


UNIVERSITY OF MYSORE
Estd. 1916

Vishwavidyanilaya Karyasoudha
Crawford Hall, Mysuru- 570 005
Dated: 18.10.2019

No.AC.2(S)/384/2014-15

NOTIFICATION

Sub: Inclusion of **Principles of Genetics** and **Human Genetics** papers for MOOCs course from the academic year 2019-20.

- Ref:**
1. Letter no. MGG/BOS/Genetics and Genomics-PG/130/2019-20, dated 20.07.2019 from Dr.N.B.Ramachandra, Department of Studies in Genetics and Genomics, Manasagangotri, Mysore.
 2. This office letter no. AC2(S)/384/2014-15 dated 3.8.2019.
 3. Letter no. MGZ/333/2019-20 dated 07.08.2019 received from the Dean, Faculty of Science and Technology, Department of Studies in Zoology, Manasagangotri, Mysore.
 4. Decision of the Academic Council meeting held on 16.09.2019.

With reference to the letter cited in reference (1) The Chairman, Department of Studies in Genetics & Genomics, Manasagangotri, Mysore has prepared the syllabus for papers **Principles of Genetics** and **Human Genetics** of Genetics and Genomics subject and recommended to include these UG papers in the list of MOOCs.

The Academic council meeting held on 16-09-2019 has approved the said syllabus from the Academic Year 2019-20.

The said syllabus of **Principles of Genetics** and **Human Genetics** papers is annexed. The contents may be downloaded from the University Website i.e., www.uni-mysore.ac.in.

Draft approved by the Registrar

Sd/-
Deputy Registrar(Academic),

To:

1. The Registrar (Evaluation), University of Mysore, Mysore.
2. The Dean, Faculty of Science & Technology, DOS in Zoology, Manasagangotri, Mysore.
3. The Chairman, BOS in Genetics & Genomics, DOS in Genetics & Genomics, Manasagangotri, Mysore.
4. The Chairman, DoS in Genetics & Genomics, Manasagangotri, Mysore.
5. The Director, College Development Council, Moulya Bhavan, Manasagangotri, Mysore.
6. The Deputy/Assistant Registrar/Superintendent, AB and EB, UOM, Mysore.
7. The P.A. to the Vice-Chancellor/Registrar/Registrar (Evaluation), UOM, Mysore.
8. Office file.

University of Mysore

Massive open online course (MOOC)

Title of the Course: Human Genetics - 4 credits

Course category : Under Graduate- B.Sc / B.Sc Honours

Discipline: Natural and Applied Science

Subject: Genetics

Rationale for developing this Course :

The study of human genetics can be intellectually fascinating, but it also has plenty of practical applications. From the use of DNA in court cases to the discovery of new therapies for genetic diseases, a thorough understanding of the human genome can have important medical, social and legal impacts. Understanding the genetic basis behind human disease is one of the most important reasons for studying the human genome. While many genetic disorders are not treatable, early diagnosis can help improve the quality of life or even extend the lifespan of sufferers. Current clinical trials on genetic therapies offer the promise of eventual treatments that may give sufferers a life free of symptoms. Diagnostic tests can help couples decide whether to risk passing on specific disease-related genes to their children. Tests assist in vitro fertility doctors to specifically select embryos that do not carry the dangerous gene.

Course Objectives:

- 1) To train the next generation of leaders in human genetics.
- 2) To expose the broad and rapidly evolving field of life sciences is human genetics which incorporates multiple areas of modern experimental biology.
- 3) To understand and tackle Mendelian diseases and genetically complex traits of key relevance to human health.
- 4) To acquire the fundamental knowledge about state-of-the-art methods for generating experimental data on human genetics.
- 5) To provide the students on the medical and ethical issues with a societal perspective on human genetics.

Pre -requisites

- Should have completed P.U.C
- Should possess a basic knowledge in Biology

Specify the Universities/Institute name, where this course is being taught:

Most of the Universities in the country who have the curriculum like B.Sc. in Genetics, Zoology and Life sciences have this course. Ex: Karnataka, Kerala, Andra Pradesh, Gujarat etc

Course Duration (in Weeks) : 12 Weeks, 108 hours (Appro. 9 hours per week)

Course Credits

1 credit will be equivalent to 15 hours; 4 credits X 15 hours = 60 hours in total

(As per UGC guidelines: Instructional Template for Facilitating Implementation of Choice Based Credit System (CBCS))

Course developer and Instructor:

Prof. N. B. Ramachandra and his team, Department of Studies in Genetics and Genomics, University of Mysore

Syllabus
Human Genetics

(4 credits)

UNIT I Introduction to Human Genetics

15 Hrs

- a) History of human cytogenetics
- b) Dermatoglyphics: Introduction and classification, Flexion creases. Dermatoglyphics in clinical disorders, Clinical applications, its advantages and limitations.
- c) Pedigree analysis: Symbols used in pedigree studies, History and Pedigree construction, Pedigrees of Sex-linked & Autosomal (dominant & recessive), Mitochondrial, Incomplete dominance & Penetrance.
- d) Chromosome - Macro-molecular organization, Primary and Secondary constriction, Sat-bodies, telomeres, Heterochromatin and Euchromatin and its significance, Ultra structure of chromosome- Nucleosome model and Nucleosome Structure, Human Karyotype and Idiogram, Paris Nomenclature, Types of karyotyping, Banding techniques, classification, use of Human Cytogenetics in Medical science.

UNIT II Chromosomal aberrations

15 Hrs

- a) Numerical Chromosomal aberrations:- Euploidy - Monoploidy, Haploidy and Polyploidy; Aneuploidy- Monosomies and Trisomies with suitable human examples.
- b) Meiotic behavior of chromosome and nondisjunction.
- c) Structural Chromosomal aberrations:- Deletions, Duplication, Translocation and Inversions with suitable human examples.
- d) Evolutionary significance of chromosomal aberrations.
- e) Chromosomal abnormalities in spontaneous abortions.

UNIT III Genetic diseases and disorders

15 Hrs

- a) Genetic Diseases and Inheritance Pattern: Autosomal inheritance – Dominant (Ex.- Neurofibromatosis), Autosomal inheritance - Recessive (Ex.- Phenylketonuria), X –

linked –Recessive (Ex.-Duchenne muscular dystrophy -DMD), X-linked Dominant (Ex.- Xg blood group), Y-linked inheritance (Holandric gene), Multifactorial inheritance (Ex.- Diabetes), Mitochondrial diseases (Ex.-Leber's hereditary optic neuropathy).

- b) Oncogenetics : Properties of malignant cells, Types of genes - Proto oncogenes, Oncogenes, Cellular oncogenes, Tumor Suppressor genes, Chromosomal abnormalities associated with the specific malignancies- APL, CML & Retinoblastoma.
- c) Immunogenetics: Cells of immune system, Genetics of immune system, Immune response, immunity-innate and acquired, inherited immunodeficiency - Ex. –X-linked agammaglobulinaemia.

UNIT IV Diagnosis, therapy, counseling and ethics

15 Hrs

- a) Human genome projects and their implications.
- b) Genetic markers- SNPs, InDels, CNVs and their applications.
- c) Prenatal Diagnosis - Amniocentesis, Chorionic villus sampling, Ultrasonography and Fetoscopy.
- d) Technology in reproductive assistance
- e) Gene therapy: Gene therapy with reference to Haemophilia, cord blood banking and Stem cell therapy.
- f) Genetic counseling.
- g) Eugenics: Positive and negative implications.

Examination

Will follow the CBCS system and MOOC program as per the UGC and University guidelines.

University of Mysore

Massive open online course (MOOC)

Title of the Course: Principles of Genetics - 4 credits

Course category : Under Graduate- B.Sc / B.Sc Honours

Discipline: Natural Science

Subject: Genetics

Rationale for developing this Course :

Genetics is a fundamental science which can be studied at all levels. It deals with the study of genes, characters and their inheritance. The knowledge of genetics has become essential to unravel the mysteries of life processes that are extensively being pursued in today's science.

Course Objectives:

- To build the knowledge on fundamental of genetics, heredity or the inheritance.
- To build the foundation on the understanding of biological principles.
- To develop the understanding of life processes - survival and maintenance.
- To enhance the skill in the applications of the genetic principles in day to day life.
- To propagate the science of genetics.

Pre -requisites

- Should have completed P.U.C
- Should possess a basic knowledge in Biology

Specify the Universities/Institute name, where this course is being taught:

Most of the Universities in the country who have the curriculum like B.Sc. in genetics or Botany and Zoology have this course. Ex: Karnataka, Kerala, Andra Pradesh, Gujarat etc

Course Duration (in Weeks) : 12 Weeks, 108 hours (Appro. 9 hours per week)

Course Credits

1 credit will be equivalent to 15 hours; 4 credits X 15 hours = 60 hours in total
(As per UGC guidelines: Instructional Template for Facilitating Implementation of Choice

Based Credit System (CBCS))

Course developer and Instructor:

Prof. N. B. Ramachandra and his team, Department of Studies in Genetics and Genomics, University of Mysore

Syllabus
Principles of Genetics

(4 credits)

Unit I : Introduction to Genetics

15 Hrs

- a) History of Science of Genetics: Definition and scope of Genetics, Pre-mendelian genetic concepts, Pre-formation, Epigenesis, Pangenesis, Inheritance of acquired characters, Germplasm theory, Heredity and Environment, Genotype and Phenotype, Heredity and Variation, Norms of reaction.
- b) Mendelism: Biography of Mendel and his experiments with pea plant. Law of segregation: Monohybrid cross, back cross and test cross, Dominance and Recessiveness, Co-dominance and Incomplete dominance, Genetic problems related.
- c) Law of Independent Assortment: Dihybrid cross in Pea plant and Drosophila, Back cross and test cross, Genetic problems related.
- d) Applications of Mendel's principles

Unit II: Extension of Mendelism

15 Hrs

- a) Chromosome Theory of Inheritance-Sutton-Boveri work, Inheritance patterns, phenomenon of Dominance, Inheritance patterns in Human (Sex-linked, Autosomal, Mitochondrial, Unifactorial, Multi-factorial)
- b) Allelic Variation & Gene function – Multiple allele - Definition, Eye color in Drosophila, Blood groups and Rh factor in Human, Genetic problems related.

Gene interactions: Inter allelic- Complementary, Supplementary, Epistasis – Dominant and Recessive, and Non Epistatic gene interaction.
- c) Lethal alleles, Penetrance (complete & incomplete), Expressivity, Pleiotropy and Phenocopy.

Unit III : Linkage and Extra - nuclear inheritance

15 Hrs

a) Linkage & Crossing over - Chromosome theory of Linkage, kinds of linkage, linkage groups, types of Crossing over, mechanism of Meiotic Crossing over, kinds of Crossing over, theories about the mechanism of Crossing over, Cytological detection of Crossing over, significance of Crossing over.

b) Sex –linked Inheritance in *Drosophila* and Humans, Inheritance of sex limited and sex influenced traits.

c) Extra - nuclear inheritance –Organelle heredity (mitochondrial, chloroplast), maternal effect, Infectious heredity in Paramecium.

UNIT IV : Sex determination

15 Hrs

Chromosomal theory of sex determination- XX-XY,XX-XO, ZZ-ZW; Genic balance theory of Bridges, Y Chromosome in sex determination in Melandrium.

Environment and sex determination. Hormonal control of sex determination. Gynandromorphs / Intersexes, Super sexes in *Drosophila*.

Molecular basis of Sex determination and Dosage compensation in *Drosophila* and Man.

Examination

Will follow the CBCS system and MOOC program as per the UGC and University guidelines.
