



UNIVERSITI TEKNOLOGI MARA

FRS653: FORENSIC BIOLOGY

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| Course Name (English) | FORENSIC BIOLOGY APPROVED |
| Course Code | FRS653 |
| MQF Credit | 4 |
| Course Description | This course emphasized the use of biological samples in providing essential information and evidence in forensic investigations, theoretical basis of analytical methods, their limitations and applications to specific problems and also the advances in technology that enhanced the application of the biological samples. Students will gain an understanding of the basic concepts relevant to technology in serology, bloodstain pattern analysis, DNA, entomology and anthropology relevance to forensic cases. They will also receive basic training in laboratory which is perfect for skill development in the necessary laboratory procedures. Graduates will acquire the skills to perform laboratory procedures in forensic biology techniques. They will also understand the theoretical basis of forensic technology to enable them to keep abreast of new techniques as they become part of forensic practice. |
| Transferable Skills | Excellent attention to detail High level of patience and concentration Analytical and investigative skills Logical, unbiased and methodical approach to solving problems Inquisitive and open-minded Work well on a team and independently Strong verbal and presentation skills Ability to summarize findings and write technical reports Present complex scientific information in clear manner that others can understand Computer/technical skills Problem solving abilities Skilled at putting pieces of a puzzle together |
| Teaching Methodologies | Lectures, Blended Learning, Lab Work, Case Study, Presentation |
| CLO | CLO1 Evaluate the proper collection, preservation of forensic biological samples from crime scene CLO2 Demonstrate communication skills in written and verbal related to forensic biology CLO3 Conduct laboratory experiment in forensic biology CLO4 Demonstrate management skills through case study related to forensic biology |
| Pre-Requisite Courses | No course recommendations |
| Topics | 1. Body fluids analysis 1.1) 1.1 Blood 1.2) 1.1.1 Composition of blood 1.3) 1.1.2 Blood grouping 1.4) 1.1.3 Presumptive test for blood 1.5) 1.1.4 Serology test 1.6) 1.2 Saliva 1.7) 1.2.1 Composition and function of saliva 1.8) 1.2.2 Presumptive test for saliva 1.9) 1.3 Semen 1.10) 1.3.1 Composition of semen 1.11) 1.3.2 Detection and identification of semen 1.12) 1.4 Collection and preservation of body fluids 1.13) 1.4.1 Collection of rape evidence 1.14) 1.5 Case study |

2. Bloodstain Pattern Analysis

- 2.1) 2.1 Bloodstain classification
- 2.2) 2.1.1 Spatter family
- 2.3) 2.1.2 Non-spatter family
- 2.4) 2.2 Anatomical considerations in bloodstain pattern analysis
- 2.5) 2.2.1 Circulatory system and shocks
- 2.6) 2.2.2 Non-traumatic causes of bleeding
- 2.7) 2.2.3 Traumatic bleeding
- 2.8) 2.2.3.1 Firearm injuries
- 2.9) 2.2.3.2 Sharp force injuries
- 2.10) 2.2.3.3 Blunt injuries
- 2.11) 2.3 Methodology for bloodstain pattern analysis
- 2.12) 2.3.1 Determining motion and directionality
- 2.13) 2.3.2 Determining the point of convergence and the area of origin
- 2.14) 2.3.3 Identify impact angles of the stains
- 2.15) 2.3.4 Documentation of bloodstain pattern
- 2.16) 2.4 Case study

3. Forensic DNA

- 3.1) 3.1 Principle of heredity
- 3.2) 3.1.1 Individuality and genes
- 3.3) 3.1.2 Genes and DNA
- 3.4) 3.1.3 DNA sequence variation among individuals
- 3.5) 3.2 Replication of DNA
- 3.6) 3.3 DNA profiling technique
- 3.7) 3.3.1 Restriction fragment length polymorphism (RFLP)
- 3.8) 3.3.2 Polymerase chain reaction (PCR)
- 3.9) 3.4 Forensic DNA marker
- 3.10) 3.4.1 Variable number tandem repeat (VNTR)
- 3.11) 3.4.2 Short tandem repeat (STR)
- 3.12) 3.4.3 Y-STR
- 3.13) 3.4.4 Mitochondrial DNA
- 3.14) 3.5 Interpretation of DNA profiles
- 3.15) 3.5.1 Single locus data
- 3.16) 3.5.2 Multiloci DNA profiles
- 3.17) 3.5.3 Paternity testing
- 3.18) 3.5.4 Quality control and complications in DNA profile data
- 3.19) 3.6 DNA databases
- 3.20) 3.6.1 CODIS
- 3.21) 3.6.2 National DNA database (NDNAD)
- 3.22) 3.6.3 Malaysia DNA databank
- 3.23) 3.7 Collection and preservation of DNA samples
- 3.24) 3.8 Case study

4. Forensic Toxicology

- 4.1) 4.1 Toxicokinetics of drugs in human
- 4.2) 4.1.1 Absorption
- 4.3) 4.1.2 Distribution
- 4.4) 4.1.3 Metabolism/ biotransformation
- 4.5) 4.1.4 Excretion/ elimination
- 4.6) 4.2 Measuring toxicity : LD50, LC50, ED50, EC50, NOEL, NOAEL
- 4.7) 4.3 Post mortem forensic toxicology
- 4.8) 4.4 Human performance toxicology
- 4.9) 4.4.1 Breath testing for alcohol
- 4.10) 4.4.2 Field sobriety test
- 4.11) 4.5 Forensic urine drugs testing /work place drug testing
- 4.12) 4.6 Collection and preservation of toxicology samples
- 4.13) 4.7 Case study

5. Forensic Examination of Human Remains

- 5.1) 5.1 Estimation of time and cause of death from post-mortem changes
- 5.2) 5.1.1 Rigor, algor and livor mortis
- 5.3) 5.1.2 Post-mortem decomposition
- 5.4) 5.1.3 Mummification and the formation of adipocere
- 5.5) 5.2 Identification of skeletalised bodies
- 5.6) 5.2.1 Identification of human and animal skeletons
- 5.7) 5.2.2 Identification of long bones
- 5.8) 5.2.3 Determining age and sex from skull
- 5.9) 5.2.4 Determining sex from pelvis
- 5.10) 5.3 Identification of non-skeletalised bodies
- 5.11) 5.4 Case study

6. Forensic Entomology

- 6.1) 6.1 Forensically important insects
- 6.2) 6.1.1 Blowflies and fleshflies
- 6.3) 6.1.2 Beetles
- 6.4) 6.1.3 Others
- 6.5) 6.2 Ecological roles of insects in decomposition process
- 6.6) 6.2.1 Necrophagous
- 6.7) 6.2.2 Omnivores
- 6.8) 6.2.3 Parasites and predators
- 6.9) 6.2.4 Incidentals
- 6.10) 6.3 Applications relates to death investigations
- 6.11) 6.3.1 Determining post-mortem interval (PMI)
- 6.12) 6.3.2 Cause and manner of death
- 6.13) 6.3.3 Movement of the corpse
- 6.14) 6.4 Collection and preservation of entomological samples
- 6.15) 6.5 Case study

7. Special topics on current research and issues in forensic biology

- 7.1) n/a

| Assessment Breakdown | % |
|-----------------------|--------|
| Continuous Assessment | 60.00% |
| Final Assessment | 40.00% |

| Details of Continuous Assessment | Assessment Type | Assessment Description | % of Total Mark | CLO |
|----------------------------------|-----------------|----------------------------------|-----------------|------|
| | Assignment | Assignment Case Study | 10% | CLO4 |
| | Lab Exercise | Laboratory practical and reports | 10% | CLO3 |
| | Test | Test | 40% | CLO1 |

| Reading List | Recommended Text | <ul style="list-style-type: none"> Gunn, A. 2009, <i>Essential Forensic Biology</i>, 2nd edition Ed., Wiley [ISBN: 9780470758038] |
|--------------------|---|--|
| | Reference Book Resources | <ul style="list-style-type: none"> Saferstein, R. 2006, <i>Criminalistics: An Introduction to Forensics Science</i>, 9th edition Ed., Prentice Hall [ISBN: 0132216558] Dorothy Gennard 2007, <i>Forensic Entomology</i>, 1st edition Ed., Wiley [ISBN: 9780470014790] Kelly M. Elkins 2012, <i>Forensic DNA Biology</i>, 1st edition Ed., Academic Press [ISBN: 9780123945853] Douglas H. Ubelaker 2012, <i>Forensic Science</i>, 1st edition Ed., John Wiley & Sons [ISBN: 9781119941231] Li, R. 2008, <i>Forensic Biology: Identification and DNA analysis of Biological Evidence</i>, 1st edition Ed., CRC Press [ISBN: 9781420043440] |
| Article/Paper List | This Course does not have any article/paper resources | |
| Other References | This Course does not have any other resources | |