



UNIVERSITI TEKNOLOGI MARA

COURSE INFORMATION

Confidential

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| Code | : FSG500 |
| Course | : Philosophy of Science |
| Level | : Degree |
| Credit Unit | : 2 |
| Contact Hour | : Lecture (2hrs/week) |
| Part | : |
| Course Status | : Core (Faculty) |
| Prerequisite | : None |
| Course Outcomes | : Upon completion of this course, students will be able to: <ol style="list-style-type: none">1. Identify their learning preferences, attitudes towards science and conceptual understanding in their field of study.2. Define truth, beliefs and knowledge and justify their own belief about science knowledge in chemistry or physics through conceptual inventories.3. Apply the philosophical approach in analyzing and justifying the scientific methods, principles, laws and theories about the natural world.4. Identify their science reasoning skills.5. Argue and justify their opinion on issues in philosophy of science6. Critically write an original 3000 words position paper in favor or against issues on science that concern ethics and morality. |
| Course Description | : Philosophy of science will focus on epistemology through the concepts of knowledge, beliefs, truth, logic, followed by metaphysics, the nature of scientific explanations, critical and science skills as well as moral and ethical issues in science. |

Nama Fakulti / Pusat Pengajian: Fakulti Sains Gunaan Tahun: 2009

Nama Program: Ijazah Sarjana Muda Sains (Kepujian) Teknologi Bahan

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Students will occasionally listen to but will mostly participate and actively engage via dialogues during the 2-hour lecture session. In addition, they will be reading, researching and philosophically analyzing content of selected articles on science propositions and methods and will communicate their arguments and reasoning through class engagement, debate and term papers. It is hoped that students will develop or enhance their thinking and science reasoning skills and use it in making sound arguments and decisions in their career and in their daily living.

Syllabus Content

- 1.0 Course Introduction: Diagnostics
 - 1.1 Science Attitudes Survey (VASS)
 - 1.2 Learning Preferences Inventory (ILS).
 - 1.3 In-class composition: self introduction, vision, mission & reasoning skills

- 2.0 Introduction to Philosophy
 - 2.1 The concept of philosophy, epistemology, metaphysics, logic and ethics in philosophy
 - 2.2 Definition of Knowledge: beliefs, truth, knowing and conditions for knowledge (Justified True Belief, Evidence, Skepticism)
 - 2.3 Diagnosing knowledge & understanding using conceptual inventories. (Examples include CSEM, FCI, FMCE, WCI, CCI)

- 3.0 The Methods of Modern Science
 - 3.1 From Observation to Conclusion (Theories, Laws, Principles, Predictions, Methods, Instruments, Experimentation, Variables, Tables, Graphs, Analysis of results & Conclusion)
 - 3.2 Philosophy of science

- 4.0 The Nature of Scientific Inference
 - 4.1 Reasoning: Deductive vs. Inductive (Arguments, Propositions, Premises, Fallacies & Conclusions)
 - 4.2 The problem of Induction
 - 4.3 Hypothetico-deductive method

- 5.0 Critical and Science Reasoning Skills in Philosophy of

Science

- 5.1 Categories of Critical Thinking Skills.
- 5.2 Philosophy of Science and critical thinking skills.
- 5.3 Critical and Science Reasoning Skills.
- 5.4 Improving Your Science Reasoning/Critical Thinking Skills Through Philosophy of Science.

6.0 Communicating and reasoning in philosophy of science: Verbal & Written

- 6.1 Effective Oral Communication: Traits of Effective Oral Communication based on Reasoning Techniques
- 6.2 Planning Your Effective Oral Communication Session.
- 6.3 Planning Your Effective Written Articles: Outlining and Writing.

7.0 Ethics & Morality in Science

- 7.1 The moral society and the principles of morals
- 7.2 Science and Ethics in Science Reporting.

Teaching Methodology

- i. Active Engagement Lecture
- ii. Debate
- iii. Scientific investigation via term papers

Assessment

- Pass or Fail based on criterion assessment. Must pass all criteria.

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|------------------|-----------------|
| Attendance | 80% and above |
| Class Engagement | Minimum of 2 |
| Mid-tem Paper | Minimum of 50% |
| Debate | Minimum of 50 % |
| Final-term paper | Minimum of 50 % |

Recommended Text (if any)

- "Understanding Philosophy of Science" by James Ladyman

References

- 1. Rosenberg, A. (2000). Philosophy of Science : A Contemporary Introduction, Routledge, London.
- 2. Schick Jr, T. (2000). Readings in the Philosophy of Science: From Positivism to Postmodernism, Mayfield Publishing Company.
- 3. Losee, J., (1993). A Historical Introduction to the

Philosophy of Science, 3rd Edition, Oxford.

4. Teichman, J. and Evans, K.C., (1995). *Philosophy, A Beginner's Guide*, 2nd Edition, Blackwell, Oxford,
5. Al-Attas S.M.N., (1999). *The Concept of Education In Islam, A Framework for An Islamic Philosophy of Education*, ISTAC, Kuala Lumpur.
6. Engel, S. M., (1982). *With Good Reason, An Introduction to Informal Fallacies*, 2nd Edition, St. Martin's Press, New York.
7. Edwards P. A ., (1973). *Modern Introduction to Philosophy*, The Free Press, New York.
8. Ginsburg, H.P. & Opper, S. *Piaget's Theory of Intellectual Development*, 3rd. ed.

COURSE OUTCOMES

| | | | |
|--------------|-----------------------|-----------------|--------------------------------|
| COURSE CODE | FSG500 | CENTRE OF STUDY | FACULTY OF APPLIED SCIENCES |
| COURSE NAME | PHILOSOPHY OF SCIENCE | PREPARED BY | ASSOC .PROF. DR. JAAFAR JANTAN |
| CREDIT HOURS | 2 | DATE | 4 th APRIL 2009 |

| COURSE OUTCOMES | PROGRAMME OUTCOMES | | | | | | | | | INSTRUCTIONAL METHODS | ASSESSMENT |
|---|--------------------|------|------|------|------|------|------|------|------|--|---|
| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | | |
| 1. Identify their learning preferences, attitudes towards science and conceptual understanding in their field of study. | 3 | | 3 | | | | | | | <ul style="list-style-type: none"> ▪ Direct method (Lecture) | <ul style="list-style-type: none"> ▪ Formative using the Inventory of Learning Preferences (by Felder) , Views of Scientific Survey (by Halloun), The Force Concept Inventory (by Hestenes) & The Chemical Concept Inventory (by) |
| 2. Define truth, beliefs and knowledge and justify their own belief about science knowledge in | 3 | | | | | | | | | <ul style="list-style-type: none"> ▪ Independent Learning (pre-class reading) ▪ Lecture-discussion | <ul style="list-style-type: none"> ▪ Class Engagement ▪ End of Class Composition |

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|--|--------------------|------|------|------|------|------|------|------|------|--|--|
| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | | |
| chemistry or physics through conceptual inventories. | | | | | | | | | | | |
| 3. Apply the philosophical approach in analyzing and justifying the scientific methods, principles, laws and theories about the natural world. | | | 3 | | | | | | | <ul style="list-style-type: none"> ▪ Independent Learning (pre-class reading) ▪ Lecture-discussion | <ul style="list-style-type: none"> ▪ Class Engagement ▪ Mid-term Paper |
| 4. Identify their science reasoning skills. | | | 3 | | | | | | | <ul style="list-style-type: none"> ▪ Lecture-discussion | <ul style="list-style-type: none"> ▪ Formative assessment using Lawson's Thinking and Scientific Reasoning Skills (by Lawson) |
| 5. Argue and justify their opinion on issues in philosophy of science. | | | | 3 | 3 | | | | | <ul style="list-style-type: none"> ▪ Independent Learning (pre-class reading) ▪ Lecture | <ul style="list-style-type: none"> ▪ Class Engagement ▪ Debate |

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| | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | | |
| | | | | | | | | | | Discussion | |
| 6. Critically write an original 3000 words position paper in favor or against issues on science that concern ethics and morality. | | | | 3 | | 3 | | | | <ul style="list-style-type: none"> ▪ Independent Learning | <ul style="list-style-type: none"> ▪ Final Term Paper |

Rating of CO addressing PO:

- 1 - Compliance Not Measurable (Slightly)
- 2 – Compliance without assessment (Moderately)
- 3 – Compliance and measurable (Substantially)

Program Outcomes:

- | | |
|--|---|
| <ul style="list-style-type: none"> PO1 Knowledge in Specific Area PO2 Practical Skills (P) PO3 Thinking and Scientific Skills (C) PO4 Communication Skills (A) PO5 Social skills, teamwork and responsibilities (A) | <ul style="list-style-type: none"> PO6 Values, Ethics and professionalism (A) PO7 Information Management and Life Long Learning (A) PO8 Management and Entrepreneurship (A) PO9 Leadership Skills (A) |
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