li>• <b>Academic writing:</b> How to write a proposal for research paper/term paper, How to write a research paper/term paper (emphasis on style, content, language, form, clarity, consistency)</li><li>• <b>Technical Report writing</b></li><li>• <b>Progress report writing</b></li></ul>	
<i>Note: Extensive reading is required for vocabulary building</i>	
<b>Recommended Books:</b>	
<b>Technical Writing and Presentation Skills</b>	
<b>a) Essay Writing and Academic Writing</b>	
1) Writing. Advanced by Ron White. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 435407 3 (particularly suitable for discursive, descriptive, argumentative and report writing).	
2) College Writing Skills by John Langan. Mc=Graw-Hill Higher Education. 2004.	
3) Patterns of College Writing (4th edition) by Laurie G. Kirszner and Stephen R. Mandell. St. Martin's Press.	
<b>b) Presentation Skills</b>	
<b>c) Reading:</b> The Mercury Reader. A Custom Publication. Compiled by northern Illinois University. General Editors: Janice Neulib; Kathleen Shine Cain; Stephen Ruffus and Maurice Scharon. (A reader which will give students exposure to the best of twentieth century literature, without taxing the taste of engineering students).	

<b>Course Name: Introduction to Computer</b>	<b>Course Code:</b>
<b>Course Structure: Lectures: 2, Practical: 1</b>	<b>Credit Hours: 3(2+1)</b>
<b>Prerequisites:</b> None	
<b>Introduction/Objectives</b> The course focuses on introducing computing environment, general application software, basic computing hardware, operating systems, desktop publishing, internet, software applications and tools and computer usage concept.	

**COURSE OUTLINE:**

Introduction to computer and Uses of computer in different disciplines. History of computer. Generations of computer. First Generation. Second generation. Third generation. Fourth generation. Fifth generation Computer Hardware: Introduction to hardware, Parts of computer and their functions (CPU,monitor,keyboard,mouse etc).computer types and classification. Types of .computer (digital and analogue).classification. Minicomputer. Micro computer. Mainframe computer. Super computerOperating System: Introduction. Windows 98/2000. Computer software .Introduction to software. Types of software. System software and application software. Internet Access. Internet Access. Different databases on Internet. Word Processing.Introduction.MS-Word. MS-Word Applications. Spread Sheets. Introduction. MS-Excel. MS-Excel Applications

**PRACTICAL:**

Other Software related Practical

**Text Books:**

1. Introduction to computer science, P.K Sinha.
2. Computer science- An Overview, Glenn Books.

A text book of computer B.com part-I

<b>Course Name:</b> Amino acid & Proteins	<b>Course Code:</b> BCHM401
<b>Course Structure:</b> Theory: 3, Practical:1	<b>Credit Hours:</b> 4(3+1)
<b>Prerequisites:</b> None	
<b>COURSE OBJECTIVES:</b>	
This course will cover the basic concepts about amino acids and proteins.	
<b>COURSE OUTLINE:</b>	
Introduction to amino acids and their structure; polypeptides; Isomerism, Zwitterions; classification of amino acids; acid-base properties of amino acids; optical activity of amino acids; isoelectric point (pI); separation and purification of amino acids; uncommon amino acids; identification of amino acids by different methods; chemical and enzymatic reactions of amino acids; introduction to proteins, classification; structure and function of proteins; physical and chemical properties; conjugated proteins; primary, secondary, tertiary and quaternary structure determination; protein denaturation and folding; interactions of proteins with other molecules; isolation, purification and characterization of proteins; advanced techniques for protein analysis.	
<b>PRACTICAL:</b>	
Qualitative tests of proteins & amino acids: Biuret Test; Niuhydrin Test; Xanthoproteic Test; Pauly's Test; Hoplein's Test; Ehrich's Test; Sakaguchi Test; Sodium nitroprusside Test; Sullivan Test; Load sulphate Test; Phosphate Test; Aldehyde Test; Extraction of proteins from plant sources and their confirmative tests. (Sources: Wheat, Rice Barely, Maize, Pulses etc); Extraction of proteins from animal sources & their confirmative tests (Sources: Egg White, Milk, Liver, Muscles etc);	



Separation of Amino Acids using Paper and Thin Layer Chromatography; Determination of total proteins by using different methods (Bradford, Lowry and Biuret methods); Protein estimation by using UV/Visible spectrophotometer; Determination of Secondary structure of Proteins using online available software; Protein purification by using different chromatographic techniques.

**BOOKS RECOMMENDED:**

1. Lehninger Principles of Biochemistry. (2012) 6th Ed. By David L. Nelson, Michael M. Cox W.H. Freeman; 6th Edition (November 21, 2012).
2. Principles of Biochemistry. (2011) 5th Ed. by Laurence A. Moran, Robert A. Horton, Gray Scrimgeour and Marc Perry.
3. Fundamentals of Biochemistry (2010) 4th Ed. by D. J. Voet, G.J. Voet and C. W. Pratt. J. Wiley & Sons Inc.
4. Textbook of Practical Biochemistry. Joshi A. Rashmi. B. Jain Publishers, 2002.
4. Introductory Practical Biochemistry. 2005. 2nd Ed. By S. K. Sawhney, Randhir Singh. Alpha Science International, Ltd.
5. Harpers Illustrated Biochemistry. (2012). 29th Ed. By Robert Murray, David Bender, Kathleen M. Botham, Peter J. Kennelly, Victor Rodwell, P. Anthony Weil. McGraw-Hill Medical.
6. Biochemistry. 7th Ed. By Jeremy M. Berg, John L. Tymoczko and Lubert Stryer. **Publisher:** Palgrave MacMillan; 7th revised international edition (April 1, 2011).

<b>Course Name:</b> Physical Chemistry	<b>Course Code:</b>
<b>Course Structure:</b> Lectures: 2, Practical: 1	<b>Credit Hours:</b> 3(2+1)
<b>Prerequisites:</b> None	
<b>COURSE OBJECTIVES:</b>	
Students will acquire knowledge to enable themselves to understand the fundamental principles and laws of thermodynamics and chemical equilibrium and to investigate the physical properties of ideal/non-ideal binary solutions. Students should also be able to study the rates of reactions and perform related calculations.	
<b>COURSE CONTENTS:</b>	
<ul style="list-style-type: none"> <li>• Chemical Thermodynamics: Equation of states, ideal and real gases, the real gas equation and the van der Waals equation for real gases, critical phenomena and critical constants, four laws of thermodynamics and their applications, thermochemistry, calorimetry, heat capacities and their dependence on temperature, pressure and volume, reversible and nonreversible processes, spontaneous and non-spontaneous processes, relations of entropy and Gibbs free energy with equilibrium constant, Gibbs Helmholtz equation, fugacity and activity.</li> <li>• Chemical Equilibrium: General equilibrium expressions, reaction quotients, examples of equilibrium reactions in solid, liquid and gas phases, extent of reactions and equilibrium constants, Gibbs energies of formation and calculations of equilibrium constants, effect of temperature and pressure on the equilibrium constants/compositions, van't Hoff equation, Le-Chatelier's principle.</li> </ul>	

- **Solution Chemistry:** Physical properties of liquids, surface tension, viscosity, refractive index, dipole moment etc. and their applications, brief account of interactions among the molecules in liquids, ideal and non-ideal solutions, Raoult's law and its applications, lowering of vapor pressure, elevation of boiling point, depression of freezing point, osmotic pressure, vapor pressure of non-ideal solutions and Henry's law, abnormal colligative properties, degrees of association and dissociation of solutes, osmotic pressure and its measurement, fractional distillation and concept of azeotropic mixtures.
- **Chemical Kinetics:** The rates of reactions, zero, first, second and third order reactions with same and different initial concentrations, half-lives of reactions, experimental techniques for rate determination and methods for determination of order of reaction (integration, half-life, initial rate, and graphical methods), Arrhenius equation.

### **PRACTICAL:**

Determination of viscosity and refractive index of liquids; Determination of percent composition of liquid solutions viscometrically; Determination of refractive index and molar refractivity; Determination of percent composition of liquid solutions by refractive index measurements; Determination of molecular weight of a compound by elevation of boiling point (ebullioscopic method); Determination of molecular weight of a compound by lowering of freezing point (cryoscopic method); Determination of heat of solution by solubility method; Determination of heat of neutralization of an acid with a base; Kinetic study of acid catalyzed hydrolysis of ethyl acetate; Determination of partition coefficient of a substance between two immiscible liquids.

### **RECOMMENDED BOOKS:**

1. McQuarrie, D. A. and Simon, J. D., *Physical Chemistry – A Molecular Approach*, 1st ed., University Science Books, (1997).
2. Atkins, P. and Paula, J.D., *Atkin's Physical Chemistry*, 9th ed., Oxford University Press, (2010).
3. Shoemaker, D., *Experiments in Physical Chemistry*, 8th ed., McGraw-Hill Publishing Company Limited, (2003).
4. Silbey, R., Alberty, R. and Bawendi, M., *Physical Chemistry*, 4th Ed., (2005).
5. Atkins, P., Jones, L., *Chemical Principles*, 5th ed., W. H. Freeman and Company, New York, (2010).
6. James, A. M., Prichard, F. E., *Practical Physical Chemistry*, 3rd ed., Longman Group Limited, New York, (1974).
7. Chaudhary, S. U., *Ilmi Textbook of Physical Chemistry*, 2nd ed., Ilmi Kitab Khana, Lahore, (2013).
8. Atkins, P., Jones, L., *Chemical Principles: The Quest for Insight*, 5th ed., W. H. Freeman, (2010).
9. Linder, B., *Elementary Physical Chemistry*, World Scientific Publishing Co. Ptv. Ltd., (2011).
10. Davis, W. M., Dykstra, C. E., *Physical Chemistry: A Modern Introduction*, 2nd ed., CRC Press, (2011).

<b>Course Name:</b> Biosafety and Ethics	<b>Course Code:</b> BCHM411
<b>Course Structure:</b> Lectures: 2	<b>Credit Hours:</b> 2
<b>Prerequisites:</b> None	
<p><b>COURSE OBJECTIVES:</b> To acquaint students with principles of biosafety and ethical perspectives pertaining to biochemistry as well as biotechnology</p> <p><b>COURSE CONTENTS :</b> Introduction to Biosafety definition, concept, uses and abuses of genetic information, and biohazards; good laboratory practices; risks related to genetically modified organisms (GMO); international rules and regulations for biosafety and GMOs; introduction to bioethics; ethical issues related to GMOs; euthanasia, reproductive and cloning technologies, transplants and eugenics; benefit sharing; role of national bioethics committees; biosafety guidelines from a national perspective.</p> <p><b>RECOMMENDED BOOKS:</b></p> <ol style="list-style-type: none"> <li>1. Altman A and Hasegawa PM, 2012. Plant Biotechnology and Agriculture: Prospects for 21st Century. 1st Edition; Academic Press.</li> <li>2. Laboratory Biosafety Manual, WHO, 2006. 3rd Edition; AITBS Publishers and Distributors, India. (Available online).</li> <li>3. Furr AK, 2000. CRC Handbook of Laboratory Safety. 5th Edition; CRC Press.</li> <li>4. Jose Maria A, 2003. Genes Technology and Policy. Available online at: <a href="http://www.apdip.net/publications/iespprimers/eprimer-genes.pdf">http://www.apdip.net/publications/iespprimers/eprimer-genes.pdf</a></li> <li>5. Krishna VS, 2007. Bioethics and Biosafety in Biotechnology. New Age International Publishers.</li> <li>6. National Biosafety Guidelines, 2005. Pakistan Environmental protection Agency (Available online)</li> </ol>	

<b>Course Name:</b> Fundamentals of Genetics	<b>Course Code:</b> BCHM402
<b>Course Structure:</b> Lectures: 3(2+1)	<b>Credit Hours:</b> 3(2+1)
<b>Prerequisites:</b> None	
<p><b>COURSE OBJECTIVES:</b> To acquaint students with classical aspects of genetics.</p> <p><b>COURSE CONTENTS:</b> Classical Mendelian genetics; monohybrid crosses, dominance, recessiveness, codominance, and semidominance; principle of independent assortment; dihybrid and trihybrid ratios; gene interactions; epistasis and multiple alleles; ABO blood type alleles and Rh factor alleles in humans; probability in Mendelian inheritance; structure of chromosomes; organization of genes and genomes; nucleic acid function; DNA as warehouse of genetic information; experimental evidence that DNA is genetic material; sex determination; linkage and crossing over, Population genetics.</p> <p><b>RECOMMENDED BOOKS:</b></p> <ol style="list-style-type: none"> <li>1. Snustad DP and Simmons MJ, 2008. Principals of Genetics. 5th Edition; John Willy &amp; Son, New York.</li> </ol>	

2. Klug WS and Cumming MR, 2008. Concepts of Genetics. 9th Edition; Prentice Hall, USA.
3. Pierce B, 2004. Genetics: A Conceptual Approach. 2nd Edition; WH Freeman, New York.
4. Brooker R, 2011. Genetics: Analysis and Principles. 4th Edition; McGraw-Hill.
5. Pierce BA, 2011. Genetics: A conceptual approach. 4th Edition. WH Freeman Publisher.



**SHAHEED BENAZIR BHUTTO WOMEN UNIVERSITY**  
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**DETAILED COURSE OUTLINE OF BIOCHEMISTRY (4 YEARS PROGRAM)**

**SEMESTER – IV**

<b>Course Name:</b> Human Physiology	<b>Course Code:</b> BCHM403
<b>Course Structure:</b> Lectures: 3	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> None	
<b>COURSE OBJECTIVES</b> This course is designed to provide a holistic overview of the various aspects of human physiology	
<b>COURSE OUTLINE:</b> <ul style="list-style-type: none"><li>➤ DIGESTION AND ABSORPTION OF MACROMOLECULES: Digestion, absorption and transport of carbohydrate, lipid and Protein.</li><li>➤ HORMONES: Introduction, classification, chemical nature, general mechanism of action.</li><li>➤ BLOOD: General composition, characteristics and functions; <i>hemoglobin</i>: chemistry, properties, synthesis, degradation, functions and derivatives. <i>Blood coagulation</i> and <i>blood clotting factors</i>; blood pressure, groups and buffers.</li><li>➤ RESPIRATION: Structure and functions of lungs; transport of oxygen and carbon dioxide in blood; acid base balance.</li><li>➤ SPECIALIZED TISSUES: Structure and functions of muscle. Kidney; structure and functions, <i>acid base balance</i>, water and electrolyte balance. Structure and <i>functions of liver</i>; with special reference to detoxification functions.</li></ul>	
<b>RECOMMENDED BOOKS:</b> <ol style="list-style-type: none"><li>1. Text Book of Medical Physiology (2008) 10<sup>th</sup> Edition by Arthur C. Gyton, John E. Hall, W. B Saunders Company.</li><li>2. Fundamentals of Biochemistry (2008) 3<sup>rd</sup> Edition by D. Voet, J. G. Voet, &amp; C. W. Pratt, John Wiley and Sons, New York.</li><li>3. Human Physiology, (2003) 5<sup>th</sup> Edition Arthur J. Vender, James H. Sherman, Dorothy S. Luciano, McGraw-Hill Company</li><li>4. Principles of Biochemistry (2008), 5<sup>th</sup> Edition by A.L. Lehninger, D.L. Nelson and M. M. Cox, Worth Publishers, New York</li></ol>	

<b>Course Name:</b> Biophysics	<b>Course Code:</b>
<b>Course Structure:</b> Lectures: 3	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> None	
<b>COURSE OBJECTIVES:</b> This course is intended for students studying life sciences and aims to impart fundamental concepts of physics in the context of biological systems.	
<b>COURSE CONTENTS:</b>	

Essentials of thermodynamics; concept of entropy, enthalpy and Gibb's free energy; order and disorder in biological systems; molecules, diffusion, random walks and friction; methods of studying macromolecules; interactions of molecules in 3-D space-determining binding and dissociation constants; molecular motors; sedimentation; Reynold's number; chemical forces and self-assembly; physics of ion channels.

**RECOMMENDED BOOKS:**

1. Nelson P, 2004. Biological Physics, Energy, Information and Life. 1<sup>st</sup> Edition; WH Freeman & Company.
2. Kirsten et al., 2010. Introduction to Biological Physics for the Health and Life Sciences. 2nd Edition; John Wiley & Sons.
3. Davidovits P, 2013. Physics for Biology & Medicine. 4th Edition; Academic Press.
4. Newman, 2008. Physics of the Life Sciences. Springer.
5. Duncan, 1975. Physics for Biologist. Blackwell Science.

**Course Name:** Microbiology

**Course Code:**

**Course Structure:** Lectures: 3, Practical: 1

**Credit Hours:** 4(3+1)

**Prerequisites:** None

**COURSE OBJECTIVES:**

This course aims to familiarize students with fundamentals of prokaryotic and eukaryotic microbial life including viruses.

**COURSE CONTENTS:**

Overview and history of microbiology including microbial diversity (Archaea, bacteria, fungi, algae, protozoa), nutrition, growth, metabolism; cultivation; viruses; control of microorganisms: sterilization and disinfection, antimicrobial agents, antibiotics, antibiotic resistance and susceptibility, antifungal and antiviral agents; cell death; symbiosis, carbon, nitrogen, sulfur and phosphorus cycles; microbiology of soil, freshwater and seawater. Emerging and reemerging microorganisms.

**PRACTICAL:**

Sterilization techniques; Preparation of stock and working solutions; culturing of bacteria in liquid and on solid medium; Gram-staining of bacteria; colony and cell morphology; bacterial cell count and growth curves; biochemical tests.

**RECOMMENDED BOOKS:**

1. Alcamo IE, 2010. Fundamentals of Microbiology. 9th Edition, Jones and Bartlett Publishers.
2. Madigan MT and Martinko J, 2010. Brock Biology of Microorganisms. 13<sup>th</sup> Edition; Pearson College Div.
3. Talaro KP, 2009. Foundations in Microbiology: Basic Principles. 7<sup>th</sup> Edition; McGraw-Hill Publisher.
4. Black JG, 2007. Microbiology: principles and explorations. 7th Edition; John Wiley and Sons.

5. Baker et al., 2006. Instant Notes in Microbiology. 3rd Edition; Taylor and Francis.
6. Prescott et al., 2005. Microbiology. 6th Edition; McGraw-Hill Medical Publishing.
7. Cappuccino JG and Sherman N, 2013. Microbiology: a laboratory manual. 10th Edition; Pearson Education.

<b>Course Name:</b> Analytical Chemistry	<b>Course Code:</b>
<b>Course Structure:</b> Lectures: 3(2+1)	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> None	
<ul style="list-style-type: none"> <li>Course contents will be designed by the subject teacher at the time of teaching according to the need and requirement of discipline.</li> </ul>	

<b>Course Name:</b> Enzymes	<b>Course Code:</b> BCHM404
<b>Course Structure:</b> Lectures: 2, Practical: 1	<b>Credit Hours:</b> 3(2+1)
<b>Prerequisites:</b> None	
<p><b>COURSE OBJECTIVES:</b> The objective of this course is to provide in depth knowledge of how enzymes work as biological catalysts and how the rates of reactions are impacted by a variety of different factors and environmental conditions.</p> <p><b>COURSE OUTLINES:</b> Introduction to enzymes, nomenclature, classification, ribozyme, general characteristics of theories of enzyme catalysis, enzyme and substrate specificity, isozymes, coenzymes, cofactors, regulation of enzyme activity, chemical kinetics and enzyme kinetics, Michaelis-Menten equation, effect of various factors on rate of reactions, inhibition of enzymatic reactions and kinetics, multi enzyme system and bisubstrate reactions, catalytic mechanisms, regulatory enzymes, immobilised enzyme and enzyme assays.</p> <p><b>PRACTICAL:</b> Extraction and estimation of enzymes. Acid and enzymatic hydrolysis of glycogen and starch Biosynthesis of enzymes by fungi and bacteria. Effect of factors on enzymes activity.</p> <p><b>RECOMMENDED BOOKS:</b></p> <ol style="list-style-type: none"> <li>Biochemistry (2007) 6th edition by J.M. Berg, J.L. Tymoczko &amp; L. Stryer W.H. Freeman &amp; Co.</li> <li>Fundamentals of Biochemistry (2008) 3rd Ed. by D. J. Voet, G.J. Voet and C. W. Pratt. J. Wiley &amp; Sons Inc.</li> <li>Lehninger Principles of Biochemistry 5th Ed. by D. L. Nelson, M. M. Cox. W. H. Freeman Publishers.</li> <li>Biochemistry. (1999) 3rd Ed. by C. K. Mathews, K. E. Van Holde, &amp; K.G. Ahern.</li> </ol>	

Prentice Hall. 5. Harper's Illustrated Biochemistry, 27th Ed. By R.K. Murray, D.K. Grannar, V.W. Rodwell. McGraw-Hill. 6. Modern Experimental Biochemistry (1993) by R.F. Boyer. Benjamin-Cummings pub. Co. 7. Varley's Practical Clinical Biochemistry (1991) 5th Edition by A.H. Gowenlock and M. Bell. CBS Publishers & Distributors. 8. Text Book of Biochemistry (1971) by B. Harrow and A. Mazur W. B. Saunders Company.	
<b>Course Name:</b> Bioenergetics	<b>Course Code:</b> BCHM412
<b>Course Structure:</b> Lectures: 2	<b>Credit Hours:</b> 2
<b>Prerequisites:</b> None	
<b>COURSE OBJECTIVES:</b> This course provides insights into energy, its production and regulation in living system.	
<b>COURSE OUTLINE:</b> Introduction; basic thermodynamic concepts of energy and free energy, enthalpy, entropy and their relationships; endothermic and exothermic reactions; biological oxidation and reduction; high energy compounds; coupling mechanisms: substrate level phosphorylation, electron transport chain, oxidative and photo phosphorylation; auto regulation of energy production.	
<b>RECOMMENDED BOOKS:</b> 1. Text Book of Biochemistry (1971) by B. Harrow and A. Mazur W.B.Saunders Company. 2. Harper's Illustrated Biochemistry, 27th Ed. By R.K. Murray, D.K. Grannar, V.W. Rodwell. McGraw Hill. 3. Physical Chemistry (2002) 7th Edition by P.W. Atkin Oxford University Press 4. Physical Chemistry (2004) 4th Edition by R.J. Sibley, R.A. Alberty & M.G. Bawendi J.Wiley & Sons.	





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**SEMESTER – V**

<b>Course Name: Metabolism I</b>	<b>Course Code: BCHM501</b>
<b>Course Structure: Lectures: 2</b>	<b>Credit Hours: 2+0</b>
<b>Prerequisites: Carbohydrates &amp; Lipids</b>	
<b>COURSE OBJECTIVES:</b> This overall goal of this course is to impart the essential aspects of intermediary metabolism and its importance to the overall biology of an organism.	
<b>COURSE CONTENTS:</b> <b>Carbohydrate metabolism:</b> Glucose central role in metabolism of plants, animals and micro-organism. Glycolysis, reactions of glycolysis. Fermentation: anaerobic fate of pyruvate, control of metabolic flux. Regulation of glycolytic pathway. Entry of Galactose, Mannose and fructose into glycolytic pathway. TCA cycle: Overview of TCA, Metabolic sources of Acetyl Coenzyme A. Amphibolic nature, anaplerotic reactions. TCA Cycle inhibitors, Regulation, pyruvate dehydrogenase complex enzyme. Other pathways of carbohydrate metabolism: Gluconeogenesis, Cori cycle, glycogenesis, glycogenolysis, glycogen storage diseases, Glyoxalate Cycle reactions, Pentose phosphate Pathway. Carbohydrate synthesis: Synthesis of starch, cellulose and peptidoglycan, glycoproteins. Glycogen metabolism, Synthesis and breakdown, glycogen synthetase and phosphorylase and their regulation, Glycogen Storage diseases. <b>Lipid metabolism:</b> Introduction to lipid metabolism, $\beta$ -oxidation of fatty acids, ketogenesis. Biosynthesis of Fatty acids. Triacylglycerols and prostaglandins. Metabolism of phospholipids, glycolipids and cholesterol. Lipoproteins: metabolism of HDL Disorder of plasma lipoproteins, fatty liver, obesity, atherosclerosis. Biosynthesis of triacylglycerols, Phospholipids, Cardiolipids, Glycolipids and sphingolipids. Arachidonate metabolism, Prostaglandins: Prostacyclins, Thromboxanes and leukotrienes, synthesis of cholesterol and steroid hormones; degradation of bile acids.	
<b>RECOMMENDED BOOKS:</b> <ol style="list-style-type: none"><li>1. Lehninger Principles of Biochemistry" by Nelson &amp; Cox, 5th edition ISBN 13:978-0-7167-7108-1.</li><li>2. Fundamentals of Biochemistry (2008) 3rd edition By DJ Voet , GJ Voet and CW Pratt. J Wiley &amp; Sons Inc.</li><li>3. Biochemistry (2007) 6th edition by JM Berg, JL Tymoczko &amp; L Stryer WH Freeman &amp; Co</li><li>4. Biochemistry 3rd Edition (Lippincott's Illustrated Reviews Series) by Richard A. Harvey.</li><li>5. Harpers Illustrated Biochemistry 29th Edition (LANGE Basic Science) by Robert Murray, D. Bender, Kathleen M. Botham and P.J. Kennelly (Feb 7, 2012)</li></ol>	

<b>Course Name:</b> Molecular Biology	<b>Course Code:</b> BCHM502
<b>Course Structure:</b> Lectures: 2, Practical: 1	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> None	
<b>COURSE OBJECTIVES:</b> To acquaint students with the chemistry and biology of macromolecules.	
<b>COURSE CONTENTS:</b> Introduction to molecular biology and history; structure and function of DNA; chromatin and structure of chromosomes; organelles genome (Mitochondrial and chloroplast), DNA replication in prokaryotes and eukaryotes; transcription in prokaryotes and eukaryotes; post transcriptional processing (e.g., RNA splicing, alternative splicing, editing); genetic code; translation, posttranslational processing in prokaryotes and eukaryotes; protein folding, targeting and turnover; DNA damage and repair, recombination and transposable elements. Signaling and control of gene regulation in prokaryotes and eukaryotes.	
<b>RECOMMENDED BOOKS:</b> <ol style="list-style-type: none"> <li>1. Nelson D and Cox MM, 2009. Lehninger Principles of Biochemistry. 5th Edition; WH Freeman, New York.</li> <li>2. Lodish et al., 2012. Molecular Cell Biology. 7th Edition; WH Freeman, New York</li> <li>3. Berg et al., 2006. Biochemistry. 6th Edition; WH Freeman, New York.</li> <li>4. Alberts et al., 2007. Molecular Biology of the Cell. 5th Edition; Garland Science</li> <li>5. Weaver R, 2011. Molecular Biology. 5th Edition; McGraw-Hill</li> </ol>	

<b>Course Name:</b> Biochemical Techniques	<b>Course Code:</b> BCHM511
<b>Course Structure:</b> Lectures: 2, Practical: 1	<b>Credit Hours:</b> 3(2+1)
<b>Prerequisites:</b> None	
<b>COURSE OBJECTIVES:</b> This course provides the information of principles & mechanism of different equipment and analysis of Biochemical and Biological samples.	
<b>COURSE OUTLINES:</b> Homogenization, centrifugation, ultra-centrifugation, paper, TLC, and column chromatography, Gel filtration, ion exchange chromatography, affinity chromatography, HPLC, lyophilization, electrophoresis, flame photometry, atomic absorption spectrophotometry, spectro-fluorimetry, UV/visible spectrophotometry and use of radioisotopes.	
<b>PRACTICAL:</b> Preparation of sample for mineral analysis by ashing method; Wet digestion procedure of sample preparation for mineral analysis; Mineral analysis of plant tissues using atomic absorption spectrophotometer. Separation of Biomolecules by affinity chromatography identification of sugars, proteins etc. by uv/vis spectrophotometer. Determination of	

sodium and potassium content in blood serum by flame photometer. Separation of amino acids by amino acid analyzer. Gel chromatography and ion exchange chromatography. Determination of molecular weight of a given protein by gel filtration. Separation of Hb and serum proteins by electrophoresis. Disk-gel electrophoresis of proteins. Separation of proteins by isoelectric focusing.

**RECOMMENDED BOOKS:**

1. Physical Biochemistry: Applications to Biochemistry and Molecular Biology (1982) by David Freifelder, W. H. Freeman.
2. Introduction to Modern liquid chromatography (1979) by L. L. Snyder & J.J Kirkland. John Wiley & Sons
3. Tools of Biochemistry (1977) T. G. Cooper & T. C. Cooper John Wiley & Sons
4. Centrifugation. A practical approach. (1987) Ed. D. Rickwood, Oxford: IRL press England.
5. Varley's Practical Clinical Biochemistry (1991) 5th Edition by A. H. Gowenlock and M. Bell. CBS Publishers & Distributors.
6. Hawk's Physiological chemistry Mc Graw-Hill publishing company
7. Tietz Textbook of Clinical Chemistry (1999) by C.A. Burtis, Ashwood & N.W. Tietz (Eds) W. B. Saunders Co.
8. Principles and Techniques of Biochemistry and Molecular Biology 6<sup>th</sup> Edition. Edited by K. Wilson & J. Walker.

<b>Course Name:</b> Immunology	<b>Course Code:</b> BCHM512
<b>Course Structure:</b> Lectures: 2, Practical: 1	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> None	
<p><b>COURSE OBJECTIVES:</b> To acquaint students with the basic principles of innate and adaptive immune systems.</p> <p><b>COURSE CONTENTS:</b> Overview of the immune system as the body's main defense mechanism; elements of innate and acquired immunity; cells and organs of the immune system; properties of antibodies and antigens together with their structure, function and interactions; genetics of antibody structure and diversity; expression of immunoglobulin genes; VDJ recombination; antigen processing and presentation; major histocompatibility complex; monoclonal and polyclonal antibodies; T-cell receptors, maturation, activation, and differentiation; B-cell generation, activation, and differentiation; complement system, hypersensitivity, cytokines, resistance and immune response to infectious diseases, cell-mediated effector response, leukocyte migration and inflammation, vaccines, diseases of the immune system - autoimmunity, transplantation immunology.</p> <p><b>PRACTICAL:</b> Practical contents will be designed by teacher.</p>	

**RECOMMENDED BOOKS:**

1. Kuby J, 2007. Immunology. 6th Edition; WH Freeman, New York.
2. Janeway et al., 2001. Immunobiology The immune system in health and disease. 5th Edition; Garland Science Publisher, New York.
3. Anderson WL, 1999. Immunology. 1st Edition; Wiley-Blackwell.
4. Delves PJ et al., 2012. Roitt's Essential Immunology. 12th Edition. Wiley-Blackwell
5. Abbas AK and Lichtman AH, 2010. Basic Immunology: Functions and Disorders of the Immune System. 3rd illustrated Edition; Saunders Publisher.
6. Harlow E and David L, 1988. Antibodies, A laboratory Manual. 1st Edition; Cold Spring Harbor laboratory Press.

<b>Course Name:</b> Plant Biochemistry	<b>Course Code:</b> BCHM513
<b>Course Structure:</b> Theory:2 Practicals:1	<b>Credit Hours:</b> 3(2+1)
<b>Prerequisites:</b> None	
<b>COURSE OBJECTIVES:</b> The objective of this course is to cover the key concepts of plant biochemistry. Topics to be covered are plant pigments, photosynthetic systems and pathways as well as phyto-hormones and related naturally occurring compounds.	
<b>COURSE OUTLINES:</b> Structure and functions of plant cell. Plant cell wall. Photosynthesis; structure of chlorophyll, absorption of light energy, photosynthetic pigments, photosystem-I, photo system-II. Hill's reaction, electron transport chain, ATPC3, C4 and CAM photosynthetic pathways, CO2 fixation (Calvin Benson cycle). Hatch Slack pathway and photorespiration. Conversion of nitrogen into ammonia and other nitrogenous compounds. Biosynthesis of Alkaloids and their biological functions. Terpenes and Terpenoids. Phenolics and related compounds. Phyto-hormones and related compounds.	
<b>PRACTICAL:</b> Extraction and qualitative analysis of chlorophyll, starch, lipids, enzymes, auxins, alkaloids, phenolics and flavonoids	
<b>RECOMMENDED BOOKS:</b> 1. Biochemistry and Molecular Biology of Plant Hormones. (1999). Edited by P. J. J., Haykaas, M. A. Hall, & K.R. Libbenga, Science Pub. Co. 2. Lehninger, A. L., Nelson, D.L. and Co. N.M., (2008). Principles of Biochemistry. W. H. Freeman; 5th Edition. 3. Plant Biochemistry by T. Wood & Mercer.	

<b>Course Name:</b> Biotechnology	<b>Course Code:</b> BCHM514
<b>Course Structure:</b> Lectures: 3	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> None	
<p><b>COURSE OBJECTIVES:</b> To acquaint students with the basic concepts, significance and applications of biotechnology as it stands today.</p> <p><b>COURSE OUTLINES:</b> Biotechnology definition and history; foundations of biotechnology and interdisciplinary pursuit; branches and/or applications of biotechnology in medicine, agriculture, food, livestock, fisheries, algae, fungi, etc.; Plant growth promoting bacteria: nitrogen fixation (nitrogenase, hydrogenase, nodulation, biocontrol of pathogens, and growth promotion by free-living bacteria. Microbial insecticides: Insecticidal toxins of <i>Bacillus thuringiensis</i>, baculovirus as biocontrol agents. Large scale production of proteins from recombinant Microorganisms. Microbial production of therapeutic agents: pharmaceuticals, enzymes, monoclonal antibodies as therapeutic agents, production of antibodies in <i>E. coli</i>, HIV therapeutic agents. Vaccines. Synthesis of commercial products by recombinant microorganisms: antibiotics and biopolymers. Bioremediation and biomass utilization: microbial degradation of xenobiotics. Transgenic plants and animals. Gene therapy. Stem cells and their application.</p>	
<p><b>RECOMMENDED BOOKS:</b></p> <ol style="list-style-type: none"> <li>1. Daugherty E, 2012. Biotechnology: Science for the New Millennium. 1<sup>st</sup>Edition, Revised; Paradigm Publication.</li> <li>2. Smith JE, 2009. Biotechnology. 5th Edition; Cambridge University Press.</li> <li>3. Nicholl TSD, 2004. An Introduction to Genetic Engineering. 2nd Edition; Cambridge University Press, UK.</li> <li>4. Purohit SS, 2005. Biotechnology Fundamentals &amp; Application. 4th Edition; Agro Bios, India.</li> <li>5. Ratlegde C and Kristiansen B, 2006. Basic Biotechnology. 2nd Edition; Cambridge University Press, UK.</li> <li>6. Thomas JA and Fuchs RL, 2002. Biotechnology and Safety Assessment. 3rd Edition; Academic Press, UK.</li> </ol>	



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**SEMESTER – VI**

<b>Course Name:</b> Clinical Biochemistry	<b>Course Code:</b> BCHM515
<b>Course Structure:</b> Theory:2 Practical:1	<b>Credit Hours:</b> 3(2+1)
<b>Prerequisites:</b> Introductory Biochemistry	
<b>COURSE OBJECTIVES:</b> Provide students with advanced understanding and applied knowledge in the theory and practice of Clinical Biochemistry and equip them with a critical understanding of how biochemical investigations are employed to develop a clinical diagnosis. Emphasis will also be placed on understanding the biochemical basis of human disease.	
<b>COURSE CONTENTS:</b> Diagnostically important Plasma Enzymes & Proteins: Identification and treatment of enzyme deficiencies, Assessment of cell damage, Factors affecting results of plasma enzyme assays. Abnormal plasma enzymes activities: isoenzymes in plasma (lactate dehydrogenase, creatine kinase, Amylase): Abnormalities of proteins in plasma: immunoglobins deficiencies, Disorders of carbohydrate metabolisms and Clinical correlations: (hyperlipidemia, cholesterol and cardiovascular diseases); Disorders of purine and pyrimidine metabolism (Gout, Arthritis); Metabolic Bone Diseases (Calcium balance, Biological functions of calcium, phosphate and magnesium metabolism); Liver Diseases (cirrhosis, specific liver diseases); Hemoglobinopathies, Disorders of Iron and porphyrin metabolism. Cancer and its consequences- tumor progression, tumor markers.	
<b>PRACTICAL:</b> Phelobotmy (blood sampling), serum/plasma isolation procedure, Complete blood count, isolation of tissues samples and storage; Total protein determination in serum and plasma; Blood glucose test, Glucose tolerance test for diabetes mellitus, Glycation (HbA1c); Liver function tests, Renal Function tests, Cardiac enzymes, Albumin determination; Determination of lipid profile, serum and urine electrolytes.	
<b>RECOMMENDED BOOKS:</b> 1. Clinical Chemistry: Principles, Procedures, Correlations by Michael L. Bishop, Edward P. Fody, Larry E. Schoeff Publisher: Lippincott Williams & Wilkins; 5th Edition (July 6, 2004) 2. Tietz Fundamentals of Clinical Chemistry by Carl A. Burtis, Edward R. Ashwood. Publisher: W.B. Saunders Company; 5th Edition (January 15, 2001). 3. Lecture Notes on Clinical Biochemistry, Alistaire F Smith, Geoffrey Beckett, Simon Walker, Peter Rae 6th Edition, John Wiley & Sons, 1998.	

<b>Course Name:</b> Methods in Molecular Biology	<b>Course Code:</b> BCHM516
<b>Course Structure:</b> Theory:2 Practical:1	<b>Credit Hours:</b> 3(2+1)
<b>Prerequisites:</b> Molecular biology	
<p><b>COURSE OBJECTIVES:</b> To acquaint students with the experimental aspects of molecular biology</p> <p><b>COURSE CONTENTS:</b> Introduction to recombinant DNA technology; restriction and modifying enzymes; cloning and expression vectors and their types; expression of recombinant proteins and their purification by affinity chromatography; polymerase chain reaction (PCR) - types; (inverse, touch-down, nested, hemi-nested, pit stop, multiplex, reverse transcriptase, RACE, real-time) and its applications; detection of mutations and/or SNPs; DNA fingerprinting; analysis of nucleic acids by gel electrophoresis – horizontal, vertical, pulse field, denaturing gradient gel electrophoresis; analysis of proteins by native and SDS-PAGE; 2-D gels; generation of antibodies and their uses; enzyme-linked immunosorbent assay; Southern, Western, Northern blotting.</p> <p><b>PRACTICAL:</b> isolation of nucleic acids and their quantification; restriction digestion of DNA and preparation of restriction maps; gel electrophoresis; polymerase chain reaction (PCR); detection of mutations by restriction fragment length polymorphism; preparation of chemically competent cells; transformation of bacteria with plasmid DNA; analysis of proteins by SDS-PAGE</p>	
<p><b>RECOMMENDED BOOKS:</b></p> <ol style="list-style-type: none"> <li>1. Ausubel FM, 2005. Short Protocols in Molecular Biology (2 volume set).5th Edition; John Wiley and Son.</li> <li>2. Green MR and Sambrook J, 2001. Molecular Cloning: A Laboratory Manual. 3rd Edition; Cold Spring Harbor Laboratory Press.</li> <li>3. Primrose SB and Twyman R, 2006. Principles of Gene Manipulation and Genomics. 7th Edition; Wiley- Blackwell.</li> <li>4. Wilson K and Walker J, 2010. Principles and Techniques of Biochemistry and Molecular Biology. 7th Edition; Cambridge University Press.</li> <li>5. Walker JM and Rapley, 2008. Molecular Biomethods Handbook (Methods in Molecular Biology). 2nd Edition; Humana Press.</li> </ol>	

<b>Course Name:</b> Bioinformatics	<b>Course Code:</b>
<b>Course Structure:</b> Lectures: 2, Practical: 1	<b>Credit Hours:</b> 3(2+1)
<b>Prerequisites:</b> None	
<p><b>OBJECTIVES:</b> To familiarize students with biological data mining from online databases and the use of various bioinformatics tools for extracting and processing biological data.</p> <p><b>COURSE CONTENTS:</b> Introduction to bio-computing; biological databases - types and retrieval of nucleic acid</p>	

(or genomic) or protein sequence information; sequence alignment - pairwise, multiple; phylogenetics; *in silico* identification of protein motifs and domains; structural bioinformatics of proteins and RNAs including protein modeling and prediction of their interactions with other proteins and small molecules; identification of genes and promoter regions within genomes; networks; strategies for whole genome sequencing and assembly.

**RECOMMENDED DATA BASES AND TOOLS**

1. NCBI, PDB, EcoCyc, DDBJ, EXPASY, SWISS-PROT, UNI-PROT, TIGR, KEGG etc.
2. DS viewer, Swiss PDB viewer, RasMol, Modeller, Ligplot, Autodock.
3. Bioedit, Repeatmasker, PHRED, PHRAP, BLAST, Prosite/BLOCKS/PFAM, CLUSTALW, Emotif, Oligo, Primer3, Molscript, Treeview, Alscript, Genetic Analysis Software, Phylip, MEGA4.0, DNA Dragon etc.

**RECOMMENDED BOOKS:**

1. Claverie JM and Notredame C, 2006. Bioinformatics for Dummies. 2<sup>nd</sup> Edition; Wiley Publishing.
2. Xiong J, 2006. Essential Bioinformatics. 1st Edition; Cambridge University Press.
3. Xia X, 2007. Bioinformatics and the Cell: Modern Computational Approaches in Genomics, Proteomics and Transcriptomics. 1st Edition. Springer
4. Mathura V and Kanguane P, 2009. Bioinformatics: A Concept-Based Introduction. Springer
5. Mount DW, 2004. Bioinformatics Sequence and Genome Analysis. Second Edition; Cold Spring Harbor Laboratory Press.
6. Sperschneider V, 2008. Bioinformatics: Problem Solving Paradigms. Springer.

<b>Course Name: Metabolism II</b>	<b>Course Code: BCHM503</b>
<b>Course Structure: Lectures: 2+0</b>	<b>Credit Hours: 2+0</b>
<b>Prerequisites:</b> Proteins & Amino acids	
<p><b>COURSE OBJECTIVES:</b> This overall goal of this course is to impart the essential aspects of intermediary metabolism and its importance to the overall biology of an organism.</p> <p><b>COURSE CONTENTS:</b>  <b>Protein metabolism:</b>            Digestion and absorption of proteins; General aspects of amino acids metabolism, deamination, transamination, transmethylation, transpeptidation and decarboxylation. Amino acid degradation and urea cycle. Inborn errors of metabolism. Nitrogen balance, biosynthesis of non-essential amino acids.            Major pathways and strategies of energy metabolism: Organ specialization Brain, Muscle, Adipose tissue, liver.            Metabolic adaptation – Starvation, Diabetes Mellitus. Shuttle systems: Introduction, importance of Shuttle Systems, Glycerol Phosphate shuttle, Malate aspartate shuttle</p>	
<p><b>RECOMMENDED BOOKS:</b></p> <ol style="list-style-type: none"> <li>1. Lehninger Principles of Biochemistry" by Nelson &amp; Cox, 5th edition ISBN 13:978-0-7167-7108-1.</li> <li>2. Fundamentals of Biochemistry (2008) 3rd edition By DJ Voet , GJ Voet and CW</li> </ol>	



Pratt. J Wiley & Sons Inc.

- Biochemistry (2007) 6th edition by JM Berg, JL Tymoczko & L Stryer WH Freeman & Co
- Biochemistry 3rd Edition (Lippincott's Illustrated Reviews Series) by Richard A. Harvey.
- Harpers Illustrated Biochemistry 29th Edition (LANGE Basic Science) by Robert Murray, D. Bender, Kathleen M. Botham and P.J. Kennelly (Feb 7, 2012)

<b>Course Name:</b> Biostatistics	<b>Course Code:</b>
<b>Course Structure:</b> Lectures: 3	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> None	
<b>COURSE OBJECTIVES:</b> To acquaint students with statistical techniques frequently used in biology to process real data.	
<b>COURSE CONTENTS:</b> Introduction and scope of biostatistics, Frequency distribution, measures of central Tendency and dispersion, statistical hypothesis and its significance, null and alternative hypothesis, confidence interval, tests involving binomial and normal distribution, Sampling techniques, Regression and correlation, Fdistribution, student's t-distribution, chi-square test, Analysis of Variance (ANOVA), LSD test, experimental designs, Completely Randomized Design (CRD), Randomized Complete Block Design (RCBD), Computer applications of Biostatistics, graphical representation of data.	
<b>RECOMMENDED BOOKS:</b> 1. Mann PS, 2010. Introductory Statistics. 7th Edition; John Wiley and Sons. 2. Freund JE and Perles MB, 2005. Modern Elementary Statistics; 12 <sup>th</sup> Edition. Pearson. 3. Chaudhry SM, 2005. Introduction to statistical theory. 6th Edition; Markazi Kutub Khana, Lahore. 4. Chernick MR and Friis RH, 2003. Introductory Biostatistics for the Health Sciences: Modern Applications Including Bootstrap. 1st Edition; Wiley Interscience. 5. Le CT, 2003. Introductory Biostatistics. 1st Edition; Wiley Interscience.	

<b>Course Name:</b> Industrial Biochemistry	<b>Course Code:</b> BCHM517
<b>Course Structure:</b> Lectures: 2, Practical: 1	<b>Credit Hours:</b> 3(2+1)
<b>Prerequisites:</b> None	
<b>COURSE OBJECTIVES:</b> This course provides information about how large-scale biochemistry is done in multinational companies and academic labs. The focus of this course will be on how locally available inexpensive raw materials may be used to develop products with good commercial value.	
<b>COURSE OUTLINES:</b> Introduction; extraction of oil from oil seeds; purification refining of oils; preparation of soap and detergents; effect of acidic species and hard water on soap; extraction of sugar	

from different sources; preparation of jams, jellies and chocolates; manufacture of starch from rice, corn, potato, wheat and its industrial applications; fermentation and its applications; production of antibiotics, acetic acid, citric acid and ethanol by microorganisms.

**PRACTICAL:**

- Extraction of oil by Soxhlet method
- Determination of Acid value
- Determination of Iodine value
- Purification of oil by column chromatography
- Separation of phospholipids by TLC
- Determination of ethanol percentage in the fermentation broth
- Determination of citric acid by titration method in the fermentation medium
- Preservation of food by UV-radiation / chemical method
- Estimation of total proteins, reducing sugar, total sugar from extract of seasonal fruits.

**RECOMMENDED BOOKS:**

1. Shreve's chemical process industries (1998) 5th Edition by G.T. Austin Publishers: McGraw-Hill
2. Kent and Riegel's Hand Book of Industrial Chemistry and Biotechnology (2007) 11th Edition by J.A. Kent. Springer.
3. Introduction to Cane Sugar Technology. by G.H. Jenkins Elsevier British pharmacopoeia.
4. Comprehensive Biotechnology (1985) Edited by M. Moo-Yong & C.L. Cooney, Pergamon Press.



**SHAHEED BENAZIR BHUTTO WOMEN UNIVERSITY**  
**PESHAWAR**  
**DETAILED COURSE OUTLINE OF BIOCHEMISTRY (4 YEARS PROGRAM)**

**SEMESTER – VII**

<b>Course Name:</b> Research Planning & Report Writing (English-IV)	<b>Course Code:</b> BCHM611
<b>Course Structure:</b> Theory:2 Practical:1	<b>Credit Hours:</b> 3(2+1)
<b>Prerequisites:</b> None	
<b>COURSE OBJECTIVES:</b> The goal of this course is to enhance awareness of students for how modern day biochemical studies are carried out using state-of-the-art instruments, how data is generated, critically evaluated and analyzed. The course also prepares students in report writing, preparing and making scientific presentations and surveying of literature.	
<b>COURSE OUTLINES:</b> Involves extensive reading of modern day biochemistry literature, designing experiments as well as projects, and critical evaluation of literature. Three key areas to be covered are: <b>RESEARCH PROCESS, DESIGN &amp; METHODOLOGY:</b> Project selection and its development, role of students & supervisor, experimental design and investigation, methodology, control, sampling methods replicating & data processing, results interpretation, primary and secondary sources, scientific research, scientific record keeping; <ul style="list-style-type: none"><li>• <b>WRITING, PRESENTATION AND PUBLISHING SCIENTIFIC PAPERS:</b> Importance of research report, thesis and scientific paper. Report writing and its presentation: Role of P value in decision making, conflict of interests, ownership of data, consent form, publication of the research paper: selection of journal, instructions to authors, letter to editor, acknowledgement, Referee's comments and suggestions, sending a revised manuscript and acceptance letter.</li><li>• <b>REVIEW &amp; SYNOPSIS:</b> The student in consultation with the supervisor will prepare an extensive review and design a research plan in the area of interest, based on introduction, literature survey, problem statement, objectives, methodology, significance and limitations.</li></ul>	
<b>PRACTICAL:</b> A variety of activities including seminars on assigned topic, written essays, poster presentation, presentation of research publications, etc will be undertaken throughout the semester. Reference indexing. Similarity index and Plagiarism Checking.	
<b>RECOMMENDED BOOKS</b> 1. Graduate research: A guide for students in the science (1998) 3 Rev Subedition by Robert V. Smith University of Washington Press. 2. Writing, Reading & Research Clifford (1985) by R. Veit, and J. Clifford Bobbs-Merrill	

Educational Publications.

3. Practical Research: Planning & Design (2009) by P.D. Leedy and J.F.,Ormsrod Publishers: Merrill.

4. Research methods: A process of Inquiry by Grazinao & Ranlin (2006)

5. Conducting Research Literature Reviews: From the Internet to Paper (2004) by A. G. Fink. Saga Publications.

<b>Course Name:</b> Biomembranes & Cell Signaling	<b>Course Code:</b> BCHM612
<b>Course Structure:</b> Lectures: 3	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> None	
<b>COURSE OBJECTIVES:</b> The aim of this course is to equip students with understanding the structures of biological membranes as well as signal transduction pathways. Topics to be covered include embrane structure and functions, membrane transport, and signal transduction networks and how they communicate with each other and impact gene expression.	
<b>COURSE OUTLINES:</b> Introduction; chemical composition and structure of membranes;transmembrane proteins; membrane junctions, receptor-ligand nteractions; protein-protein interactions; interaction of proteins with other molecules; second messengers; DAG, calcium, Cyclic AMP, Cyclic GMP, Inocitol 3 Phosphate; cell signaling pathways and networks: their activation and impact on gene expression; G-protein and G-protein coupled receptors. Neurotransmitters.	
<b>RECOMMENDED BOOKS:</b> 1. Molecular Cell Biology (2007) 6th Edition. H. Lodish, C.A. Kaiser, M. Krieger. M.P. Scott, A. Bretscher, H. Ploegh, & P. Matsudaira, W.H.Freeman. 2. Biochemistry (2007) 6th edition by J.M. Berg, J.L. Tymoczko & L. StryerW.H. Freeman & Co. 3. Molecular Biology of the Cell, (2008) 5th Editon .B. Alberts, A. Johnson, J.Lewis, M. Raff, K. Roberts & P. Walter 5th Edition Garland Sciences,Taylor and Francis 4. Molecular Cell Biology (2007) 6th Edition. H. Lodish, C.A. Kaiser, M.Krieger. M.P. Scott, A. Bretscher, H. Ploegh, & P. Matsudaira, W.H.Freeman. 5. Cell and Molecular Biology: Concepts and Experiments (2008) by G.Karp John Wiley & Sons	

<b>Course Name:</b> Marketing & Management (Social Sciences-III)	Course code:
<b>Course Structure:</b> Lectures: 3	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> None	
<b>Course Description will be taken from Management sciences</b>	



**SHAHEED BENAZIR BHUTTO WOMEN UNIVERSITY  
PESHAWAR**

**DETAILED COURSE OUTLINE OF BIOCHEMISTRY (4 YEARS PROGRAM)**

**SEMESTER – VIII**

<b>Course Name:</b> Current Trends In Biochemistry	<b>Course Code:</b> BCHM613
<b>Course Structure:</b> Lectures: 3, Practical: 0	<b>Credit Hours:</b> 3(3+0)
<b>Prerequisites:</b> None	
<b>COURSE OBJECTIVES</b> This course provides the information about the latest developments and revolutions in the biochemistry.	
<b>COURSE OUTLINE:</b> Latest developments in areas of current interest will be covered. Course content will be based on recent reviews and research publications in top-tier journals	
<b>RECOMMENDED BOOKS:</b> 1 The Biology of Cancer by Robert A Weinberg. 2 Cancer Biology by Raymond W. Ruddon, latest edition, Oxford University Press. 3 Wintrobe's Clinical Haematology by Maxwell, M. Wintrobe, G. Richard Lee, Williams and Wilking Publishers, New York.	

<b>Course Name:</b> Research/Internship	<b>Course Code:</b> BCHM699/BCHM698
<b>Course Structure:</b> 6 Cr. hrs. research/ 3 Cr. Hrs. internship+ one course of 3 Cr. Hrs.)/(2 courses each of 3 Cr. Hrs.)	<b>Credit Hours:</b> 6

**2 elective subjects from the list of Optional subjects.**

## LIST OF OPTIONAL SUBJECTS

COURSE TITLE	CREDIT HOURS
Cancer Biology	3
Genomics	3
Proteomics	3
General Virology	3
Cell and tissue culture	2+1
Pharmacology	3
Antimicrobials and Chemotherapeutics	3
Functional Genomics	3
Structural Biology	3
Drug Development	3
Fermentation Biotechnology	3
Neurochemistry	3
Toxicology	3

*Note: In addition to the above, the university can offer any elective which they feel necessary subject to the availability of resources.*

## LIST OF SOCIAL SCIENCE SUBJECTS

COURSE TITLE	CREDIT HOURS	COURSE CODE
Sociology	3	From Concerned Dept.
Psychology	3	
Philosophy of Science	3	
Ethics	3	
Clinical Psychology	3	

*Note: In addition to the above, the university can offer any other which they feel necessary subject to the availability of resources.*



**SHAHEED BENAZIR BHUTTO WOMEN UNIVERSITY  
PESHAWAR**

**CURRICULUM OF MS/M.PHIL BIOCHEMISTRY (2018 & ONWARD)**



## SHAHEED BENAZIR BHUTTO WOMEN UNIVERSITY PESHAWAR

### MS/M.Phil. APPROVAL

- i) Eligibility Criteria
- ii) Curriculum

### ELIGIBILITY CRITERIA

#### Minimum Criteria for Admission in MS/M.Phil

This is for the information of all concerned that the degrees awarded by the Universities/Degree Awarding Institutions must meet the following minimum criteria for recognition by the HEC.

#### MS/M.Phil Programme:

1. BS/M.Sc (16 years education) (124 credit hours) in Biochemistry/Biological Sciences or equivalent in relevant disciplines.
2. Min. 2<sup>nd</sup> division or GPA 2.50 or above.
3. Subject GRE/NTS or in-house written test.
4. For award of M.Phil/M.S/Equivalent degree, candidates will need to complete 30 credit hours (24 credit hours of course work along with a minimum of 6 credit hours for research work/thesis).





## SHAHEED BENAZIR BHUTTO WOMEN UNIVERSITY PESHAWAR

The structure of M.Phil./MS Biochemistry Program will be as follows:

### 1<sup>st</sup> Semester

S.NO	SEMESTER	COURSE TITLE	COURSE CODE	Theory	Practical	CREDIT HOURS
1.	1 <sup>st</sup>	Advances in Biochemistry	BCHM 721	3	0	3
2.		Advanced Biostatistics	BCHM 722	2	0	2
3.		Elective I	BCHM 7*	2	0	2
4.		Molecular Biology & Biochemistry Lab	BCHM 723	2	1	3
		Elective II	BCHM 7*	3	0	3
<b>Total Credit Hours</b>				<b>12</b>	<b>1</b>	<b>13</b>

### 2<sup>nd</sup> Semester

S.N O	SEMESTER	COURSE TITLE	COURSE CODE	Theory	Practical	CREDIT HOURS
1.	2 <sup>nd</sup>	Advances in Molecular Biology	BCHM724	3	0	3
2.		Elective III	BCHM 7*	2	1	3
3.		Research Methodology/ Advanced Bioinformatics	BCHM725/ BCHM726	3	0	3
4.		Elective IV	BCHM 7*	3	0	3
<b>Total Credit Hours</b>				<b>11</b>	<b>1</b>	<b>12</b>

3<sup>rd</sup> and 4<sup>th</sup> semester will comprise of Research Project and Thesis of 06 credit hours with course code BCHM899.

\*Course and code will be assigned from list of major subject.

## **Curriculum:**

### **List of Subject:**

Advanced Molecular Genetics  
Advances in Clinical Biochemistry  
Advances in Endocrinology  
Advances in Biotechnology  
Recent Trends in Immunology  
Application of Techniques to Biomolecules  
Community Nutrition  
Protein Structure, Function and Engineering  
Enzymes - Mechanism & Kinetics  
Biostatistics and Biomathematics  
DNA Techniques and Clinical Applications  
Project Planning, Monitoring and Evaluation  
Signal Transduction  
Biochemistry of Metabolic Disorders  
Natural Products Biochemistry  
Nutrition for health promotion and  
disease prevention  
Recombinant DNA Technology  
Chemistry of Biomolecules  
Bio analytical Techniques  
Research Methodology 1 & II  
Research Methods in Biochemistry  
Advanced Biochemical Techniques  
Numerical problems in Biochemistry  
Genomics, Proteomics and Metabolomics  
Regulation of Gene Expression  
Molecular Biology & Biochemistry Lab  
Food Biochemistry  
Vegetables Oil Technology  
Directed Enzyme evolution  
Renewable bioenergy Resources  
Molecular Mechanism of Diseases  
Molecular Evolution  
Directed Studies in bio molecular structure and Functions  
Pharmaceutical Biochemistry  
Pathogens and Pathogenicity  
Graduate Seminar-I  
Graduate Seminar with Special Problems-II  
Drug Designing and metabolism  
Medical Biochemistry

Forensic Biochemistry and Molecular Biology  
Special topics  
Current trends

*Note: In addition to the above, the university can offer any other which they feel necessary subject to the availability of resources.*

*Note: In addition to the above, the university can offer any elective which they feel necessary subject to the availability of resources.*

## **Research Project:**

1. Duration of the research project will be at least one full year. An independent research topic chosen by the student and supervised by a full-time faculty member of the department is required for all students in M.Phil Biochemistry.
2. The research work of each student will be reviewed periodically by the supervisor/head of department to ensure the objectives laid down for study are being met.
3. All students must present and defend their research work before the panel of examiners as per the rules of the university.