COURSE TEMPLATE

1.	**Department/Centre proposing the course**	DBEB
2.	**Course Title** *(< 45 characters)*	MOLECULAR BIOLOGY AND GENETICS
3.	**L-T-P structure**	3-0-3
4.	**Credits**	4.5
5.	**Course number**	BBL231
6.	**Status** (*category* for *program*)	Departmental Core (DC)

7.	**Pre-requisites** (course no./title)	BBL131 and BBL132

8.	**Status vis-à-vis other courses** *(give course number/title)*	
8.1	Overlap with any UG/PG course of the Dept./Centre	No
8.2	Overlap with any UG/PG course of other Dept./Centre	No
8.3	Supercedes any existing course	No

9.	**Not allowed for** (indicate program names)	

10.	**Frequency of offering**	☐Every sem ☐1st sem ☒2nd sem ☐Either sem

11.	**Faculty who will teach the course** Ritu Kulshreshtha	
12.	**Will the course require any visiting faculty?**	No

13. Course objective *(about 50 words)***:**

Molecular biology and genetics are the two main pillars on which the entire edifice of new biology rests. The biotechnology explosion owes it to these two fundamental disciplines. The students will be familiarized with the basic principles of genetics and fundamentals of molecular biology to be able to grasp the exciting development taking place all around us in biology.

14. Course contents *(about 100 words) (Include laboratory/design activities)***:**

Historical development and essentials of Mendelian genetics. Chromosomal theory of inheritance. Evolution and development of molecular biology. DNA model and classes. Organization of eukaryotic chromosome – the chromatin structure. Gene structure and Genome. Transposon. Genetic Information and its perpetuation – DNA replication, damage and repair. Telomere and Aging. Transcription, translation. Molecular biology of bacteriophage lamda. Gene exchange in bacteria. Gene regulation in prokaryotes. The operon model – lac, ara, trp operons and gene regulation. Gene Regulation in Eukaryotes.DNA

	Methylation and Genomic Imprinting Laboratory : Isolation of genomic and plasmid DNA, Agarose Gel Electrophoresis of DNA, Restriction digestion of DNA, RNA isolation, Primer design, PCR, RT-PCR, Competent cell preparation and Transformation, Gene Induction

15. Lecture Outline *(with topics and number of lectures)*

Module no.	Topic	No. of hours
1	Mendelian genetics – theories of segregation and independent assortment, mono- and dihybrid crosses	2
2	Evolution of molecular biology – from Griffiths to Hershey-Chase.	2
3	Molecular concept of gene, DNA types	2
4	Organization of chromosomes – the chromatin, nucleosome and higher order of organization, active chromatin, Transposon	4
5	DNA replication – perpetuation of genetic information. The replication mechanism in E. coli and eukaryotes. Replication of chromosomal ends – the telomere	5
6	DNA damage and repair – SOS response and uv repair	2
7	Transcription – Prokaryotic transcription, RNA polymerase, rho factor. Eukaryotic transcription – RNA pol I, I and III. General and specific transcription factors, splicing.	4
8	Translation – in prokaryotes. The ribosomes, various types of RNAs, the genetic code, the collinearity of gene and protein. The translation machinery	4
9	Regulation of eukaryotic gene expression, DNA methylation and genomic imprinting	4
10	Molecular biology of phage lambda – a paradigm of gene regulationat prokaryotic level	3
11	Genetic exchanges in bacteria – Conjugation, transduction and transformation	4
12	The operon concept of prokaryotic gene organization – lac, trp and ara operons	5
COURSE TOTAL *(14 times 'L')*		

16. Brief description of tutorial activities

NA

17. Brief description of laboratory activities

Module no.	Experiment description	No. of hours
1	Isolation of genomic DNA	3
2	Agarose Gel Electrophoresis	3
3	iIsolation of plasmid DNA	3
4	Restriction digestion of DNA	3
5	RNA isolation	3
6	Primer design	3
7	PCR	3
8	RT-PCR	3
9	Competent cell preparation and Transformation	3
10	Gene Induction	3
COURSE TOTAL *(14 times 'P')*		

18. Suggested texts and reference materials

STYLE: Author name and initials, Title, Edition, Publisher, Year.

Introduction to genetic analysis by Suzuki et al., Genes by Lewin, Principles of Biochemistry by Cox and Nelson, Molecular Cell Biology by Darnel et al.

19. Resources required for the course *(itemized & student access requirements, if any)*

19.1	Software	
19.2	Hardware	LCD projector
19.3	Teaching aides (videos, etc.)	Videos
19.4	Laboratory	
19.5	Equipment	Micropipettes, microfuges, high speed centrifuge, uv-visible spectrophotometer, PCR machine, Real-time PCR machine, Gel Running Apparatus, Electrophoresis power supply.
19.6	Classroom infrastructure	
19.7	Site visits	

20. Design content of the course *(Percent of student time with examples, if possible)*

20.1	Design-type problems	
20.2	Open-ended problems	
20.3	Project-type activity	
20.4	Open-ended laboratory work	
20.5	Others (please specify)	

Date: (Signature of the Head of the Department)