

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**TOTAL STRUCTURE OF THE SYLLABUS**  
**FOR BACHELOR OF ENGINEERING (B.E.)**  
**BRANCH : BIOTECHNOLOGY ENGINEERING**

**CLASS : S.E. (Biotechnology Engineering)**  
**(To be implemented from Academic Year 2014-15)**  
**SEMESTER (III)**

Name of the Subject	Teaching Scheme (Hours/week)				Examination Scheme (Marks)				
	L	T	P	Total	Theory	TW	POE	OE	Total
<b>1.Engineering Mathematics-III</b>	3	1*	-	4	100	25	-	-	125
<b>2. Unit Operations-1</b>	4	-	2	6	100	50	-	-	150
<b>3. Macromolecules and Biomembranes</b>	3	-	2	5	100	25	25	-	150
<b>4. Cell Biology</b>	4	-	2	6	100	25	25	-	150
<b>5. Microbiology</b>	4	-	2	6	100	25	50	-	175
<b>6. Soft Skills-1</b>	-	1*	-	1	-	25	-	-	25
<b>7. Basic Computer Language Skills</b>	-	-	2	2	-	25	-	-	25
<b>Total</b>	<b>18</b>	<b>2</b>	<b>10</b>	<b>30</b>	<b>500</b>	<b>200</b>	<b>100</b>	<b>-</b>	<b>800</b>

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\* Tutorials shall be conducted batch wise.

**CLASS : S.E. (Biotechnology Engineering)**  
**SEMESTER (IV)**

Name of the Subject	Teaching Scheme (Hours/week)				Examination Scheme (Marks)				
	L	T	P	Total	Theory	TW	POE	OE	Total
1. Biostatistics	3	1*	-	4	100	25	-	-	125
2. Unit Operations-2	3	-	2	5	100	25	25	-	150
3. Enzyme Technology	3	-	2	5	100	25	25	-	150
4. Molecular Biology	4	-	4	8	100	25	50	-	175
5. Metabolic Pathways	3	-	2	5	100	50	-	-	150
6. Soft Skills-2	-	1*	-	1	-	25	-	-	25
7. Microbial Identification Studies	-	-	2	2	-	25	-	-	25
<b>Total</b>	<b>16</b>	<b>2</b>	<b>12</b>	<b>30</b>	<b>500</b>	<b>200</b>	<b>100</b>	<b>-</b>	<b>800</b>

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**CLASS : T.E. (Biotechnology Engineering)**  
(To be implemented from Academic Year 2015-16)  
**SEMESTER (V)**

Name of the Subject	Teaching Scheme (Hours/week)				Examination Scheme (Marks)				
	L	T	P	Total	Theory	TW	POE	OE	Total
1. Process Calculations	3	-	-	3	100	-	-	-	100
2. Biological Thermodynamics	3	-	-	3	100	-	-	-	100
3. Fermentation Technology-1	3	-	2	5	100	50	-	-	150
4. Genetic Engineering	3	-	4	7	100	25	25	-	150
5. Bioinformatics	3	-	2	5	100	25	-	-	125
6. Immunology and Diagnostics	3	-	2	5	100	25	25	-	150
7. Basics of Cell Culture	-	-	2	2	-	25	-	-	25
<b>Total</b>	<b>18</b>	<b>-</b>	<b>12</b>	<b>30</b>	<b>600</b>	<b>150</b>	<b>50</b>	<b>-</b>	<b>800</b>

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**CLASS :T.E. (Biotechnology Engineering)**  
**SEMESTER (VI)**

Name of the Subject	Teaching Scheme (Hours/week)				Examination Scheme (Marks)				
	L	T	P	Total	Theory	TW	POE	OE	Total
<b>1. Bioprocess Equipment Design</b>	3	-	2	5	100	25		25	150
<b>2. Analytical Techniques in Biotechnology</b>	4	-	2	6	100	25	25	-	150
<b>3. Fermentation Technology-2</b>	4	1*	-	5	100	25	-	-	125
<b>4. Drug Design, Development and Manufacturing</b>	4	-	-	4	100	-	-	-	100
<b>5. Industrial Organization, Management and Entrepreneurship</b>	4	-	-	4	100	-	-	-	100
<b>6. Plant Biotechnology</b>	3	-	-	3	100	-	-	-	100
<b>7. Seminar \$</b>	-	-	2	2	-	25	-	-	25
<b>8. Industrial Visit</b>	-	-	1	1	-	50	-	-	50
<b>Total</b>	<b>22</b>	<b>1</b>	<b>7</b>	<b>30</b>	<b>600</b>	<b>150</b>	<b>25</b>	<b>25</b>	<b>800</b>

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\* Tutorials shall be conducted batch wise.

\$ For Seminar, a group of ten students shall be considered for work load purpose.

Industrial training is compulsory and should be completed in vacation after sem VI

**CLASS :B.E. (Biotechnology Engineering)**  
**(To be implemented from Academic Year 2016-17)**  
**SEMESTER (VII)**

Name of the Subject	Teaching Scheme (Hours/week)				Examination Scheme (Marks)				
	L	T	P	Total	Theory	TW	POE	OE	Total
<b>1. Bioreaction Engineering</b>	4	-	2	6	100	25	25	-	150
<b>2. Process Engineering Costing and Plant Design</b>	4	1*	-	5	100	25	-	-	125
<b>3. Protein Engineering</b>	3	1*	-	4	100	25	-	-	125
<b>4. Pharmaceutical Biotechnology</b>	4	-	-	4	100	25	-	-	125
<b>5. Elective -1</b>	3	1*	-	4	100	25	-	-	125
<b>6. Comprehensive Test ~</b>	-	-	2	2	-	50	-	-	50
<b>7. Industrial Training #</b>	-	-	-	-	-	50	-	-	50
<b>8. Project Work Phase -1</b>	-	-	2	2	-	50	-	-	50
<b>Total</b>	<b>18</b>	<b>3</b>	<b>6</b>	<b>27</b>	<b>500</b>	<b>275</b>	<b>25</b>	<b>-</b>	<b>800</b>

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\* Tutorials shall be conducted batch wise.

~ Objective tests based on the subjects from S.E. to B.E. level

# Industrial training shall be completed at the end of 6<sup>th</sup> Semester and assessment work will be carried out with project phase -I

**Elective-1**

1. Medical Biotechnology
2. Good Manufacturing Practices
3. Vaccine and Biosimilar Technology
4. Bioethics, Biosafety and IPR

**CLASS :B.E. (Biotechnology Engineering)**  
**SEMESTER (VIII)**

Name of the Subject	Teaching Scheme (Hours/week)				Examination Scheme (Marks)				
	L	T	P	Total	Theory	TW	POE	OE	Total
<b>1. Bioprocess Modeling and Simulation</b>	4	-	2	6	100	25	-	-	125
<b>2. Bioseparation Processes</b>	4	-	2	6	100	25	25	-	150
<b>3. Animal Biotechnology</b>	3	-	-	3	100	25	-	-	125
<b>3. Bioprocesses</b>	4	-	2	6	100	25	25	-	150
<b>5. Elective-2</b>	3	1*	-	4	100	25	-	-	125
<b>6. Project Work Phase -2</b>	-	-	4	4	-	50	-	75	125
<b>Total</b>	<b>18</b>	<b>1</b>	<b>10</b>	<b>29</b>	<b>500</b>	<b>175</b>	<b>50</b>	<b>75</b>	<b>800</b>

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**Elective-2**

1. Environmental Biotechnology
2. Food and Dairy Biotechnology
3. Metabolic Engineering
4. Genomics and Proteomics

### EQUIVALENCE OF OLD AND NEW SYLLABI (S.E.)

<b>Old Examination</b>	<b>Sr. No.</b>	<b>Subject under old syllabus</b>	<b>New Examination</b>	<b>Equivalent subject under new syllabus</b>
	1	Engineering Mathematics-III	S.E.(Biotech.Engg) Sem- III	Engineering Mathematics-III

S.E.(Biotech.Engg) Sem- III	2	Microbiology	S.E.(Biotech.Engg) Sem- III	Microbiology
	3	Cell Biology	S.E.(Biotech.Engg) Sem- III	Cell Biology
	4	Macromolecules and Biomembranes	S.E.(Biotech.Engg) Sem- III	Macromolecules and Biomembranes
	5	Unit Operations-I	S.E.(Biotech.Engg) Sem- III	Unit Operations-I
	6	Microbial Identification studies	S.E.(Biotech.Engg) Sem- IV	Microbial Identification studies
	7	Soft skills-I	S.E.(Biotech.Engg) Sem- III	Soft skills-I
S.E.(Biotech.Engg) Sem- IV	1	Biostatistics	S.E.(Biotech.Engg) Sem- IV	Biostatistics
	2	Unit operations-II	S.E.(Biotech.Engg) Sem- IV	Unit operations-II
	3	Enzyme Technology	S.E.(Biotech.Engg) Sem- IV	Enzyme Technology
	4	Metabolic pathways and their regulation	S.E.(Biotech.Engg) Sem- IV	Metabolic pathways
	5	Molecular Biology	S.E.(Biotech.Engg) Sem- IV	Molecular Biology
	6	Basic Computer languages skills	S.E.(Biotech.Engg) Sem- III	Basic Computer languages skills
	7	Soft Skill - II	S.E. (Biotech. Engg) Sem – III	Soft Skill - II

## EQUIVALENCE OF OLD AND NEW SYLLABI (T.E.)

Old Examination	Sr. No.	Subject under old syllabus	New Examination	Equivalent subject under new syllabus
T.E.(Biotech.Engg) Sem- I	1	Nil	T.E.(Biotech.Engg) Sem- V	Process Calculations
	2	Biological Thermodynamics	T.E.(Biotech.Engg) Sem- V	Biological Thermodynamics
	3	Immunology	T.E.(Biotech.Engg) Sem- V	Immunology and diagnostics
	4	Fermentation Technology	T.E.(Biotech.Engg) Sem- V	Fermentation Technology - 1
	5	Genetic Engineering	T.E.(Biotech.Engg) Sem- V	Genetic Engineering
	6	Bioinformatics	T.E.(Biotech.Engg) Sem- V	Bioinformatics
	7	Basics of cell culture	T.E.(Biotech.Engg) Sem- V	Basics of cell culture
T.E.(Biotech.Engg) Sem- VI	1	Bioinstrumentation	T.E.(Biotech.Engg) Sem- VI	Analytical techniques in Biotechnology
	2	Medical Biotechnology	B.E.(Biotech.Engg) Sem- VII	Medical Biotechnology(EI-1)
	3	Microbial Technology	T.E.(Biotech.Engg) Sem- VI	Fermentation Technology -2
	4	Drug Development and Gene Therapy	T.E.(Biotech.Engg) Sem- VI	Drug Design Development and Manufacturing
	5	Industrial economics, management and entrepreneurship	T.E.(Biotech.Engg) Sem- VI	Industrial organization, management and entrepreneurship
	6	Bioprocess Equipment Design and Drawing	T.E.(Biotech.Engg) Sem- VI	Bioprocess Equipment Design
	7	Nil	T.E.(Biotech.Engg) Sem- VI	Plant Biotechnology
	8	Industrial Visits	T.E.(Biotech.Engg) Sem- VI	Industrial Visits



## EQUIVALENCE OF OLD AND NEW SYLLABI (B.E.)

Old Examination	Sr. No.	Subject under old syllabus	New Examination	Equivalent subject under new syllabus
B.E.(Biotech.Engg) Sem- VII	1	Bioreaction Engineering	B.E.(Biotech.Engg) Sem- VII	Bioreaction Engineering
	2	Protein Engineering	B.E.(Biotech.Engg) Sem- VII	Protein Engineering
	3	Pharmaceutical Biotechnology	B.E.(Biotech.Engg) Sem- VII	Pharmaceutical Biotechnology
	4	Bioprocesses	B.E.(Biotech.Engg) Sem- VIII	Bioprocesses
	5	Elective- I	B.E.(Biotech.Engg) Sem- VII	Elective- I
	6	Comprehensive tests (On all subjects from S.E.toB.E.-I)	B.E.(Biotech.Engg) Sem- VII	Comprehensive tests (On all subjects from S.E.toB.E.-I)
	7	Industrial training	B.E.(Biotech.Engg) Sem- VII	Industrial training at end of 6th Semester (3Week)
	8	Project Work Phase – I	B.E.(Biotech.Engg) Sem- VII	Project Work Phase - I

Old Examination	Sr. No.	Subject under old syllabus	New Examination	Equivalent subject under new syllabus
B.E.(Biotech.Engg) Sem- VIII	1	Bio separation Processes	B.E.(Biotech.Engg) Sem- VIII	Bio separation Processes
	2	Bioprocess Modeling and Simulation	B.E.(Biotech.Engg) Sem- VIII	Bioprocess Modeling and Simulation
	3	Bioprocess Engineering & Economics	B.E.(Biotech.Engg) Sem- VII	Process Engineering costing and plant Design
	4	Animal Biotechnology	B.E.(Biotech.Engg) Sem- VIII	Animal Biotechnology
	6	Elective- II	B.E.(Biotech.Engg) Sem- VIII	Elective- II
	7	Project Work Phase – II	B.E.(Biotech.Engg) Sem- VIII	Project Work Phase - II