Programme Name (UG/PG): UG/ B.Sc. /B.Sc. Hons./B.Sc. Hons with Research of Bioinformatics

First Year- Semester I												
Course Category	**Course Code**	**Course Title**	**Nature of Course**	**No. of Credits**	**Teaching (Contact hrs/ week)**		**Evaluation Scheme (Marks)**			**Minimum Passing (Marks)**		
					L	**P**	**Internal**	**External**	**Total**	**Internal**	**External**	**Total**
MM	BIO42MML101	Physics I-Mechanics and Relativity	Lecture	2	2	-	30	20	50		8	2
MM	BIO42MML102	C Programming & computer organization	Lecture	3	3		60	40	100		16	40
IKS	BIO42IKL101	Preservation and documentation of manuscripts	Lecture	2	2	-	30	20	50		8	20
AEC	MGM54AEL104	Functional Marathi	Lecture	2	2	-	30	20	50		8	20
OE	OE-1	*OE-1 University Basket	Lecture	2	2	-	30	20	50		8	20
OE	OE-2	*OE-2 University Basket	Lecture	2	2	-	30	20	50		8	20
VEC	MGM21VEL101	Environmental Studies	Lecture	2	2	-	30	20	50		8	20
VSC	BIO42VSP101	Bioinformatics Lab	Practical	2		4	30	20	50		8	20
SEC	BIO42SEP101	Programming Lab	Practical	2		4	30	20	50		8	20
MM	BIO42 MMP101	Foundations of Bioinformatics-I	Practical	1	-	2	30	20	50		8	20
CC	MGM85CCP101	Cultural Activities	Practical	2		4	50	-	50	20	-	20
Total				22	15	14	380	220	600	20	88	240

First Year- Semester II												
Course Category	**Course Code**	**Course Title**	**Nature of Course**	**No. of Credits**	**Teaching (Contact hrs/ week)**		**Evaluation Scheme (Marks)**			**Minimum Passing (Marks)**		
					L	**P**	**Internal**	**External**	**Total**	**Internal**	**External**	**Total**
MM	BIO42MML103	C++ Programming	Lecture	2	2		30	20	50		8	20
MM	BIO42MML104	Data structures and Algorithms	Lecture	3	3	-	60	40	100		16	40
MI	Minor	*Minor University Basket	Lecture	2	2	-	30	20	50		8	20
AEC	MGM54AEL102	Functional English	Lecture	2	2	-	30	20	50		8	20
OE	OE-3	*OE-3 University Basket	Lecture	2	2	-	30	20	50		8	20
OE	OE-4	*OE-4 University Basket	Lecture	2	2	-	30	20	50		8	20
VEC	MGM56VEL102	Constitution of India	Lecture	2	2	-	30	20	50		8	20
VSC	BIO42VSP10	Bioinformatics Lab II	Practical	2		4	30	20	50		8	20
SEC	BIO42SEP102	Bioinformatics Exploration I	Practical	2		4	30	20	50		8	20
MM	BIO42 MMP102	Foundations of Bioinformatics-II	Practical	1	-	2	30	20	50		8	20
CC	MGM82CCP103	Sports	Practical	2		4	50	-	50	20	-	20
Total				22	15	14	380	220	600	20	88	240

Level 4.5 Award of UG certificate with 40 credits and an additional 4-credits core NSQF course / internship OR continue with major and minor

Second Year- Semester III													
Course Category	**Course Code**	**Course Title**	**Nature of Course**	**No. of Credits**	**Teaching (Contact hrs/ week)**		**Evaluation Scheme (Marks)**			**Minimum Passing (Marks)**		
					L	**P**	**Internal**	**External**	**Total**	**Internal**	**External**	**Total**
MM	BIO42MML201	Molecular Biology of cell	Lecture	2	2		30	20	50	-	08	20
MM	BIO42MML202	Mathematical Techniques for Bioinformatics-III	Lecture	3	3	-	60	40	100	-	16	40
MM	BIO42MML203	Fundamental of Bioinformatics	Lecture	2	2	-	30	20	50	-	08	20
OE	OE-5	*OE-5 University Basket	Lecture	2	2	-	30	20	50	-	08	20
MI	Minor	*Minor University Basket	Lecture	3	3	-	60	40	100	-	16	40
AEC	MGM54AEL103	Functional Hindi	Lecture	2	2	-	30	20	50	-	08	20
MI	Minor	*Minor University Basket	Practical	1		2	30	20	50	-	08	20
VSC	BIO42VSP201	Applied BI Lab I	Practical	2		4	30	20	50	-	08	20
MM	BIO42MMP201	Bioinformatics tools in Molecular Biology	Practical	1		2	30	20	50	-	08	20
FP	BIO42FPJ201	Field Project	Project	2	-	4	50	-	50	20	-	20
CC	MGM82CCP201 / 101 / 102	Health and Wellness / National Cadet Crops / Yoga	Practical	2		4	50	-	50	20	-	20
Total				22	14	16	430	220	650	40	88	260

Second Year- Semester IV

Course Category	Course Code	Course Title	Nature of Course	No. of Credits	Teaching (Contact Hrs/ week)		Evaluation Scheme (Marks)			Minimum Passing (Marks)		
					L	P	Internal	External	Total	Internal	External	Total
MM	BIO42MML204	Genetics of Life	Lecture	2	2	-	30	20	50	-	08	20
MM	BIO42MML205	Computational Molecular Biology	Lecture	3	3	-	60	40	100	-	16	40
MM	BIO42MML206	Structural Bioinformatics	Lecture	2	2	-	30	20	50	-	08	20
OE	OE-6	*OE-6 University Basket	Lecture	2	2	-	30	20	50	-	08	20
MI	Minor	*Minor University Basket	Lecture	3	3	-	60	40	100	-	16	40
AEC	MGM54AEL203	Communication Skills	Lecture	2	2	-	30	20	50	-	08	20
SEC	BIO42SEP201	Applied BI Lab - II	Practical	2	-	4	30	20	50	-	08	20
MI	Minor	*Minor University Basket	Practical	1	-	2	30	20	50	-	08	20
MM	BIO42MMP202	Python and Structural Bioinformatics Lab	Practical	1	-	2	30	20	50	-	08	20
CEP	BIO42CEP201	Community Engagement Programme	Practical	2	-	4	50	-	50	20	-	20
CC	MGM82CCP104 / MGM73CCP105 / 106	NSS / Fine Arts / Visual Arts	Practical	2		4	50	-	50	20	-	20
Total				22	14	16	430	220	650	40	88	260

Level 4.5 Award of UG certificate with 40 credits and an additional 4-credits core NSQF course / internship OR continue with major and minor

Third Year- Semester V												
Course Category	**Course Code**	**Course Title**	**Nature of Course**	**No. of Credits**	**Teaching (Contact hrs/ week)**		**Evaluation Scheme (Marks)**			**Minimum Passing (Marks)**		
					L	**P**	**Internal**	**External**	**Total**	**Internal**	**External**	**Total**
MM	BIO42MML301	Database Management System	Lecture	2	2	-	30	20	50		8	20
MM	BIO42MML302	Foundations of Machine learning and AI	Lecture	3	3	-	60	40	100		16	40
MM	BIO42MML303	Python programming	Lecture	2	2	-	30	20	50		8	20
ME	BIO42ME L201	Computational Systems Biology	Lecture	3	3	-	60	40	100		16	40
	BIO42ME L202	Algorithms in Bioinformatics										
MI	Minor	*Minor University Basket	Lecture	3	3	-	60	40	100		16	40
VSC	BIO42VSP302	ML Lab	Practical	2		4	30	20	50		8	20
MI	Minor	*Minor University Basket	Practical	1	-	2	30	20	50		8	20
VSC	BIO42VSP30	Python Lab	Practical	2	-	4	30	20	50		8	20
MM	BIO42MMP301	DBMS Lab	Practical	1	-	2	30	20	50		8	20
FP	BIO42FPJ301	Field Project	Practical	2		4	50	-	50	20	-	20
ME	BIO42MEP201	Computational Systems Biology Lab	Practical	1	-	2	30	20	50		8	20
	BIO42MEP202	Bioinformatics Workflow Automation Lab										
				22	13	18	440	260	700	20	104	280

Course Category	Course Code	Course Title	Nature of Course	No. of Credits	Teaching (Contact hrs/ week)		Evaluation Scheme (Marks)			Minimum Passing (Marks)		
					L	P	Internal	External	Total	Internal	External	Total
MM	BIO42M ML304	R language	Lecture	2	2		30	20	50		8	20
MM	BIO42M ML305	Genomics and Proteomics	Lecture	3	3		60	40	100		16	40
MM	BIO42M ML306	Deep Learning	Lecture	3	3		60	40	100		16	40
ME	BIO42ME L203	Metabolomics	Lecture	3	3		60	40	100		16	40
	BIO42ME L204	Transcriptomics and Metagenomics										
MI	Minor	*Minor University Basket	Lecture	3	3		60	40	100		16	40
MI	Minor	*Minor University Basket	Practical	1		2	30	20	50		8	20
OJT	BIO42JTP301	On Job Training / Internship/ Apprenticeship	Training	4		8	60	40	100		16	40
MM	BIO42M MP302	Genomics and Proteomics Lab	Practical	1		2	30	20	50		8	20
MM	BIO42M MP303	Mini project	Practical	1		2	30	20	50		8	20
ME	BIO42ME P203	Metabolomics Lab	Practical	1		2	30	20	50		8	20
	BIO42ME P204	Transcriptomics and Metagenomics Lab										
				22	14	16	450	300	750		120	300

APPENDIX 6 A

Fourth Year- Semester VII												
Course Category	**Course Code**	**Course Title**	**Nature of Course**	**No. of Credits**	**Teaching (Contact hrs/ week)**		**Evaluation Scheme (Marks)**			**Minimum Passing (Marks)**		
					L	**P**	**Internal**	**External**	**Total**	**Internal**	**External**	**Total**
MM	BIO42MML401	Drug, design and development	Lecture	3	3		60	40	100		16	40
MM	BIO42MML402	Health Informatics	Lecture	3	3		60	40	100		16	40
MM	FPT42MML403	Data Mining	Lecture	3	3		60	40	100		16	40
MM	BIO42MML404	Biosafety,IPR and Bioethics	Lecture	2	2		30	20	50		8	20
ME	BIO42MEL301	Computational Neuroscience	Lecture	3	3		60	40	100		16	40
	BIO42MEL302	Chemoinformatics										
RM	BIO42RML401	Research Methodology	Lecture	3	3		60	40	100		16	40
RM	BIO42RMP401	Research Methodology	Practical	1		2	30	20	50		8	20
ME	BIO42MEP301	Computational Neuroscience Lab	Practical	1		2	30	20	50		8	20
	BIO42MEP302	Chemoinformatics Lab										
MM	BIO42MMP401	R Programming	Practical	1		2	30	20	50		8	20
MM	BIO42MMP402	Major Project	Practical	1		2	30	20	50		8	20
MM	BIO42MMP403	Deep Learning with Python	Practical	1		2	30	20	50		8	20
				22	17	10	480	320	800		128	320

Fourth Year- Semester VIII												
Course Category	**Course Code**	**Course Title**	**Nature of Course**	**No. of Credits**	**Teaching (Contact hrs/ week)**		**Evaluation Scheme (Marks)**			**Minimum Passing (Marks)**		
					L	P	Internal	External	Total	Internal	External	Total
MM	BIO42MML405	Cloud Computing	Lecture	3	3		60	40	100		16	40
MM	BIO42MML406	Bioinformatics for Personalized Medicine	Lecture	3	3		60	40	100		16	40
MM	BIO42MML407	Big Data Analysis in Bioinformatics	Lecture	3	3		60	40	100		16	40
MM	BIO42MML408	Entrepreneurship in Bioinformatics	Lecture	2	2		30	20	50		8	20
ME	BIO42ME L303	Pharmacogenomics	Lecture	3	3		60	40	100		16	40
	BIO42ME L304	Computational Epigenomics										
OJT	BIO42JTP401	On Job Training/Internship/Apprenticeship	Training	4		8	60	40	100		16	40
ME	BIO42ME P303	Pharmacogenomics Lab	Practical	1		2	30	20	50		8	20
	BIO42ME P304	ComputaionalEpigenomics Lab										
MM	BIO42MMP404	Cloud Computing Lab	Practical	1		2	30	20	50		8	20
MM	BIO42MMP405	Big Data Analysis in Bioinformatics Lab	Practical	1		2	30	20	50		8	20
MM	BIO42MMP406	Microarray Data Analysis Lab	Practical	1		2	30	20	50		8	20
				22	**14**	**16**	450	300	**750**		120	300

APPENDIX 6 B

Fourth Year- Semester VII Honours with Research													
Course Category	**Course Code**	**Course Title**	**Nature of Course**	**No. of Credits**	**Teaching (Contact hrs/ week)**		**Evaluation Scheme (Marks)**			**Minimum Passing (Marks)**		
					L	**P**	**Internal**	**External**	**Total**	**Internal**	**External**	**Total**
MM	BIO42MML401	Bioethics regulatory & quality control I	Theory	3	3		60	40	100		16	40
MM	BIO42MML402	Biostatistics I	Theory	2	2		30	20	50		8	20
MM	BIO42MML403	Subject based case studies I	Theory	2	2		30	20	50		8	20
MM	BIO42MML404	Bioinformatics I	Theory	2	2		30	20	50		8	20
ME	BIO42MEL301	Evolutionary application I	Theory	3	3		60	40	100		16	40
	BIO42MEL302	Science Communication I										
RM	BIO42RML401	Research Methodology I	Theory	3	3		60	40	100		16	40
RM	BIO42RMP401	Research Methodology II	Practical	1		2	30	20	50		8	20
ME	BIO42MEP301	Evolutionary application Lab I	Practical	1		2	30	20	50		8	20
	BIO42MEP302	Science Communication Lab I										
MM	BIO42MMP401	Subject based case studies seminar I	Practical	1		2	30	20	50		8	20
RP	BIO42RPJ401	Research Project	Practical	4		8	60	40	100		16	40
				22	**15**	**14**	**420**	**280**	**700**		**112**	**280**

Fourth Year- Semester VIII Honours with Research												
Course Category	**Course Code**	**Course Title**	**Nature of Course**	**No. of Credits**	**Teaching (Contact hrs/ week)**		**Evaluation Scheme (Marks)**			**Minimum Passing (Marks)**		
					L	**P**	**Internal**	**External**	**Total**	**Internal**	**External**	**Total**
MM	BIO42MML405	Bioethics regulatory & quality control II	Theory	3	3		60	40	100		16	40
MM	BIO42MML406	Biostatistics II	Theory	2	2		30	20	50		8	20
MM	BIO42MML407	Subject based case studies II	Theory	2	2		30	20	50		8	20
MM	BIO42MML408	Bioinformatics II	Theory	2	2		30	20	50		8	20
ME	BIO42MEL303	Evolutionary application II	Theory	3	3		60	40	100		16	40
	BIO42MEL304	Science Communication II										
ME	BIO42MEP303	Evolutionary application Lab II	Practical	1		2	30	20	50		8	20
	BIO42MEP304	Science Communication Lab II										
MM	BIO42MMP402	Subject based case studies seminar II	Practical	1		2	30	20	50		8	20
RP	BIO42RPJ402	Research Project	Practical	8		16	120	80	100		32	80
Total				**22**	**12**	**20**	**390**	**260**	**550**		**104**	**260**

Level 6.0Four year UG Honours with research Degree in major and minor (44+44+44+44) = 176 credits*[Students who secure 75% marks and above in the first six semesters and wish to undertake research at the undergraduate level can choose a research stream in the fourth year.]