

Kertas Cadangan Program Baru

**Diploma Pasca Siswazah dalam
Pengurusan Tanah Gambut
(Peatland Management)**

Dicadang oleh



**Fakulti Sains dan Teknologi Sumber
Universiti Malaysia Sarawak**

Tajaan/Pembiayaan

Geran EU ASIALINK-ASI/B7-301/98/679-015

1. INSTITUSI

Universiti Malaysia Sarawak

2. TUJUAN

Tujuan kertas ini ialah untuk mendapat persetujuan Jawatankuasa Pendidikan Tinggi (JKPT) bagi Fakulti Sains dan Teknologi Sumber, Unimas menawar satu program baru di peringkat Diploma Pasca Siswazah dalam bidang Pengurusan Tanah Gambut.

3. NAMA PROGRAM AKADEMIK YANG DIPOHON

3.1 Nama program: **Pengurusan Tanah Gambut** (Peatland Management)

3.2 Nama Ijazah: **Diploma Pasca Siswazah**.

- Program yang dicadangkan ini adalah suatu program vokasional lanjutan yang dirangka khusus untuk membangunkan kapasiti pemegang-pemegang ijazah pertama yang perkhidmatan mereka berkaitan dengan penggunaan dan pengurusan tanah gambut atau persekitarannya.
- Program ini berciri multidisiplin - merangkumi wacana akademik dari disiplin-disiplin sains sosial, kejuruteraan dan sains tulen (*broad based*).
- Calon-calon pelajar adalah terdiri daripada siswazah dari kelompok sains gunaan, sains tulen dan kejuruteraan.
- Asas pengetahuan yang spesifik dari pelbagai disiplin yang ada di kalangan pelajar-pelajar ini dijangka tidak menimbulkan masalah dalam menyajikan kurikulum bercorak interdisiplin (*breadth*); namun masalah *foundation* akan timbul sekiranya wacana akademik yang mendalam (*depth*) cuba dilakukan untuk disiplin tertentu.
- Justeru, program ini dianggap sebagai program yang 'terminal' dari segi pengkhususan akademiknya – yakni bukan suatu program yang menyediakan pengkhususan akademik yang mencukupi bagi mana-mana program ijazah lanjutan (sarjana atau kedoktoran).

Dengan yang demikian, peringkat ijazah yang difikirkan paling sesuai bagi program ini ialah Diploma Pasca Siswazah.

3.3 Keperluan pengiktirafan badan professional: Tiada.

4. FAKULTI YANG MEMOHON

4.1 **Nama fakulti yang memohon:** Fakulti Sains dan Teknologi Sumber (FSTS), Unimas.

4.2 **Sejarah ringkas fakulti:** FSTS adalah antara tiga fakulti yang pertama ditubuhkan di Unimas pada tahun 1993. Pada sesi pengajian 2003/2004 FSTS mempunyai seramai 68 staf akademik dan 34 staf sokongan. Staf akademik terdiri daripada 6 Profesor, 15 Profesor Madya, 37 Pensyarah dan 10 Tutor.

Jumlah pelajar prasiswazah FSTS pada sesi pengajian 2003/2004 ini ialah 606, meningkat sebanyak 10% berbanding dengan sesi sebelumnya. Kursus-kursus peringkat prasiswazah yang ditawarkan, berjumlah 120, adalah dari lima program pengajian:

Program Kimia Sumber
Program Bioteknologi Sumber
Program Sains dan Pengurusan Sumber Haiwan
Program Sains dan Pengurusan Sumber Tumbuhan, dan
Program Sains dan Pengurusan Sumber Akuatik

Pada sesi 2003/2004 FSTS juga telah menerima masuk empat pelajar peringkat kedoktoran, 30 pelajar sarjana sains melalui penyelidikan dan 11 pelajar program sarjana sains sekitaran yang ditawarkan melalui kerja kursus.

Semenjak penubuhannya, FSTS telah melahirkan seramai 604 orang siswazah

5. PERINGKAT PENGAJIAN

Peringkat lepasan ijazah pertama (di antara sarjanamuda dan sarjana)

6. TAHUN DIMULAKAN

Program ini dirancang untuk ditawarkan mulai semester 3 sesi pengajian 2004/2005 (April 2005).

7. JANGKA MASA DAN KAEDAH PENGAJIAN

7.1 **Mode:** Program yang dicadangkan ini akan disasarkan terutamanya kepada pegawai-pegawai kerajaan dan swasta dalam perkhidmatan (*mid-career professionals*). Pengalaman sehingga ini menunjukkan bahawa sebahagian besar calon-calon dari golongan ini lebih menggemari program yang dilaksanakan secara *flexi-time*, contohnya pada hujung minggu dan hari-hari kelepasan lain untuk membolehkan mereka melanjut pelajaran sambil bekerja.

7.2 **Jangka masa:** Program ini dapat diselesaikan dalam tempoh tidak melebihi 12 bulan. Tempoh tersebut akan dibahagikan kepada 9 bulan kerja kursus dan 3 bulan untuk menyiapkan kertas projek.

7.3 **Kaedah penawaran program:** Program ini terdiri daripada 22 jam kredit kerja kursus, 2 kredit latihan lapangan bersepadu dan 3 kredit bagi penyediaan kertas projek.

7.4 **Bahasa Pengantar:** Bahasa Inggeris. Program ini diwujudkan melalui pembiayaan EU-ASIALINK dengan penglibatan *resource persons* dari luar negara. Ianya disasarkan juga kepada pelajar-pelajar dari luar negara selain dari pelajar tempatan.

8. JUSTIFIKASI MENGADAKAN PROGRAM

8.1 Polisi Semasa dan Keperluan Tenaga Manusia

Keseluruhan polisi kerajaan Malaysia (malah juga negara-negara lain di wilayah ini) terhadap pengurusan guna tanah dan sumber asli adalah bermatlamatkan pembangunan ekonomi negara melalui penggunaan sumber secara mampan. Pelbagai dasar dan program telah dirintis bagi menggalakkan integrasi

pengurusan alam sekitar dan sumber asli secara mampan dalam perancangan dan pelaksanaan projek-projek pembangunan.

Di Malaysia, Dasar Kepelbagaian Biologi Kebangsaan dan Rancangan Tindakan Kepelbagaian Biologi telah direncana dan dilancarkan pada bulan April 1998. Konvensyen RAMSAR bagi pemuliharaan dan perlindungan tanah paya telah digunapakai. Petunjuk untuk pengurusan hutan mampan telah juga disediakan dan telah diterima oleh Pertubuhan Pembalakan Tropika Antarabangsa (ITTO) dan mula diimplimentasikan pada tahun 2000. Dasar Pengurusan Zon pesisiran secara bersepadu juga sedang dirangka. Majlis Air Kebangsaan telah ditubuhkan pada tahun 1998 bagi memastikan bahawa pembangunan tidak memusnahkan sumber air serta mencari jalan yang sewajarnya untuk meningkatkan bekalan air penduduk dan mengurangkan pembaziran air.

Kejayaan dalam mengimplimentasi polisi-polisi dan dasar-dasar di atas bergantung sepenuhnya kepada kewujudan sumber manusia yang mencukupi, baik dari segi jumlah mahupun tahap kemampuan (kualiti), dalam agensi-agensi tempatan – kerajaan mahupun swasta.

8.2 Keperluan Semasa dalam Pengurusan Tanah Gambut

Sekitar satu per empat daripada keseluruhan kawasan tanah gambut dunia terletak di kepulauan Borneo. Tanah-tanah gambut ini mempunyai kepentingan ekologi sejagat kerana di sinilah terdapatnya saki baki hutan hujan tanah rendah yang menjadi habitat penting kepada banyak spesies haiwan dan tumbuhan yang terancam. Selain itu, kawasan tanah gambut juga merupakan takungan karbon dan air yang amat besar kuantitinya serta mempunyai kepentingan ekonomi yang jelas dari segi bekalan hasil hutan dan tanah untuk penempatan dan pertanian.

Namun, disebabkan kurangnya kesedaran serta ketidakfahaman mengenai amalan pengurusan mampan, terdapat projek-projek pertanian dan pembangunan di tanah gambut yang tidak memberikan pulangan yang diharapkan atau mengakibatkan kesan sekitaran yang tidak diingini.

Di Malaysia (juga di Indonesia), kawasan tanah gambut terus diterokai (dieksploitasi) secara meluas terutama oleh sektor pertanian (paling ketara kelapa sawit), dan saban tahun sebahagian daripada kawasan tersebut termusnah oleh kebakaran. Di Sarawak, sekitar 0.5 juta ha kawasan tanah gambut telah ditebusguna dan keluasan yang hampir sama telah termusnah pada tahun 1997 – 1998 oleh kebakaran. Kemusnahan ini sekaligus menghapus tumbuhan dan hidupan liar yang sebahagiannya belum pernah diinventorikan serta melupuskan kesemua simpanan bijian (seedbank) yang terdapat pada tanah tersebut. Kebakaran begini juga bertanggungjawab kepada pelepasan karbon yang besar kuantitinya kepada atmosfera.

Program pengajian yang dicadangkan akan memberikan perhatian khusus terhadap isu pengurusan tanah secara mampan dengan merujuk secara spesifik kepada pengurusan tanah gambut tropika. Kelemahan dalam pengurusan tanah gambut secara mampan dan bersepadu adalah ketara di negara ini kerana personalia yang dipertanggungjawab mengawasi dan menyelia projek (termasuk projek pemuliharaan di kawasan tanah gambut), walaupun mungkin seorang siswazah, tidak memiliki pengetahuan terkhusus untuk menangani sumber dan persekitaran yang agak unik ini. Justeru, pendidikan peringkat diploma pasca siswazah ini diperlukan untuk meningkatkan kemampuan mereka mengurus sumber tersebut secara mampan dan bersepadu melalui pertimbangan saintifik, teknikal, sosial, ekonomi dan sebagainya.

8.3 Kumpulan Sasaran

Kategori kumpulan sasaran serta kemanfaatan program ini baik secara langsung atau tidak langsung adalah seperti berikut:

Kumpulan Sasaran Secara Langsung	Kumpulan Sasaran Secara Tidak Langsung
<p><u>1. Pegawai dalam Perkhidmatan:</u></p> <ul style="list-style-type: none"> • Pegawai pertanian • Pegawai pengairan dan saliran • Pegawai/pengurus kerja raya (jurutera awam, bekalan air dsb.) • Sektor swasta e.g. juruperunding (kejuruteraan, persekitaran, pertanian, juru ukur, arkitek dsb.) • Pegawai perhutanan • Pengurus/perancang projek pertanian komersil. • Pegawai alam sekitar • Pegawai penyelidikan pertanian • Pegawai-pegawai kementerian negeri dan pusat (pertanian, infrastruktur, kerajaan tempatan) • Pegawai perancang pembangunan peringkat negeri, bahagian dan daerah • Pegawai jabatan tanah dan ukur • Pegawai dari badan-badan bukan kerajaan yang bergiat dalam inisiatif pemuliharaan • Ahli profesional lain yang berminat dengan sebahagian daripada modul program ini. <p><u>2. Graduan baru</u></p> <ul style="list-style-type: none"> • Graduan kejuruteraan awam • Graduan program sains sekitaran • Graduan biologi (tumbuhan, haiwan) dan kimia <p><u>3. Organisasi lain</u></p> <ul style="list-style-type: none"> • Semua organisasi yang terlibat secara langsung dalam pembangunan pertanian, prasarana, pemuliharaan dan pengurusan tanah gambut. 	<ul style="list-style-type: none"> • Kementerian-kementerian dan agensi-agensinya yang berkaitan dengan pengurusan (perancangan dan pembangunan) sumber. • Kementerian dan agensi yang berkaitan dengan pengurusan alam sekitar. • Kementerian dan agensi yang berkaitan dengan perusahaan utama. • Kementerian dan agensi yang berkaitan dengan pembangunan prasarana. • Agensi perancang ekonomi negeri peringkat kebangsaan dan negeri. <p>Peneraju dan penaja</p> <ul style="list-style-type: none"> - European Union - Unimas - Universitas Palangka Raya - Leicester University - Wageningen University

8.4 Pembiayaan Program

Program akademik terkhusus ini akan direalisasikan melalui pengembelian tenaga pengajar yang berpengalaman dari Unimas dan beberapa institusi tempatan dan luar negara. Pembiayaan untuk tahun pertama bagi program yang dicadangkan ini disediakan oleh EU-ASIALINK. Institusi-institusi pengajian lain yang turut terlibat dalam rangkaian kerjasama biayaan program EU-ASIALINK ini ialah Wageningen University (Holland), Leicester University (UK) dan Universitas Palangka Raya (Indonesia).

9 MATLAMAT PROGRAM

9.1 Rasional

Seperti yang dinyatakan pada Bahagian 8, program pengajian yang dicadangkan ini akan memberi perhatian khusus terhadap isu pengurusan tanah secara mampan dengan merujuk secara spesifik kepada pengurusan tanah gambut tropika. Kelemahan dalam pengurusan tanah gambut secara mampan dan bersepadu adalah ketara di negara ini kerana personalia yang dipertanggungjawab tidak memiliki pengetahuan terkhusus untuk menangani sumber dan persekitaran yang agak unik ini.

Justeru, program pengajian ini telah dirangka berasaskan matlamat untuk meningkatkan kemampuan mereka mengurus sumber tersebut secara mampan dan bersepadu melalui pertimbangan saintifik, teknikal, sosial, ekonomi dan sebagainya. Secara khusus program ini bertujuan:

- Membina suatu kurikulum pendidikan peringkat diploma pasca siswazah berciri interdisiplin yang relevan dengan keperluan latihan di negara ini iaitu dalam bidang pengurusan tanah gambut secara mampan.
- Menguatkan asas sumber manusia di negara ini dengan keupayaan mengurus sumber tanah gambut melalui pendidikan yang bercorak multidisiplin dan berbentuk gunaan.
- Meningkatkan tahap kepekaan dan kesedaran di kalangan pelajar mengenai pentingnya mengurus tanah gambut secara bijak (*wise management*) sebagaimana yang dihasratkan oleh agenda tempatan dan paradigma pembangunan mampan.
- Melibatkan diri dalam suatu rangkaian kerjasama di peringkat antarabangsa dalam bidang pendidikan dan penyelidikan berkaitan dengan pengurusan mampan tanah gambut.

9.2 Kesesuaian dengan visi dan misi universiti

Misi Unimas adalah untuk tampil sebagai sebuah universiti bertaraf antarabangsa dan institusi ilmunan yang terpilih oleh kalangan pelajar dan tenaga pengajar melalui kecemerlangan dalam pengajaran, penyelidikan dan keserjanaan.

Misi ini akan dicapai melalui penawaran berbagai peluang pendidikan, latihan dan khidmat keserjanaan serta melalui pengembelian ilmu secara strategik dan inovatif untuk mempertingkatkan kualiti budaya serta kesejahteraan bangsa dan negara.

Matlamat Pertama dalam Rancangan Strategik Unimas menyebut secara khusus hasrat untuk mengembang dan memajukan ilmu yang **relevan dan berguna**. Dalam konteks justifikasi dan matlamat yang diberikan sebelum ini (Perkara 8 dan 9), Program Pengurusan Tanah Gambut yang dirancang adalah amat menepati misi pendidikan di Unimas.

10 HASIL PEMBELAJARAN

Program ini akan menghasilkan kumpulan siswazah yang memiliki kemampuan khusus dalam melakukan tugas-tugas perancangan, penyelidikan, penyeliaan dan pengurusan sumber tanah gambut secara mampan dan bersepadu. Kumpulan siswazah ini berkeupayaan untuk menilai situasi semasa dan potensi

sesuatu kawasan tanah gambut dalam konteks kedudukan geografi dan sosio-ekonomi. Mereka juga berupaya menyediakan kerangka perancangan mengenai penggunaan, pengurusan dan pemantauan tanah gambut serta melaksanakan kerja-kerja pengurusan dan penyeliaan yang berkaitan. Kemampuan atau kebolehan tersebut didasarkan pada kefahaman menyeluruh dari segi teori dan amalan tentang pelbagai aspek ekologi, ciri asas tanah dan hidrologi kawasan gambut, selain daripada kemahiran dalam teknologi-teknologi sesuai untuk inventori sumber, penggunaan dan pengurusan kawasan gambut dengan mengambil kira dimensi kemanusiaan serta ekonomi setempat dan di peringkat negara.

Untuk mencapai matalamat di atas, kursus-kursus atau modul-modul digubal dengan tujuan menyampaikan serta menerapkan ilmu-pengetahuan, kemahiran dan sikap positif kepada calon. Hasil pembelajaran berupa kompetensi dalam subjek modul-modul berkenaan, masing-masing menjurus kepada pengetahuan dan kemahiran untuk pengurusan mapan tanah gambut tropika. Masa dan bimbingan yang mencukupi diberi kepada calon supaya dapat membina asas teori, membiasa dan memahirkan diri dengan amalan serta teknologi sokongan seperti ICT, GIS dan penderiaan jauh, serta manipulasi dan penstoran data. Contoh dan kajian kes dalam setiap modul, serta kerja lapangan secara berkumpulan akan menghasilkan keupayaan untuk menyelesaikan masalah dan membuat keputusan secara kreatif, baik dalam keadaan bersendirian mahupun berpasukan. Tugasan, pelaksanaan projek penyelidikan mengikut masa yang diperuntukkan dan pembentangan seminar akan meningkatkan disiplin, jati diri dan kebolehan berkomunikasi calon.

Hasil pembelajaran yang dijangka dari setiap kursus yang ditawarkan adalah seperti berikut:

Ecology, Natural Resources and Environment

- Memperoleh kefahaman tentang ekologi sebagai asas pengurusan sumber asli dan alam sekitar dengan penekanan khas kepada kawasan tanah gambut
- Keupayaan mentafsir dan menilai kawasan yang sensitif serta kesan dan impak degradasi terhadapnya.
- Mempunyai pengetahuan baik mengenai konvensyen dan sistem pengurusan alam sekitar serta kaedah penilaian impak.

Water Resources and Hydrology of Peatland Catchments

- Memperoleh kefahaman mengenai dan kepentingan pertalian antara hidrologi dan sumber air
- Memperoleh kemahiran untuk mengenalpasti dan mengguna pakai analisis hidrologi dan pemodelan untuk pembangunan mampan kawasan tadahan air dalam persekitaran gambut.

Human Dimensions and Resource Economics in Peatland Management

- Memahami dimensi kemanusiaan dan isu-isu dalam perancangan dan pentaksiran projek-projek pembangunan; ini termasuk kefahaman terhadap objektif, skop, jenis, kitaran dan proses perancangan.
- Kefahaman terhadap kaitan antara projek pembangunan dengan nilai sumber dan alam sekitar. Ini merangkumi kefahaman terhadap konsep-konsep asas perakaunan sumber dan ekonomi persekitaran; sumber tanah, air dan hutan serta pengurusanpenilaian impak sosial

Peat Soils and Land Use

- Memperoleh kefahaman mendalam mengenai genesis dan ciri tanah gambut serta pemetaannya

- Mempunyai kefahaman tentang kualiti dan prestasi tanah serta prinsip penilaian tanah
- Mampu menilai kesesuaian kawasan tanah gambut untuk pelbagai penggunaan serta implikasinya terhadap pengurusan dan pemuliharaan

GIS and Remote Sensing for Peatland Management

- Mempunyai kefahaman mendalam tentang prinsip penderiaan jauh serta teknologi GIS
- Mempunyai kemahiran dalam operasi GIS seperti 'elevation and spatial modeling and manipulation' serta penstoran data sumber tanah gambut.

Interdisciplinary Research Methodologies, Field Course and Research Project in Peatland Management

- Mempunyai kefahaman yang kukuh yang disokong dengan pengalaman amali mengenai kaedah-kaedah penyelidikan sains tulen dan sains sosial, terutama bagi projek-projek yang berkaitan dengan sumber tanah gambut dan persekitarannya
- Mampu menghadapi cabaran kerja secara berkumpulan dalam menangani isu kehidupan sebenar secara sistematik
- Mempunyai pengalaman untuk menyediakan cadangan projek dan laporan teknikal mengikut format tertentu

11 KAJIAN PASARAN

Dalam abad ke-21 dianggarkan dunia akan membelanjakan lebih USD400 bilion setahun bagi membiayai usaha-usaha pemuliharaan dan perlindungan alam sekitar, termasuk membiayai pelbagai jawatan/bidang kerja yang berkaitan. Bidang-bidang tugas yang perlu dan akan ditangani oleh para pengurus alam sekitar di seluruh dunia, secara serentak ialah membaikpulih ekosistem yang telah termusnah ke tahap yang 'sihat'; mengurangkan semimum mungkin kesan negatif kegiatan semasa ke atas alam sekitar; dan membina cara hidup yang benar-benar mampan untuk masa depan.

Tempoh 15 tahun yang akan datang – yakni baki masa yang ada untuk menyediakan Malaysia ke era negara maju mulai tahun 2020 – merupakan tempoh kritikal bagi pembangunan kerjaya dalam bidang pengurusan alam sekitar. Desakan keperluan semasa, serta kewajiban yang lebih mencabar pada masa hadapan mendesak Malaysia menyediakan lebih banyak para pengurus alam sekitar dengan tahap kelayakan yang sesuai. Cabaran pada masa hadapan bukan sekadar mengawal pencemaran, malah mengelakkannya; bukan setakat mengurangkan kadar kemusnahan habitat dan tanah, malah membaikpulih (*restoring*) kemusnahan yang telah berlaku; dan bukan sekadar mengawalselia kegiatan mampan, malah menerbitkan idea-idea baru ke arah itu.

Satu kajian pasaran telah dilakukan pada bulan Januari 2004 bagi menilai sambutan pihak-pihak berkaitan terhadap Program ini. Soal-selidik (LAMPIRAN 1A) telah diedarkan kepada 34 agensi *stakeholders* yang berkaitan dalam sektor awam dan swasta di seluruh negara (LAMPIRAN 1B). Ini termasuklah:

- Setiausaha Kerajaan Negeri
- Setiausaha Tetap Kementerian-kementerian berkaitan
- Ketua agensi-agensi yang relevan dari sektor pertanian, perhutanan, kerja raya, pengurusan sumber dan alam sekitar, pengairan dan saliran, pembangunan tanah, geosains dsb.
- Firma perundingan

Responden diberi masa 1.5 bulan untuk memberikan maklumbalas. Selepas 3 bulan hanya 14 agensi yang mengembalikan borang soal selidik. Rumusan utama dari kajian pasaran ini adalah seperti berikut:

- 71.4% berpendapat program ini memenuhi prinsip asas disiplin. 92.9% menyatakan program ini memenuhi segala teori-teori asas yang perlu.
- 71.4% berpendapat bahawa konsep dan prinsip yang digunakan dalam membangunkan program ini adalah relevan dengan konteks keperluan semasa. 85.7% percaya kandungan kursus yang dicadangkan dapat membantu membina satu program yang kuat dan 92.9% menegaskan tiada kursus yang bakal ditawarkan tidak relevan.
- 85.7% berpendapat komponen yang melibatkan penggunaan ICT adalah mencukupi atau sekadar memadai. Kesemua responden percaya aspek penakulan kuantitatif mencukupi atau memadai.
- 78.6% berpendapat tempoh pengajian yang dicadangkan adalah mencukupi.
- Antara bidang-bidang pekerjaan yang disenaraikan sebagai sesuai bagi calon lepasan program ini ialah:
 - a) Pengurusan alam sekitar
 - b) Perundingan persekitaran
 - c) Penyelidikan dan pembangunan (Pegawai Penyelidik)
 - d) Perancangan pembangunan
 - e) Tanah dan Ukur
 - f) Pengurusan sumber
 - g) Pengurusan sungai
 - h) Perancangan projek
 - i) Pengurusan ladang/estet
 - j) Pengurusan Hutan
 - k) Hidrologi hutan
- 64.3% memaklumkan graduan dari program ini dapat mengisi 1 – 3 jawatan dalam organisasi mereka, dengan julat gaji antara RM1,000 – RM3,000.
- 71.4% menyatakan mereka akan menggalakkan kakitangan mereka mengikuti program ini.

Dokumen-dokumen yang berkaitan dengan Kajian Pasaran serta rumusan penuh hasil soal selidik ini diberikan pada LAMPIRAN 1.

12 STRUKTUR KURIKULUM

12.1 Cadangan Kursus/Modul

Program ini terdiri daripada tiga modul kesemuanya dengan jumlah 28 jam kredit. Taburan jam kredit serta tajuk-tajuk modul dan kursus yang ditawarkan adalah seperti berikut:

Modul Teras (12 jam kredit) terdiri dari:

- *Ecology, Natural Resources and Environment* (4 jam kredit)
- *Water Resources and Hydrology of Peatland Catchments* (4 jam kredit)
- *Peat Soils and Land Use* (4 jam kredit)

Modul Pelengkap (8 jam kredit) terdiri dari:

- *Human Dimensions and Resource Economics in Peatland Management* (4 jam kredit)
- *GIS and Remote Sensing for Peatland Management* (4 jam kredit)

Modul *Experiential* (8 jam kredit) terdiri dari:

- *Interdisciplinary Research Methodologies* (3 jam kredit)
- *Field course* (2 jam kredit)
- *Research Project (Project Paper)* (3 jam kredit)

Setiap calon dikehendaki lulus kesemua kursus yang ditawarkan di atas untuk layak dianugerahkan Diploma Pasca Siswazah (Pengurusan Tanah Gambut).

12.2 Sinopsis Kursus

Sinopsis bagi setiap kursus yang dicadangkan adalah seperti pada Lampiran 2.

12.3 Kandungan dan Struktur Program

Kurikulum ini bertujuan menyediakan bahan serta modul latihan yang dapat menerapkan pengetahuan semasa dan hasil penyelidikan terkini di kalangan pelajar bagi meningkatkan kemahiran dan kepakaran mereka dalam penggunaan sumber asli, khususnya sumber tanah gambut, secara mampan.

Bagi maksud di atas suatu kurikulum yang merangkumi aspek-aspek ekologi; sumber asli dan alam sekitar; sumber air dan hidrologi; tanah gambut dan guna tanah; dimensi kemanusiaan dan ekonomi sumber, GIS dan penderiaan jauh sebagai teknologi sokongan, serta latihan lapangan dan projek penyelidikan telah dibentuk.

Kandungan program di atas disusun dalam tiga modul pembelajaran seperti disenaraikan dalam Bahagian 12.1. Kerelevanan setiap kursus dalam modul-modul berkenaan dalam konteks keperluan tenaga terlatih dan berpengtahuan bolehlah digambarkan secara berikut:

- *Ecology, Natural Resources and Environment* – untuk menyampaikan ilmu terkini mengenai ekosistem, isu dan masalah pengurusannya serta kaitannya dengan pengurusan mampan tanah gambut.
- *Water Resources and Hydrology of Peatland Catchments* – untuk menerapkan kefahaman mengenai isu-isu dan strategi-strategi berkesan berkaitan dengan pengurusan sumber air secara bersepadu, serta kefahaman tentang hidrologi dan kemahiran mengurus sumber air tanah di kawasan tanah gambut.
- *Human Dimensions and Resource Economics in Peatland Management* – untuk mengembangkan skop pertimbangan dalam *decision making* agar aspek-aspek kemanusiaan dan ekonomi sumber diintegrasikan dalam setiap perancangan pembangunan.
- *Peat Soils and Land Use* – untuk meningkatkan kefahaman mengenai ciri penting tanah gambut serta kemampuan menilai kesesuaian kawasan tanah gambut untuk pelbagai penggunaan serta implikasinya terhadap pengurusan dan pemuliharaan.
- *GIS and Remote Sensing for Peatland Management* – untuk menerapkan kefahaman tentang prinsip penderiaan jauh serta memberikan kecekapan

asas dalam penggunaan teknologi RS-GIS dalam pengurusan dan penilaian maklumat *spatial* persekitaran gambut.

- *Interdisciplinary Research Methodology, Field Course dan Research Project/Project Paper in Peatland Management*; kursus-kursus dalam modul *experiential* ini bertujuan menyajikan pengetahuan mengenai kaedah-kaedah yang relevan dalam penyelidikan sains semulajadi dan sains sosial dengan menekankan pengalaman *hands on* di makmal dan lapangan. Peluang diberi kepada pelajar untuk mempraktikkan metodologi yang dipelajari melalui latihan lapangan serta projek mini yang melibatkan permasalahan sebenar di luar bilik kuliah.

Setiap kursus dipecahkan mengikut unit-unit pembelajaran yang bersesuaian dari segi liputan akademik dan peruntukan masanya.

Pendekatan umum dalam pengendalian kursus ialah pengenalan dan huraian kursus secara generik serta disokong dengan (a) contoh dan kajian kes yang berhubung kait dengan pengurusan tanah gambut, dan (b) pengalaman *hands on* di makmal dan di lapangan.

Aliran konsep dari segi penekanan terhadap *subject matter* boleh digambarkan mengikut skema berikut:

Pengurusan sumber asli → guna tanah umum → kawasan pamah tropika → tanah gambut tropika

Prinsip yang dijadikan garispanduan dalam merangka kurikulum yang turut memperlihatkan inovasi dalam kendalian program ialah dari dua aspek:

- 1) Pendekatan multi- dan antara- disiplin seperti eko-hidrologi yang menjadikan program lebih holistik.
- 2) Penerapan pengetahuan serta hasil penyelidikan primer dan terkini ke dalam modul. Ini dimungkinkan menerusi sokongan langsung dari program R&D berkaitan dengan pengurusan strategik tanah gambut tropika (Projek STRAPEAT biayaan EU yang melibatkan dua negara Asia Tenggara – Malaysia dan Indonesia dan tiga negara Eropah – UK, Belanda dan German).

Penawaran

Sebilangan besar calon yang disasarkan adalah terdiri daripada mereka yang sedang bekerja. Oleh demikian program akan dilaksanakan secara sepenuh masa pada hujung minggu (Sabtu dan Ahad), pada kadar 10-12 jam kuliah seminggu. Cuti rihaat seminggu diberikan selepas setiap modul. Berdasarkan 14 jam *contact hours* bagi setiap kredit, jangkamasa pengajian (diatur mengikut urutan penawaran kursus) adalah seperti jadual berikut:

	Tajuk Kursus	Kredit	Jangkamasa (minggu)
1	Ecology, Natural Resources and Environment	4	5
	Cuti		1
2	Water Resources and Hydrology of Peatland Catchments	4	5
	Cuti		1

3	Peat Soils and Land Use	4	5
Cuti			1
4	Interdisciplinary Research Methodologies	3	3.5
5	Field Course	2	2 (sepanjang masa)
Cuti			1.5
6	Human Dimensions and Resource Economics in Peatland Management	4	5
Cuti			1
7	GIS and Remote Sensing for Peatland Management	4	5
Cuti			1
8	Research Project	3	12
Total		28	49

Penilaian

Setiap kursus mensyaratkan calon hadir sekurang-kurangnya 80% daripada jumlah jam kuliah dan kerja lapangan untuk layak menduduki peperiksaan/penilaian. Penilaian adalah dalam bentuk kombinasi tugas, laporan kerja lapangan/amali, pembentangan seminar serta ujian dan peperiksaan mengikut wajaran yang dinyatakan di akhir sinopsis tiap-tiap modul seperti dipaparkan dalam LAMPIRAN 2.

Pemarkahan dan penggredan adalah mengikut sistem semasa yang diamalkan oleh Unimas (LAMPIRAN 3). Calon perlu memenuhi semua keperluan modul dan lulus setiap kursus dengan sekurang-kurangnya **Gred C+**.

Untuk pengurniaan diploma calon perlu mencapai Gred Nilai Purata Kumulatif (**CGPA**) = **2.5** bagi keseluruhan program.

Pemantauan dan Pemantapan Kualiti

Bagi maksud memantap dan meningkatkan kualiti program, dua jawatankuasa akan ditubuhkan untuk mengendalikan dua aktiviti seperti berikut:

- (a) Jawatankuasa Penasihat Saintifik dan Kurikulum
 - Keanggotaan terdiri daripada Timbalan Naib Canselor (Akademik) Unimas atau wakilnya; Penyelaras-penyelaras Projek PEATWISE dari Malaysia (Unimas), Wageningen University, University of Leicester dan Universitas Palangka Raya; seorang profesor dalam bidang sains tanah dari Fakulti Sains & Teknologi Sumber, seorang wakil dari Jawatankuasa Penyelarasan R&D Tanah Gambut Sarawak dan seorang pakar perunding tempatan dalam bidang pengurusan tanah gambut.
 - Ke kerapannya bersidang – sekurang-kurangnya sekali setahun
 - Bidang tugas yang utama ialah untuk meneliti kandungan kurikulum program dari kesesuaian/kerelevanan semasa dan memberi input mengenai langkah-langkah perlu untuk lebih menjayakan program ini.
- (b) Jawatankuasa Program [= J/K atau 'Lembaga' Pengajian (JKP)]
 - Dipengerusikan oleh Dekan Fakulti Sains dan Teknologi Sumber atau wakilnya
 - Keahlian adalah sama seperti J/K Pasca Siswazah Fakulti iaitu terdiri daripada 5 orang Ketua Teras berikut:

- Teras Sains dan Pengurusan Sumber Tumbuhan
- Teras Sains dan Pengurusan Sumber Haiwan
- Teras Sains dan Pengurusan Sumber Akuatik
- Teras Kimia Sumber
- Teras Bioteknologi Sumber
- Ahli tambahan adalah satu orang profesor dalam bidang sains tanah dan hidrologi dan jika perlu akan *dicoopt* juga seorang profesor dalam bidang hidrologi.
- Bidang tugas utama J/K ini ialah memantau perjalanan harian program serta mengesahkan keputusan penilaian untuk perakuan J/K Pasca Siswazah dan Senat Unimas.

Langkah-langkah lain termasuklah:

- menempatkan program ini dalam rangkakerja kod amalan kualiti JPT;
- menjalankan kajian 'tracer' terhadap graduan secara berkala; dan
- mengemukakan soal selidik terhadap majikan graduan secara berkala.

Pengiktirafan Badan Profesional

Tidak berkenaan

Bahasa Pengantar

Untuk memberi laluan kepada pengajaran-pembelajaran bersama dengan rakan EU-ASIALINK yang lain serta membuka peluang kemasukan pelajar-pelajar dari luar negara, terutama dari wilayah Asia Tenggara, program ini ditawarkan dalam Bahasa Inggeris.

13 ETIKA DAN KEMANUSIAAN

Aspek etika dan kemanusiaan diterapkan ke dalam program ini melalui tiga kursus:

- a) Kursus *Ecology, Natural Resources and Environment*, akan menyelitkan wacana mengenai *environmental ethics*;
- b) Kursus *Human Dimensions and Resource Economics in Peatland Management* akan memasukkan perbincangan dimensi kemanusiaan dalam perancangan pembangunan secara menyeluruh; dan
- c) Kursus *Interdisciplinary Research Methodologies* akan menyentuh secara spesifik mengenai *research ethics*, baik dalam penyelidikan *natural sciences* mahupun *social sciences*.

14 UNJURAN PELAJAR

Berdasarkan fakta bahawa bidang pengajian yang ditawarkan ini menjurus kepada suatu aspek yang begitu terkhusus, serta hasrat Fakulti untuk memastikan wujudnya suatu suasana pembelajaran boleh menggalakkan penglibatan setiap pelajar secara aktif, maka kemasukan pelajar ke dalam program ini pada setiap pengambilan akan dihadkan bilangannya. Bagi maksud ini, bilangan optimum yang difikirkan ialah 25 pelajar, dan bilangan ini akan dikekalkan bagi setiap pengambilan seperti berikut:

Tahun	2005	2006	2007	2008	2009
Pengambilan	25	25	25	25	25

15 SYARAT-SYARAT KEMASUKAN

Calon-calon bagi program ini dimestikan mempunyai ijazah pertama dengan PNGK sekurang-kurangnya 2.5 dari mana-mana institusi pengajian tinggi yang diiktiraf oleh Senat Unimas; atau kelayakan lain yang setara dengan ijazah pertama serta kelayakan atau pengalaman berkaitan yang diiktiraf oleh Senat Unimas.

Calon program ini diutamakan kepada kakitangan kerajaan dan swasta yang mempunyai Ijazah Sarjana Muda dalam mana-mana bidang dari gugusan sains, kejuruteraan atau pertanian yang diiktiraf oleh Senat Unimas yang bidang tugas mereka berkaitan dengan pengurusan dan pembangunan tanah/paya gambut. Calon-calon lain akan juga dipertimbang berdasarkan kelayakan dan kekosongan tempat.

Peraturan peperiksaan dan penganugerahan Diploma Pasca Siswazah (Pengurusan Tanah Gambut) ini akan tertakluk sepenuhnya kepada peraturan-peraturan yang telah ditetapkan dalam Kaedah dan Peraturan Pembelajaran Pasca Siswazah Unimas (LAMPIRAN 3).

16 IMPLIKASI KAKITANGAN, FIZIKAL DAN KEWANGAN

a. Implikasi Kakitangan

Program ini akan memanfaatkan staf akademik yang sedia ada di Unimas serta beberapa pakar dari agensi kerajaan dan juruperunding tempatan. Peruntukan juga disediakan oleh geran ASIALINK untuk pembangunan kapasiti dua hingga tiga orang tenaga akademik Unimas melalui penempatan sementara di Universiti Wageningen dan/atau Leicester.

Secara khusus, tenaga pengajar bagi program ini akan didapatkan dari sumber-sumber berikut:

- kakitangan akademik Unimas dari fakulti-fakulti yang berkaitan dengan bidang pengajian yang ditawarkan, contohnya dari Fakulti Sains dan Teknologi Sumber, Fakulti Sains Sosial dan Institut Kepelbagaian Biologi dan Pemuliharaan Alam Sekitar;
- kakitangan akademik yang dijemput dari institusi pengajian tinggi tempatan, contohnya dari UKM dan UPM;
- pakar-pakar dari agensi penyelidikan, firma dan perunding tempatan, contohnya dari FRIM, MARDI, Jabatan Pertanian, Jabatan Pengairan dan Saliran, Jabatan Alam Sekitar, Lembaga Pengurusan Sumber Asli dan Alam Sekitar Sarawak, dan lain-lain;
- institusi-institusi dari rangkaian kerjasama PEATWISE khususnya dari Wageningen University, Holland dan University of Leicester, U.K.

Antara kakitangan yang dikenalpasti adalah seperti yang diberikan pada (tetapi tidak terhad kepada) LAMPIRAN 4.

b. Implikasi Fizikal

Program hujung minggu ini akan memanfaatkan prasarana akademik yang sedia ada di Kampus Unimas, Kota Samarahan. Ini termasuklah:

- Bilik kuliah
- Kemudahan pengajaran (peralatan multimedia, reprografi dsb.)
- Kemudahan kerja lapangan seperti Water quality (HACH) kit, hydraulic modelling package, hydrolab surveyor, GPS, flow meters, depth finders dsb.
- Kemudahan makmal dan penyelidikan seperti makmal sains tanah, makmal kimia, makmal GIS, makmal kualiti air, makmal hidrologi, museum dan herbarium, peta dan imej satelit, PC dan lesen ArcView. Gran EU-AsiaLink akan menambah lagi dua buah PC kepada bilangan yang sedia ada, khusus untuk kerja-kerja penyediaan bahan on-line/jarak jauh dan RS-GIS.
- Kemudahan sokongan IT menggunakan rangkaian setempat (LAN) yang tersedia
- Kemudahan perpustakaan.

c. Implikasi kewangan

Pembiayaan program ini bagi tahun pertama adalah ditanggung secara separa oleh geran ASIALINK. Jumlah peruntukan yang telah diluluskan oleh penganjur (EU) bagi program ini adalah sebanyak RM 300,000.00. Elemen-elemen kos yang dibiayai oleh geran ini adalah merangkumi item-item berikut:

- Elaun pengurusan projek
- Kos operasi/*overhead*
- Subsidi yuran pelajar
- Elaun syarahan, penyediaan bahan pengajaran dan penyemakan skrip peperiksaan.

Sebarang kos tambahan pada tahun pertama dan keseluruhan kos pengendalian program bagi tahun-tahun berikutnya akan ditampung melalui yuran pengajian yang dikenakan ke atas pelajar.

17 PROGRAM AKADEMIK SEDIA ADA

Program-program ijazah pertama di Unimas yang relevan dengan program Diploma Pasca Siswazah (Pengurusan Tanah Gambut) yang dicadang ini adalah:

- Sains dan Pengurusan Sumber Haiwan
- Sains dan Pengurusan Sumber Akuatik
- Sains dan Pengurusan Sumber Tumbuhan
- Bioteknologi Sumber
- Kimia Sumber
- Kejuruteraan Awam
- Pengurusan dan Perancangan Pembangunan
- Ekonomi dan Organisasi Industri
- Perubatan
- Politik dan Kerajaan
- Kerja-kerja Sosial

Pada masa ini FSTS sememangnya ada menawarkan program-program pada peringkat Sarjana dan PhD secara penyelidikan dan satu program Sarjana

melalui kerja kursus iaitu program Sarjana Sains Sekitaran (Pengurusan Gunatanah dan Sumber Air), atau lebih dikenali sebagai program SLUSE.

Program SLUSE adalah suatu program pembangunan kapasiti ke arah menggalakkan pengurusan gunatanah dan sumber air secara mampan. Program 16 bulan ini terdiri dari 12 bulan perkuliahan dan 4 bulan kerja penyediaan disertasi. Program SLUSE menawarkan 13 kursus ditawarkan melalui tiga modul iaitu modul Interdisiplin, Modul Teras dan Modul *Experiential*.

Pelaksanaan program Diploma Pasca Siswazah (Pengurusan Tanah Gambut) yang dicadangkan ini akan dilakukan mengikut mekanisma yang sama seperti yang diamalkan untuk program SLUSE iaitu melalui pengembelian tenaga akademik dari beberapa Fakulti dan Institut di Unimas. Fakulti dan institut berkenaan adalah Fakulti Sains Sosial, Fakulti Ekonomi, Fakulti Kejuruteraan, serta Institut Kepelbagaian Biologi dan Pemuliharaan Alam Sekitar.

18. PERTINDIHAN PROGRAM YANG DIPOHON DENGAN IPTA LAIN

Program serupa di peringkat diploma pasca siswazah belum wujud di IPTA lain di Malaysia. Program pengajian yang hampir sama cirinya ialah program MSc in Land Resource Management yang ditawarkan bersama oleh Fakulti Pertanian, UPM dengan kerjasama University of Cambridge. Program tersebut yang mengenakan yuran pengajian sebanyak RM20,000 menawarkan 30 jam kredit dalam 2 semester serta satu lawatan sambil belajar ke United Kingdom (atau Eropah Barat). Tesis atau disertasi tidak disyaratkan tetapi calon perlu menyediakan laporan mengenai lawatan sambil belajar. Program UPM ini walau bagaimanapun membuat liputan umum mengenai tanah, dan tidak memberi penekanan khas kepada pengurusan tanah gambut.

19. PERBANDINGAN DENGAN PROGRAM AKADEMIK DI UNIVERSITI LUAR NEGARA

Terdapat banyak universiti luar negara yang memberi liputan mengenai tanah gambut khususnya dalam program pengajian pengurusan sumber asli, sumber tanah atau perhutanan di pelbagai peringkat. Contohnya, universiti-universiti Minnesota, North Carolina dan Florida, USA, University of Guelph Canada, Wageningen Agricultural University, Netherlands dan universiti-universiti di Finland di peringkat Sarjana. University of Queensland menawarkan pengajian dalam bidang-bidang (1) Environmental Management dan (2) Natural Resource Management di peringkat Postgraduate Certificate dan Postgraduate Diploma. University of Leicester UK pula bercadang menawarkan Postgraduate Certificate in Conservation of Biodiversity. Namun program-program yang dimaksudkan di atas bukanlah tertumpu kepada pengurusan tanah gambut tropika yang begitu penting di peringkat global. Kebanyakan kurikulum terhad kepada aspek tertentu sahaja seperti ekologi/pemuliharaan, agronomi dan/atau hidrologi, bukannya memberi liputan secara menyeluruh dan bersepadu ke atas ekosistem khas seperti yang akan diusahakan dalam program Diploma Pasca Siswazah Pengurusan Tanah Gambut ini.

20. KEAHLIAN DAN ULASAN LEMBAGA PENGAJIAN TERHADAP PROGRAM YANG DIPOHON

Program ini mempunyai satu "Jawatankuasa Program" (JKP) yang bidang tugasnya adalah sama seperti 'Lembaga' Pengajian. JKP dipengerusikan oleh Dekan Fakulti Sains dan Teknologi Sumber atau wakilnya. Keahlian JKP adalah seperti berikut:

<i>Nama</i>	<i>Jawatan</i>	<i>Bidang Kepekaran</i>
Prof Murtedza Mohamed	Dekan, FSTS	Kimia Sekitaran
Dr Lee Nyanti	Timbalan Dekan (Pascasiswazah)	Sains Perikanan dan Akuakultur
Prof Madya Dr Mohd Tajuddin Abdullah	Ketua Teras Sains dan Pengurusan Sumber Haiwan	Pengurusan Hidupan Liar
Dr Ismail Jusoh	Ketua Teras Sains dan Pengurusan Sumber Tumbuhan	Fisiologi Tumbuhan
Prof Wan Sulaiman Wan Harun	Profesor	Sains Tanah
Prof Madya Dr Lau Seng	Pensyarah	Kuaiti Air, Hidrologi

Ulasan JKP:

a) Kesesuaian program dengan kepekaran Fakulti

Program Pengurusan Tanah Gambut yang dicadangkan mempunyai kaitan langsung dengan teras atau *niche areas* Fakulti Sains dan Teknologi Sumber Unimas dalam pengurusan sumber. Teras-teras yang dimaksudkan merangkumi pengurusan sumber-sumber akuatik, haiwan, tumbuhan, air dan tanah serta pemuliharaan alam sekitar secara amnya.

Sejak beberapa tahun yang lampau, fakulti telah membina kekuatan penyelidikan dalam bidang pengurusan dan pemuliharaan tanah gambut menerusi penyertaan aktif dalam projek-projek tempatan dan juga projek-projek kerjasama pembiayaan European Union STRAPEAT (Strategies for implementing sustainable management of peatlands in Borneo), PEATWISE dan RESTORPEAT. Para-penyelidik dan pelajar pasca-siswazah fakulti turut terlibat dalam penyelidikan bersama dengan CRAUN (Crops and Applied Research Unit, Sarawak) berkaitan dengan penebusgunaan ladang sagu pada tanah gambut di kawasan Mukah. Usaha di atas telah melahirkan kepekaran dalam pelbagai bidang berkaitan dengan tanah gambut seperti kepelbagaian biologi, pengurusan tanah dan air dan bidang sosioekonomi. Dengan *critical mass* yang telah diwujudkan ini fakulti, baru-baru ini, telah menerajui ekspedisi penyelidikan ke Taman Negara Loagan Bunut, iaitu, salah satu daripada tiga hutan paya gambut terpelihara di Malaysia. Penawaran program Pengurusan Tanah Gambut seperti yang dicadangkan akan memanfaatkan sepenuhnya pengalaman dan kepekaran yang sedia ada ini dan sekaligus akan menampilkan Unimas sebagai Pusat Kecemerlangan Tanah Gambut Tropika yang unggul.

b) Kepentingan program kepada Negeri Sarawak

Tanah gambut meliputi kira-kira 13% daripada keluasan negeri Sarawak. Hampir keseluruhan tanah jenis ini terletak di zon pantai yang juga mengandungi majoriti penempatan penduduk Sarawak. Dengan demikian, tanah gambut atau *peatlands* Sarawak bukan sahaja memainkan peranan sejagat ekologi dan alam sekitar yang penting ia mempunyai kepentingan sosioekonomi yang amat ketara bagi negeri Sarawak. Penerokaan sekitar 0.5 juta hektar tanah gambut Sarawak untuk aktiviti pertanian dan yang berkaitan adalah petanda jelas kepentingannya.

Perkara utama yang perlu diambil kira dalam memperkatakan penggunaan dan pemuliharaan tanah gambut, ialah hakikat bahawa tanah gambut adalah suatu ekosistem yang amat sensitif dan *fragile* yang perlukan pengurusan secara mampan. Sekiranya usaha penerokaan, penggunaan dan pemuliharaan tidak dilaksana sebaik mungkin, pelbagai masalah akan timbul yang boleh memberi impak besar kepada

alam sekitar, komuniti dan sosioekonomi tempatan serta membawa kepada kegagalan projek pembangunan. Masalah yang dimaksudkan termasuklah:

- susutan atau penurunan aras air bumi yang boleh menyebabkan kebakaran
- pengeringan tanah tak berbalik yang membawa kepada kehilangan produktiviti tanah dan kemungkinan kemusnahannya
- pengoksidaan tak terhinder yang mengakibatkan amblesan (susut aras permukaan tanah) dan pelepasan gas rumah kaca yang berlebihan – tegasnya kepupusan storan karbon
- kehilangan kepelbagaian biologi
- kehilangan keupayaan menahan daripada berlakunya banjir

Program yang dicadangkan akan memberi liputan menyeluruh mengenai isu-isu di atas dan cara menanganinya. Ini merupakan sumbangan secara langsung ke arah usaha Kerajaan Negeri mewujudkan sumber tenaga teknikal yang berkebolehan serta arif tentang pengurusan mampan tanah gambut.

21 TARIKH PROGRAM DILULUSKAN

Kelulusan di peringkat Fakulti: 16 Jun 2004

Kelulusan di peringkat J/K Pasca Siswazah:

Kelulusan di peringkat Senat:

22 KESIMPULAN/SYOR

Program ini berhasrat untuk melengkapkan pelajar dengan kebolehan interdisiplin yang membolehkan mereka menangani secara cekap dan berkesan masalah-masalah yang berkaitan dengan pengurusan tanah gambut tropika, khususnya di Malaysia. Program ini dijangka dapat membantu menjayakan pembangunan sumber manusia negara bagi keperluan Wawasan 2020 iaitu melalui program akademik yang relevan yang dapat memantapkan tahap kemampuan negara mengurus sumber asli dan alam sekitar secara mampan. Di samping itu program ini akan meletakkan Malaysia amnya dan Unimas khususnya dalam satu rangkaian kerjasama dan kemuafakatan antarabangsa ke arah menjayakan aspirasi yang digariskan oleh Agenda 21.

Dengan itu ahli J/K Pengajian Siswazah adalah dengan hormatnya diminta memperakukan program Diploma Pasca Siswazah (Pengurusan Tanah Gambut) untuk ditawarkan sebagai salah satu program pengajian melalui kerja kursus di FSTS, Unimas.

MARKET SURVEY SUMMARY FOR POST-GRADUATE DIPLOMA PROGRAMME IN PEATLAND MANAGEMENT

A market survey for the Postgraduate Diploma Programme in Peatland Management was conducted in January 2004. The questionnaire (ANNEX 1) was sent out to 34 stakeholder agencies and individuals in the public and private sectors, nationwide (ANNEX 2). These include:

- State Secretaries
- Permanent Secretaries of the relevant ministries
- Head of relevant agencies in charge agriculture, forestry, public works, environment and resource management, drainage and irrigation, land development, geoscience etc.
- Consultancy firms

The respondents were given 1.5 months to respond. After 3 months only 14 agencies returned the questionnaire. The following are the responds (supported by frequency tables) received:

Part 1: CONTENTS OF PROGRAM AND ITS RELEVANCE TO THE NEEDS OF THE ORGANIZATION

1. State the type of organisation / industry

All organizations (100%) who participated are local agencies.

2. Does the programme fulfil the basic principles within the discipline?

71.4% perceived that the program fulfilled the basic principles within the discipline.

3. Are the concepts and principles relevant to the present context?

71.4% perceived that the program's concepts and principles are relevant to the present context.

4. Do the course contents help to build a strong programme?

85.7% believed that the course contents help to build a strong program. 7.1% said it fairly helps, and another 7.1% said it doesn't.

5. Does the proposed programme cover all relevant subjects/topics?

57.1% believed that the program covers all relevant subjects/topics. 42.9% thought the program fairly covers all that.

For this item, some respondents said that there are additional areas that need to be covered by the program. The suggestions are:

- a) Social Impact Assessment (SIA)
- b) Integrated Water Resource Management (IWRM)
- c) Integrated River Basin Management (IRBM)
- d) Peatland Rehabilitation and Threats
- e) Modelling
- f) Land Reclamation
- g) Peat Drainage
- h) Agriculture
- i) Infrastructure
- j) Engineering

6. Is there any subject that is not relevant in the programme?

92.9% perceived that there are no subjects in the program which is irrelevant.

7. State whether the programme fulfils the basic theories, current concepts, legal aspects, use of ICT, quantitative treatment and market/industry relevance.

92.9% perceived that the program fully fulfils the basic theories.

64.3% perceived that the current concepts are fully fulfilled. The remaining 35.7% thought it partially fulfilled the current concepts.

57.1% thought that the program did not fulfil the legal aspect component. 35.7% perceived that it is partially fulfilled.

The majority 50% perceived that the ICT usage component is fully fulfilled in the program. 35.7% thought it is partially covered, and only 7.1% thought it did not fulfil the criteria.

64.3% believed that the Quantitative Treatment aspect is fully fulfilled in this program. The remaining 35.7% thought that it is partially fulfilled.

92.9% perceived that the program either fully or partially fulfilled the Marketing/Industry Relevance aspect.

8. Is this programme sufficient in terms of the length of study and duration of practical training.

78.6% thought the length of study for the program is sufficient. One respondent suggested that the length of the program should be at least 12 months. The respondent mentioned that "Peat itself needs detailed study – Peat is disappearing very soon."

64.3% perceived that the duration for Practical Training is appropriate. Three respondents indicated that the appropriate duration "depends" on some factors, which include "the practical training received/given in the first/basic/professional degree". One respondent said that "2 weeks is not enough even just to go around in Sarawak, what more to say doing some investigation. Please note that accessibility is 'very poor'."

PART 2: CAREER OPPORTUNITIES

9. Do you think that graduates of this programme are suitable to work in your organisation? If yes, please indicate the areas.

The bulk of the respondents did not answer this item (78.6%). Only three respondents (21.4%) thought that the graduates of this program are suitable to work in their organization as Environmental Managers.

10. Please indicate relevant jobs in your organization for the graduate of this programme.

Four respondents (28.6%) thought that the graduates of this program are suitable to work in their organization as Land & Survey Officers.

Five respondents (35.7%) thought that the graduates of this program are suitable to work in their organization as Resource Planners.

For this section, there are some additional suggestions from the respondents, about the type of work that the graduates of the program may be eligible for:

- l) Environmental Management
- m) Research & Development
- n) Developmental Planning
- o) River Management
- p) Project Planning
- q) Estate Management
- r) Forest Management
- s) District Forest Officers
- t) Forest Environment
- u) Forest Hydrology

11. Please indicate relevant jobs in your organization for the graduate of this programme.

Five respondents (35.7%) replied, and thought that the graduates could work as Environmental Officers.

28.6% thought they could work as Environmental Consultants.

Only 28.6% thought these graduates could work as Agriculture Officers.

For this item, some respondents indicated that the relevant jobs for these graduates at their organization:

- a) Research Officer
- b) Management Planning
- c) Estate Management
- d) Development Planning
- e) District Forest Officer

12. State the number of posts in your organisation that can be filled by graduates of this programme.

64.3% thought that the graduates of the program can fill about 1 to 3 posts in their organization. Only one respondent (7.1%) thought that the graduates could fill the post as an In-Service Officer.

What is the appropriate range of salary payable to graduates of this programme?

- a) RM1,000 – RM3,000 (1 response)
- b) RM1,500 – RM2,000 (1 response)
- c) RM1,500 – RM2,500 (1 response)
- d) RM1,800 – RM2,000 (1 response)
- e) RM2,000 – RM2,500 (1 response)
- f) RM2,500 – RM3,000 (2 responses)
- g) J41 and G41* (2 response)

**J41 and G41 are government scales for jobs which are engineering and geological-oriented*

13. Is this programme suitable for articulation to a higher level?

92.9% perceived that the program is suitable for articulation to a higher level.

78.6% of the respondents thought that it is suitable for Masters level, and another 14.3% thought it is suitable for PhD level.

14. For which level do you think this programme will have greater demand?

The majority of the respondents (35.7%) thought that the program will have a greater demand at Master's level. The same quantity of responses (28.6%) was collected for the demand to be at Post-graduate Diploma level and at Bachelor's level.

PART 3: OTHERS

15. Sponsorship

Has your organisation sponsored students in this field / area?

The majority of the respondents (71.4%) indicated that they have not students in this field/area.

Would you encourage your staff to undergo this course?

71.4% said that they will encourage their staff to undergo the course.

16. Outcome of the Programme

In your opinion, will this programme be able to produce the right kind of graduates for the employment market?

57.1% answered YES. Only 14.3% answered negatively, and 4 respondents abandoned the item completely.

Those saying YES elaborated the relevance and needs of the Programme as follows:

- a) The program may provide opportunities for in-service officers to enrich knowledge on Peatland, which maybe of hand in land use planning. The employment market nevertheless is quite limited as more of the Peatland areas are converted into agriculture. Unless the profile or importance of Peatland/Peat forest is raised amongst the main stakeholders, the demand for such graduates may be very little.
- b) The state has abundance peat soil to be developed into commercial ventures and plantations.
- c) A comprehensive course outlines to cater for various issues regarding the Peat development.
- d) Sarawak is still lacking of graduates in this field. IPTAs should open up more opportunities to students to take up this course because the state of Sarawak has every potential to be a highly developed state in the future, especially in Agriculture and Industries related to it.
- e) In view of the extensive development going on in Peat soil areas in Sarawak.
- f) The subject matter may be more appropriately incorporated in Engineering courses or Environmental studies or degrees on Resource Planning.
- g) More equipped with basic technical knowledge on Peat Management, especially in Project Planning & Management in these areas.

**Post-graduate Diploma Programme in Peatland Management
– A Market Survey**

The greater proportion of the world's 11 million hectares of tropical peatlands occurs in the coastal regions of South-east Asia. Many of these regions, including those in Sarawak are earmarked for agricultural development. Being some of the largest remaining areas of lowland forest in South-east Asia, these peatlands have global ecological significance because of their unique and diverse ecosystem having vital roles as reservoirs of biodiversity, as carbon stores and as hydrological buffers. They also play an important regional economic role by providing forest products and land for settlement. Owing to a lack of awareness and understanding about sustainable land management practices, however, many peatland development projects fail to achieve their declared objectives, leading to serious environmental degradation and impoverishment of local communities.

In response to the above, PEATWISE, an EU funded education project undertaken by a consortium of two South-east Asian universities (University of Malaysia Sarawak and the University of Palangka Raya, Kalimantan, Indonesia) and two European universities (Wageningen University and Research Centre, The Netherlands and the University of Leicester, U.K.) have developed a curriculum on the management of peatlands, focusing on the peat-covered lowlands of Borneo. This unique curriculum uses innovative educational methods and tools to make available course materials and training modules that incorporate up-to-date research results and advice for enhancing skills and expertise needed to promote the sustainable use of natural resources in socio-economic development, particularly in the areas of Sarawak and Central Kalimantan.

The curriculum consists of six modules, five of them of equal weightage and the sixth (field course and research project) having twice the weightage of the others. Designed as a post-graduate programme, it can be completed in ten months of weekend classes, at the end of which successful candidates will be conferred the Post-graduate Diploma in Peatland Management.

We believe your organization, being an important agency directly involved or having interest in land development, would find this programme particularly relevant to the needs of professionals dealing with planning, implementation and evaluation/monitoring. And it is also with this in view that we are sending you the accompanying **Market Survey Questionnaire**. The market survey, as you are probably aware of, is part of the Ministry of Education's procedural requirement for the approval of new academic programmes to be offered by universities in Malaysia. We will be most grateful if you or your representative could kindly complete the questionnaire and return to us in the self-addressed envelope before 20 February 2004. We believe your valuable inputs can help us improve and correct whatever deficiency there is in the proposed curriculum.

We thank you in anticipation of your response.

**POST GRADUATE DIPLOMA PROGRAMME IN
PEATLAND MANAGEMENT**

<i>Course Title</i>	<i>Credit Hours*</i>
1. Ecology, Natural Resources and Environment	4
2. Water Resources and Hydrology for Peatland Catchments	4
3. Human Dimensions and Resource Economics in Peatland Management	4
4. Peat Soils and Land Use	4
5. GIS and RS for Peatland Management	4
6. Field Course and Research Project in Peatland Management	8
Total Credit Hours	28

* 1 Credit hour = 14 contact (lecture) hours or 3 hours of laboratory work.

COURSE OUTLINES

Course 1: Ecology, Natural Resources and Environment (NRM)

Ecology: Basis for environmental management
 Biodiversity; introduction to ecological biogeography.
 Ecological hierarchy; major ecosystems, communities, populations
 Environmentally sensitive areas; assessment for conservation and protection
 Environmental degradation, carrying capacity and new ecology, degradation and change, deforestation, and soil erosion.
 Aquatic biodiversity and conservation: Bioindicators, biomonitoring, habitat management
 Introduction to sustainability and criticality concepts in land use and NRM
 Competing land use systems
 Water rights and governance
 Global and regional conventions (UNCED, Ramsar, Dublin, WWForum etc);
 Agenda 21: Environmental politics and reality.
 The Federal Constitution and legal framework for environmental management.
 The National Policy on the environment.
 Institutional framework for environmental management.
 Principles of environmental enforcement and compliance.
 Environmental Acts, Regulations/Orders, guidelines and standards
 Paradigm Shift in Natural Resource and Environmental Management
 Environmental Impact Assessment (EIA)

Course 2: Water Resources and Hydrology of Peatland Catchments

Hydrological cycle; Precipitation; Evaporation; Transpiration; Infiltration
 Climatology; Hydrograph
 Geohydrology
 River basin and catchment area
 River flow
 Fundamentals of fluid mechanics and hydraulics
 Water quality classification, standards and guidelines
 Cleanwater treatment, storage and reticulation
 Wastewater treatment and recycling

Impacts of engineering works on peatland rivers, estuaries and coastal areas
Optimisation of water use
Protection areas for drinking water
Ethics in water resources management
Concepts in modelling and modelling tools
Model set-up, data collection, calibration, verification
Model interpretation
Case studies for surface, groundwater water and watershed/river basin modelling using MIKE-SHE, MIKE-11, MODFLOW, REPEAT and others packages.

Course 3: Human Dimension and Resource Economics in Peatland Management

Nature and scope of development planning
Projects, plans, and development objectives
Project cycles and planning processes
Appraisals and human elements / issues in project evaluations
Environmental and social impact assessment in development planning
Project planning and management for the future
Public health issues in peatland ecosystem
Availability, distribution and uses of peat resources
Natural resource accounting (NRA)
Economic consideration in peat resource planning
Potential Conflicts to Cooperation Potential (PCCP)
Case studies: analysis of local project plans.

Course 4: Peat Soils and Land Use

Introduction to peat soil genesis.
Evolution and application of peat soil taxonomy.
Basic principles of peat soil mapping.
Basic principles of land evaluation.
Soil performance and soil capability.
Basic concepts in sustainable land resource management.
Impact of peat soil degradation, spatial variability and soil diversity on sustainability.
Soil quality and soil remediation.
Significance of remote sensing techniques and GIS in precision land use.
Impact of land use on quality of soils and natural waters – qualitative and quantitative considerations.
Agricultural Systems.
Land tenure and social institution.
Tropical forestry and Agroforestry.
Animal production in the tropics.
Tropical crop production.
Agricultural land and water management on peatland
Integrated soil conservation and management.

Course 5: GIS and Remote Sensing for Peatland Management

Decision support systems
Introduction to mapping & surveying
Environmental and landuse parameters for mapping
Earth observation (Eo) technology & system
Principles of GIS and basic GIS operations
Elevation and spatial modelling and manipulation
GPS for Eo and GIS

Development of integrated water resource management system and system maintenance

Data/collection and storage/archive and dissemination

Web based technology for information sharing

Course 6: Field Course and Research Project in Peatland Management

Technical writing: organisation, illustrations/visuals, language, style, references (prints, on-line), exercises.

Natural science methodologies

Statistical methods

Peat soils monitoring, sampling and analysis

Biological methods and indices

Water sampling and analysis

River classification

Social science methodologies

Study population, sample & sampling procedures

Interviews and etiquette in social inquiry

Questionnaires & Household Surveys

Participatory Action Research (PAR) & Participatory Rural Appraisal (PRA)

Preparation and presentation of proposals for field course

10-14 days Field Course followed by report preparation and presentation

Dissertation projects.

Kindly return to us only this questionnaire (completed)
using the self-addressed envelope

UNIVERSITI MALAYSIA SARAWAK

MARKET SURVEY FOR POST-GRADUATE DIPLOMA
PROGRAMME IN PEATLAND MANAGEMENT

**PART I : CONTENTS OF PROGRAMME AND ITS RELEVANCE TO THE NEEDS
OF ORGANISATIONS**

[Please tick (✓) where applicable]

1. State the type of organisation / industry:

I. Locally owned organisation / industry

II. Foreign owned organisation / industry

A. Fulfilment of Theories, Concepts and Principles

2. Does the programme fulfil the basic principles within the discipline?

Fully

Partially

None

3. Are the concepts and principles relevant to the present context?

Yes

Fairly

No

4. Do the course contents help to build a strong programme?

Yes

Fairly

No

5. Does the proposed programme cover all relevant subjects/topics?

Yes

Fairly

No

If your answer is 'Fairly' or 'No', please indicate other additional areas that need to be covered by the programme.

6. Is there any subject that is not relevant in the programme?

Yes

No

If your answer is 'Yes', what are the subjects that need to be omitted?

7. State whether the programme fulfils these criteria:

Remarks
(if any)

	Fully	Partially	None
a. Basic Theory	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Current Concepts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Legal aspects	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Use of ICT	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Quantitative Treat ^{mt}	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Market / Industry Relevance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Is this programme sufficient in terms of:

a. Length of study Yes

No

If your answer is 'No', please suggest the appropriate length of study duration. Please explain your suggestion.

- b. Duration of practical training Yes
 No

If your answer is 'No', please suggest the appropriate duration of practical training. Please explain your suggestion.

PART II : CAREER OPPORTUNITIES

9. Do you think that graduates of this programme are suitable to work in your organisation? If yes, please indicate the areas.
e.g. a) Environmental Management
b) Land and Survey
c) Resource Planning
d) Others (Please specify)

1. _____
2. _____
3. _____
4. _____

10. Please indicate relevant jobs in your organization for the graduate of this programme.
e.g. a) Environmental officer
b) Environmental Consultant
c) Agriculture Officer

1. _____
2. _____
3. _____
4. _____

11. State the number of posts in your organisation that can be filled by graduates of this programme.

- 1 – 3 posts
 4 – 6 posts
 7 – 9 posts
 Others. Please specify: _____

12. What is the appropriate range of salary payable to graduates of this programme?

13. Is this programme suitable for articulation to a higher level?

- Yes
 No

If your answer is 'Yes', please tick the appropriate level (s)

- Master level
 PhD

14. This programme will have greater demand at the following level:

- Bachelor's level
 Post-graduate diploma level
 Master's level

PART III : OTHERS

15. Sponsorship

a. Has your organisation sponsored students in this field / area?

- Yes
 No

b. Would you encourage your staff to undergo this course?

- Yes
 No

If your answer is 'No', please state the reason(s).

16. Outcome of the Programme

In your opinion, will this programme be able to produce the right kind of graduates for the employment market?

Yes

No

Please elaborate.

Thank you

LIST OF AGENCIES INVITED TO PARTICIPATE IN THE MARKET SURVEY

- 1 YB Datuk Haji Talib Zulpilip
Pengerusi
Perbadanan Pembangunan Ekonomi Sarawak (SEDC)
Tingkat 11, Menara SEDC
Sarawak Plaza
Jalan Tunku Abdul Rahman
Peti Surat 400
93902 Kuching
Tel: 082-426777/416777; Faks: 082-418266

- 2 YBhg Datu Hubert Thian Chong Hui
Pengarah
Jabatan Kerja Raya
Ibu Pejabat JKR, Wisma Saberkas
Jalan Tun Abang Haji Openg
93582 Kuching
Tel: 082-203100/203005; Faks: 082-429679

- 3 Encik Winsel Ahtos
Pengarah
Jabatan Pengairan dan Saliran
Tingkat 9 dan 10, Wisma Saberkas
Jalan Tun Abang Haji Openg
93000 Kuching
Tel: 082-243241/414212; Faks: 082-426400

- 4 YBhg Datu Cheong Ek Choon
Pengarah
Jabatan Perhutanan
Wisma Sumber Alam
Jalan Stadium, Petra Jaya
93050 Kuching
Tel: 082-319102/442553; Faks: 082-441377

- 5 Tuan Haji Mohd Sepuan bin Haji Anu
Pengarah
Jabatan Pertanian Sarawak
Ibu Pejabat, Tingkat 12-17
Menara Pelita, Petra Jaya
93050 Kuching
Tel: 082-441000/447632; Faks: 082-447639

- 6 YBhg Datu Haji Mohammed Baijuri Kipli
Pengarah
Jabatan Tanah dan Survei Sarawak
Ibu Pejabat, Tingkat 6, Menara Pelita
Jalan Tun Abdul Rahman Yaakub
Petra Jaya
93050 Kuching
Tel: 082-444111/446446; Faks: 082-446611

- 7 Encik Sung Siew Eng
Pemangku Pengurus Besar
Lembaga Air Kuching
Jalan Batu Lintang
93200 Kuching
Tel: 082-240371/254911; Faks: 082-244546
- 8 Encik Daniel Wong Park Ing
Pengurus Besar
Lembaga Air Sibul
KM 5, Jalan Salim
Peti Surat 405
96007 Sibul
Tel: 084-211001/211567; Faks: 084-211543
- 9 Encik Vasco Sabat Singkang
Pengurus Besar
Lembaga Penyatuan dan Pemulihan Tanah Sarawak (SALCRA)
Tingkat 1-3, Bangunan Majlis Luar Bandar, Kuching
Kota Padawan, Batu 10
Jalan Penrissen
Peti Surat 1981
93740 Kuching
Tel: 082-616177/610766; Faks: 082-616801
- 10 Encik Abdullah Chek bin Sahamat
Pengurus Besar
Lembaga Pembangunan dan Lindungan Tanah (PELITA)
Tingkat 5, 8 & 12, Wisma Satok
Jalan Satok
93400 Kuching
Tel: 082-235944/235975; Faks: 082-236001
- 11 Encik Muhamad Yakup bin Kari
Controller
Lembaga Sungai-Sungai Sarawak
Tingkat 2, Bangunan electra House
Lebuh Power
93000 Kuching
Tel: 082-207108; Faks: 082234096
- 12 Encik Yong Chiong Yun
Ketua Pegawai Eksekutif
Lembaga Air Kawasan Utara (LAKU)
6th Floor, Soon Hup Tower
Lot 907, Jalan Merbau
98000 Miri
Tel: 085442020/442008; Faks: 085-442042/442005
- 13 Tuan Haji Mohamad Bolhair Reduan
Pengarah Kawasan
Lembaga Kemajuan Tanah Sarawak (SLDB)
Lot 1174, Block 9, MCLD, Miri Waterfront
Jalan Permaisuri
98000 Miri
Tel: 085413814/233550; Faks: 085-416192

- 14 YBhg Dato' Dr Haji Shahir Bin Nasir
Setiausaha Kerajaan Negeri Johor
Pejabat Setiausaha Kerajaan Negeri Johor
Aras 2, Bangunan Sultan Ibrahim
80503 Johor Bahru
Johor
Tel: 07-2237344/7345; Faks: 07-2235253
- 15 YBhg Dato' Zainal Abidin bin Haji Mat Said
Setiausaha Kerajaan Negeri Pahang
Pejabat Setiausaha Kerajaan Negeri
Wisma Sri Pahang
25503 Kuantan
Pahang
Tel: 09-5521600; Faks: 09-5523443
- 16 YBhg Dato' Dr Isahak Bin Yeop Mohd Shar
Setiausaha Kerajaan Negeri Perak
Aras 3, Bangunan Perak Darul Ridzuan
Jalan Panglima Bukit Gantang Wahab
30820 Ipoh
Perak
Tel: 05-2415668/2531957 ext 5000; Faks: 05-254323
- 17 **Setiausaha Kerajaan Negeri Sabah**
Pejabat Setiausaha Kerajaan Negeri
Jabatan Ketua Menteri
Tingkat 26, Bangunan Yayasan Sabah
88502 Kota Kinabalu
Sabah
Tel: 088-225633/223599; Faks: 088-421125
- 18 YBhg Dato' Annuar Ma'aruf
Ketua Setiausaha Kementerian Pertanian
Kementerian Pertanian Malaysia
Wisma Tani
Jalan Sultan Salahuddin
50624 Kuala Lumpur
Tel: 03-2982011; Faks: 03-2913758
- 19 **Setiausaha Tetap**
Kementerian Pembangunan Pelancongan Alam Sekitar Sains & Teknologi
Tingkat 5 & 6, Menara Sabah Bank
Wisma Tun Fuad Stephens, Karamuning
88300 Kota Kinabalu
Sabah
Tel: 088-258472; Faks: 088-236005
- 20 Dato' Ir. Haji Keizrul Abdullah
Ketua Pengarah
Jabatan Pengairan dan Saliran
Jalan Sultan Salahuddin
50626 Kuala Lumpur
Tel: 03-2954708; Faks: 03-2914282

- 21 **Ketua Pengarah**
FELCRA Berhad
Tingkat 1-7, Bangunan LTAT
Jalan Bukit Bintang
P O Box 12254
50772 Kuala Lumpur
Tel: 03-2422488; Faks: 03-2485318
- 22 **Ketua Pengarah**
FELDA
Wisma FELDA
Jalan Perumahan Gurney
54000 Kuala Lumpur
Tel: 03-2935066; Faks: 03-2920087
- 23 **Pengarah**
Jabatan Konservasi Alam Sekitar
Kementerian Pembangunan Pelancongan Alam Sekitar Sains & Teknologi
D/a Tingkat 5 & 6, Menara Sabah Bank
Wisma Tun Fuad Stephens, Karamuning
88300 Kota Kinabalu
Sabah
Tel: 088-251290/1
- 24 **Ketua Pengarah**
Jabatan Pertanian
Kementerian Pertanian dan Industri Makanan
Ibu Pejabat Pertanian
Tgt Bawah, 1, 2, 3 & 4
Menara Khidmat, Jalan Belia
88632 Kota Kinabalu
Sabah
Tel: 088-283283/211306; Faks: 088-239046
- 25 **Pengarah**
Jabatan Perhutanan Negeri Sabah
Beg Berkunci 68
90009 Sandakan
Sabah
Tel: 089-660811; Faks: 089-669170
- 26 **Pengarah**
Unit Pembangunan Sumber Manusia
Jabatan Ketua Menteri
Tingkat 10, Wisma Bapa Malaysia, Petra Jaya
93502 Kuching
Sarawak
Attn: Mr Malcom Yong
Ph: 082-492458; Fax: 082-448214
- 27 **Ketua Pengarah**
Jabatan Alam Sekitar
Kementerian Sains, Teknologi & Alam Sekitar
Tingkat 3 – 7 Blok C4
Pusat Pentadbiran Kerajaan Persekutuan
62662 Putrajaya
Ph: 03-888 58200; Fax: 03-8888 9987

- 28 **Timbalan Pengerusi**
Natural Resource and Environment Board (NREB)
Tingkat 19 Menara Pelita, Petra Jaya
93050 Kuching
Sarawak
Ph: 082-319502; Fax: 082-448254
- 29 **Project Manager**
PPES Works (Sarawak) Sdn. Bhd
3rd Floor, Lot 619-623,
Section 62, Jalan Padungan
93100 Kuching
Sarawak
- 30 **Dr Tie Yiu Liong**
Agrosol Soil Survey Srevicees (M) Sdn Bhd
- 31 **Chief Executive Officer**
Samling Bhd
Miri, Sarawak
- 32 **En. Wan Zawawie Wan Akil**
Ground Water Technologies Sdn. Bhd.
Lot 7415 No. 9 First Floor
Jalan Simpang Tiga
93300 Kuching
- 33 **Dr Abdul Rahim Nik**
Forest Research Institute Malaysia
Kepong
52109 Kuala Lumpur
- 34 **Dr Abd Rahman Awang**
Pengarah
Jabatan Alam Sekitar (Sarawak)
Tingkat 9 Bangunan Sultan Iskandar
Jalan Simpang Tiga
93592 Kuching

COURSE 1: ECOLOGY, NATURAL RESOURCES AND THE ENVIRONMENT

Course code		Semester	
Course title	Ecology, Natural Resources and the Environment	Credit (Hours)	4 credits (56)
Course facilitator	Siti Rubiah Zainudin	E-mail	zsrubiah@frst.unimas.my
Resource person(s)		E-mail	
Course objectives The main objectives of this course are to: <ul style="list-style-type: none"> provide a general understanding of the ecological basis of the environment and its current state; the earths hierarchical level of organization and the linkages between the major ecosystems; identify and understand the importance of environmentally sensitive areas focusing on aquatic and terrestrial biodiversity and conservation of tropical peatland; explore various conventions, policies, laws and regulations pertaining to the environmental management at the States, national, regional and global levels; explore the principal framework of using environmental monitoring and auditing for assessing decision making within both the public and private sector; introduce fundamental concepts pertaining to environmental management systems. introduce ISO 14000 series for strategic environmental management; explore the theory and practice of Environmental Impact Assessment (EIA). Upon successful completion of this module, students would be able to: <ul style="list-style-type: none"> explain the basic principles of biodiversity conservation describe and explain the principal issues, objectives and provisions of various conventions, declarations, policies, Acts, Orders, Ordinance and Regulations in Malaysia, within ASEAN countries as well as those by the United Nations propose or decide on management and conservation strategies for environmentally sensitive areas particularly pertaining to tropical peatland based on the above and on a broad understanding of fundamental concepts of environmental management systems including the ISO14000. participate effectively in Environmental Impact Assessment (EIA) undertakings 		Learning Units LU1. Introduction to ecological systems LU2. Principles of biodiversity conservation. LU3. Environmentally sensitive area and conservation strategies LU4. Aquatic and Terrestrial biodiversity and peatland conservation LU5. Environmental Policy, Laws and Conventions LU6. Environmental Compliance, Enforcement, Monitoring and Auditing LU7. Environmental Management System (EMS) LU 8. Environmental Impact Assessment (EIA)	
Course synopsis. In this course, the importance of ecology as the basis for environmental management, the importance of environmentally sensitive areas such as aquatic and terrestrial habitats in biodiversity conservation and the role of biological indicators as signs of habitat degradation will be discussed. Special focus will be on Tropical peatlands, their wise use and management. Principles of environmental monitoring, international conventions, legal and regulatory framework at national and provincial levels especially pertaining to environmental and water resources management will be elaborated. There will also be deliberations on other relevant topics such as overview of EIA processes, case studies, experiences and issues on EIA in Malaysia. Students will get a hand in learning to prepare and review EIA reports in detail.			

Course contents	
LU 1	Definition of environment, resources, ecology, ecosystem and the concept of sustainability. Review of current state of the environment and resources – problems, causes and connections. Examples of ecological imbalances leading to environmental instability and degradation. Hierarchical classification of the biosphere: Biomes, ecosystems, communities, and populations. Definition and examples of each level of classification. Energy: Law of Thermodynamics. Energy in driving ecological processes. Energy pathways through various ecosystems. Element transport in global biogeochemical cycling, includes inorganics, organics and particulates, with emphasis on fluxes and kinetics of breakdown in hydrological systems. Definition of ecological succession, importance of achieving climax state and ecological stability. Succession in aquatic systems, eutrophication.
LU2	Definition of biodiversity, diversity measurements (diversity indices, species richness, etc). A review of the Biodiversity Conventions leading to the legal implications of protecting biodiversity. Principles and guidelines in biodiversity conservation. Current issues on the implementation of the biodiversity conservation laws and regulations.
LU 3	Environmentally sensitive environments. Terrestrial and aquatic environment. Highlands environment. Catchment processes, riparian effects, instream / river processes. Importance of wetlands. Impacts of degradation of sensitive ecosystems on the physical, biological and human environments. Relevance of riverine ecology to the protection of water resources. Management strategies for environmentally sensitive areas.
LU 4	Classification of aquatic organisms and their diversity, key characteristic features (identification) of selected groups of organisms, habitat preferences. Endangered and exploited species. Commercial species. Bioprospecting. The habitat as a tool for understanding and managing water resources. Use of structural information from species analyses to produce inferences on ecosystem functions. Functional habitats in some selected hydrological systems. Definitions of bioindicators. Examples from various classes of organisms. Bioassays and toxicity tests.
LU 5	Peatland Structure and Biodiversity: unique, endemic and threatened, Overview of the Nature of Tropical peats and peat soils, Location and Extent, origin and genesis, Natural Resource Functions of Tropical Peatlands: Carbon balance, Hydrological, climatic, Biodiversity and related forest resource functions, productivity and nutrient cycling, other ecological and landscape functions, Socio-economic importance and values, Impacts on Tropical Peatlands, Wise Use Guidelines for Tropical Peatlands, Peatland Management: lessons learned and new approaches, conservation, sustainable use and management strategies in South East Asia
LU 6	Global and regional conventions on environment and water resources (Mar del Plata Action Plans, UNCED, Ramsar, Dublin Statement, WWForum etc); Agenda 21: Environmental politics and reality; the Federal Constitution and legal framework for environmental management; the national Policy on Environment; institutional framework for environment and water resources management. The Environmental Quality Act, 1974 and subsequent amendments; Regulations/Orders, guidelines and standards made pursuant to EQA. Other legislations under other Federal Ministries applicable for environmental management and natural resources conservation. Other legislations under other State governments applicable for environmental management and natural resources conservation.
LU 7	Ethics in water resources management; principles of environmental enforcement and compliance; Non-compliance, prosecution and legal proceedings for environmental offences; issues related to enforcement and prosecution; Principles of environmental monitoring and pollution control strategies; global programmes on environmental monitoring; National and State environmental monitoring programmes; environmental auditing; Environmental Information System; roles and functions of environmental groups, interests and movements.
LU 8	Paradigm shift in natural resource and environmental management; organisational EMS; integration of business and environmental objectives; ISO14000 series of standards; the 17 elements of an effective EMS; strategies and tools for implementation of EMS.
LU 9	The concept of sustainable development and the role that EIA can play in implementing the concept. The scenario of 'no-EIA'. General perspectives of EIA procedure and requirements and specific reference to Malaysia (EQA). Overview of key procedural stages in EIA such as screening, scoping, assessment, review and public participation put into perspective as part of the overall EIA process. EIA reporting and review. Discussion on the elements of Environmental Management Plan (EMP), which include resource requirement, monitoring and auditing programmes. Devolution of environmental management in Malaysia. EIA in practice.

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Course highlights

- Ecological processes and its impacts on mankind
- Biodiversity issues
- Tropical ecology with emphasis on aquatic ecosystems and peat land management
- Participation in activities related to EMS elements such as development of Environmental Policy Statement, determination of environmental aspects, EMS audits, identification of environmental performance indicators etc.
- Participation in the actual review process of an EIA report; involvement in a 'mock' EIA study and EIA report preparation

Assessment

Written examination: 50%
Term papers, reports: 50%

COURSE 2: WATER RESOURCES AND HYDROLOGY

Course code		Semester	
Course title	Water Resources and Hydrology	Credit (Hours)	4 (56)
Course facilitator(s)	Lau Seng	Email	lauseng@ibec.unimas.my
Resource person(s)		Email	
Course objectives The course is aimed at providing (a) an overview on hydrological aspects of water resource science, (b) an understanding of basic hydrological concept within peatland catchments, and (c) the fundamental water resource management concept particularly for peatlands and coastal areas. Students completing this course would be able to: a) describe the hydrological features of a catchment area b) conduct fundamental hydrological measurements c) identify and apply appropriate hydrological analysis for sustainable development of catchment and water resource d) practise water resource management within peatland catchments		Learning Units 1. General introduction to hydrology and water resources; 2. Hydrological processes – precipitation, river flow, evapotranspiration, infiltration, geohydrology and hydrographs; 3. Hydrological aspects relating to peatland catchment management and development sustainability. 4. Water quality classification, standards, guidelines and monitoring. 5. Treatment of peatland water and pollution control measures 6. Introduction to hydrological and water quality modelling 7. Applications of hydrological and water quality models 8. Case Studies	
Course synopsis Overview of hydrology in the context of water resource management; detailed treatment of the main hydrological processes and their importance in the management of the water resources in peatland catchments; discussions on water chemistry, water quality standards, monitoring and treatments and pollution control measures for peatland areas; and finally, introduction to water resource applications software for management of groundwater, surface water and water quality assessments.			
Course contents			
LU 1 4 h	The hydrological cycle. Hydrology from different perspectives - engineers, environmentalists, agriculturists, water managers. The hydrologic water balance – global, regional, national. Relationship between weather and hydrology – heat balance, radiation, thermal circulation, earth's rotation, weather fronts, humidity. Definition of river basin and catchment area. The hydrological station. How hydrology fits in the general scheme of Integrated Water Resource Management (IWRM).		
LU 2 8 h	Quantitative surface water hydrology . Precipitation – types (cyclonic, convective, orographic), measurements, precipitation data analysis, intensity duration frequency (IDF) curves. Streamflow – river stage and gauging, discharge measurements, Stage-Discharge relationship, rating curves, streamflow data interpretation, hydrographs, streamflow variations(annual, seasonal, daily). Evaporation and Transpiration – Controlling factors, measurements, Penman-Monteith Equation. Infiltration – fundamental process and infiltration methods. Geohydrology – definitions and terminologies, Darcy's Law. Hydrograph analysis.		
LU 3 6 h	Peatland Catchment Management. The hydrological aspects relating to catchment management and development sustainability includes – surface run-off management(quantity and quality), effects of land clearing and development in catchment areas, river and groundwater extraction, reservoir sedimentation, saline intrusion, changes in land use. Impacts of hydraulic processes due to developments on peatlands. River works and dams, intakes and outfalls, flood control structures, dredging and sand mining, reclamation. Assessments of impacts from case studies.		
LU 4 4 h	Water Quality, Classification and Monitoring. Parameters of water quality and WHO standards for drinking water. River classification and water quality indices. Planning principles for water demand and for water conveyance. Protection of water resources from pollution and eutrophication. Ecology and management of natural and receiving waters.		

LU 5 6 h	Water Treatment and Pollution Control. Water treatment processes for removing particles in water and wastewater, particle characterization, coagulation / flocculation, sedimentation, filtration and disinfection. Formation of trihalomethanes (THMs) in the treatment of peat water. Removing dissolved organic contaminants from water & wastewater; activated carbon, stripping, membrane separation, removed of ammonia. Biological treatment systems - activated sludge and wetland systems. Wastewater and sludge disposal, and re-use. Wastewater in urban and rural areas and in different climate zones. Basic types of sewage treatment plants.
LU 6 10 h	Introduction to Hydrological and Water Quality Modelling <i>Types of models used in IWRM tools:</i> Conceptual, mathematical and numerical models, "black box" and physically based models, lumped and distributed models, empirical, deterministic and stochastic models. <i>Process of building a model:</i> Schematisation, data, discretisation, calibration, verification and simulation. Numerical methods: numerical integration, solution of equations, method of finite difference and method of finite elements. <i>Optimisation techniques:</i> Introduction to linear programming, dynamic programming, generic algorithms.
LU 7 8 h	Applications of hydrological and Water Quality Models <i>Hydrological and Water Quality Models:</i> Introduction to modelling softwares (Mike 21, QUEL 2E, WASP etc.) <i>Model set-up:</i> Setting the boundary conditions, determining the model domain area, grid sizes, time-step etc. <i>Data Collection:</i> Methods of data capture. Field data (sampling points, duration, frequency etc.) and office data (existing maps, discharge records, rain, wind, tidal and wave records etc) collection. Role of data in modelling and decision making. <i>Calibration:</i> Short-term calibration dataset (parameters), Long-term dataset for inference. Location of calibration points, quality of calibration and verification data. Parameters include water levels, velocity, river discharge etc. <i>Verification:</i> Accuracy (parameter calibration/ model structure). Reliability <i>Sensitivity analysis:</i> Parameter optimisation. State variable sub-spaces. Parameter uncertainty. Sensitivity gradients <i>Interpretation of model outputs.</i> Physical meaning of the model outputs. Model output accuracy. Hypothesis testing and regression modelling.
LU 8 10 hr	Case studies (Practical) Surface Water Modelling: Case study and practical. XP-SWMM (Storm Water Management Model), MIKE 21, MIKE SHE (A Watershed Scale Model for Soil and Water Resources Management), SHESED (Basin Scale Water Flow and Sediment Transport Modelling System) Groundwater Modelling: Case study and practical. ASMWIN, MODFLOW <i>River Basin Modelling:</i> Applications of the ISIS-FLOW software. Case study.
Key References Abbott, M.B. and Refsgaard, J.C. 1996. <i>Distributed Hydrological Modelling</i> . Dordrecht, The Netherlands: Kluwer. Arnold Herschy, R.W. (ed). 1978. <i>Hydrometry: Principles and Practices</i> . John Wiley. Beven, K. 2000. <i>Hydrologic Modelling A Primer</i> . J. Wiley & Sons. Black P.E. 1996. <i>Watershed Hydrology</i> . Ann Arbor Press. Chelsea, MI. Chin D.A. 2000. <i>Water Resources Engineering</i> . Prentice-Hall Inc. Upper Saddle River, NJ. Clark, Viesman and Hammer. 1977. <i>Water Supply and Pollution Control</i> , Haper and Row. DID and LAWO. 2001. <i>Water Management Guideleines for Agrcultural Development in Lowland Peat Swamps of Sarawak – Manual</i> . Department of Drainage & Irrigation. Kuching, Sarawak. Fetter W. 1994. <i>Applied Hydrogeology</i> . Prentice Hall Gribbin J.E. 1997. <i>Hydraulics and Hydrology for Stormwater Management</i> . Delmar. Albany, NY. Haan C.T, Barfield C.J. and Hayes J.C. 1994. <i>Design Hydrology and Sedimentology for Small Catchment</i> . Academic Press, New York. Hammer and Hammer, 2001. <i>Water and Wastewater Technology</i> , Prentice-Hall. <i>HEC-RAS User's Manual</i> . Latest version.	

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 Oweis I.S., Khera R.P. 1998. *Geotechnology of Waste Management*, PWS Publishing Co.
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 UPNS (Unit Perancang Negeri Sarawak) and Sime Darby . 1998. Integrated Development Plan Study for Coastal Peat Land, Sarawak. Economic Planning Unit, Kuching, Sarawak.

Course highlights

Practicals consisting of case studies on surface water, ground water and river basin modelling

Assessment

Written examination	(50%)
Assignment	(30%)
Group work/project	(20%)

COURSE 3: PEAT SOILS AND LAND USE

Course code		Semester	
Course title	Peat Soils and Land Use	Credit (Hours)	4 (56)
Course facilitator	Wan Sulaiman Wan Harun	E-mail	whwsulaiman@frst.unimas.my
Resource person(s)		E-mail	
Course objectives The module is aimed at providing an understanding of the complexities of peat soils and issues related to their use based on theoretical frameworks, philosophies, ideologies, current thinking and practices in the areas of land use and natural resource utilization. At the end of the module candidates would have the ability to: <ul style="list-style-type: none"> - describe the genesis and characteristics of peat soils - explain the meaning and implications of soil quality - explain the principles and approaches to land evaluation - appraise and evaluate suitability of peatlands for various land uses, giving implications on management and conservation 		Learning Units LU1. General understanding of soil with a comprehensive treatment of peat soils LU2. Concept of soil quality and performance, and principles and practices in land evaluation for land-use planning as related to resource evaluation, allocation and utilization LU3. Land use - Sectoral needs and conflicts, land use change and impact, and case analyses for peatland LU4. Integrated Soil Conservation Management with emphasis on agricultural development of peatland.	
Course Synopsis Beginning with a broad overview of soils, the module goes into an in-depth treatment on the nature of peat soils, examines the various concepts relevant to soil quality and sustainable use, and introduces the various principles and techniques in land evaluation and land-use planning. Present and future sectoral land use, and their impacts are then discussed through case studies, with special reference to peatlands. The final part of the module deals with the general concepts of integrated soil conservation management, and in particular, integrated catchment/watershed management (ICM) as an approach towards "wise use" of peatlands.			
Course Outline <ul style="list-style-type: none"> • Overview of soils: formation, concept of individual soils, basic properties (physical, chemical and biological), soil taxonomy, wetlands • Peat soils: genesis, properties and behaviour, taxonomy and mapping • Soil Quality and Performance: concept of soil quality/soil health and its assessment, soil resistance and resilience, carrying capacity and sustaining biological productivity, soil remediation • Land evaluation: land evaluation for land-use planning, interpretations for various soil uses, controls in land-use planning • Sectoral land use: agriculture, forestry, plantation, nature, infrastructures, etc., land-use conflicts, wise sectoral land use • Land use change: spatial and temporal monitoring of changes, impact on ecosystems, the peatland case • Soil conservation management: land degradation (focus on erosion and peat soil subsidence), integrated approach to peat soil/land conservation, agricultural land and water management on peatland 			
Course contents			
LU 1	Overview of soils and peats: Targeting at postgraduate students from different disciplinary backgrounds, this LU will introduce soils from historical and philosophical perspectives as much as from the scientific and utilitarian perspectives. Topics include concepts in soil formation and of individual soils; basic physical, chemical and biological properties and how these relate to soil's use and the environment; organizing soil information covering soil survey and classification including Soil Taxonomy; and brief overview of wetlands. The treatment is then extended to peat soils and the attendant issues pertaining to peat soils use. Reading list includes recent comprehensive textbooks on soils, compendiums on soils and sustainable land use, and on peatlands.		

LU 2	<p>Soil quality, performance and land evaluation: This learning unit deals with concepts in resource evaluation, allocation, and use. Theoretical background is covered under various topics that include concept of soil quality or soil health and methods of assessment/evaluation; soil resistance and resilience; carrying capacity and sustaining biological productivity; soil remediation. The second part of the learning unit deals with land evaluation for land-use planning, land capability classification systems, land evaluation and site assessment, interpretations for various soil uses, land potential ratings, and controls in land-use planning.</p>
LU 3	<p>Sectoral land use and land use change: This learning unit will address the principles, ideals and realities of landuse management and practices in Malaysia and in other countries for comparative evaluation. Formal instruments include the landuse and natural resources policies and strategies as embodied in the National Development Plans, Structure Plans and published agendas such as the “Strategi Pembangunan Mampan dan Agenda 21 Selangor”. Included too are the codified guidelines of the Department of The Environment, Forestry, Fisheries, Land and Mines with regards to landuse and resource utilization. The learning unit will be heavily oriented towards case analysis that will illustrate the success and failures; uses and abuses; management and mismanagement and impacts on the larger ecosystem. Suggested studies include:</p> <ul style="list-style-type: none"> • The Green Revolution as landuse and resource enhancement strategies in relation to rice production in Asia. • Sustainable Development of Wetland Habitats. • Successes of pineapple and oil palm on peat, problem cases like sago plantation development and Kalimantan mega rice project, and sustainability of smallholder approach. • Nature conservation areas such as Sarawak’s Loagan Bunut National Park.
LU4	<p>Integrated soil conservation management: LU4 deals with problems of land degradation with emphasis on soil erosion and peat soil subsidence. Attention will be given to water management aspects in peatland conservation and utilization especially for agriculture. Integrated catchment management (ICM) concept will be introduced and subsequently elaborated for peat basins – these include watershed management approach, issues and conflicts, analysis and planning, preventive measures and action plans, institutional framework and challenges in ICM.</p>
<p>Key references Brady, N.C., and R.R. Miller, 2002. The Nature and Properties of Soils, 13th edition. Prentice Hall, New Jersey. Dasmann, R.F., Milton and Freeman, 1973, “Ecological Principles For Economic Development”, John Wiley & Sons Ltd., London. Doran, J.W., and A.J. Jones (eds). 1966. Methods for Assessing Soil Quality. SSSA Special Publication no.49. Madison, Wis., Soil Sci. Soc. Amer. Fischer, A.C., 1983, “Resource And Environmental Economics”, Cambridge University Press, Cambridge. Miller, R.W. and D.T. Gardner. 2001. Soils in Our Environment, 9th edition. Prentice Hall, New Jersey. O’Callaghan, J.R. 1996. Land use: The interaction of economics, ecology and hydrology. Chapman & Hall, London. Pierce, D.W. and Turner, R.K., 1990, “Economics of Natural Resources and the Environment”, John Hopkins University Press, Baltimore. Pimentel, D. (ed) 1993. World soil erosion and conservation. Cambridge Univ. Press, Cambridge. Sarre, P., Hodder and Stoughton (eds), 1991, “Environment, Population and Development. Syers, J.K. & D.L. Rimmer (ed) (1994). Soil science and sustainable land management in the tropics. CAB International, Wallingford. William Thomas Jr. (ed), 1966, “Man’s Role in Changing The Face Of The Earth”, Werner Green Foundation For the Anthropological Research and the National Science Foundation, University of Chicago Press. Chan, H.T., Ong, Gong and Sasekumar, 1993, The socio-economic, Ecological and Environmental Ecosystems in Malaysia and the Present state of conservation in Southeast Asia and Pacific Region, International Society For Mangrove Ecosystem. Jabatan Alam Sekitar (JAS), 1993, Buku Panduan Kawasan Sensitif Alam Sekitar Malaysia, Kementerian Saions, Teknologi dan Alam Sekitar.</p>	

Jabatan Perancangan Bandar dan Desa (JPBD), 1997, Garis Panduan Perancangan Pemeliharaan Topografi Semulajadi di dalam Perancangan dan Pembangunan Fizikal Mengikut Akta Perancangan Bandar dan Desa 1976.

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Malaysian Institute of Economic Research (MIER), 1990, Economic Policies for Sustainable Development: Implementing the Brundtland Commission in Malaysia.

Oh, C., 1998, Highland Development : An Integrated Approach to Policy, Planning and Management, Bengkel Alam Sekitar JPBD, Semenanjung Malaysia.

Perancangan Bandar Dan Desa Negeri Selangor Darul Ehsan dan Lestari Unuversiti Kebangsaan Malaysia, 1999, Strategi Pembangunan Mampan dan Agenda 21 Selangor.

Ramakrishnan, S., 1998, Pembangunan Tanah Lembah: Isu-isu Berkaitan, Bengkel Alam Sekitar Jabatan Perancangan Bandar dan Desa Semenanjung Malaysia.

Structure Plans, Local Plans of the various districts, municipalities and selected towns and cities of Malaysia published by the Town and Country Planning Department, throughout the nineties.

The Seventh and Eight Malaysia Plans.

Course highlights

Case studies on land development in general and peatland development in particular

Assessment

Written examination: 50%

Assignments: 30%

Classroom attendance, presentation skills and participation: 20%

COURSE 4: HUMAN DIMENSION AND RESOURCE ECONOMICS

Course Code:		Semester of offer:	
Course Title:	Human Dimension and Resource Economics	Credit (Hours):	4 (56)
Module:	Core Module	E-mail:	gtnoweg@calm.unimas.my
Course Facilitator(s):	Assoc. Prof. Dr. Gabriel T. Noweg	Room/Lecture Hall:	
Course Objectives: The objectives of the course are: <ol style="list-style-type: none"> 1) To provide students with a broad knowledge of the planning requirements in development. 2) To expose students to simple (common techniques) in economic analysis, project planning and appraisal. 3) To familiarize students with various aspects of the human dimension in both the planning and management stages of development projects. After completing the course students would be able to: <ol style="list-style-type: none"> (a) Undertake simple economic analysis of development plans (b) Draw up plans for small development projects (c) Making appraisal and economic evaluation of development projects 		Learning Units LU1: Appraisals of human dimension and issues in development economics, planning and evaluations. LU2: Nature and scope of development planning; development objectives, project cycles and planning processes. LU3: Basic Concepts in Development and Key Environmental Concerns LU4: Economics of pollution and environmental degradation. LU5: Natural Resource Economics, Resource Utilization, and Natural Resource Accounting LU6: Economic Appraisals and the Human Elements in Development LU7: Environmental and Social Impacts Assessment (SIA) in Development Planning LU8: Project Planning and Management for the Future LU9: Case studies: Economic analysis of local plans or development projects.	
Course Synopsis: The course deals with development planning, resource and environmental economics with special emphasis on their human dimensions. Topics include project plans and its relationships to national development objectives and plans; project appraisal & economic evaluation encompassing environmental and social impact assessment as a requirement in national development planning. Key human (social) elements associated with the planning and economic decision making processes in development are also discussed.			
Course contents			
LU 1	Appraisals of human dimension and issues in development economics, planning and evaluations. - Social and economic Issues in development - Introduction to Development Planning - Concepts of Development Economics and Development Planning - Levels of planning (both operational and spatial); planners and planning agencies - Planning in Developing countries. Ref: Conyers and Hills (1984); Kasliwal (1995).		

LU 2	<p>Nature and scope of development planning; development objectives, project cycles and planning processes.</p> <ul style="list-style-type: none"> - Project and project management: definitions, parameters and scope - Project and development plans: contexts in local, national and regional developments - Project plans in relations to development objectives: private versus societal goals - Project cycles, planning cycle, and economic tools - Planning goals and the stakeholders' question (developer and the society) <p>Ref: Ayob (1989); Noweg (2000), Weiss and Wysocki (1992); Kerzner (1995)</p>
LU 3	<p>Basic Concepts in Development and Key Environmental Concerns</p> <ul style="list-style-type: none"> - Fundamental environmental issues in Development Planning and Management - Environmental management concepts - Principles and theories in natural resource and environmental economics - Institutions, ethics, risks and future generation. <p>Ref: Tietenberg (1996)</p>
LU4	<p>Economics of Pollution and Environmental Degradation</p> <ul style="list-style-type: none"> - Concepts in pollution economics - Taxation and optimal pollution - Environmental standards and measurements of environmental damages - Pollution control and policy
LU5	<p>Natural Resource Economics, Resource Utilization, and Natural Resource Accounting</p> <ul style="list-style-type: none"> - Concepts of resource economics and resource use - Renewable and exhaustible resources - Resource utilization, sustainable yield and natural resource accounting - Forest resource management and timber rents - Sustainable resource management: the politics and challenges for developing countries
LU6	<p>Economic Appraisals and the Human Elements in Development</p> <ul style="list-style-type: none"> - Appraisal and project evaluation: concepts and techniques. - Pricing and valuing costs and benefits, valuation of environmental and natural goods; intangibles; ethical issues in evaluations - Economic feasibility; Project worth: benefit-cost ratio, net present value, social net benefits; - Inter-generational issues: - resource exploitation and rate of discount, etc. - Human resource development – community empowerment, organization, training. <p>Ref: Kerzner (1995); Ayob (1989); Gittinger (1982); Cocker and Richards (1992)</p>
LU7	<p>Environmental and Social Impacts Assessment (SIA) in Development Planning</p> <ul style="list-style-type: none"> - Impacts assessment: role and relationship to planning to planning, policy, politics and management - Briefs on environmental Impact Assessment (EIA) and its relation to Social Impact Assessment (SIA) - Elements of SIA; SIA and sustainable development; SIA and the planning process; - Case discussions: (1) conservation areas; (2) relocation, resettlement and migration, (3) hazards and diseases - Issues, problems and future challenges in SIA. <p>Ref: Barrow (1997); Glasson et al. (1999); Morgan (1998); Hanley and Spash (1995).</p>
LU8	<p>Project Planning and Management for the Future</p> <ul style="list-style-type: none"> - Contemporary issues in project management: customer/clientele focus, program management, stakeholder analysis, organizational changes - The roles of various laws (Federal laws, State Laws [Ordinances], Native Land Rights, Customary Rights). - Project planning and management in contemporary environments - Excellence in project management; Quality Management: ISO 9000 series, etc. <p>Ref: Weiss and Wysocki (1992); Kerzner (1995).</p>

LU9	<p>Case Studies: analysis of local project plans</p> <p>- Cases of local project plans will be discussed. The focus will be on human problems and issues associated with these plans. Students will work in groups. Materials to be used in this exercise will be made available to students ahead of time to allow sufficient time for pre-class review and group discussions. Each group will present its analysis both orally and in the form of a brief report.</p>
<p>Key References:</p> <p>Ayob, A.M. 1989. Perancangan dan penilaian projek pembangunan. Kuala Lumpur: DBP. 231 pp.</p> <p>Barrow, C.J. 1997. Environmental and social impact assessment: an introduction. London: Arnold. 310 pp.</p> <p>Carew-Reid, R., S. Prescott-Allen, S. Bass and B. Dalal-Clayton. 1994. Strategies for national sustainable development: a handbook for their planning and implementing development. London: Earthscan Publications Ltd. 203 pp.</p> <p>Carley, M. and I. Christie. 1992. Managing sustainable development. London: Earthscan Publications Ltd. 303 pp.</p> <p>Coker, A. and Richards, C. (Eds.) 1992. Valuing the environment: economic approaches to environmental evaluation. A proceeding of a workshop held at Langrove Hall, Middlesex Polytechnic. London: Balhaven Press. 183 pp.</p> <p>Conyers, D. and P. Hills. 1984. An introduction to development planning in the Third World. New York: John Wiley & Sons Ltd. 271 pp.</p> <p>Farrington, J., A. Bebbington, K. Welland and D.J. Lweis. 1993. Reluctant partners: non-governmental organizations, the state and sustainable development. 222 pp.</p> <p>Glasson J, A. Therival and A. Chadwick. 1999. Introduction to environmental impact assessment: principles and procedures, practice and prospects. London. UCL Press Limited. 496 pp.</p> <p>Hanley, N. and C.L. Spash. 1995. Cost-benefit analysis and the environment. Brookfield, Vermont USA: Edward Edgar Publishing Ltd. 278 pp.</p> <p>Kasliwal, P. 1995. Development economics. Cincinnati, Ohio: South-Western Publishing Company. 348 pp.</p> <p>Kerzner, H. 1995. Project management: a systems approach to planning, scheduling, and controlling. New York. Van Nostrand Reinhold. 1152 pp.</p> <p>Morgan, R.K. 1998. Environmental impact assessment: a methodological perspective, London: Kluwer Academic Publishers. 307 pp.</p> <p>Mosse, D., J. Farringdon and A. Rew. 1998. Development as a process: concepts and methods for working with complexity. London: Routeledge. 202 pp.</p> <p>Noweg. G.T. 2000. A compilation of lectures on "project Planning and Evaluation." (Unpublished).</p> <p>Szirmai, A. 1997. Economic and social development: trends, problems and policies. London: Prentice Hall. 483 pp.</p> <p>Spinner, M. 1992. Elements of project management: plan, schedule, and control. Englewood Cliffs, New Jersey: Prentice Hall. 211 pp.</p> <p>Tietenberg, T. 1996. Environmental and natural resource economics. New York: HarperCollins College Publishers. 614 pp.</p> <p>Gittinger, J.P. 1982. Economic analysis of agricultural projects. Baltimore: The John Hopkins University Press. 505 pp.</p> <p>Wysocki, R., R. Beck and D. Crane. 2000. Effective management. New York: Wiley & Sons, Inc. 359 pp.</p> <p>Other references (for case studies/evaluations) *** subject to changes</p> <p>Bowie, A. 1991. Crossing the industrial divide: state, society, and the economic transformation in Malaysia. New York: Columbia University Press. 222 pp.</p> <p>Clearly, M. and P. Eaton. 1992. Borneo: Change and Development. Oxford University Press. 271 pp.</p> <p>Cleary. and P. Eaton. 1996. Tradition and Reform: land tenure and rural development in South-East Asia. Oxford University Press. 148 pp.</p> <p>IDEAL. 1999. Tanah Pengidup Kitai (Our Land is our Livelihood). Sibul, Sarawak: IDEAL. 90 pp.</p>	

Course highlights

1. Role –playing in decision-making process in planning based on economic and environmental analytical tools – a hypothetical planning problem is discussed where each student is assigned a role to play
2. Economic analysis of selected planning problem or development projects (actual cases in Sarawak, Malaysia).

Assessment

- | | |
|-------------------------------|-----|
| a. Writing assignments: | 20% |
| b. Case Analysis of projects: | 30% |
| c. Examinations: | 50% |

COURSE 5: GIS AND REMOTE SENSING FOR PEATLAND MANAGEMENT

Course code		Semester	
Course title	GIS and Remote Sensing for Peatland Management	Credit/ Hours	4 (56 hrs)
Course facilitator	To be named	E-mail	
Resource person(s)		E-mail	
Course objectives - Understand the principles and technologies related to remote sensing (RS) and GIS. - Development of basic skills in the interpretation of RS imageries and operation of various GIS extensions such as 'elevation and spatial modeling and manipulation' and storage of database related peatland resources.		Learning Units LU1 Introductory Cartography LU2 Fundamentals of Remote Sensing LU3 Remote Sensing and Image Processing LU4 Remote Sensing Applications LU5 Introduction to Geographic Information Systems LU6 Geographic Information Systems: Theory LU7 Geographic Information Systems: Functional Capabilities LU8 Geographic Information Systems Applications LU9 Practical/case study.	
Course synopsis Introductory cartography; fundamentals of remote sensing; remote sensing and image processing; remote sensing applications; introduction to geographic information systems; geographic information systems: theory, functional capabilities and applications.			
Learning Outcome After completing the module students would be able to: <ul style="list-style-type: none"> Describe the various techniques constituting Remote Sensing (RS) and make an appropriate choice of RS techniques for monitoring of land use and land use change. Monitor and interpret changes in the peatland ecosystem using RS technology. Demonstrate basic skills in GIS functional capabilities such as digitizing maps and their manipulation, spatial analyses, modeling and geo-visualization. Perform spatial analyses and geo-visualization of the peatland ecosystem using GIS 			
Course contents			
LU 1	Introductory Cartography. Definition of maps, types of maps and representing information on maps. Reading and using maps, Environmental and landuse parameters for mapping.		
LU 2	Fundamentals of Remote Sensing Definitions of 'Remote Sensing', Origins of Remote Sensing. Aerial Photography and simple Photogrammetry, Parallax Electromagnetic Radiation and the Electromagnetic Spectrum, Energy-Matter Interactions, Remote Sensing Systems 1. Passive 2. Active, Remote Sensing Platforms		
LU 3	Remote Sensing and Image Processing Visual Image Interpretation, Digital Image Processing		
LU 4	Remote Sensing Applications Change Detection – Remote Sensing for Monitoring the Environment		
LU 5	Introduction to Geographic Information Systems GIS and Spatial Analysis. Georeferencing, Introduction to GPS Positioning		

LU 6	GIS: Theory The nature of geographical data, Data Models and Data Structures, Topology and Spatial Relationships, Attribute Database Management
LU7	GIS: Functional Capabilities Data capture: Input and Editing (of Errors), storage, management, retrieval, analysis: Manipulating Spatial Data, display
LU8	GIS: Applications Spatial analysis and modeling, Geo-visualization, Terrain analysis and modeling.
LU9	Practical/case study. Study of RS images and their analysis, Use of GIS for spatial analyses and geo-visualization.
Key references	
<ol style="list-style-type: none"> 1. Barrett, E.C. and Curtis, L.F., 1982, Introduction to Environmental Remote Sensing, Chapman and Hall. 2. Booth, B., 2001, Using Arcgis 3d Analyst, ESRI Press 3. Burrough, P.A., McDonnell, R.A., Editors, 1998, Principles of Geographic Information Systems, 2nd Ed. Clarendon Press 4. Chrisman, N., 1997, <u>Exploring Geographical Information Systems</u>, John Wiley and Sons 5. Colwell, R.N., Editor, Manual of Remote Sensing, Vol I and II, American Society of Photogrammetry, Falls Church, VA 6. Curran, P.J., Principles of Remote Sensing, Longman. 7. Demers, M., 1999, <u>Fundamentals of Geographical Information Systems, 2nd Edition</u>, John Wiley and Sons 8. Goodchild, M., Steyaert, L. and Parks B.O., Editors, 1996, <u>GIS and Environmental Modelling: Progress and research Issues</u>, John Wiley and Sons 9. Gonzalez, R.C. and Wintz, P., 1977, Digital Image Processing, Addison-Wesley, Reading 10. Hearnshaw, H.M. and Unwin, D.J., 1994, <u>Visualisation in Geographical Information Systems</u>, John Wiley and Sons 11. Hord, R.M., 1986, Remote Sensing – Methods and Applications, Wiley, New York 12. Jensen, J.R., 1986, Introductory Digital Image Processing, Prentice Hall. 13. Jones, C.B., 2004, GIS and Computer Cartography, Prentice Hall 14. Lillesand, T.M. and Kiefer, R.W., 1987, Remote Sensing and Image Interpretation, Wiley. 15. Longley, P.A., Goodchild, M.F. and Rhind, D.W., 2001, <u>Geographic Information Systems and Science</u>, John Wiley and Sons 16. MacEachren, A. M., 1995, <u>How Maps Work - Representation, Visualization and Design</u>, Taylor and Francis 17. Sabins, F.F. Jr., 1987, Remote Sensing Principles and Interpretation, Freeman, San Francisco 18. Schanda, E., Editor, Remote Sensing for Environmental Sciences, Springer, Berlin 19. Star, J. and Estes, J., 1989, Geographic Information Systems: An Introduction, Prentice Hall 20. Wise, S., 2002, GIS Basics, Routledge. 	
Course highlights	
Students will be exposed to appropriate GIS and RS software like ArcGIS, Arc View, Mike-11 GIS, ERDAS software and given opportunity to experience simple analyses and display of their data during Laboratory practicals.	
Assessment	
Written examination: 50%	
Assignments: 50%	

COURSE 6: PEATWISE RESEARCH METHODOLOGIES

Course code		Semester	
Course title	PEATWISE RESEARCH METHODOLOGIES	Credit/ Hours	3 Credits
Course facilitator(s)		E-mail	
Resource person(s)		E-mail	
Course objectives The objective this course is to impart to the students the necessary skills in both qualitative and quantitative natural and social scientific methods relevant to the needs of PEATWISE. The specific objectives are to enable students to: <ul style="list-style-type: none"> • understand the major theoretical and philosophical approaches to research in natural and social sciences and their relevance to PEATWISE. • acquire skills in research problem formulation, proposal writing, research design, and data collection. • become familiar with the major techniques in natural and social scientific research, particularly in areas relating to hydrological measurements, ground and surface water and wastewater sampling and analysis, biological methods, soil analysis, socio-economic appraisals, perception and opinion surveys, and statistical methods. 		Learning Units LU 1. Statistical Methods LU 2. Natural scientific methods LU 3. Social scientific methods	
Course synopsis Statistical methods: Definitions; population and sample, data distributions, probability plots; parametric and non-parametric tests for 2 and multiple sample comparisons: simple linear regression; ANOVA and Chi-square tests. Interpreting and communicating research statistics and findings. Natural scientific methodologies: Surface water, groundwater and wastewater sampling and analysis; introduction to hydrological methods; river classification; soil sampling and analysis, Universal Soil Loss Equation (USLE); biological methods; Social scientific methodologies: Introduction to social research; empiricism vs subjectivism; study population, sample and sampling procedures; interviews and etiquette in social inquiry; questionnaires and household surveys; participatory action research (PAR) and participatory rural appraisal (PRA).			
Course contents			
LU 1	The definition and basic steps of statistical data analysis; the concepts of data collection methods, population versus sample, quantitative and qualitative data, hypothesis testing,. Overview of the normal distribution; probability plots, transformations of a given variable, descriptive statistics, the 95% confidence interval; Parametric and non-parametric tests for 2 sample comparisons: Independent sample t-test, Mann Whitney test and Wilcoxon-sign rank test; simple linear regression and Pearson's correlation coefficient and Spearman's rho correlation coefficient. Parametric and non-parametric tests for multiple sample comparisons: One-way and two way ANOVA, Kruskal-Wallis test and Friedman's test; Chi-square test for discrete data in a contingency table. Interpreting and communicating research statistics and findings. Tutorial sessions of statistical computations using statistical packages.		
LU 2	Introduction to social research: Philosophy, epistemology, empiricism versus subjectivism, qualitative approaches in social sciences, quantitative approaches in social sciences. Study population, sampling, sampling design and procedure: Definitions – census versus sample, determining study population and sample, and sampling design. Data Collection: Secondary data collection and use, sources of secondary data, advantages of using secondary data, limitations and pitfalls. Primary data collection, use, advantages and limitations, instrumentation, interviews and etiquette in social inquiry; Rapid Rural Appraisal (RRA) and Participatory Rural Appraisal, definition and distinctions between RRA and PRA.		

LU 3	Natural scientific methodologies: Methods for groundwater, surface water and wastewater sampling, sample preservation and sample analysis; introduction to hydrological methods (flow, channel profile, rainfall etc); river classification. Soil sampling and analysis; Universal Soil Loss Equation (USLE); biological methods: random and systematic sampling (line and belt transects), plant sample collection, biomass estimation; assessment of aquatic resources; indicator species for stream pollution; biological indices.
<p>Key references</p> <p>Latest edition of APHA Methods for Water and Wastewater Analysis.</p> <p>Gunston H (1998). <i>Field Hydrology in Tropical Countries: A Practical Introduction</i>.</p> <p>DOE Technical Report: Development of Water Quality Criteria and Standards - River Classification.</p> <p>Dumanski, J (1997). Criteria and indicators for land quality and sustainable land management. <i>Proc. Intern. Conf. on Geoinfo. for Sustainable Land Management</i>. Enschede, NL. CD-ROM.</p> <p>Landon J R (1991). <i>Booker Tropical Soil Manual – A Handbook for Soil Survey and Agricultural Land Evaluation in the Tropics and Sub-Tropics</i>. Longman. London.</p> <p>Soepadmo, E. (1987). Structure, above ground biomass and floristic composition of forest formations at Gunung Janing Barat, ulu Endau, Johore, Malaysia. <i>Malayan Nature Journal Vol. 41: 275-290</i></p> <p>Yamakura, T., Hagihara, A., Sukardjo, S. and Ogawa, H. (1986). Aboveground biomass of tropical rain forest stands in Indonesia Borneo. <i>Vegetation 58: 71-82</i>.</p> <p>Martin G. (1993). <i>Ethnobotany: A Methods Manual</i>. Chapman & Hall, London.</p> <p>Babbie, E. 1998. <i>The Practice of Social Research</i>. 8 th. Edn. Belmont, CA: Wadsworth Publishing Company. 112 pp.</p> <p>Black, T. R. 1999. <i>Doing Quantitative Research in the Social Sciences: an integrated approach to research design, measurement and statistics</i>. London: SAGE Publications Ltd. 751 pp.</p> <p>McCall, C. H. 1982. <i>Sampling and Statistics Handbook for Research</i>. Ames, Iowa: Iowa State University Press. 340 pp.</p> <p>Marshall, C. and G. B. Rossman. 1999. <i>Designing Qualitative Research (3 rd. Ed.)</i> London: SAGE Publications. 224 pp.</p> <p>Pratt, B. and P. Loizos. 1992. <i>Choosing Research Methods: data collection for development workers</i>. Oxford: Oxfam. 120 pp.</p> <p>O’Sullivan and Rassel, <i>Research Methods for Public Administrators</i>, 3rd ed., 1999, Longman</p> <p>Foster, J. J. 1998. <i>Data Analysis Using SPSS for Windows. A beginner's Guide</i>. Sage Publications, London.</p> <p>Harraway, J.A. 1997. <i>Introductory Statistical Methods and the Analysis of Variance</i>. University of Otago Press, Dunedin.</p> <p>Ott, L. 1988. <i>An Introduction to Statistical Methods and Data Analysis</i>. 3rd. Edition. PWS-Kent Pub. Co., Boston.</p> <p>Steel, R.G.D. and Torrie J.H. 1980. <i>Principles and Procedures of Statistics. A Biometrical Approach</i>. McGraw-Hill, Singapore.</p> <p>SPSS Inc. (1999). <i>The Basics: SPSS for Windows 10.0</i>. SPSS Inc. Training Department, Chicago.</p> <p>SPSS Professional Statistics 7.5. SPSS Inc. Training Department, Chicago.</p> <p>SPSS Advanced Statistics 6.1. SPSS Inc. Training Department, Chicago.</p> <p>Zar, J.H. 1996. <i>Biostatistical Analysis</i>, 3rd. Edition. Prentice Hall., New Jersey.</p>	
<p>Course highlights</p> <ul style="list-style-type: none"> • Cross-disciplinary exposure to research methodologies (preparation and testing of questionnaires) • Exercises for river classification exercise, biomass estimation etc. • Use of statistical software (SPSS Version 10.0 and MS-Excel). 	
<p>Assessment</p> <p>Written examination: 50%</p> <p>Assignments: 50%</p>	

COURSE 7: FIELD COURSE

Course code		Semester	
Course title	FIELD COURSE	Credit/ Hours	2 Credits
Course facilitator(s)		E-mail	
Resource person(s)		E-mail	
Course objectives The field work is aimed at providing students with: <ul style="list-style-type: none"> • the knowledge/guides for standard technical report writing; • the opportunity to apply/practice the interdisciplinary research methodologies learned in classroom • the challenges of group work in addressing real-life issues in a systematic manner; • the experience of preparing project proposal and full fledge technical report according to specified format. 		Learning Units LU 1. Technical Writing LU 2. Grouping and preparation of project proposal LU 3. Fieldwork LU 4. Report preparation	
Learning Outcomes <ul style="list-style-type: none"> • full understanding of the conventions, rules and requirement with respect to formatting and preparation of technical reports; • knowledge and skills in the preparation of full-fledged and appropriately organised and formatted research proposals; • exposure to hands-on/practical skills in using the different natural and social scientific methodologies; • a good understanding of the applicability (e.g. needs, validity, constraints etc.) of the various interdisciplinary research methodologies learned in classroom to the real world issues and problems; • experience in group work participation in the context of interdisciplinary field activity; • knowledge and skills in writing a full-fledged research report based on the findings of the field course. 			
Course synopsis This course will provide the students with an opportunity for joint/group field exercise. The students, divided into a number of small groups, will be working on short but well defined mini-projects using the various interdisciplinary methodologies earlier provided. Suitable field locations in Malaysia will be identified for the purpose. At the end of the field course students are expected to have been exposed to hands-on/practical skills in using the different natural and social scientific methodologies and present/discuss and compile their findings and recommendations in short reports for assessment. The course begins with presentation of guides for technical writing and preparation of project proposals.			
Course contents			
LU 1	Technical Writing: Types of reports, stages of report preparation, report style and formats (including figures, tables, illustrations and language), report introduction, experiment and analysis descriptions, results and discussion, concluding and supporting sections, review of reports, citing and listing of references, author's checklist and report writing aids.		
LU 2	Group Formation: The students will be divided into several teams or groups of five to six students. Each team will work with an overall problem and will sub-divide into at least two disciplinary sub-groups which address specific aspects of the overall problem. The sub-groups may be formed permanently or can be flexible depending on the students' preferences and the requirements for data. Preparation of research/fieldwork proposal for field course. Preparation of Project Proposal: Each group will be required to develop a proposal for the field work that allow for application of interdisciplinary methods and approaches. A draft, followed by pre-field project proposal (max 5000 words) will have to be submitted before the fieldwork. The proposal should contain title of project, literature review (thematic), objectives and research questions, methodology (including schedule of field activities), references, and appendices (optional, e.g. questionnaires, sampling strategies etc.).		

	<p>Typically, project activities/tasks will include (a) preparation of an overview of the existing physical, biological and human environment within the selected river basin. Features to address include the climatic condition, topography/geology, natural drainage (river) system, hydrology, water quality, vegetation cover and wildlife, land and water use, and population structure and socio-economic status. These shall involve collection of primary data in the field and secondary data from the relevant agencies and literature; (b) understand and document the awareness of the human communities living within and surrounding the river basin with respect to their: i) dependence on the natural resources therein, ii) the communities' understanding and commitment to sustainable use of natural resources, iii) their perception to water pollution, and iv) the potential opportunities or threats of market forces e.g. tourism on their livelihood; (c) addressing issues pertaining to the land use and water resource within the river basin. These include:</p> <ul style="list-style-type: none"> • the compliance/non-compliance and the actual performance of structural designs (such as slope protection/erosion control measures, riparian reserve, agriculture and logging/plantation road design and construction, and the drainage system installed) and also timber harvesting and agricultural practices (e.g. use of agrochemicals, tree felling and land clearing) as observed or measured in the field against the stipulated standards, criteria and guidelines; • estimation and identification of sources and impacts of sediment load in rivers, including impacts on water supply and flood events within the watershed. A small sub-catchment can be selected and used for an USLE estimation of soil loss; • identification of sources and impacts of specific pollutants such as agrochemicals and coliform inputs into the watershed. Field measurement of water quality at selected locations shall be required; • identification of the cause and effects of flooding (if applicable), particularly on the agriculture fields and effect on river transportation, physical infrastructures and properties; • identifying legal and institutional frameworks and provisions relevant to the land and water use in the river basin. • recommend appropriate management strategies and action plans for the mitigation and abatement of problems and impacts observed/prevailing within the river basin.
LU 3	<p>The students will carry out their fieldwork at pre-designated location(s), beginning with a pilot study. Thereafter, the groups will make adjustments to their sampling strategies, study outline etc as deemed necessary. Student activities/participation in the fieldwork will be individually assessed.</p>
LU4	<p>A report containing details of the field course findings, analysis and discussion following the format of an integrated river basin management plan (IRBMP). Oral examinations/evaluation of report will be carried out based on group assessment.</p>
<p>Key references C. A. Vidoli 2000. NASA Technical Memorandum 105419 R. B. Standler 2000. Technical Writing – An Overview http://www.rbs0.com/tw.htm, last revised 22 Aug 2000. Other references cited in the Course Specifications for Course No. 6.</p>	
<p>Course highlights</p> <ul style="list-style-type: none"> • Learning the do's and don'ts in technical report writing • Group work in the preparation of project proposal, strategising field work, and report compilation. 	
<p>Assessment Project proposal (group): 15% Project report (group): 75% Individual performance/participation: 10%</p>	

**UNIMAS POST GRADUATE STUDIES REGULATIONS (PGSRR)
Regulations for Masters Degree and Postgraduate
Diploma via Coursework**

These regulations, as from time to time amended, shall apply to all postgraduate students of Coursework Programmes, and shall be deemed a part of the terms and conditions under the Unimas Postgraduate Studies Regulations and the Faculty's Regulations.

1. Admission Requirements

A candidate for a Coursework Programme must possess:

- 1.1 A bachelor's degree with a minimum CGPA of 2.5 or an equivalent second Class Honours from a recognised University, or
- 1.2 A bachelor's degree with at least two years of full-time relevant working or professional experience, or
- 1.3 Other equivalent qualifications approved by the Senate.

2. Registration

- 2.1 A candidate must register as full-time or part-time and pay all stipulated fees at the time of registration.
- 2.2 Enrolment into a coursework programme shall normally be conducted at the beginning of semester 1 and semester 2.
- 2.3 A student may enrol either as a full time or part time candidate.
- 2.4 A candidate is not allowed to register after the fourth week of the semester. In exceptional circumstances, a candidate may be permitted at the discretion of the Dean of the Centre for Postgraduate Studies to register on other days; and in such cases, and additional late registration fee may be charged to the candidate.

3. Interruption of Studies

- 3.1 A registered candidate may interrupt his/her registration due to valid reasons acceptable to the Senate. This interruption will not be considered part of the duration of study.
- 3.2 The interruption shall be for a period of not less than one semester and not more than two semesters.
- 3.3 a candidate who has been granted permission to interrupt his/her studies will not be considered as a registered student. With that, he/she is not allowed to use the facilities provided by the University except for consultations with their supervisors regarding his/her study.

4. Fees

- 4.1 Tuition fees are payable on semester basis.

- 4.2 Examination fees are included in the tuition fees, but any fee for re-examination shall be paid separately.
- 4.3 A candidate may request a review of his/her evaluation results if he/she is not satisfied with them. In such a case, the Faculty Postgraduate Committee will review the results as requested after the student has paid a review fee.
- 4.4 Additional incidental fees may be charged for specific services, such as late registration, conversion from full-time to part-time student or vice versa, library fines, special courses, and field trips.
- 4.5 All fees are non-transferable.
- 4.6 A refund of any fee shall be made only in exceptional cases.

5. **Duration of Study**

- 5.1 The duration of full-time study is from two to six semesters; and for the part-time study; it is from three to ten semesters;
- 5.2 The period of interruption of registration will not be considered part of the duration of study.

6. **Course Requirements**

The course requirements are subjected to individual Faculty programmes, and may range from 20 to 30 credits for Postgraduate Diploma and 36 to 46 credits for masters degree.

7. **Examinations**

- 7.1 The Faculty will establish a board of examiners for each programme. Each board shall include all the examiners who are involved in the teaching of the courses in the programme, who shall have regard to the totality of each degree programme and who shall be involved and particularly influential in the decisions relating to the award of every degree. The board be able to specifically comment and give judgment on the validity and integrity of the assessment process and the standard of student attainment.
- 7.2 Examination procedures shall ensure that assessment is and can be demonstrated to be fair and impartial.
- 7.3 In the case of students failure to satisfy the criteria for progression, the Faculty Postgraduate Committee will specify the form of re-evaluation (e.g. by re-examination or repeating a course) and the time needed before the student can proceed with his/her studies.

Schemes of examination shall be prescribed in the individual programmes regulations and unless the individual programme regulations indicate otherwise shall include the submission of a significant piece of individual work in the form of an essay, report or dissertation which may be based on a project of fieldwork.

- 7.4 A candidate wishing to defer sitting one or more examinations must first obtain the support of his or her supervisor and submit a written application for deferring the sitting of the specific examination to the Faculty Postgraduate Committee. Where such an essay/report/ dissertation is submitted later than the specified date the faculty shall at its discretion either disregard its lateness or not consider it at all or, having not considered it, award lower marks or grades for it than would otherwise have been awarded.

- 7.5 If the essay, report or dissertation is adequate except that it requires minor amendment the examiners may require the candidate to make within one month the amendment specified by them or one of their number nominated by them.
- 7.6 In exceptional circumstances examiners shall have the discretion to require a student to be examined orally in one or more components of his/her examination.
- 7.7 Where the regulations permit a candidate to offer work written outside the examination room, the work submitted must be certified to be his/her own and any quotation from the published or unpublished works or other persons must be acknowledged.

8. Student Responsibilities

- 8.1 The student is fully responsible for the completeness and accuracy of registration and payment of all fees.
- 8.2 Students shall state at the time of registration their full addresses (home, office and e-mail) and phone numbers where they can easily be contacted. The Faculty must be informed of any change of correspondence address within 14 days of the change.
- 8.3 Students shall comply with all requirements of the rules, regulations and procedures of the University and the Programme, at the time being in force.
- 8.4 Students who fail to conform to any of the University regulations, or who are responsible for any form of academic dishonesty or misconduct in the course of their academic pursuits, are subjected to administrative action and/or disciplinary penalties, which may include expulsion from the University.

9. Conferment of Degree

- 9.1 The degree will be awarded to candidates who have fulfilled all requirements;
- 9.2 The degree will be conferred by the Senate of the University upon recommendation from the Centre for Postgraduate Studies.

10. Termination of Candidature

- 10.1 A student's candidature may be terminated at any time by the University in the event that the candidate is:
 - 10.1.1 deemed unfit for further studies in the University, as certified by a Medical Board selected by the University;
 - 10.1.2 convicted of any crime which, in the opinion of the University is likely to bring the University into disrepute.
 - 10.1.3 Guilty of insobriety or gross impropriety or misconduct.
- 10.2 The candidate has the right to appeal in writing against decisions made by the University related to his/her termination of study, and disciplinary matters.
- 10.3 An appeal to re-register will be considered within a period of one to three calendar years after withdrawal or dismissal from the University. Such an

appeal will be granted only after the student's conduct, academic record and work experience have been reviewed by the Faculty Postgraduate Committee.

**SENARAI TENTATIF KAKITANGAN AKADEMIK
BAGI PROGRAM DIPLOMA PASCA SISWAZAH
(PENGURUSAN TANAH GAMBUT)**

Prof Dr Murtedza Mohamed – Fakulti Sains & Teknologi Sumber
Assoc Prof Dr Lau Seng – Fakulti Sains & Teknologi Sumber
Prof Dr Dimbab Ngading – Fakulti Sains Sosial
Assoc Prof Dr Hamsawi Sani - Fakulti Sains & Teknologi Sumber
Dr Gabriel Tonga Noweg – Fakulti Sains & Teknologi Sumber
Prof Wan Sulaiman Wan Harun - Fakulti Sains & Teknologi Sumber
Dr Lee Nyanti - Fakulti Sains & Teknologi Sumber
Dr Petrus Bulan - Fakulti Sains & Teknologi Sumber
Dr Siti Rubiah Zainudin - Fakulti Sains & Teknologi Sumber

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Pakar/Pensyarah Jemputan

Dr Tie Yiu Liong - Agrosol Sdn Bhd, Sarawak
Dr James Dawos Mamit - Natural Resource & Environment Board, Sarawak
Yogeswaran Mailvaganam - Geological Survey Department –rtd
Dr Henk Ritzema - Wageningen University

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