|  |
| --- |
| **Course Title**:Molecular Genetics |
| **Course Code**:BCH465 |
| **Program**: **Bachelor’s degree (BSc) in Biochemistry** |
| **Department**: Biochemistry |
| **College**: College of Science |
| **Institution**:King Saud University |
| **Version**:V1 |
| **LastRevision Date**:*Pick Revision Date.* |

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# **A. General information about the course:**

**1. Course Identification**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 1. Credit hours: | | | | | | |
| 2+0+0 | | | | | | |
| 2. Course type | | | | | | |
| A. | ☐University | ☐College | ☒Department | | ☐Track | ☐Others |
| B. | ☐Required | | | ☒Elective | | |
| 3. Level/year at which this course is offered:(8th level, year 4) | | | | | | |
| 4. Course general Description: | | | | | | |
| This course is to provide knowledge about the fundamental aspects of genetic diseases and their classification, modes of inheritance, population genetics, genetic polymorphism, treatment, control and prevention of genetic disorders. | | | | | | |
| 5. Pre-requirements for this course (if any): | | | | | | |
| BCH303 | | | | | | |
| 6. Co-requisites for this course (if any): | | | | | | |
| None | | | | | | |
| 7. Course Main Objective(s): | | | | | | |
| The main objective of this course is to provide knowledge about the fundamental aspects of genetic diseases, their classification, modes of inheritance, population genetics and genetic polymorphism, treatment, control and prevention and genetic counseling. | | | | | | |

**2. Teaching mode**(mark all that apply)

| **No** | **Mode of Instruction** | **Contact Hours** | **Percentage** |
| --- | --- | --- | --- |
| 1 | Traditional classroom | 24 | 80% |
| 2 | E-learning |  |  |
| 3 | Hybrid   * Traditional classroom * E-learning |  |  |
| 4 | Distancelearning | 6 | 20% |

**3. Contact Hours**(based on the academic semester)

|  |  |  |
| --- | --- | --- |
| **No** | **Activity** | **Contact Hours** |
|  | **Lectures** | 24 |
|  | **Laboratory/Studio** |  |
|  | **Field** |  |
|  | **Tutorial** | 6 |
|  | **Others (specify)** |  |
| **Total** | | 30 |

# **B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods**

| **Code** | **Course Learning Outcomes** | **Code of CLOs aligned with program** | **Teaching Strategies** | **Assessment Methods** |
| --- | --- | --- | --- | --- |
| **1.0** | **Knowledge and understanding** | | | |
| 1.1 | **Recognize the fundamental**  **aspects of genetic diseases,**  **different patterns of inheritance and**  **their identification** | **K4** | **Lectures, discussion, literature search on the internet** | **Written Examination, quiz (MCQ, single response, short answer questions) home work** |
| 1.2 | **Classifications of genetic diseases and how todiagnose and treat them** | **K4** | **Lectures, discussion, literature search on the net** | **Written Examination, quiz (MCQ, single response, short answer questions) home work** |
| 1.3 | **To understand how the cellcycle is controlled and have**  **knowledge about**  **cytogenetic analysis** | **K4** | **Lectures, discussion, literature search on the net** | **Written Examination, quiz (MCQ, single response, short answer questions) home work** |
| 1.4 | **To learn about Geneticpolymorphisms,**  **population genetics andtheir applications** | **K6** | **Lectures, Discussion, literature search on the net** | **Written Examination, quiz (MCQ, single response, short answer questions) home work** |
| 1.5 | **Understanding the importance of genetic counseling and the role of consanguinity, genetic testing, and new born screening in controlling genetic diseases.** | **K5** | **Group discussion** | **Interactive viva** |
| **2.0** | **Skills** | | | |
| 2.1 | **Analyze and summarize**  **information critically, using handout and other course materials.** | **S2** | **Questions, discussions** | **Assessing how the responsibility was fulfilled** |
| 2.2 | **Students engage in deeplearning by applying class activities and interact in group discussions.** | **S4** | **Questions, discussions, giving problems** | **Subjective methods** |
| … |  |  |  |  |
| **3.0** | **Values, autonomy, and responsibility** | | | |
| 3.1 | **Education and awareness of**  **genetic counseling; genetic**  **screening and testing for**  **carrier detections; presymptomatic and susceptibility testing to prevent genetic diseases** | **V1** | **Group discussion using case studies** | **Assessing their work** |
| 3.2 | **Develop professionalism and ethical values.** | **V4** | **Appointing group leader** | **Interactive sessions** |
| ... |  |  |  |  |

# **C. Course Content**

|  |  |  |
| --- | --- | --- |
| **No** | **List of Topics** | **Contact Hours** |
|  | Brief history of geneticsand Modes of inheritance in man | **2** |
|  | The human cytogenetic, chromosome number and identification, the cell cycle and its control and gametogenesis. Review of the genetic material, gene expression | **2** |
| **3.** | Mutagenesis and mutations:Mutagens and mutation (stable and unstable mutations, frequency of mutations, mutation affecting gene expression). Review of the genetic material, gene expression. Overview of genetic disease:Single gene disorders, chromosomal disorders, multifactorial disorders, mitochondrial disorders, disorders of somatic cells. | **3** |
| **4.** | Single gene disorders:Examples of genetic disease (autosomal and sex linked) illustrating the molecular pathology, prevalence, and diagnosis. | **3** |
| **5.** | Inborn errors of metabolism: classification, prevalence and diagnosis. Chromosomal disorders: numerical and structural disorders;(autosomal and sex chromosomes), chromosome breakage syndrome; prevalence; diagnosis; and indication for chromosomal analysis | **3** |
| **6.** | Multifactorial disorders: Definitions, classification (congenital and adult onset), environmental influences using two common diseases (obesity and diabetes). | **2** |
| **7.** | Mitochondrial genome and mitochondrial disorders:Classification, prevalence and diagnosis of mitochondrial disorders. | **2** |
| **8.** | SNPs, RFLP, VNTR, copy number variations, microsatellite instability and uses linkage analysis, and genotype and phenotype correlations. | **2** |
| **9.** | Population genetics:The human population, probability, binomial distribution, the Hardy-Weinberg equilibrium and its application | **2** |
| **10.** | Treatment of genetic diseases: Metabolic manipulation, surgical intervention, modification of gene expression, modification of the somatic genome, gene therapy; antisense therapy; iRNA. Control and prevention of genetic disorders.Types of prevention; pre-implantation genetic diagnosis; prenatal diagnosis; carrier detection; pre-marital screening; mutagen control | **2** |
| **11.** | Genetic counseling:Education and awareness program; genetic counseling; genetic screening and testing for carrier detections; pre-symptomatic and susceptibility testing | **2** |
| **Total** | | **24** |

# **D. Students Assessment Activities**

| **No** | **Assessment Activities \*** | **Assessment timing**  **(in week no)** | **Percentage of Total Assessment Score** |
| --- | --- | --- | --- |
|  | Quiz 1 (objective type questions based on any one lecture) | **3** | **5%** |
|  | First Mid Term Exam(objective type and short answer questions based on lectures covered during 4 teaching weeks) | **5** | **25%** |
|  | Quiz 2(objective type questions based on any one lecture) | **8** | **5%** |
| **4** | Second Mid Term Exam(objective type and short answer questions based on lectures covered during 4 teaching weeks) | **10** | **25%** |
| **5.** | Major final exam (objective type, long and short answer questions based on entire course content semester) | **14** | **40%** |

\*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

# **E. Learning Resources and Facilities**

**1.References and Learning Resources**

|  |  |
| --- | --- |
| **Essential References** | Mueller RF, Young ID; Emery’s Elements of Medical Genetics. Churchill Livingstone, New York. Latest edition |
| **Supportive References** | Thompson MW, McInnes RR, Willard, HF. Genetics in Medicine. W.B. Saunders Company, London. Latest edition |
| **Electronic Materials** | eBook:https://hum-molgen.org/literature/11-2003/000003.html |
| **Other Learning Materials** |  |

**2. Required Facilities and equipment**

| **Items** | **Resources** |
| --- | --- |
| **facilities**  (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.) | Classrooms, equipped with audio visible facilities, white board, etc. The lecture is given in a well-equipped room fitted with overhead projector and KSU-installed podium with smart Board installed as well. The number of seats per room is around 30 which is more than enough for the theory part of this course |
| **Technology equipment**  (projector, smart board, software) | The lecture is given in a well-equipped room fitted with overhead projector and KSU-installed podium with smart board installed as well. All course materials are prepared and given using PowerPoint data show facility. Students can access these materials by different means:   * Through faculty website * Through direct PDF-version of the PPT slides sent to students by KSU emails (students portal and faculty portal are provided by KSU). |
| **Other equipment**  (depending on the nature of the specialty) | **none** |

# **F. Assessment of Course Quality**

| **Assessment Areas/Issues** | **Assessor** | **Assessment Methods** |
| --- | --- | --- |
| Effectiveness of teaching | Students, Faculty | Direct, Indirect |
| Effectiveness of  Studentsassessment | Program Leader | Indirect |
| Quality of learning resources | Faculty, Peer Reviewer | Direct, Indirect |
| The extent to which CLOs have been achieved | Faculty, Program Leader | Direct |
| Other |  |  |

**Assessors (**Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

**Assessment Methods**(Direct, Indirect)

# **G. Specification Approval**

|  |  |
| --- | --- |
| **Council /COMMittee** |  |
| **Reference No.** |  |
| **Date** |  |