



Faculty of Medicine
Suez Canal University



Genetics Unit
Department of Histology & Cell Biology

PROGRAM SPECIFICATIONS

Program Title:

MD of Medical Genetics

Code:

HTMG



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PROGRAM SPECIFICATIONS

A- Basic Information

Program Title: MD of Medical Genetics

Program Type: Single ✓ Double Multiple

Department(s): Department of Histology & Cell Biology

Coordinator: Prof. Fouad Mohamed Badr

External Evaluator(s): Prof. Olfat Gameel Shaker

Last date of program specifications approval: April 2019

Date of specification revision approval: April 2024

Number of credit points (CP) for this degree: 180 CP

B- Professional Information

1- PROGRAM AIM

The program aims are :

- In case the student select the cytogenetic Course:
 1. Provide students with advanced knowledge and skills in the subject of Cytogenetics that will enable them to:
 - a. Understand structure, biology, abnormalities and identification of chromosomes .
 - b. Perform different analytical cytogenetic techniques and know their applications.
 - c. Know different aspects and applications of genetic counselling & prenatal diagnosis.
 2. Enable students to use transferable skills in oral presentations, report writing.



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3. Make students perfect in bioinformatics tools use.
 4. Provide students with adequate experience in cytogenetics & cytogenetic techniques as well as knowledge of the principles and practice of medical genetics, which will enable them to evaluate individuals and families with genetic disorders, and to choose and interpret the appropriate genetic investigations .
 5. Make student able to share in genetic counselling process.
 6. Provide students with adequate knowledge and skills in research methodology that enable them to design experiments, analyze data, and review literature critically.
- In case the student select the Molecular Course:
1. Provide students with advanced knowledge and skills in the subject of Molecular Genetics that will enable them to:
 - a. Recognize structure and organization of the human genome at the molecular level and mechanisms of human genes expression.
 - b. Know the DNA repair system, polymorphism, mutations, gene mapping, and gene transfer.
 - c. Perform different analytical Molecular techniques and know their applications.
 - d. Understand genetic counselling and clinical risk assessment.
 2. Enable students to use transferable skills in oral presentations, report writing.
 3. Make students perfect in bioinformatics tools use.
 4. Provide students with adequate experience in Molecular genetics as well as knowledge of the principles and practice of medical genetics, which will enable them to evaluate individuals and families with genetic disorders, and to choose and interpret the appropriate genetic investigations.
 5. Make student able to share in genetic counselling process.
 6. Provide students with adequate knowledge and skills in research methodology that enable them to design experiments, analyze data, and review literature critically.



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2- INTENDED LEARNING OUTCOMES OF THE PROGRAM

A- KNOWLEDGE & UNDERSTANDING:

- In case the student select the cytogenetic Course:

By the end of this program, participants should be able to:

A1. Discuss structure, function of chromosomes and their behavior during cell cycle and cell division.

A2. Explain X- chromosome inactivation mechanism and consequences of inactivation.

A3. Identify chromosomes and their abnormalities.

A4. Discuss different analytical techniques:

- Classic cytogenetic tests (Interphase sex chromatin analysis, Micronucleus testing, Lymphocyte culture, Bone marrow chromosomal preparation, Prenatal tissue culture techniques.
- Specialized cytogenetic techniques (Fragile site examination, Sister chromatid differentiation, Double minutes & homogeneously staining regions, Meiotic studies in man.)
- Molecular Cytogenetics & Localization of Specific DNA Sequences on Chromosomes (*In situ* hybridization techniques, Flow Cytometry, Somatic Cells Hybrids.

A5. Explain the application of Cytogenetic investigations to clinical practice (*Preimplantation diagnosis, Prenatal applications, Post-natal applications, Chromosomal instability syndromes, Cancer cytogenetics*).

A6. Recognize Basic Concepts in Microscopy & Computerized Image Analysis Systems

A7. Discuss Genetic Counselling and Clinical Risk Assessment for different cytogenetic and multifactorial disorders.

A8. Understand ethical and Medicolegal aspects of different techniques , prenatal diagnosis and genetic counselling .

- In case the student select the Molecular Course:

By the end of this program, participants should be able to:

A1. Explain the levels of human genome organization.



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A2. Discuss the mechanisms of human genes expression and different levels of regulation.

A3. Describe Instability of the human genome: mutation, polymorphism and DNA repair.

A4. Discuss different analytical Molecular techniques:

- Testing Genotoxicity.
- Nucleic acid hybridization.
- Amplifying DNA.
- Analysing DNA and gene structure, variation and expression.
- Human genome projects.
- Beyond the genome project
- Mapping & identifying disease genes and mutations

A5. Recognize Genetic testing in individuals and populations.

A6. Recognize Genetic manipulation of cells and animals.

A7. Discuss Genetic Counselling and Clinical Risk Assessment for different single gene and multifactorial disorders.

A8. Understand ethical and Medicolegal aspects of different molecular techniques and counselling.

B- INTELLECTUAL SKILLS

- In case the student select the cytogenetic Course:

By the end of this program, participants should be able to:

- B1. Recognize the importance and impact of genetic tests results for families and communicate implications of results clearly to them.
- B2. Be able to adapt to new techniques and tests as they arise and incorporate them into clinical practice appropriately.
- B3. Recognize and Interpret clinical consequences of chromosome rearrangements.
- B4. Analyze Barr body, micronucleus test, karyotype, sister chromatid exchange, FISH, CGH results.



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- B5. Analyze banded metaphase chromosomes by karyotyping and classify karyotypes using the current ISCN, with reference to the clinical referral condition.
 - B6. Compare between the different cytogenetic techniques in respect to indications, samples, results and clinical referral needs.
 - B7. Recognize how to select a specific cytogenetic technique for a specific sample.
 - B8. Assess the risk of chromosomal abnormalities and recurrence risk.
 - B9. Describe how to council specific cases with chromosomal abnormalities.

- In case the student select the Molecular Course:

By the end of this program, participants should be able to:

- B1. Recognize the importance and impact of genetic tests results for families and communicate implications of results clearly to them.
- B2. Be able to adapt to new techniques and tests as they arise and incorporate them into clinical practice appropriately.
- B3. Recognize and Interpret clinical consequences of polymorphism and genes mutations.
- B4. Compare between genomic and cDNA libraries.
- B5. Interpretation of novel sequence variants
- B6. Compare between the different molecular techniques in respect to indications, samples, results and clinical referral needs
- B7. Recognize how to select a specific Molecular technique for a specific sample.
- B8. Describe how to council specific cases with single gene & multifactorial disorders.

C- PROFESSIONAL & PRACTICAL SKILLS

- In case the student select the Cytogenetic Course:

By the end of this program, participants should be able to: Use ISCN nomenclature correctly

- C1. Interpret results of cytogenetic tests (normal karyotype, heterochromatic variants, abnormal karyotype, FISH and CGH)



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- C2. Report cytogenetic and molecular cytogenetic findings in both clinical and research reports using updated nomenclature system.
 - C3. Evaluate the performance and application of different probe types.
 - C4. Explain how to deal with trouble shoots in different cytogenetic techniques.
 - C5. Assess the recurrence risk of cytogenetic, cancer and mendelian conditions.
 - In case the student select the Molecular Course:

By the end of this program, participants should be able to:

- C1. Use mutation & gene variance nomenclature correctly
- C2. Interpret and report results of molecular tests (genotoxicity tests, PCR, Sequencing, Southern blotting, Northern Blotting, Array....)
- C3. Be able to use comet assay analysis software.
- C4. Explain how to deal with trouble shoots in different Molecular techniques.
- C5. Assess the recurrence risk of multifactorial cancer and mendelian conditions.
- C6-.Design PCR experiment for different targets.

D- GENERAL & TRANSFERABLE SKILLS

- Cytogenetic & Molecular courses.

By the end of the program, participants should be able to:

- D1. Collaborate with members of other departments
- D2. Master computer skills
- D3. Perform efficiently in oral communications
- D4. Master effective presentation skills
- D5. Implement problem solving skills to real life situations
- D6. Master critical thinking and judgment skills
- D7. Continue self-learning



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3- ACADEMIC STANDARDS

A - EXTERNAL REFERENCES FOR STANDARDS (BENCHMARKS)

- The generic Academic Reference Standards (ARS) of NAQAAE for Postgraduate (2009)

b - Comparaison of Provision to External References

- Some unique elements were suggested and introduced during preparation of the program.

4- CURRICULUM STRUCTURE & CONTENTS

A- PROGRAM DURATION:

The program lasts for a minimum of 3 academic years and maximum 7 years, as specified in the internal bylaws for postgraduate studies based on credit points system in the Faculty of Medicine, Suez Canal University approved on February 7th, 2016.

B- PROGRAM STRUCTURE:

MD Program Credit Point (CP) structure:

Total required CPs for acquiring a MD degree: 180 CP

The program consists of the First Part (30 CP), Thesis (50 CP), and the Second Part (100 CP):

1. The First Part (30 CP)

Duration: 15 weeks for one academic semester

This part lasts for 6 months and ends in written, practical, and oral exams.

It includes:

- a. A course in Research Methodology (Code: BR) (8 CP) planned by and held at the Community Medicine Department, Faculty of Medicine, Suez Canal University.
- b. Two elective courses (Code: E) (2+2 CP): Students should select two elective courses which have not been selected in the Master program.



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- c. A specialized course in Medical Genetics (Code: HTMG51) (10 CP) planned by and held at the Medical Genetics Unit, Department of Histology & Cell Biology, Faculty of Medicine, Suez Canal University.
 - d. A specialized course in Bioinformatics (Code: HTMG52) (8 CP) planned by and held at the Medical Genetics Unit, Department of Histology & Cell Biology, Faculty of Medicine, Suez Canal University.

2. Doctoral Thesis (50 CP)

(not included in the total marks of the doctoral degree)

The candidate has the right to register the thesis protocol 6 months after registration for the MD degree.

The thesis defense is allowed 6 months after the date of the Faculty Council approval of the thesis protocol and passing the First Part exam.

3. The Second Part (100 CP)

Duration: 75 weeks for 5 consecutive academic semesters.

This part lasts for 2 years and ends in written, practical, and oral exams.

It includes:

- a. A specialized course in Medical Genetics (60 CP), planned by and held at the Medical Genetics Unit, Department of Histology & Cell Biology, Faculty of Medicine, Suez Canal University. Students should select one of the following two courses:
 - i. Cytogenetics (Code: HTMG53)
 - ii. Molecular Genetics (Code: HTMG54)



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- b. A Practical Course (CP 10) in the student's field of study, planned by and held at the Medical Genetics Unit, Department of Histology & Cell Biology, Faculty of Medicine, Suez

Courses	Assessment
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Canal University.

- c. Scientific Activities (CP 10) (not included in the total marks of the MD degree)

No. of hours per week: 2 CP / week which is equivalent to 50 hours / week, comprising lectures, tutorials, self-learning and hands-on training.

No. of CP: The doctoral program comprises 180 CP.

One CP is equivalent to 25 working hours (30% (= 7 hours) for face-to-face learning activities, and 70% (=18 hours) for self-learning activities).

5- PROGRAM COURSES

1- FIRST PART



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Code	Course Title	No. of CP*	Written Exam			Oral Exam	Practical or Clinical Exam
			No. of Papers	Duration	Marks		
BR	Biostatistics & Research Methodology	8	1	3 hours	160		
HTMG51	Medical Genetics	10	1	3 hours	110	20	70
HTMG52	Bioinformatics	8	1	3 hours	70		90
E**	Two Elective Courses	2+2	1+1	1 hour + 1 hour	40+40		
Total		30 CPs			600 Marks***		

*CP: Credit Points

**E: Students should select two elective courses which have NOT been selected for the Master program:

E01	Evidence-Based Medicine	(Community Department)
E02	Scientific Writing	(Medical Education Department)
E03	Quality in Medical Education	(Medical Education Department)
E04	Infection Control	(Microbiology Department)
E05	Critical Appraisal	(Community Department)
E06	Communication Skills	(Medical Education Department)

***Each credit point is equivalent to 20 marks



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2- SECOND PART

Courses			Assessment					
Code	Course Title	CP*	Written Exam			Oral Exam	Practical or Clinical Exam	Continuous Assessment (Portfolio)**
			No. of Papers	Duration	Marks			
HTMG53	Medical Genetics including : Advanced Course in Cytogenetics	60	2	3 hours For each paper	360 for each paper	180	360	540
HTMG54	Advanced Course in Molecular Genetics							
	Practical Course	30						
	Scientific Activities***	10						
Total			100 CPs			1800 Marks****		

*CP: Credit Point

**Portfolio scores are distributed on different items of the portfolio, and its total score is included in the total mark of the Second Part.

***Scientific activities are not included in the total marks.

****Each credit point is equivalent to 20 marks.

3- THESIS:

One senior and one junior supervisor are nominated from the staff members by the Department Council to prepare a proposal of the thesis protocol after selection of a topic relevant to the research plans of the Department. Data collection, methodologies, study question, time table, ethical considerations and budget are formulated into a research project by the candidate under the guidance of his/her supervisors. The research protocol is then pre-reviewed by two other staff members nominated by the Head of the Department who convey their comments to the supervisors to reach a final form. The thesis protocol is then openly



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discussed in the Department Council for approval and referral to the Faculty Research Committee, whereby it is critically appraised to confirm it meets the basic research standards set by the Committee. The thesis protocol must then be approved by the Committee of Postgraduate Studies, the Faculty Council and the University Council in successive order, to be registered. The candidate has the right to register the thesis protocol 6 months after registration for the MD degree. The thesis defense is allowed 6 months after the date of the Faculty Council approval of the thesis protocol and passing the First Part exam.

N.B.: Thesis represents 50 CPs not included in the total mark for master degree.

6- PROGRAM ADMISSION REQUIREMENTS

- The program accepts candidates with Master of Medical Genetics (signed up at least **Good**)
- Registration for the MD program opens twice a year, according to the Internal Bylaws for Postgraduate Studies of the Faculty of Medicine, Suez Canal University.

7- STUDENT ASSESSMENT METHODS

Written (MEQs)	to assess the cognitive domain.
MCQs	to assess the cognitive domain
Oral Viva Cards	to assess higher cognitive and attitude domains.
Observations	to assess practical and presentation skills.
Portfolio	to assess the cognitive, psychomotor and the affective domains.



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8- WEIGHTING OF ASSESSMENTS

Total marks for MD degree: 2400

Type of Exam

First Part (30 CPs = 600 marks)

Written exam	420
Oral and practical exam	180
Total	600

Second Part (60 CPs = 1800 marks) (including 10 CPs not included in the total marks)

Written exam	720
Oral exam	180
Practical exam	360
Portfolio	540
Total	1800

9- REGULATIONS FOR PROGRESSION AND PROGRAM COMPLETION

The regulations for program completion follow the regulations of the MD degree of Medical Genetics, Faculty of Medicine, Suez Canal University, approved by the Supreme Council of Universities. The program is considered complete with the accomplishment of 2 summative assessment (for the first and the second parts) and the defence of a thesis developed and submitted for the purpose of acquiring the degree.

- **First Part**

Passing level: 60% of the total marks of the First Part exams, and at least 50% of the total marks of written exam are necessary.



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- **Second Part**

Passing level: 60% of the total marks of the Second Part exams, and at least 60% of the total marks of the practical and oral exams is necessary.

- **Thesis**

Passing the thesis defense is a prerequisite for acquiring a MD degree in Medical Genetics.

10- EVALUATION OF PROGRAM INTENDED LEARNING OUTCOMES (ILOS)

<i>Evaluator</i>	<i>Tool</i>	<i>Sample</i>
<i>Postgraduate students</i>	Needs assessment questionnaires	Random sample of participants
<i>Alumni</i>	Self-administered questionnaires	Comprehensive sample
<i>Stakeholders</i>	Self-administered questionnaires	Random sample
<i>External evaluator(s)</i>	External audit of the program specifications	

Head of the Medical Genetics Unit

Ass.Prof. Eman Abdel-Moemen Mohammed

Head of the Department

Prof. Lamiaa Mohammed Farghaly