



**UNIVERSITI PENYELIDIKAN**

**UNIVERSITI TEKNOLOGI MALAYSIA**

**KERTAS KERJA UNTUK PERTIMBANGAN DAN KELULUSAN KEMENTERIAN PENDIDIKAN TINGGI**

**DISEDIAKAN OLEH**

**SEKOLAH RAZAK UTM DALAM KEJURUTERAAN DAN TEKNOLOGI TERMAJU**

**UNIVERSITI TEKNOLOGI MALAYSIA**

**CADANGAN MEWUJUDKAN PROGRAM**

**AKADEMIK BAHARU**

**SARJANA SAINS (REKA BENTUK KEJURUTERAAN)**

**SECARA KERJA KURSUS**

**KERTAS KERJA BIL:**

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| **KEPUTUSAN** | **🗸** |
| **MAKLUMAN** |  |

KERTAS KERJA UNTUK PERTIMBANGAN DAN KELULUSAN

KEMENTERIAN PENDIDIKAN TINGGI

**CADANGAN MEWUJUDKAN PROGRAM AKADEMIK BAHARU**

**SARJANA SAINS (REKA BENTUK KEJURUTERAAN)**

**SECARA KERJA KURSUS**

**SEKOLAH RAZAK UTM DALAM KEJURUTERAAN DAN TEKNOLOGI TERMAJU, UNIVERSITI TEKNOLOGI MALAYSIA**

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| **Tarikh** | **03 Mac 2016** |  |  |

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# RINGKASAN EKSEKUTIF

**CADANGAN MEWUJUDKAN PROGRAM AKADEMIK BAHARU**

**SARJANA SAINS (REKA BENTUK KEJURUTERAAN)**

**SECARA KERJA KURSUS**

**DI SEKOLAH RAZAK UTM DALAM KEJURUTERAAN DAN TEKNOLOGI TERMAJU**

**UNIVERSITI TEKNOLOGI MALAYSIA**

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| **1.0** | **UNIVERSITI/KOLEJ UNIVERSITI** | UNIVERSITI TEKNOLOGI MALAYSIA (UTM) |
| **2.0** | **TUJUAN** | Kertas kerja ini bertujuan mendapatkan pertimbangan dan kelulusan Kementerian Pendidikan Tinggi bahawa Sekolah Razak UTM Dalam Kejuruteraan Dan Teknologi Termaju, Universiti Teknologi Malaysia akan menawarkan program Sarjana Sains (Reka Bentuk Kejuruteraan) secara kerja kursus. |
| **3.0** | **PROGRAM AKADEMIK YANG DIPOHON** | Sarjana Sains (Reka Bentuk Kejuruteraan)  *Master of Science* (*Engineering Design*)  Nama Penganugerahan (dalam Bahasa Malaysia):  Sarjana Sains (Reka Bentuk Kejuruteraan)  Nama Penganugerahan (dalam Bahasa Inggeris):  **Master of Science (Engineering Design)** |
| **4.0** | **FAKULTI / SEKOLAH /**  **PUSAT YANG MEMOHON** | Sekolah Razak UTM Dalam Kejuruteraan & Teknologi Termaju  *(UTM Razak School of Engineering and Advanced Technology)*  Universiti Teknologi Malaysia Kuala Lumpur. |
| **5.0** | **PERINGKAT PENGAJIAN** | Ijazah Sarjana |
| **6.0** | **TAHUN DIMULAKAN** | Jangkaan ditawarkan pada  **(Semester I, Sesi 2016/2017)** |
| **7.0** | **JANGKAMASA / KAEDAH PENGAJIAN** | Sepenuh Masa :  Minimum 1 1/2 tahun (3 semester lazim)  Maksimum 3 tahun (6 semester lazim)  Separuh Masa :  Minimum 2 tahun (4 semester lazim)  Maksimum 4 tahun (8 semester lazim)  Program ini juga boleh dilaksanakan secara luar kampus sekiranya mendapat permintaan daripada pemegang taruh dan bilangan calon yang mencukupi (sekurang-kurangnya 15 orang diperlukan untuk menjalankan Program Luar Kampus). |
| **8.0** | **OBJEKTIF / MATLAMAT PROGRAM** | Program Sarjana Sains (Reka Bentuk Kejuruteraan) mendukung teras ‘Membudayakan Pembelajaran Sepanjang Hayat’ dengan menawarkan peluang pemerkasaan ilmu kepada graduan yang berlatarbelakangkan Sarjana Muda Kejuruteraan, Sarjana Muda Teknologi dan Sarjana Muda Sains. Pemerkasaan ilmu yang terkandung di dalam program pasca-siswazah ini merangkumi reka bentuk produk, sistem mekanikal dan sistem elektrikal yang bermatlamat melahirkan graduan pakar yang berupaya membangunkan penyelesaian inovatif sesebuah sistem atau produk dengan mengambil kira manfaat kepada masyarakat dan kelestarian alam sekitar.  Graduan Program Sarjana Sains (Reka Bentuk Kejuruteraan) berpotensi mempamerkan kebolehan seperti yang berikut:   1. mendemonstrasikan pengetahuan reka bentuk kejuruteraan yang diperolehi daripada program ini apabila mewujudkan penyelesaian yang inovatif kepada permasalahan yang berkaitan industri 2. mempamer kemahiran berkomunikasi dengan berkesan di kalangan ahli kumpulan daripada pelbagai bidang. 3. mendukung etika professional apabila melaksanakan tanggungjawab dengan mengambil kira aspek masyarakat, persekitaran dan isu-isu global. 4. mempertingkatkan pengetahuan yang berkaitan dengan reka bentuk kejuruteraan melalui pengurusan maklumat yang baik dan pembelajaran sepanjang hayat.   *PEO – Program Educational Objective* |
| **9.0** | **JUSTIFIKASI MENGADAKAN PROGRAM** | 1. **Aspirasi Nasional**   Program Transformasi Ekonomi (Economic Transformation Programme, (ETP) melihat bidang kejuruteraan mampu memberi impak kepada pendapatan kasar negara (gross national income, GNI) dan tahap daya saing Malaysia di peringkat antarabangsa. Laporan ETP menganggarkan 1 juta kekosongan jawatan dapat diwujudkan sehingga tahun 2020 di mana 7 peratus memerlukan kelayakan peringkat sarjana. Bidang Ekonomi Utama Negara (National Key Economic Area, NKEA) sektor elektronik dan elektrik menganggarkan 1,000 orang jurutera memerlukan latihan pasca siswazah setiap tahun sehingga tahun 2020. Kos latihan tersebut menelan belanja kira-kira RM 10,000 setahun setiap seorang jurutera. Kepakaran di dalam kejuruteraan turut dikenalpasti di dalam sub-segmen yang mempunyai potensi tertinggi untuk meningkatkan GNI seperti minyak dan gas, kejuruteraan biomedik, kejuruteraan awam dan mekanikal dan integrasi sistem.   1. **Tinjauan Relevansi Kurikulum Program Sarjana Sains (Reka Bentuk Kejuruteraan)**   Satu tinjauan yang bertujuan menilai relevansi kurikulum Program Sarjana Sains (Reka Bentuk Kejuruteraan) kepada keperluan industri telah dilaksanakan. Maklum balas diperolehi daripada 95 responden yang mewakili 3 jenis organisasi yang dengan pecahan 25% daripada milik kerajaan, 42% milik tempatan dan selebihnya 33% milik asing. 71% daripada kesemua responden berpendapat teori-teori asas menurut disiplin ilmu telah terangkum di dalam kurikulum program ini. Baki responden melihat hanya sebahagian sahaja teori-teori asas yang diutarakan memenuhi keperluan kandungan program. Walau bagaimanapun dari satu sudut pandangan lain, 96% responden bersetuju bahawa teori-teori tersebut relevan dengan permasalahan semasa dan ini menyumbang kepada kekuatan program. Kesesuaian kursus yang terkandung di dalam program ini mendapat respon positif daripada kebanyakan responden (85%). Responden turut diminta untuk menyatakan sejauh mana tahap program ini dengan mengambil kira empat ciri seperti yang tertera dalam **Jadual 1** di bawah:  **Jadual 1**   |  |  |  | | --- | --- | --- | | CIRI-CIRI | TAHAP | | | SEPENUHNYA | SEBAHAGIAN | | 1. Reka bentuk kejuruteraan | 40% | 60% | | 1. Penggunaan teknologi maklumat komunikasi dan maklumat | 75% | 25% | | 1. Penggunaan analisis berangka | 55% | 45% | | 1. Bertepatan dengan kehendak industri | 60% | 40% |   Hampir kesemua (94%) responden bersetuju dengan tempoh masa pengajian (3 semester secara sepenuh masa) untuk program ini. Selebihnya mencadangkan sekurang-kurangnya 4 semester bagi mencapai tahap keperluan industri. Umumnya responden berpendapat graduan program ini sesuai bekerja di organisasi masing-masing. Sebahagian besar responden berpendapat tahap kesesuaian bidang kerja tertinggi dengan program ini ialah reka bentuk kejuruteraan disusuli bidang penyelidikan dan pembangunan, reka bentuk produk dan pembangunan produk (**Rajah 1**). Turutan kesesuaian jawatan yang terdapat di dalam organisasi responden didahului dengan Jurutera Reka Bentuk diikuti dengan Jurutera Pembangunan Produk seterusnya Pengurus Teknikal (**Rajah 2**).   |  | | --- | |  | | **Rajah 1** | |  | | **Rajah 2** |   Prospek graduan program ini adalah positif seperti yang digambarkan oleh **Rajah 3** di mana setiap organisasi berupaya memperuntukkan sekurang-kurangnya satu jawatan dan anggaran pencapaian pendapatan sekurang-kurangnya RM 3,000 (**Rajah 4**). Ini membuktikan bahawa sebahagian besar responden berpendapat graduat program ini mempunyai nilai tersendiri dan sangat diperlukan di dalam sektor kejuruteraan. Kelebihan graduan terus diiktiraf dengan kesediaan organisasi responden menawarkan kenaikan pangkat (**Rajah 5**).   |  | | --- | |  | | **Rajah 3** | |  | | **Rajah 4** | |  | | **Rajah 5** |   Dapatan kajian merumuskan hanya 33% daripada organisasi responden menyatakan kesediaan untuk menaja pelajar di dalam bidang yang setara dengan program ini. Namun begitu, program ini berpeluang mendapat sambutan baik berdasarkan kesediaan sebahagian besar organisasi responden (83%) memberi galakan kepada staf menyertai program ini. Sejumlah 98% responden bersetuju bahawa program ini berupaya meningkatkan kebolehan seseorang jurutera atau pengurus. Kesesuaian program ini untuk dinaikkan taraf ke peringkat PhD dipersetujui oleh 75% daripada responden. Justeru, fleksibiliti program ini terserlah. Aspek keboleh pasaran graduat program ini diperakukan lebih 90% responden berdasarkan rumusan pendapat seperti yang berikut:   1. Dapat meningkatkan daya saing jurutera tempatan berbanding jurutera dari luar negara. 2. Mencadangkan subjek analisis risiko dimasukkan ke dalam program. 3. Menepati keperluan semasa dan nilai tambah kepada staf dari aspek keterampilan dan pengetahuan.   Kesimpulannya, Program Sarjana Sains (Reka Bentuk Kejuruteraan) amat relevan dengan usaha pembangunan profesional bagi sama ada akademik atau sektor swasta. Penerangan lebih lanjutan mengenai kajian pasaran ini boleh dirujuk pada **Lampiran 1K**.   1. **Bidang Kerjaya**   Program Sarjana Sains (Reka Bentuk Kejuruteraan) menawarkan peluang pemerkasaan ilmu kepada graduan yang berlatarbelakangkan Sarjana Muda Kejuruteraan, Sarjana Muda Teknologi dan Sarjana Muda Sains. Di samping kursus teras, program ini menyediakan tiga bidang elektif; reka bentuk sistem mekanikal, reka bentuk produk dan reka bentuk sistem elektronik. Ketiga-tiga elektif ini merangkumi keperluan kejuruteraan masa kini. Program ini menyediakan kaedah, model dan alat untuk mereka bentuk produk mekanikal dan mereka bentuk sistem pengurusan industri.  Faktor teknikal, kemanusiaan dan ekonomi turut diambil kira. Teknologi mikroelektronik yang berkembang pesat tanpa mengira iklim ekonomi dunia, memerlukan jurutera yang berpengalaman dan berpengetahuan teknologi terkini. Graduan memperoleh pengetahuan mengintegrasi sistem kawalan pintar dan peranti mekanikal dan elektronik untuk menghasilkan produk pengguna yang inovatif. Kerjaya di dalam reka bentuk produk memerlukan pengetahuan menghasilkan produk yang memenuhi kehendak fungsi, pengguna dan masyarakat. Kepantasan penghasilan produk kini menjadi keutamaan. Calon akan didedahkan kepada proses dan elemen-elemen yang terlibat di dalam pembangunan sesuatu produk seperti dorongan kreativiti dan kaedah pengurusan.  Kesimpulannya, jelas sekali penawaran ketiga-tiga elektif di dalam kurikulum secara langsung mencerminkan bidang kerjaya yang bakal graduan program ini ceburi. |
| **10.0** | **HASIL PEMBELAJARAN PROGRAM (*PROGRAM OUTCOMES*)** | Selain memenuhi kehendak pemegang taruh, program ini mendokong visi, misi dan matlamat yang telah digariskan oleh Universiti Teknologi Malaysia dan Sekolah Razak UTM.  Pada akhir program ini, graduan berupaya:   1. mengintegrasi dan menjana pengetahuan lanjutan reka bentuk kejuruteraan bagi membangun atau mencipta produk inovatif dan penyelesaian proses dalam situasi atau konteks baru. 2. menganalisis dan menilai masalah secara kritis dan menyediakan penyelesaian melalui penggunaan alatan dan teknik yang sesuai. 3. menilai situasi dan berkomunikasi dengan jelas berkaitan hasil kajian, pengetahuan dan cadangan secara rasional kepada rakan dan pakar dalam bidang berkaitan serta berupaya memimpin dan bekerjasama dalam pasukan. 4. merancang dan menjalankan kerja-kerja reka bentuk / projek secara profesional, beretika dan bertanggungjawab, dengan mengambil kira pelbagai kepentingan dan persekitaran. 5. menilai dan mengadaptasi pengetahuan kontemporari secara berdikari serta menguruskan maklumat dengan berkesan sepanjang hayat. 6. mengurus isu-isu kompleks berkaitan reka bentuk kejuruteraan serta mengenalpasti peluang keusahawanan. |
| **11.0** | **STRUKTUR KURIKULUM** | Struktur program terbahagi kepada kursus teras, kursus umum universiti (wajib), kursus umum universiti (pilihan), kursus elektif dan projek sarjana. Setelah menetapkan salah satu kursus elektif, pelajar dikehendaki memilih mana-mana empat kursus yang terkandung di dalam elektif tersebut. Jadual yang berikut menyenaraikan kursus-kursus yang terkandung di dalam **Program**  **Sarjana Sains (Reka Bentuk Kejuruteraan):**  **STRUKTUR PROGRAM**  **SARJANA SAINS (REKA BENTUK KEJURUTERAAN)**   | ***Kod*** | ***Nama Kursus*** | ***Nilai Kredit*** | | --- | --- | --- | | **KURSUS TERAS (18 kredit) (Wajib SEMUA)** | | | | MRSM 1213 | Engineering Design Optimization | 3 | | MRSM 1223 | Technovation Management | 3 | | MRSM 1233 | Engineering Design Process & Methodology | 3 | | MRSM 1243 | Materials Selection and Manufacturing Process | 3 | | MRSM 1253 | Computer Aided Design (CAD) / Computer Aided Engineering (CAE) | 3 | | MRSE 2603 | Creativity and Innovation Management | 3 | | **KURSUS ELEKTIF REKA BENTUK SISTEM MEKANIKAL (12 kredit) (Pilih 4)** | | | | MRSM 2213 | Automotive Engineering Design | 3 | | MRSM 2223 | Design for Reliability | 3 | | MRSM 2233 | Fluid Power | 3 | | MRSM 2243 | New Product Development | 3 | | MRSM 2253 | Mechatronics System Design | 3 | | MRSM 2263 | Metrology and Measurement | 3 | | MRSM 1823 | Special Topic | 3 | | **KURSUS ELEKTIF REKA BENTUK PRODUK (12 kredit) (Pilih 4)** | | | | MRSM 2273 | Life Cycle Cost Analysis for Engineers | 3 | | MRSM 2283 | Design for Sustainability, Manufacturing and Assembly | 3 | | MRSM 2293 | Entrepreneurship and Marketing | 3 | | MRSM 2303 | Theory of Inventive Problem Solving (TRIZ) | 3 | | MRSM 2313 | Robust Product Design | 3 | | MRSM 2323 | Industrial Design & Human Factors | 3 | | MRSM 1823 | Special Topic | 3 | | **KURSUS ELEKTIF REKA BENTUK SISTEM ELEKTRONIK (12 kredit) (Pilih 4)** | | | | MKEL 1173 | Advanced Digital System Design | 3 | | MKET 1423 | Wireless Communications Systems | 3 | | MKET 1463 | Advanced Communications Electronics | 3 | | MRSL 1443 | Advanced Sensor System | 3 | | MANN 1053 | System Processors and Peripherals | 3 | | MRSM 1823 | Special Topic | 3 | | **KURSUS UMUM UNIVERSITI (3 kredit) (Wajib)** | | | | URSP 0013 | Research Methodology | 3 | | **KURSUS UMUM UNIVERSITI (3 kredit) (Pilih SATU)** | | | | URSP 6013 | Environmental Ethics (Etika Alam Sekitar) | 3 | | URSP 6023 | Information and Communication Technology Ethics and Society (Etika Teknologi Informasi Serta Komunikasi dan Masyarakat) | 3 | | UHAP 6013 | Seminar on Global Development, Economic and Social Issues | 3 | | UHAZ 6123 | Malaysian Society and Culture | 3 | | UHAW 6033 | Dynamics of Leadership | 3 | | UHAZ 6323 | Malay Language for Postgraduates | 3 | | UDPE 1123 | Organizational Behavior and Development | 3 | | UCSM 1263 | IT Project Management | 3 | | ULAJ 1163 | Japanese Language | 3 | | **PROJEK SARJANA** | | | | MRSM 1914 | Master Project 1 | 4 | | MRSM 2926 | Master Project 2 | 6 | | JUMLAH KREDIT KESELURUHAN | | **46** |   Taburan pecahan kursus teras, elektif dan kursus umum universiti adalah ditunjukkan dalam jadual dibawah:   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Kumpulan Kursus** | **Kredit** | **Kredit Terkumpul** | **(%)** | | 1. | Kursus Teras | 18 | 18 | 39.2 | | 2. | Kursus Elektif | 12 | 30 | 26.1 | | 3. | Kursus Umum Universiti (Wajib dan Pilihan) | 6 | 36 | 13.0 | | 4. | Projek Sarjana | 10 | 46 | 21.7 | |  | **Jumlah Keseluruhan** | **46** | **130** | **100** | |
| **12.0** | **ETIKA DAN KEMANUSIAAN** | Program ini akan mengutarakan isu-isu sosial, undang-undang dan etika yang berkaitan dengan reka bentuk kejuruteraan. Pelajar akan diterapkan dengan nilai-nilai profesional, tanggungjawab sosial dan pemahaman tentang undang-undang berhubung dengan tugas di tempat kerja masing-masing.  Bagi menghasilkan graduan yang beretika, profesional dalam kerjaya, bertanggungjawab dan berperanan dalam pembangunan organisasi serta masyarakat dan mengambil berat tentang alam sekitar, aspek-aspek tersebut telah diberi penekanan dalam PO dan diterapkan secara bersepadu dalam kurikulum.  Perkara ini terdapat dalam PO berikut iaitu graduan berkeupayaan untuk:   1. menilai situasi dan berkomunikasi dengan jelas berkaitan hasil kajian, pengetahuan dan cadangan secara rasional kepada rakan dan pakar dalam bidang berkaitan serta berupaya memimpin dan bekerjasama dalam pasukan. 2. merancang dan menjalankan kerja-kerja reka bentuk / projek secara profesional, beretika dan bertanggungjawab, dengan mengambil kira kepentingan pemegang taruh dan persekitaran. 3. menilai dan mengadaptasi pengetahuan kontemporari secara berdikari serta menguruskan maklumat dengan berkesan sepanjang hayat.   Beberapa kursus telah dikenalpasti untuk memberi penekanan kepada aspek etika, kemasyarakatan dan undang-undang (**Lampiran 1E**). Aspek komunikasi juga telah diambil kira, kursus dan komunikasi akademik dilaksanakan dalam Bahasa Inggeris untuk melatih pelajar mahir berkomunikasi supaya mampu berinteraksi, berbincang dan membuat penyampaian secara profesional dan berkesan. Penekanan diberikan kepada kemahiran menyampaikan maklumat reka bentuk kejuruteraan supaya ilmu dalam kedua-dua bidang ini dapat disampaikan dalam bentuk yang berkesan dan mudah difahami.  Program ini juga akan menerapkan aspek etika dan profesionalisme dalam projek berdasarkan masalah industri yang mana pelajar akan mempraktikan penyelesaian masalah dan isu berkaitan reka bentuk kejuruteraan. Ia juga akan memberi pelajar peluang untuk menentukan kaedah penyelidikan yang sesuai serta melakukan analisa ke atas data yang dikumpul. Pelajar digalakkan mengguna masalah sebenar dari tempat kerja, industri atau organisasi supaya hasil kajian akan dapat digunakan untuk meningkatkan pembangunan organisasi.  Selain itu, aspek etika juga turut ditekankan melalui penawaran kursus-kursus umum universiti dan kursus tambah-nilai secara pilihan. Antara kursus yang ditawarkan adalah:   1. URSP 6013 Environmental Ethics (Etika Alam Sekitar) 2. URSP 6023 Information and Communication Technology Ethics and Society (Etika Teknologi Informasi Serta Komunikasi dan Masyarakat) 3. UHAP 6013 Seminar on Global Development, Economic and Social Issues (Seminar Isu Pembangunan Global, Ekonomi dan Sosial) 4. UHAW 6023 Philosophy of Science and Social Development (Falsafah Sains dan Pembangunan Sosial) 5. UHAF 6033 Dynamics of Leadership (Dinamika Kepimpinan) 6. UHAZ 6123 Malaysian Society and Culture (Masyarakat dan Budaya Malaysia) 7. UHAZ 6323 Malay Language for Postgraduates (Bahasa Malaysia Penulisan Ilmiah) 8. UDPE 1123 Organizational Behavior and Development (Tabiat dan Pembangunan Organisasi) 9. UCSM 1263 IT Project Management (Pengurusan Projek IT) 10. ULAJ 1163 Japanese Language (Bahasa Jepun) |
| **13.0** | **UNJURAN PELAJAR** | **Unjuran Pelajar untuk 4 tahun bermula**  **Semester 1 Sesi 2016-2017**   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Sesi** | **2016/17** | | **2017/18** | | **2018/19** | | **2019/2020** | | | **Sem 1** | **Sem 1** | **Sem 1** | **Sem 2** | **Sem 1** | **Sem 2** | **Sem 1** | **Sem 2** | | Pengambilan | 10 | 10 | 15 | 15 | 15 | 15 | 15 | 15 | | Enrolmen | 10 | 20 | 35 | 40 | 45 | 45 | 45 | 45 | | Keluaran | 0 | 0 | 10 | 10 | 15 | 15 | 15 | 15 | |
| **14.0** | **SYARAT-SYARAT KEMASUKAN** | 1. **Syarat Am Universiti:**   Memiliki kelayakan minimum Ijazah Sarjana Muda dengan CPA 3.00/4.00 dalam bidang yang berkaitan atau yang setaraf oleh Universiti yang diiktiraf mengikut syarat-syarat asas kemasukan berdasarkan **Garis Panduan Penilaian Syarat Kemasukan 1998 Pind.1/2013**.   1. **Syarat Khas Fakulti:**   Syarat Khas Fakulti/Sekolah:   1. Syarat kemasukan adalah seperti yang ditetapkan oleh Sekolah Pengajian Siswazah (rujuk Lampiran 1N). Syarat tambahan ialah Ijazah pertama dalam bidang Kejuruteraan atau Teknologi yang diiktiraf oleh Senat UTM dengan CGPA ≥ 3.0 bagi calon yang baru graduat.   ATAU   1. Bagi calon yang mempunyai ijazah pertama dalam   bidang Sains Gunaan atau Sains Tulen dengan CGPA ≥  3.0, pengesahan pengalaman kerja dalam bidang yang berkaitan program ini diperlukan.  ATAU   1. Bagi calon yang mempunyai pencapaian akademik yang lebih rendah, pengesahan pengalaman kerja dalam bidang yang berkaitan program ini diperlukan. 2. Syarat Bahasa Inggeris adalah seperti ditentukan oleh UTM (**Lampiran M**). 3. **Syarat Bahasa Inggeris (bagi mahasiswa antarabangsa):**   Semua pelajar antarabangsa yang memohon di UTM mesti mempunyai sijil IELTS band 6 ataupun TOEFL skor 550 (atau 79 IBT) yang tempoh sah laku 2 tahun dari tarikh lulus.  *(All international students applying to UTM must have a valid two-year old TOEFL or IELTS certificate. Students with a TOEFL score of 550 (or 79 IBT) or an IELTS Band 6.)*  Bermula dari ambilan semester II/2010/2011, pelajar yang memohon untuk program Sarjana atau PhD - Pengajaran Bahasa Inggeris sebagai Bahasa Kedua, mesti mempunyai sijil IELTS band 7 ke atas ataupun TOEFL skor 600 ke atas (atau IBT/CBT dengan markah setara) yang tempoh sah laku 2 tahun dari tarikh lulus.  (*Starting from Semester II/2010/2011, students who applied for Master or PhD programme - Teaching English as a Second Language, must have a valid two-year certificate of TOEFL with a score of 600 and above or IELTS Band 7 and above (or IBT/CBT equivalent).*. |
| **15.0** | **IMPLIKASI KAKITANGAN/ FIZIKAL/KEWANGAN** | 1. **Kakitangan**   Untuk mengendalikan program ini, Sekolah Razak UTM mempunyai pensyarah yang cukup pengalaman dan kepakaran dalam bidang Kejuruteraan Mekanikal dan Elektrikal bagi menampung keperluan tenaga pengajar. Untuk panel Mekanikal, terdapat dua orang Profesor, empat orang Profesor Madya, dan sepuluh orang pensyarah berkelulusan PhD yang akan menjadi sumber tenaga pengajar utama bagi program ini. Untuk panel Elektrik pula, terdapat tiga orang Professor Madya dan lima orang pensyarah berkelulusan PhD manakala pensyarah-pensyarah lain juga dijemput seperti daripada Panel Sains, dan Fakulti Kejuruteraan Mekanikal (FKM), Skudai.  Program ini juga akan dikendalikan oleh beberapa Profesor pelawat dari universiti luar negara serta penceramah tamu dari pihak industri untuk memberi pendedahan kepada keperluan semasa. Ini bertujuan mendedahkan pelajar kepada isu semasa serta keperluan industri selain memperkayakan kualiti pembelajaran dengan tenaga pengajar yang bermutu dan mempunyai kepakaran di dalam bidang ini. Senarai staf pengajar yang dicadangkan serta profil mereka adalah seperti di **Lampiran 1M**.   1. **Fizikal**   Implikasi fizikal adalah yang minimum. Semua kuliah akan dijalankan dengan menggunakan ruang dan prasarana sedia ada di UTM Kuala Lumpur. Senarai fizikal/makmal/peralatan/perisian dan lain-lain yang ada di UTM Kuala Lumpur adalah seperti di **Lampiran 1Q**. Walau bagaimanapun beberapa ruang kerja pelajar terutama semasa menjalankan projek sarjana serta bilik diskusi diperlukan mengikut kapasiti pelajar dari masa ke masa.   1. **Kewangan**   Tiada implikasi kewangan tambahan bagi keperluan fizikal kerana kemudahan fizikal yang terdapat di UTM Kuala Lumpur seperti bilik kuliah dan makmal dapat dikongsi bersama. Peruntukan kewangan tahunan adalah untuk menampung bayaran elaun mengajar penceramah jemputan dari pihak industri di mana peruntukan kewangan adalah menggunaan bajet Sekolah Razak UTM serta yuran pelajar.  Program ini akan melibatkan implikasi kewangan sekiranya pada masa akan datang ianya dilaksanakan secara luar kampus (Program Luar) yang melibatkan sewaan ruang kuliah dan fasiliti lain termasuk bayaran kepada penyelaras program, pensyarah, penyelia, pengerusi, panel penilai, pengawas, pembantu pengawas dan bayaran kepada pembantu pusat pembelajaran di pusat pembelajaran yang terlibat.  Sebarang kos operasi tambahan, pembelian perisian, urusan pentadbiran dan perbelanjaan diluar jangkaan akan dibiayai dengan menggunakan sebahagian pendapatan daripada program ini. |
| **16.0** | **PROGRAM AKADEMIK YANG DITAWARKAN DI FAKULTI/SEKOLAH/ PUSAT YANG MEMOHON (DIPLOMA, IJAZAH PERTAMA, SARJANA DAN KEDOKTORAN)** | * 1. **Program Pasca Siswazah**  1. Sarjana Eksekutif Pengurusan Keselamatan dan Kesihatan Pekerjaan. 2. Sarjana Sains (Pengurusan Perniagaan Kejuruteraan) 3. Sarjana Sains (Reka bentuk Bandar Lestari) 4. Sarjana Sains Professional 5. Sarjana Sains (Kejuruteraan Sistem) 6. Sarjana Falsafah (Reka Bentuk Industri) 7. Sarjana Falsafah (MPhil) 8. Doktor Falsafah (PhD) 9. Doktor Kejuruteraan (Pengurusan Perniagaan Kejuruteraan)    1. **Program Pra Siswazah** 10. Sarjana Muda Reka bentuk Industri     1. **Program Diploma Eksekutif** |
| **17.0** | **PERTINDIHAN PROGRAM YANG DIPOHON DENGAN IPTA LAIN** | Tiada pertindihan program dengan mana-mana IPTA atau IPTS (rujuk **Lampiran 1O**). Program sedia ada di peringkat sarjana secara kerja kursus yang ditawarkan oleh IPTA tempatan hanya di UPM yang lebih menjurus kepada Inovasi dan Reka bentuk Kejuruteraan dan tertumpu kepada inovasi, bahan kejuruteraan dan CAD. Ianya adalah amat berbeza dengan program yang dicadangkan ini di mana, program ini memberi fokuskepada reka bentuk kejuruteraan yang mengaplikasikan pengetahuan analisis kejuruteraan berkomputer, CAD dan methodologi, reka bentuk kejuruteraan pengoptimuman, pengurusan strategik innovasi teknologi serta proses reka bentuk kejuruteraan sebagai kursus teras. Untuk memenuhi keperluan negara ke arah negara pencipta teknologi, program ini menawarkan kursus elektif yang berkonsepkan *limited focus elective* dalam bidang reka bentuk sistem mekanikal, produk pengguna dan sistem elektronik. Program ini tidak bertindih dengan mana-mana program yang ditawarkan oleh fakulti/sekolah lain di UTM hatta dengan program dalaman Sekolah Razak UTM sendiri. Ini kerana tidak ada lagi fakulti/sekolah di UTM menawarkan satu program khusus dalam reka bentuk kejuruteraan. |
| **18.0** | **PERBANDINGAN DENGAN PROGRAM AKADEMIK DI UNIVERSITI LUAR NEGARA** | Terdapat beberapa universiti di Amerika Syarikat, United Kingdom, Sweden, dan Kanada juga menawarkan program sarjana reka bentuk kejuruteraan. Beberapa universiti di United Kingdom, menggabungkan elemen rekabentuk industri, innovasi disamping reka bentuk kejuruteraan. Ini boleh dilihat pada program yang ditawarkan oleh Brunnel University, Loughborough University dan University of Bath. Bagaimanapun, program yang sama ditawarkan di universiti-universiti di Amerika Syarikat seperti California State University Long Beach lebih menjurus kepada reka bentuk kejuruteraan yang hampir bersamaan dengan program yang dicadangkan ini. Lampiran 1P menunjukkan perbandingan program yang dicadangkan dengan program Sarjana yang serupa atau berkaitan di luar negara. |
| **19.0** | **KEAHLIAN DAN ULASAN LEMBAGA PENGAJIAN TERHADAP PROGRAM AKADEMIK YANG DIPOHON** | 1. **Keahlian Lembaga Pengajian:**  |  |  |  |  | | --- | --- | --- | --- | | **Bil.** | **Ahli** | **Fakulti/ IPTA/ Industri** | **Jawatan** | | 1 | Ir. Md. Khir Mohamad | Ikasuri Sdn Bhd/ The Institution of Engineer, Southern Region | Project/Executive Director | | 2 | En. Norhizam Hamzah | Astronautic Technology (M) Sdn Bhd | Senior Vice President | | 3 | En. Ahmad Nizar Harun | Mimos Bhd | Senior Staff Engineer | | 4 | Dr. Zainal Fitri | PROTON | Section Manager | | 5 | Prof. Dr. Norhamidi Muhamad | Universiti Kebangsaan Malaysia | Department of Mechanical & Materials Engineering, Faculty of Engineering and Built Environment | | 6 | Assoc. Prof. Dr. Siti Zawiyah Md. Dawal | Universiti Malaya | Associate Professor, Department of Engineering Design and Manufacture, Faculty of Engineering | | 7 | Prof. Dr Roslan Abdul Rahman | Universiti Teknologi Malaysia | Dean /Professor, Faculty of Mechanical Engineering | | 8 | En. Khairul Azli Khalid | Energy Quest Sdn. Bhd. | Senior Reservoir Engineer |   Keahlian dari UTM pula adalah seperti berikut:   |  |  |  | | --- | --- | --- | | **Bil.** | **Ahli** | **Fakulti / Jabatan** | | 1 | Prof. Dr. Awaluddin bin Mohamed Shaharoun | Dekan, Sekolah Razak UTM | | 2 | Prof. Dr. Sha’ri bin Mohd Yusof | Timbalan Dekan, Sekolah Pengajian Siswazah UTMKL | | 3 | Prof. Madya Dr. Zalina binti Mohd Daud | Timbalan Dekan Akademik, Sekolah Razak UTM | | 4 | Prof. Madya Dr. Abd. Rahman bin Abdul Rahim | Ketua Jabatan Kejuruteraan, Sekolah Razak UTM | | 5 | Prof. Madya Dr. Khairur Rijal bin Jamaluddin | Pengurus Akademik Pengajian Siswazah,  Sekolah Razak UTM | | 6 | Dr. Mohd. Yusof bin Daud | Ketua Panel Mekanikal,  Sekolah Razak UTM | | 7 | Dr. Kamilah binti Radin Salim | Ketua Panel Elektrik,  Sekolah Razak UTM | | 8 | Prof. Madya Dr. Robiah binti Ahmad | Pensyarah Jabatan Kejuruteraan, Sekolah Razak UTM | | 9 | Prof. Madya Dr. Astuty binti Amrin | Pensyarah Jabatan Kejuruteraan, Sekolah Razak UTM | | 9 | Dr. Habibah @ Norehan binti Haron | Pensyarah Jabatan Kejuruteraan, Sekolah Razak UTM | | 10 | Dr. Hairi bin Zamzuri | Pensyarah Jabatan Kejuruteraan, Sekolah Razak UTM | | 11 | Dr. Norliza binti Mohamed | Pensyarah Jabatan Kejuruteraan, Sekolah Razak UTM | | 12 | En. Norazmein bin Abdul Raman | Pensyarah Jabatan Kejuruteraan, Sekolah Razak UTM |  1. **Ulasan Lembaga Pengajian:**   Semua ahli panel Lembaga Pengajian yang hadir di mesyuarat Lembaga Pengajian pada 22 Februari 2013 telah sebulat suaramenyokong pelaksanaan program ini. Seterusnya, beberapa cadangan penambahbaikan seperti dalam **Lambiran 1R** telah diberikan. Minit mesyuarat Lembaga Pengajian adalah seperti di **Lampiran 1J**. **Minit Mesyuarat Lembaga Pengajian:** Minit mesyuarat Lembaga Pengajian adalah seperti dalam **Lampiran 1S**. **Mesyuarat bersama Fakulti Kejuruteraan Mekanikal, UTM** Mesyuarat susulan diadakan bersama Fakulti Kejuruteraan Mekanikal, UTM pada 21 Ogos 2014 bagi memperhalusi penambahbaikan yang dilakukan ke atas kandungan program ini. Hasil mesyuarat ini diminitkan di dalam **Lampiran 1T**. |
| **20.0** | **TARIKH PROGRAM DILULUSKAN** | Maklumat tarikh kelulusan:   |  |  |  | | --- | --- | --- | | **Bil.** | **Mesyuarat** | **Tarikh** | | 1. | Lembaga Pengajian | 22 Feb 2013 | | 2. | Jawatankuasa Akademik Fakulti | 7 Jun 2013 | | 3. | Jawatankuasa Semakan Kertas Kerja Program Pascasiswazah UTM | 14 Mei 2015 | | 4. | Mesyuarat Saringan Awal, Kementerian Pengajian Tinggi | 23 Nov 2015 | | 5. | Jawatankuasa Tetap Senat Kurikulum dan Kualiti Akademik | 26 Nov 2015 | | 6. | Senat Universiti | 3 Dis 2015 | | 7. | Lembaga Pengarah Universiti | 13 Jan 2016 | | 8. | Kementerian Pendidikan Tinggi |  | |
| **21.0** | **KESIMPULAN / SYOR** | Kementerian Pendidikan Tinggi dengan segala hormatnya adalah dipohon untuk mempertimbangkan seterusnya meluluskan cadangan mengenai penawaran program Sarjana Sains (Reka Bentuk Kejuruteraan) secara kerja kursus yang akan dilaksanakan oleh Sekolah Razak UTM dalam Kejuruteraan Dan Teknologi Termaju (Sekolah Razak UTM), Universiti Teknologi Malaysia mulai **Semester I, Sesi 2016/2017**. |

**KERTAS KERJA UNTUK KELULUSAN KEMENTERIAN PENDIDIKAN TINGGI**

**CADANGAN MEWUJUDKAN PROGRAM AKADEMIK BAHARU**

**SARJANA SAINS (REKA BENTUK KEJURUTERAAN)**

**SECARA KERJA KURSUS**

**DI SEKOLAH RAZAK UTM DALAM KEJURUTERAAN DAN TEKNOLOGI TERMAJU**

**(SEKOLAH RAZAK UTM),**

**UNIVERSITI TEKNOLOGI MALAYSIA**

# UNIVERSITI

# Universiti Teknologi Malaysia

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# TUJUAN

# Kertas kerja ini bertujuan untuk mendapatkan kelulusan Kementerian Pendidikan Tinggi, bahawa Sekolah Razak UTM dalam Kejuruteraan dan Teknologi Termaju (Sekolah Razak UTM) akan menawarkan Sarjana Sains (Reka Bentuk Kejuruteraan) atau Master of Science (Engineering Design).

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# PROGRAM AKADEMIK YANG DIPOHON

# Nama program adalah:

Sarjana Sains (Reka Bentuk Kejuruteraan)

atau;

**Master of Science (Engineering Design)**

Nama Penganugerahan (dalam Bahasa Malaysia):

**Sarjana Sains (Reka Bentuk Kejuruteraan)**

Nama Penganugerahan (dalam Bahasa Inggeris):

**Master of Science (Engineering Design)**

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# FAKULTI/SEKOLAH/PUSAT YANG MEMOHON

# Program ini akan ditawarkan di Sekolah Razak UTM Dalam Kejuruteraan & Teknologi Termaju, Universiti Teknologi Malaysia Kuala Lumpur.

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# PERINGKAT PENGAJIAN

# Program ini akan dikendalikan pada peringkat sarjana secara kerja kursus serta penyelidikan dan akan ditawarkan secara sepenuh masa dan separuh masa.

# TAHUN DIMULAKAN

# Pengambilan pelajar sepenuh masa dan separuh masa bagi program ini dijangka akan bermula pada Semester I, Sesi 2016/2017.

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# JANGKAMASA DAN KAEDAH PENGAJIAN

# Program Sarjana Sains (Reka Bentuk Kejuruteraan) secara sepenuh masa mengambil tempoh minimum 3 semester lazim dan minimum 4 semester lazim bagi pengajian secara separuh masa.

# Jadual perancangan pengajian Sarjana Sains (Reka Bentuk Kejuruteraan) secara sepenuh masa dan separuh masa adalah seperti di dalam Lampiran 1I.

# Program ini juga boleh dilaksanakan secara luar kampus sekiranya mendapat permintaan daripada pemegang taruhdengan bilangan calon yang mencukupi.

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# OBJEKTIF / MATLAMAT PROGRAM

Program Sarjana Sains (Reka Bentuk Kejuruteraan) mendukung teras ‘Membudayakan Pembelajaran Sepanjang Hayat’ dengan menawarkan peluang pemerkasaan ilmu kepada graduan yang berlatarbelakangkan Sarjana Muda Kejuruteraan, Sarjana Muda Teknologi dan Sarjana Muda Sains. Pemerkasaan ilmu yang terkandung di dalam program pasca-siswazah ini merangkumi reka bentuk produk, sistem mekanikal dan sistem elektrikal yang bermatlamat melahirkan graduan pakar yang berupaya membangunkan penyelesaian inovatif sesebuah sistem atau produk dengan mengambil kira manfaat kepada masyarakat dan kelestarian alam sekitar.

Graduan Program Sarjana Sains (Reka Bentuk Kejuruteraan) berpotensi mempamerkan kebolehan seperti dalam *Program Educational Objective (PEO)*  yang berikut:

1. mendemonstrasikan pengetahuan reka bentuk kejuruteraan yang diperolehi daripada program ini apabila mewujudkan penyelesaian yang inovatif kepada permasalahan yang berkaitan industri
2. mempamer kemahiran berkomunikasi dengan berkesan di kalangan ahli kumpulan daripada pelbagai bidang.
3. mendukung etika professional apabila melaksanakan tanggungjawab dengan mengambil kira aspek masyarakat, persekitaran dan isu-isu global.
4. mempertingkatkan pengetahuan yang berkaitan dengan reka bentuk kejuruteraan melalui pengurusan maklumat yang baik dan pembelajaran sepanjang hayat.

# JUSTIFIKASI MENGADAKAN PROGRAM

# Aspirasi Nasional

Program Transformasi Ekonomi (Economic Transformation Programme, (ETP) melihat bidang kejuruteraan mampu memberi impak kepada pendapatan kasar negara (gross national income, GNI) dan tahap daya saing Malaysia di peringkat antarabangsa. Laporan ETP menganggarkan 1 juta kekosongan jawatan dapat diwujudkan sehingga tahun 2020 di mana 7 peratus memerlukan kelayakan peringkat sarjana. Bidang Ekonomi Utama Negara (National Key Economic Area, NKEA) sektor elektronik dan elektrik menganggarkan 1,000 orang jurutera memerlukan latihan pasca siswazah setiap tahun sehingga tahun 2020. Kos latihan tersebut menelan belanja kira-kira RM 10,000 setahun setiap seorang jurutera. Kepakaran di dalam kejuruteraan turut dikenalpasti di dalam sub-segmen yang mempunyai potensi tertinggi untuk meningkatkan GNI seperti minyak dan gas, kejuruteraan biomedik, kejuruteraan awam dan mekanikal dan integrasi sistem.

1. **Tinjauan Relevansi Kurikulum Program Sarjana Sains (Reka Bentuk Kejuruteraan)**

Satu tinjauan yang bertujuan menilai relevansi kurikulum Program Sarjana Sains (Reka Bentuk Kejuruteraan) kepada keperluan industri telah dilaksanakan. Maklum balas diperolehi daripada 95 responden yang mewakili 3 jenis organisasi yang dengan pecahan 25% daripada milik kerajaan, 42% milik tempatan dan selebihnya 33% milik asing. 71% daripada kesemua responden berpendapat teori-teori asas menurut disiplin ilmu telah terangkum di dalam kurikulum program ini. Baki responden melihat hanya sebahagian sahaja teori-teori asas yang diutarakan memenuhi keperluan kandungan program. Walau bagaimanapun dari satu sudut pandangan lain, 96% responden bersetuju bahawa teori-teori tersebut relevan dengan permasalahan semasa dan ini menyumbang kepada kekuatan program. Kesesuaian kursus yang terkandung di dalam program ini mendapat respon positif daripada kebanyakan responden (85%). Responden turut diminta untuk menyatakan sejauh mana tahap program ini dengan mengambil kira empat ciri seperti yang tertera dalam **Jadual 1** di bawah:

**Jadual 1 Relevansi Kurikulum Program Sarjana Sains (Reka Bentuk Kejuruteraan)**

|  |  |  |
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| **CIRI-CIRI** | **TAHAP** | |
| **SEPENUHNYA** | **SEBAHAGIAN** |
| 1. Reka bentuk kejuruteraan | 40% | 60% |
| 1. Penggunaan teknologi maklumat komunikasi dan maklumat | 75% | 25% |
| 1. Penggunaan analisis berangka | 55% | 45% |
| 1. Bertepatan dengan kehendak industri | 60% | 40% |

Hampir kesemua (94%) responden bersetuju dengan tempoh masa pengajian (3 semester secara sepenuh masa) untuk program ini. Selebihnya mencadangkan sekurang-kurangnya 4 semester bagi mencapai tahap keperluan industri. Umumnya responden berpendapat graduan program ini sesuai bekerja di organisasi masing-masing. Sebahagian besar responden berpendapat tahap kesesuaian bidang kerja tertinggi dengan program ini ialah reka bentuk kejuruteraan disusuli bidang penyelidikan dan pembangunan, reka bentuk produk dan pembangunan produk (**Rajah 1**).Turutan kesesuaian jawatan yang terdapat di dalam organisasi responden didahului dengan Jurutera Reka Bentuk diikuti dengan Jurutera Pembangunan Produk seterusnya Pengurus Teknikal (**Rajah 2**).

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| **Rajah1** |
|  |
| **Rajah 2** |

Prospek graduan program ini adalah positif seperti yang digambarkan oleh Rajah 3 di mana setiap organisasi berupaya memperuntukkan sekurang-kurangnya satu jawatan dan anggaran pencapaian pendapatan sekurang-kurangnya RM 3,000 (rujuk Rajah 4). Ini membuktikan bahawa sebahagian besar responden berpendapat graduat program ini mempunyai nilai tersendiri dan sangat diperlukan di dalam sektor kejuruteraan. Kelebihan graduan terus diiktiraf dengan kesediaan organisasi responden menawarkan kenaikan pangkat (Rajah 5).

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|  |
| **Rajah 3** |
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| **Rajah 4** |
|  |
| **Rajah 5** |

Dapatan kajian merumuskan hanya 33% daripada organisasi responden menyatakan kesediaan untuk menaja pelajar di dalam bidang yang setara dengan program ini. Namun begitu, program ini berpeluang mendapat sambutan baik berdasarkan kesediaan sebahagian besar organisasi responden (83%) memberi galakan kepada staf menyertai program ini. Sejumlah 98% responden bersetuju bahawa program ini berupaya meningkatkan kebolehan seseorang jurutera atau pengurus. Kesesuaian program ini untuk dinaikkan taraf ke peringkat PhD dipersetujui oleh 75% daripada responden. Justeru, fleksibiliti program ini terserlah. Aspek keboleh pasaran graduat program ini diperakukan lebih 90% responden berdasarkan rumusan pendapat seperti yang berikut:

1. Dapat meningkatkan daya saing jurutera tempatan berbanding jurutera dari luar negara.
2. Mencadangkan subjek analisis risiko dimasukkan ke dalam program.
3. Menepati keperluan semasa dan nilai tambah kepada staf dari aspek keterampilan dan pengetahuan.

Kesimpulannya, Program Sarjana Sains (Reka Bentuk Kejuruteraan) amat relevan dengan usaha pembangunan profesional bagi sama ada akademik atau sektor swasta. Penerangan lebih lanjutan mengenai kajian pasaran ini boleh dirujuk pada **Lampiran 1K**.

1. **Bidang Kerjaya**

Program Sarjana Sains (Reka Bentuk Kejuruteraan) menawarkan peluang pemerkasaan ilmu kepada graduan yang berlatarbelakangkan Sarjana Muda Kejuruteraan, Sarjana Muda Teknologi dan Sarjana Muda Sains. Di samping kursus teras, program ini menyediakan tiga bidang elektif; reka bentuk sistem mekanikal, reka bentuk produk dan reka bentuk sistem elektronik. Ketiga-tiga elektif ini merangkumi keperluan kejuruteraan masa kini. Program ini menyediakan kaedah, model dan alat untuk mereka bentuk produk mekanikal dan mereka bentuk sistem pengurusan industri. Faktor teknikal, kemanusiaan dan ekonomi turut diambil kira. Teknologi mikroelektronik yang berkembang pesat tanpa mengira iklim ekonomi dunia, memerlukan jurutera yang berpengalaman dan berpengetahuan teknologi terkini. Graduan memperoleh pengetahuan mengintegrasi sistem kawalan pintar dan peranti mekanikal dan elektronik untuk menghasilkan produk pengguna yang inovatif. Kerjaya di dalam reka bentuk produk memerlukan pengetahuan menghasilkan produk yang memenuhi kehendak fungsi, pengguna dan masyarakat. Kepantasan penghasilan produk kini menjadi keutamaan. Calon akan didedahkan kepada proses dan elemen-elemen yang terlibat di dalam pembangunan sesuatu produk seperti dorongan kreativiti dan kaedah pengurusan.

Kesimpulannya, jelas sekali penawaran ketiga-tiga elektif di dalam kurikulum secara langsung mencerminkan bidang kerjaya yang bakal graduan program ini ceburi.

# HASIL PEMBELAJARAN PROGRAM (*PROGRAM OUTCOME*)

Selain memenuhi kehendak pemegang taruh, program ini mendokong visi, misi dan matlamat yang telah digariskan oleh Universiti Teknologi Malaysia dan Sekolah Razak UTM. Pada akhir program ini, graduan berupaya:

1. mengintegrasi dan menjana pengetahuan lanjutan reka bentuk kejuruteraan bagi membangun atau mencipta produk inovatif dan penyelesaian proses dalam situasi atau konteks baru.
2. menganalisis dan menilai masalah secara kritis dan menyediakan penyelesaian melalui penggunaan alatan dan teknik yang sesuai.
3. menilai situasi dan berkomunikasi dengan jelas berkaitan hasil kajian, pengetahuan dan cadangan secara rasional kepada rakan dan pakar dalam bidang berkaitan serta berupaya memimpin dan bekerjasama dalam pasukan.
4. merancang dan menjalankan kerja-kerja reka bentuk / projek secara profesional, beretika dan bertanggungjawab, dengan mengambil kira kepentingan pemegang taruh dan persekitaran (tanggungjawab sosial).
5. menilai dan mengadaptasi pengetahuan kontemporari secara berdikari serta menguruskan maklumat dengan berkesan sepanjang hayat.
6. mengurus isu-isu kompleks berkaitan reka bentuk kejuruteraan dan mengenalpasti peluang perniagaan.

# STRUKTUR KURIKULUM

# Pelajar perlu mengambil empat puluh enam (46) kredit untuk menamatkan pengajian Sarjana Sains (Reka Bentuk Kejuruteraan). Di dalam mereka bentuk kurikulum bagi program ini, prinsip yang dijadikan panduan adalah berdasarkan ‘ABET Requirement’ iaitu mengambilkira ciri-ciri pembangunan kreativiti pelajar, penggunaan masalah terbuka (*open-ended problems*), pembangunan dan penggunaan teori dan metodologi reka bentuk moden, formulasi penyataan masalah reka bentuk dan spesifikasi, pertimbangan penyelesaian alternatif, pertimbangan kebolehlaksanaan (*feasibility consideration*), proses pengeluaran, reka bentuk kejuruteraan serentak (*concurrent engineering*), dan penerangan sistem terperinci. Di samping itu, pelbagai kekangan yang realistik juga diambilkira seperti faktor-faktor ekonomi, keselamatan, kebolehpercayaan, estetika, etika dan kesan sosial.Elemen-elemen tersebut dimasukkan di dalam kursus-kursus yang ditawarkan sepanjang pelajar mengikuti pengajian program ini.

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## **Struktur Program**

## Struktur program ini terdiri daripada 4 komponen iaitu:

1. Kursus Teras
2. Kursus Elektif
3. Projek Sarjana
4. Kursus Umum Universiti

Ciri inovasi dalam program ini ialah menyediakan keanjalan dengan membolehkan pelajar untuk memilih salah satu dari tiga pengkhususan bagi bidang reka bentuk kejuruteraan iaitu (i) Reka Bentuk Sistem Mekanikal, (ii) Reka Bentuk Produk dan (iii) Reka Bentuk Sistem Elektronik. **Jadual 2** menjelaskan pembahagian jumlah kredit serta komponen kursus yang terbabit. Pelajar dikehendaki mengambil 46 jam kredit minima untuk layak dianugerahkan sebagai graduan. Senarai lengkap kursus yang perlu diambil oleh pelajar dilampirkan pada **Lampiran 1I**. Silibus serta perancangan kuliah dan sinopsis disertakan pada **Lampiran 1H**.

## **Pembahagian Kredit**

Struktur Program dan Taburan kredit mengikut jenis kursus adalah seperti dalam **Jadual 2** dan **Jadual 3** di bawah.

**Jadual 2 Struktur Program Sarjana Sains (Reka Bentuk Kejuruteraan)**

| ***Kod*** | ***Nama Kursus*** | ***Nilai Kredit*** |
| --- | --- | --- |
| **KURSUS TERAS (18 kredit) (Wajib SEMUA)** | | |
| MRSM 1213 | Engineering Design Optimization | 3 |
| MRSM 1223 | Technovation Management | 3 |
| MRSM 1233 | Engineering Design Process & Methodology | 3 |
| MRSM 1243 | Materials Selection and Manufacturing Process | 3 |
| MRSM 1253 | Computer Aided Design (CAD) / Computer Aided Engineering (CAE) | 3 |
| MRSE 2603 | Creativity and Innovation Management | 3 |
| **KURSUS ELEKTIF REKA BENTUK SISTEM MEKANIKAL (12 kredit) (Pilih 4)** | | |
| MRSM2213 | Automotive Engineering Design | 3 |
| MRSM 2223 | Design for Reliability | 3 |
| MRSM 2233 | Fluid Power | 3 |
| MRSM 2243 | New Product Development | 3 |
| MRSM 2253 | Mechatronics System Design | 3 |
| MRSM 2263 | Metrology and Measurement | 3 |
| MRSM 1823 | Special Topic | 3 |
| **KURSUS ELEKTIF REKA BENTUK PRODUK (12 kredit) (Pilih 4)** | | |
| MRSM2273 | Life Cycle Cost Analysis for Engineers | 3 |
| MRSM 2283 | Design for Sustainability, Manufacturing and Assembly | 3 |
| MRSM 2293 | Entrepreneurship and Marketing | 3 |
| MRSM 2303 | Theory of Inventive Problem Solving (TRIZ) | 3 |
| MRSM 2313 | Robust Product Design | 3 |
| MRSM 2323 | Industrial Design & Human Factors | 3 |
| MRSM 1823 | Special Topic | 3 |
| **KURSUS ELEKTIF REKA BENTUK SISTEM ELEKTRONIK (12 kredit) (Pilih 4)** | | |
| MKEL 1173 | Advanced Digital System Design | 3 |
| MKET 1423 | Wireless Communications Systems | 3 |
| MKET 1463 | Advanced Communications Electronics | 3 |
| MRSL 1443 | Advanced Sensor System | 3 |
| MANN 1053 | System Processors and Peripherals | 3 |
| MRSM 1823 | Special Topic | 3 |
| **KURSUS UMUM UNIVERSITI (3 kredit) (Wajib)** | | |
| URSP 0013 | Research Methodology | 3 |
| **KURSUS UMUM UNIVERSITI (3 kredit) (Pilih SATU Sahaja)** | | |
| URSP 6013 | Environmental Ethics (Etika Alam Sekitar) | 3 |
| URSP 6023 | Information and Communication Technology Ethics and Society (Etika Teknologi Informasi Serta Komunikasi dan Masyarakat) | 3 |
| UHAP 6013 | Seminar on Global Development, Economic and Social Issues | 3 |
| UHAZ 6123 | Malaysian Society and Culture | 3 |
| UHAW 6033 | Dynamics of Leadership | 3 |
| UHAZ 6323 | Malay Language for Postgraduates | 3 |
| UDPE 1123 | Organizational Behavior and Development | 3 |
| UCSM 1263 | IT Project Management | 3 |
| ULAJ 1163 | Japanese Language | 3 |
| **PROJEK SARJANA** | | |
| MRSM 1914 | Master Project 1 | 4 |
| MRSM 2926 | Master Project 2 | 6 |
| JUMLAH KREDIT KESELURUHAN | | **46** |

## **Taburan Kredit dan Kumpulan Kursus**

Pecahan peratus setiap komponen kursus adalah seperti di **Jadual 3.**

**Jadual 3 Taburan Kredit dan Peratus Bagi Kumpulan Kursus**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No.** | **Kumpulan Kursus** | **Kredit** | **Terkumpul** | **(%)** |
| 1. | Kursus Teras | 18 | 18 | 39.2 |
| 2. | Kursus Elektif | 12 | 30 | 26.1 |
| 3. | Kursus Umum Universiti (Wajib dan Pilihan) | 6 | 36 | 13.0 |
| 4. | Projek Sarjana | 10 | 46 | 21.7 |
|  | **Jumlah Keseluruhan** | **46** | **130** | **100** |

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## **Kursus Umum Universiti**

Kursus umum universiti terbahagi kepada kursus wajib ambil dan kursus pilihan. Kursus wajib ambil ialah Research Methodology manakala kursus pilihan yang perlu diambil ialah salah satu (1) kursus umum universiti (3 kredit) dari mana-mana kursus umum universiti yang ditawarkan seperti yang berikut:

1. URSP 6013 Environmental Ethics (Etika Alam Sekitar)
2. URSP 6023 Information and Communication Technology Ethics and Society (Etika Teknologi Informasi Serta Komunikasi dan Masyarakat)
3. UHAP 6013 Seminar on Global Development, Economic and Social Issues (Seminar Isu Pembangunan Global, Ekonomi dan Sosial)
4. UHAW 6023 Philosophy of Science and Social Development (Falsafah Sains dan Pembangunan Sosial)
5. UHAF 6033 Dynamics of Leadership (Dinamika Kepimpinan)
6. UHAZ 6123 Malaysian Society and Culture (Masyarakat dan Budaya Malaysia)
7. UHAZ 6323 Malay Language for Postgraduates (Bahasa Malaysia Penulisan Ilmiah)
8. UDPE 1123 Organizational Behavior and Development (Tabiat dan Pembangunan Organisasi)
9. UCSM 1263 IT Project Management (Pengurusan Projek IT)
10. ULAJ 1163 Japanese Language (Bahasa Jepun)

## **Kursus Teras**

Terdapat enam kursus teras yang wajib diambil. Kursus-kursus tersebut menerapkan dua ciri kemahiran penting iaitu analitikal dan penyelesaian masalah terbuka (open-ended problem). Ciri yang pertama amat diperlukan di dalam bidang matematik, sains fizikal dan sains kejuruteraan. Ciri kedua meningkatkan keterampilan graduan dari segi keupayaan menganalisis, merumus dan menyelesaikan permasalahan kejuruteraan. Kedua-dua ciri ini terkandung di dalam kursus-kursus teras yang ditawarkan seperti yang berikut:-

1. Engineering Design Optimization
2. Technovation Management
3. Engineering Design Process and Methodology
4. Material Selection and Manufacturing Process
5. Computer Aided Design (CAD) / Computer Aided Engineering (CAE)
6. Creativity and Innovation Management

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## **Kursus Elektif**

Program ini mengandungi tiga kumpulan kursus elektif iaitu Reka Bentuk Sistem Mekanikal (Mechanical Systems Design), Reka Bentuk Produk (Product Design) dan Reka Bentuk Sistem Elektronik (Electronic Systems Design). Pelajar perlu menetapkan salah satu elektif dan seterusnya memilih mana-mana **empat** kursus di dalam elektif tersebut.

## **Projek Sarjana**

Projek Sarjana merupakan kursus yang memberi pendedahan kepada penyelidikan dan penyelesaian masalah dalam industri dan pengurusan. Projek Sarjana terbahagi kepada Projek Sarjana 1 dan Projek Sarjana 2. Projek Sarjana 1 terdiri daripada penyediaan dan pembentangan cadangan kajian. Projek Sarjana 2 merangkumi kutipan data, analisis data dan perbincangan dapatan kajian.

## **Skema Pengajian**

**Jadual 4** menunjukkan contoh skema pengajian bagi pelajar sepenuh masa. Program sepenuh masa ini akan melibatkan masa pengajian selama 1 tahun atau merangkumi 3 semester lazim sepenuh masa. Maksimum bilangan kredit yang boleh diambil adalah dua puluh (**20**) kredit bagi semester lazim sebagaimana yang ditetapkan dalam Peraturan Akademik Pengajian Siswazah.

**Jadual 4 Contoh Skema Pengajian Bagi Pelajar Sepenuh Masa**

| **Semester** | **Kod** | **Kursus** | **Kredit** |
| --- | --- | --- | --- |
| **TAHUN 1** | | | |
| **I**  **(LAZIM)** | MRSM 1213 | Engineering Design Optimization | 3 |
| MRSM 1243 | Materials Selection and Manufacturing Process | 3 |
| MRSM 1233 | Engineering Design Process & Methodology | 3 |
| URSP 0013 | Research Methodology | 3 |
| MXXX XXX3 | Elective 1 | 3 |
|  |  | **Jumlah Kredit** | **15** |
| **II**  **(LAZIM)** | MRSM 1253 | Computer-Aided Design (CAD) / Computer-Aided Engineering (CAE) | 3 |
| MRSM 1223 | Technovation Management | 3 |
| MXXX XXX3 | Elective 2 | 3 |
| MRSM 1914 | Master Project 1 | 4 |
| UXX XXX3 | (University General Course) | 3 |
|  |  | **Jumlah Kredit** | **16** |
| **TAHUN 2** | | | |
| **I**  **(LAZIM)** | MRSE 2603 | Creativity and Innovation Management | 3 |
| MXXX XXX3 | Elective 3 | 3 |
|  | MXXX XXX3 | Elective 4 | 3 |
| MRSM 2926 | Master Project 2 | 6 |
|  |  | **Jumlah Kredit** | **15** |
|  | **Jumlah Kredit Keseluruhan** | | **46** |

**Jadual 5** pula menunjukkan contoh skema pengajian bagi pelajar separuh masa. Program separuh masa ini akan melibatkan masa pengajian selama 3 tahun atau merangkumi 6 semester lazim. Maksimum bilangan kredit yang boleh diambil adalah dua belas (12) kredit bagi semester lazim sebagaimana yang ditetapkan dalam Peraturan Akademik Pengajian Siswazah.

**Jadual 5 Contoh Skema Pengajian Bagi Pelajar Separuh Masa**

|  |  |  |  |
| --- | --- | --- | --- |
| **Semester** | **Kod** | **Kursus** | **Kredit** |
| **TAHUN 1** | | | |
| **I**  **(Lazim)** | MRSM 1213 | Engineering Design Optimization | 3 |
| MRSM 1243 | Materials Selection and Manufacturing Process | 3 |
| MRSE 2603 | Creativity and Innovation Management | 3 |
|  |  | **Jumlah Kredit** | **9** |
| **II**  **(Lazim)** | MRSM 1233 | Engineering Design Process & Methodology | 3 |
| MRSM 1223 | Technovation Management | 3 |
| MXXX XXX3 | Elective 1 | 3 |
|  |  | **Jumlah Kredit** | **9** |
| **TAHUN 2** | | | |
| **I**  **(Lazim)** | MXXX XXX3 | Elective 2 | 3 |
| MRSM 1253 | Computer-Aided Design (CAD) / Computer-Aided Engineering (CAE) | 3 |
| URSP 0013 | Research Methodology | 3 |
|  |  | **Jumlah Kredit** | **9** |
| **II**  **(Lazim)** | MRSM 1914 | Master Project 1 | 4 |
| UXX XXX3 | (University General Course) | 3 |
|  |  | **Jumlah Kredit** | **7** |
| **TAHUN 3** | | | |
| **I**  **(Lazim)** | MXXX XXX3 | Elective 3 | 3 |
| MXXX XXX3 | Elective 4 | 3 |
|  |  | **Jumlah Kredit** | **6** |
| **II**  **(Lazim)** | MRSM 1914 | Master Project 2 | 6 |
|  |  | **Jumlah Kredit** | **6** |
|  | **Jumlah Kredit Keseluruhan** | | **46** |

## **Jam Pembelajaran Pelajar (JPP)**

Jam pembelajaran pelajar (JPP) bagi setiap unit kredit adalah 40 jam merangkumi kuliah, tugasan, ujian, peperiksaan, perbincangan dan ulangkaji seperti yang ditunjukkan dalam **Jadual 6**.

**Jadual 6 Senarai Jam Belajar**

| ***Kod*** | ***Nama Kursus*** | ***Nilai Kredit*** | ***Jam Belajar*** |
| --- | --- | --- | --- |
| **KURSUS TERAS (Wajib SEMUA)** | | **18** | **720** |
| MRSM 1213 | Engineering Design Optimization | 3 | 120 |
| MRSM 1223 | Technovation Management | 3 | 120 |
| MRSM 1233 | Engineering Design Process & Methodology | 3 | 120 |
| MRSM 1243 | Materials Selection and Manufacturing Process | 3 | 120 |
| MRSM 1253 | Computer Aided Design (CAD) / Computer Aided Engineering (CAE) | 3 | 120 |
| MRSE 2603 | Creativity and Innovation Management | 3 | 120 |
| **KURSUS ELEKTIF SISTEM MEKANIKAL (Pilih 4)** | | **12** | **480** |
| MRSM 2213 | Automotive Engineering Design | 3 | 120 |
| MRSM 2223 | Design for Reliability | 3 | 120 |
| MRSM 2233 | Fluid Power | 3 | 120 |
| MRSM 2243 | New Product Development | 3 | 120 |
| MRSM 2253 | Mechatronics System Design | 3 | 120 |
| MRSM 2263 | Metrology and Measurement | 3 | 120 |
| MRSM 1823 | Special Topic | 3 | 120 |
| **KURSUS ELEKTIF PRODUK PENGGUNA (Pilih 4)** | | **12** | **480** |
| MRSM 2273 | Life Cycle Cost Analysis for Engineers | 3 | 120 |
| MRSM 2283 | Design for Sustainability, Manufacturing and Assembly | 3 | 120 |
| MRSM 2293 | Entrepreneurship and Marketing | 3 | 120 |
| MRSM 2303 | Theory of Inventive Problem Solving (TRIZ) | 3 | 120 |
| MRSM 2313 | Robust Product Design | 3 | 120 |
| MRSM 2323 | Industrial Design & Human Factors | 3 | 120 |
| MRSM 1823 | Special Topic | 3 | 120 |
| **KURSUS ELEKTIF REKA BENTUK ELEKTRONIK (Pilih 4)** | | **12** | **480** |
| MKEL 1173 | Advanced Digital System Design | 3 | 120 |
| MKET 1423 | Wireless Communications Systems | 3 | 120 |
| MKET 1463 | Advanced Communications Electronics | 3 | 120 |
| MRSL 1443 | Advanced Sensor System | 3 | 120 |
| MANN 1053 | System Processors and Peripherals | 3 | 120 |
| MRSM 1823 | Special Topic | 3 | 120 |
| **KURSUS UMUM UNIVERSITI (3 kredit) (Wajib)** | | **3** | **120** |
| URSP 0013 | Research Methodology | 3 | 120 |
| **KURSUS UMUM UNIVERSITI (3 kredit) (Pilih SATU Sahaja)** | | **3** | **120** |
| URSP 6013 | Environmental Ethics | 3 | 120 |
| URSP 6023 | Information and Communication Technology Ethics and Society | 3 | 120 |
| UHAP 6013 | Seminar on Global Development, Economic and Social Issues | 3 | 120 |
| UHAZ 6123 | Malaysian Society and Culture | 3 | 120 |
| UHAW 6033 | Dynamics of Leadership | 3 | 120 |
| UHAZ 6323 | Malay Language for Postgraduates | 3 | 120 |
| UDPE 1123 | Organizational Behavior and Development | 3 | 120 |
| UCSM 1263 | IT Project Management | 3 | 120 |
| ULAJ 1163 | Japanese Language | 3 | 120 |
| **PROJEK SARJANA** | | **10** | **400** |
| MRSM 1914 | Master Project 1 | 4 | 160 |
| MRSM 2926 | Master Project 2 | 6 | 240 |
| JUMLAH KREDIT KESELURUHAN | | **46** | **1720** |

## **Silabus**

1. Kursus akan dilaksanakan mengikut kaedah modular atau yang bersesuaian.
2. Pembelajaran dan Penilaian Program

Setiap kursus akan ditawarkan secara tersendiri tanpa memerlukan pelajar mengambil kursus pra-syarat. Syarat lulus program adalah lulus dalam tiga aspek yang berikut :

1. **Penilaian Kursus**

Kaedah-kaedah penilaian kursus adalah tugasan, pembentangan, kerja kumpulan, laporan projek, ujian dan peperiksaan akhir.

1. **Projek Sarjana**

Projek Sarjana merupakan kursus yang memberi pendedahan kepada penyelidikan dan penyelesaian masalah dalam industri dan pengurusan. Projek Sarjana terbahagi kepada Projek Bahagian 1 dan Projek Bahagian 2. Projek Bahagian 1 terdiri daripada penyediaan dan pembentangan cadangan kajian. Projek Bahagian 2 merangkumi kutipan data, analisis data dan perbincangan dapatan kajian.

1. **Kehadiran**

Calon mestilah menghadiri sekurang-kurangnya 80% jam perkuliahan yang ditetapkan. Pelajar tidak akan dibenarkan daripada menduduki peperiksaan akhir sekiranya kehadiran kuliah tidak mencapai 80 %.

1. **Lain-lain**

Peraturan lain berhubung penilaian dan pencapaian pelajar serta lain peruntukan yang sehubungan adalah seperti pada Peraturan Akademik Pengajian Siswazah yang diterima pakai oleh UTM. Pelajar mesti mencapai purata nilai gred B terkumpul setiap semester untuk layak meneruskan pengajian mereka, walaupun minimanya gred B− (B tolak) dianggap lulus bagi sesuatu kursus. Pencapaian purata nilai gred B terkumpul adalah juga diperlukan untuk layak dianugerahkan Ijazah Sarjana Sains.

# ETIKA DAN KEMANUSIAAN

# Program ini akan mengutarakan isu-isu sosial, undang-undang dan etika yang berkaitan dengan Reka bentuk kejuruteraan. Pelajar akan diterapkan dengan nilai-nilai profesional, tanggungjawab sosial dan pemahaman tentang undang-undang berhubung dengan tugas di tempat kerja masing-masing. Bagi menghasilkan graduan yang mempunyai etika, profesional dalam kerjaya, bertanggungjawab dan berperanan dalam pembangunan organisasi serta masyarakat dan mengambil berat tentang alam sekitar, aspek-aspek tersebut telah diberi penekanan dalam Hasil Pembelajaran (PO) dan diterapkan secara bersepadu dalam kurikulum. Perkara ini terdapat dalam PO berikut:

1. menilai situasi dan berkomunikasi dengan jelas berkaitan hasil kajian, pengetahuan dan cadangan secara rasional kepada rakan dan pakar dalam bidang berkaitan serta berupaya memimpin dan bekerjasama dalam pasukan.
2. merancang dan menjalankan kerja-kerja reka bentuk / projek secara profesional, beretika dan bertanggungjawab, dengan mengambil kira kepentingan pemegang taruh dan persekitaran.
3. menilai dan mengadaptasi pengetahuan kontemporari secara berdikari serta menguruskan maklumat dengan berkesan sepanjang hayat.

Beberapa kursus telah dikenalpasti untuk memberi penekanan kepada aspek etika, kemasyarakatan dan undang-undang (**Lampiran 1E**). Aspek komunikasi juga telah diambil kira, kursus dan komunikasi akademik dilaksanakan dalam Bahasa Inggeris untuk melatih pelajar mahir berkomunikasi supaya mampu berinteraksi, berbincang dan membuat penyampaian secara profesional dan berkesan. Penekanan diberikan kepada kemahiran menyampaikan maklumat reka bentuk kejuruteraan supaya ilmu dalam kedua-dua bidang ini dapat disampaikan dalam bentuk yang berkesan dan mudah difahami.

Program ini juga akan menerapkan aspek etika dan profesionalisme dalam projek berdasarkan masalah industri yang mana pelajar akan mempraktikkan penyelesaian masalah dan isu berkaitan reka bentuk kejuruteraan. Ia juga akan memberi pelajar peluang untuk menentukan kaedah penyelidikan yang sesuai serta melakukan analisa ke atas data yang dikumpul. Pelajar digalakkan mengguna masalah sebenar dari tempat kerja, industri atau organisasi supaya hasil kajian akan dapat digunakan untuk meningkatkan pembangunan organisasi.

Selain itu, aspek etika juga turut ditekankan melalui penawaran kursus-kursus umum universiti dan kursus tambah-nilai secara pilihan. Antara kursus yang ditawarkan adalah:

* 1. URSP 6013 Environmental Ethics (Etika Alam Sekitar)
  2. URSP 6023 Information and Communication Technology Ethics and Society (Etika Teknologi Informasi Serta Komunikasi dan Masyarakat)
  3. UHAP 6013 Seminar on Global Development, Economic and Social Issues (Seminar Isu Pembangunan Global, Ekonomi dan Sosial)
  4. UHAW 6023 Philosophy of Science and Social Development (Falsafah Sains dan Pembangunan Sosial)
  5. UHAF 6033 Dynamics of Leadership (Dinamika Kepimpinan)
  6. UHAZ 6123 Malaysian Society and Culture (Masyarakat dan Budaya Malaysia)
  7. UHAZ 6323 Malay Language for Postgraduates (Bahasa Malaysia Penulisan Ilmiah)
  8. UDPE 1123 Organizational Behavior and Development (Tabiat dan Pembangunan Organisasi)
  9. UCSM 1263 IT Project Management (Pengurusan Projek IT)
  10. ULAJ 1163 Japanese Language (Bahasa Jepun)

# 

# UNJURAN PELAJAR

# Kemasukan pelajar bagi program ini dan unjuran untuk masa akan datang ditunjukkan dalam Jadual 7. Bilangan ini dijangka terus meningkat dengan adanya berbagai program penggalakan seperti biasiswa, pinjaman, dan geran penyelidikan daripada agensi kerajaan dan swasta.

**Jadual 7 Unjuran Pengambilan Pelajar, Enrolmen dan Graduan**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sesi** | **2015-16** | **2016-17** | **2017-18** | **2018-19** | **2019-20** | **2020-21** |
| Pengambilan | 20 | 25 | 30 | 35 | 40 | - |
| Enrolmen | 20 | 45 | 55 | 65 | 75 | 40 |
| Keluaran | 0 | 20 | 25 | 30 | 35 | 40 |

# 

# SYARAT-SYARAT KEMASUKAN

# Syarat Am Universiti :

# Memiliki kelayakan minimum Ijazah Sarjana Muda dengan CPA 3.00/4.00 dalam bidang yang berkaitan atau yang setaraf oleh Universiti yang diiktiraf mengikut syarat-syarat asas kemasukan berdasarkan Garis Panduan Penilaian Syarat Kemasukan 1998 Pind.1/2013.

# Syarat Khas Fakulti :

Syarat khas Sekolah Razak UTM ialah ijazah pertama di dalam bidang Kejuruteraan atau Teknologi dibawah disiplin Eletrikal, Elektronik, Mekanikal, Pembuatan, Komputer atau yang berkaitan (dengan kepujian atau setara dengannya) yang diiktiraf oleh Senat UTM.

**ATAU**

1. Bagi kelayakan akademik ijazah pertama yang lebih rendah, maka pelajar mestilah mempunyai pengalaman kerja selama 2 tahun dalam bidang yang berkaitan dengan minimum CPA 2.70/4.00 atau pengalaman kerja selama 4 tahun dalam bidang yang berkaitan dengan minimum CPA 2.50/4.00.
2. Syarat Bahasa Inggeris adalah seperti ditentukan oleh UTM (**Lampiran 1M**).
3. **Syarat Bahasa Inggeris (bagi mahasiswa antarabangsa):**
4. Semua pelajar antarabangsa yang memohon di UTM mesti mempunyai sijil IELTS band 6 ataupun TOEFL skor 550 (atau 79 IBT) yang tempoh sah laku 2 tahun dari tarikh lulus.

*(All international students applying to UTM must have a valid two-year old TOEFL or IELTS certificate. Students with a TOEFL score of 550 (or 79 IBT) or an IELTS Band 6.)*

1. Bermula dari ambilan semester II/2010/2011, pelajar yang memohon untuk program Sarjana atau PhD - Pengajaran Bahasa Inggeris sebagai Bahasa Kedua, mesti mempunyai sijil IELTS band 7 ke atas ataupun TOEFL skor 600 ke atas (atau IBT/CBT dengan markah setara) yang tempoh sah laku 2 tahun dari tarikh lulus.

(*Starting from Semester II/2010/2011, students who applied for Master or PhD programme - Teaching English as a Second Language, must have a valid two-year certificate of TOEFL with a score of 600 and above or IELTS Band 7 and above (or IBT/CBT equivalent).*

1. **Penganugerahan**

Pelajar akan dianugerahkan Sarjana Sains (Reka Bentuk Kejuruteraan) atau *Master of Science* (*Engineering Design*) setelah tamat pengajian dan memenuhi syarat yang telah ditetapkan oleh UTM seperti di bawah :

1. Berjaya menamatkan kesemua komponen pengajian sebanyak 46 jam kredit dan mendapat kelulusan CGPA 3.0 ke atas.
2. Lulus Projek Sarjana dan menghasilkan laporan Projek Sarjana berjilid dengan jayanya.
3. Pelajar telah memohon penganugerahan Sarjana Sains (Reka Bentuk Kejuruteraan).

# IMPLIKASI FIZIKAL, KAKITANGAN DAN KEWANGAN

1. **Implikasi Kakitangan**

Untuk mengendalikan program ini, Sekolah Razak UTM mempunyai pensyarah yang cukup pengalaman dan kepakaran dalam bidang Kejuruteraan Mekanikal dan Elektrikal bagi menampung keperluan tenaga pengajar. Untuk panel Mekanikal, terdapat dua orang Profesor, empat orang Profesor Madya, dan sepuluh orang pensyarah berkelulusan PhD yang akan menjadi sumber tenaga pengajar utama bagi program ini. Untuk panel Elektrik pula, terdapat tiga orang Professor Madya dan lima orang pensyarah berkelulusan PhD manakala pensyarah-pensyarah lain juga dijemput seperti daripada Fakulti Kejuruteraan Mekanikal (FKM), Skudai.

Program ini juga akan dikendalikan oleh beberapa Profesor pelawat dari universiti luar negara serta penceramah tamu dari pihak industri untuk memberi pendedahan kepada keperluan semasa. Ini bertujuan mendedahkan pelajar kepada isu semasa serta keperluan industri selain memperkayakan kualiti pembelajaran dengan tenaga pengajar yang bermutu dan mempunyai kepakaran di dalam bidang ini. Senarai staf pengajar yang dicadangkan serta profil mereka adalah seperti di **Lampiran 1M**.

1. **Implikasi Fizikal**

Implikasi fizikal adalah yang minimum. Semua kuliah akan dijalankan dengan menggunakan ruang dan prasarana sedia ada di UTM Kuala Lumpur. Senarai fizikal/makmal/peralatan dan lain-lain yang ada di UTM Kuala Lumpur adalah seperti di **Lampiran 1Q**. Walau bagaimanapun beberapa ruang kerja pelajar terutama semasa menjalankan projek sarjana serta bilik diskusi diperlukan mengikut kapasiti pelajar dari masa ke masa.

1. **Implikasi Kewangan**

Tiada implikasi kewangan tambahan bagi keperluan fizikal kerana kemudahan fizikal yang terdapat di UTM Kuala Lumpur seperti bilik kuliah dan makmal dapat dikongsi bersama. Peruntukan kewangan tahunan adalah untuk menampung bayaran elaun mengajar penceramah jemputan dari pihak industri di mana peruntukan kewangan adalah menggunaan bajet Sekolah Razak UTM serta yuran pelajar.

Program ini akan melibatkan implikasi kewangan yang dijana daripada yuran pelajarsekiranya pada masa akan datang ianya dilaksanakan secara luar kampus (Program Luar) yang melibatkan sewaan ruang kuliah dan fasiliti lain termasuk bayaran kepada penyelaras program, pensyarah, penyelia, pengerusi, panel penilai, pengawas, pembantu pengawas dan bayaran kepada pembantu pusat pembelajaran di pusat pembelajaran yang terlibat.

Sebarang kos operasi tambahan, pembelian perisian, urusan pentadbiran dan perbelanjaan diluar jangkaan akan dibiayai dengan menggunakan sebahagian pendapatan daripada program ini.

# PROGRAM AKADEMIK YANG SEDANG DITAWARKAN DI FAKULTI/ SEKOLAH/ PUSAT YANG MEMOHON

Pada ketika ini, Sekolah Razak UTM menawarkan program-program seperti dinyatakan di dalam **Jadual 8**.

**Jadual 8 Program-program yang sedang ditawarkan di Sekolah Razak UTM**

|  |  |  |
| --- | --- | --- |
| **Bil.** | **Program** | **Peringkat** |
| 1. | Diploma Eksekutif | Diploma Eksekutif |
| 2. | Sarjana Muda Reka bentuk Industri | Sarjana Muda |
| 3. | Sarjana Eksekutif Pengurusan Keselamatan dan Kesihatan Pekerjaan | Sarjana Eksekutif |
| 4. | Sarjana Sains (Pengurusan Perniagaan Kejuruteraan) | Sarjana (Kerja Kursus) |
| 5. | Sarjana Falsafah | Sarjana secara Penyelidikan |
| 6. | Sarjana Sains (Reka bentuk Bandar Lestari) | Sarjana (Kerja Kursus) |
| 7. | Sarjana Sains (Reka Bentuk Industri) | Sarjana secara Penyelidikan |
| 8. | Sarjana Sains Professional | Sarjana (Kerja Kursus) |
| 9. | Sarjana Sains (Kejuruteraan Sistem) | Sarjana (Kerja Kursus) |
| 10. | Doktor Kejuruteraan (Pengurusan Perniagaan Kejuruteraan) | Doktor Kejuruteraan |
| 11. | Doktor Falsafah | Doktor Falsafah |

Program Diploma Eksekutif telah dimulakan pada tahun 1999. Manakala Integrated Graduate Develoment Scheme, IGDS (MSc EBM) pada tahun 1995 dan Doktor Kejuruteraan (Pengurusan Perniagaan Kejuruteraan) pada tahun 1998. Program Diploma Eksekutif telah direka bentuk untuk menggantikan program separa profesional, Integrated Graduate Develoment Scheme (IGDS) yang telah dimulakan pada tahun 1992. Jumlah pelajar yang mengikuti program Diploma Eksekutif telah menjangkau 3000 orang. Manakala jumlah pelajar dalam program Sarjana Sains (Pengurusan Perniagaan Kejuruteraan) bersama Universiti Warwick pula melebihi 500 orang dan program Doktor Kejuruteraan (Pengurusan Perniagaan Kejuruteraan) melebihi 50 orang.

Suatu program kerjasama Dwi Sarjana UTM, Universiti Meiji, Jepun telah mendapat kelulusan daripada Lembaga Pengarah Universiti (LPU), MQA dan Kementerian Pengajian Tinggi (KPT). Pelajar yang berjaya mengikuti program ini akan dianugerahkan Master of Business Administration (MBA), Universiti Meiji dan Sarjana Sains (Pengurusan Kejuruteraan Perniagaan), UTM. Program ini telah bermula pada semester Disember 2010/2011 dengan kumpulan pertama adalah terdiri daripada kakitangan MIMOS, Proton, Sapura, FPSO, TUDM, ATM, Sapura dan KPT.Sehingga kini, jumlah pelajar di Sekolah Razak UTM ialah 39 orang dan jumlah pelajar di Universiti Meiji, Jepun ialah 11 orang.

Terdapat pensyarah Sekolah Razak UTM yang telah berpengalaman mengendalikan program sarjana secara kerja kursus serta menyelia pelajar sarjana secara penyelidikan dan ijazah Doktor Falsafah dalam bidang Kejuruteraan.

# PERTINDIHAN PROGRAM YANG DIPOHON DENGAN IPT LAIN

## Kajian yang dilakukan mendapati bahawa tiada pertindihan program yang sama dengan program yang dicadangkan ini dengan mana-mana IPTA atau IPTS di Malaysia (rujuk **Lampiran 1O**). Walau bagaimanapun UPM ada menawarkan program reka bentuk kejuruteraan tetapi ianya adalah jauh berbeza dengan program yang dicadangkan ini. Program yang ditawarkan di UPM bukanlah berteraskan reka bentuk kejuruteraan yang mengaplikasikan pengetahuan lanjutan kejuruteraan dan pengkomputeran sehingga kepada konsep reka bentuk produk kejuruteraan. Bagaimanapun, program yang ditawarkan oleh UPM lebih menjurus kepada konsep inovasi, bahan kejuruteraan dan CAD. Ianya jelas berbeza dengan program yang dicadangkan. Kekuatan program ini adalah dari segi adunan ilmu reka bentuk kejuruteraan yang mengaplikasikan pengetahuan reka bentuk kejuruteraan pengoptimuman, pengurusan strategik inovasi teknologi, proses reka bentuk kejuruteraan dan methodologi, pemilihan bahan dan pembuatan serta reka bentuk bantuan komputer (CAD) dan kejuruteraan bantuan komputer (CAE) sebagai kursus teras. Ini penting dalam menghasilkan graduan yang dapat memenuhi keperluan negara menjadi negara yang berdaya saing dari segi innovasi dan berupaya mencipta teknologi. Untuk memantapkan lagi program ini, kursus elektif yang berkonsepkan *limited focus elective* dalam bidang seperti reka bentuk sistem mekanikal, reka bentuk produk dan reka bentuksistem elektronik. Sehubungan dengan itu, didapati bahawa program ini tidak mempunyai sebarang pertindihan dengan mana-mana program yang ditawarkan oleh IPTA dan IPTS lain, malahan tiada sebarang fakulti/sekolah lain di UTM atau program dalaman Sekolah Razak UTM sendiri yang menawarkan program yang sama dengan program yang dicadangkan ini. Sila lihat **Lampiran 1O**.

# PERBANDINGAN DENGAN UNIVERSITI LUAR NEGARA

Beberapa universiti di Amerika Syarikat, United Kingdom, Sweden dan Kanadamenawarkan program Sarjana Reka Bentuk Kejuruteraan. Bagaimanapun, di United Kingdom, program ini menggabungkan elemen reka bentuk industri, innovasi dan hanya sedikit elemen reka bentuk kejuruteraan. Ini boleh dilihat pada program yang ditawarkan oleh Kingston University dan University of Bath. Bagaimanapun, program yang sama ditawarkan di universiti-universiti di Amerika Syarikat seperti California State University Long Beach lebih menjurus kepada reka bentuk kejuruteraan yang hampir bersamaan dengan program yang dicadangkan ini. **Lampiran 1P** menunjukkan perbandingan program yang dicadangkan dengan program Sarjana yang serupa atau berkaitan di luar negara.

Sehubungan dengan itu, kekuatan program yang dicadangkan ini adalah mirip kepada program reka bentuk kejuruteraan yang ditawarkan di Universiti di Amerika Syarikat. Penumpuannya adalah menjurus kepada penggunaan pengetahuan asas saintifik untuk dimanfaatkan kepada reka bentuk seterusnya penghasilan produk yang boleh dimanfaatkan oleh pengguna. Penerokaan penyelesaian masalah adalah berdasarkan kepada “prinsip pertama” dan menggunakan pengetahuan matematik dan sains bagi menyelesaikan masalah. Di samping itu, pengetahuan yang menjurus kepada inovasi, kejuruteraan bahan dan pengurusan juga diterapkan.

# KEAHLIAN DAN ULASAN JAWATANKUASA PEMBANGUNAN KURIKULUM TERHADAP PROGRAM YANG DIPOHON

# Keahlian Lembaga Pengajian

Keahlian Lembaga Pengajian terdiri daripada pakar dari industri dan juga universiti tempatan yang terlibat dengan reka bentuk kejuruteraan di dalam kerjaya mereka. Senarai ahli adalah seperti dalam **Jadual 9** yang berikut:

**Jadual 9 Senarai Keahlian Daripada Pihak Industri**

|  |  |  |  |
| --- | --- | --- | --- |
| **Bil.** | **Ahli** | **Fakulti/ IPTA/ Industri** | **Jawatan** |
| 1 | Ir. Md. Khir Mohamad | Ikasuri Sdn Bhd / The Institution of Engineer, Southern Region | Project/Executive Director |
| 2 | En. Norhizam Hamzah | Astronautic Technology (M) Sdn Bhd | Senior Vice President |
| 3 | En. Ahmad Nizar Harun | Mimos Bhd | Senior Staff Engineer |
| 4 | Dr. Zainal Fitri | PROTON | Section Manager |
| 5 | Prof. Dr. Norhamidi Muhamad | Universiti Kebangsaan Malaysia | Department of Mechanical & Materials Engineering, Faculty of Engineering and Built Environment |
| 6 | Prof. Madya Dr. Siti Zawiyah Md. Dawal | Universiti Malaya | Associate Professor, Department of Engineering Design and Manufactur, Faculty of Engineering |
| 7 | Prof. Dr. Roslan Abdul Rahman | Universiti Teknologi Malaysia | Dean /Professor, Faculty of Mechanical Engineering |
| 8 | En Khairul Azli Khalid | Energy Quest Sdn. Bhd. | Senior Reservoir Engineer |

1. **Keahlian dari UTM pula adalah seperti berikut:**

**Jadual 10 Senarai Keahlian Daripada Pihak UTM**

|  |  |  |
| --- | --- | --- |
| **Bil.** | **Ahli** | **Fakulti / Jabatan** |
| 1 | Prof. Dr. Awaluddin bin Mohamed Shaharoun | Dekan,  Sekolah Razak UTM |
| 2 | Prof. Dr. Sha’ri bin Mohd Yusof | Timbalan Dekan,  Sekolah Pengajian Siswazah UTMKL |
| 3 | Prof. Madya Dr Zalina binti Mohd Daud | Timbalan Dekan Akademik,  Sekolah Razak UTM |
| 4 | Prof. Madya Dr. Abd. Rahman bin Abdul Rahim | Ketua Jabatan Kejuruteraan,  Sekolah Razak UTM |
| 5 | Prof. Madya Dr. Khairur Rijal bin Jamaluddin | Pengurus Akademik Pengajian Siswazah,  Sekolah Razak UTM |
| 6 | Dr Mohd. Yusof bin Daud | Ketua Panel Mekanikal,  Sekolah Razak UTM |
| 7 | Dr. Kamilah binti Radin Salim | Ketua Panel Elektrik,  Sekolah Razak UTM |
| 8 | Prof. Madya Dr. Robiah binti Ahmad | Pensyarah Jabatan Kejuruteraan,  Sekolah Razak UTM |
| 9 | Prof. Madya Dr. Astuty binti Amrin | Pensyarah Jabatan Kejuruteraan,  Sekolah Razak UTM |
| 10 | Dr. Habibah @ Norehan binti Haron | Pensyarah Jabatan Kejuruteraan,  Sekolah Razak UTM |
| 11 | Dr. Hairi bin Zamzuri | Pensyarah Jabatan Kejuruteraan,  Sekolah Razak UTM |
| 12 | Dr. Norliza binti Mohamed | Pensyarah Jabatan Kejuruteraan,  Sekolah Razak UTM |
| 13 | En. Norazmein bin Abdul Raman | Pensyarah Jabatan Kejuruteraan,  Sekolah Razak UTM |

## **Ulasan Lembaga Pengajian**

## Semua ahli panel Lembaga Pengajian yang hadir di mesyuarat Lembaga Pengajian pada 22 Februari 2013 telah sebulat suara menyokong pelaksanaan program ini. Seterusnya, beberapa cadangan penambahbaikan seperti dalam **Lampiran 1R** telah diberikan. Beberapa penambahbaikan telah dilakukan seperti yang ditunjukkan dalam lampiran ini.

## **Minit Mesyuarat Lembaga Pengajian**

Minit mesyuarat Lembaga Pengajian adalah seperti dalam **Lampiran 1S**.

## **Mesyuarat bersama Fakulti Kejuruteraan Mekanikal, UTM**

Mesyuarat susulan diadakan bersama Fakulti Kejuruteraan Mekanikal, UTM pada 21 Ogos 2014 bagi memperhalusi penambahbaikan yang dilakukan ke atas kandungan program ini. Hasil mesyuarat ini diminitkan di dalam **Lampiran 1T**.

# TARIKH PROGRAM DILULUSKAN

Tarikh-tarikh di bawah merakamkan kelulusan yang diperoleh ke atas usaha memperkenalkan program Sarjana Sains (Reka Bentuk Kejuruteraan).

* + - 1. Lembaga Pengajian: **22 Februari 2013**
      2. Jawatankuasa Akademik Fakulti: **7 Jun 2013**
      3. Jawatankuasa Semakan Kertas Kerja Program Pascasiswazah UTM: **14 Mei 2015**
      4. Mesyuarat Saringan Awal, Kementerian Pengajian Tinggi : **23 November 2015**
      5. Jawatankuasa Tetap Senat Kurikulum dan Kualiti Akademik: **26 November 2015**
      6. Senat Universiti : **3 Disember 2015**
      7. Lembaga Pengarah Universiti: **13 Januari 2016**
      8. Kementerian Pendidikan Tinggi:

# KESIMPULAN / SYOR

Kementerian Pendidikan Tinggi dengan segala hormatnya adalah dipohon untuk mempertimbangkan seterusnya meluluskan cadangan mengenai penawaran program Sarjana Sains (Reka Bentuk Kejuruteraan) secara kursus yang akan dilaksanakan oleh Sekolah Razak UTM, Universiti Teknologi Malaysia Kuala Lumpur, Universiti Teknologi Malaysia mulai **Semester I , Sesi 2016/2017.**

**LAMPIRAN 1A**

**SPESIFIKASI PROGRAM**

**SARJANA SAINS (REKA BENTUK KEJURUTERAAN)**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1. Program Name** | | | | | | | Master of Science (Engineering Design) | | | |
| **2. Award Name** | | | | | | | Master of Science (Engineering Design) | | | |
| **3. Awarding Institution** | | | | | | | Universiti Teknologi Malaysia | | | |
| **4. Teaching Institution** | | | | | | | UTM Razak School of Engineering and Advanced Technology | | | |
| **5. Professional or Statutory Body of Accreditation** | | | | | | | Not relevant | | | |
| **6. Language of Instruction** | | | | | | | English | | | |
| **7. Mode of Study (Conventional, distance learning, etc)** | | | | | | | Modular | | | |
| **8. Mode of Operation (Franchise, self-govern, etc)** | | | | | | | Self-govern | | | |
| **9. Study Scheme (Full Time/Part Time)** | | | | | | | Full Time / Part time | | | |
| **10. Study Duration** | | | | | | | Full-time: 1 1/2 years  Part-time: 3 years | | | |
| **Type of Semester** | | **No. of Semesters** | | | | | **No. of weeks** | | | |
| **Full Time** | | **Part Time** | | | **Full Time** | | | **Part Time** |
|  | | **Min** | **Max** | **Min** | | **Max** |  | | |  |
| **Normal** | | **3** | **6** | **4** | | **8** | 42 | | | 56 |
| **Short** | | **-** | | **~~-~~** | | | - | | | - |
| **11. Entry Requirement** | | University Requirement:  Minimum requirement Degree holder with CPA of 3.00/4.00 in the related field or equivalent from recognised university based on entrance requirement Garis Panduan Penilaian Syarat Kemasukan 1998 Pind. 1/2013. (refer to Lampiran 1N)  Faculty Requirement:   1. Bachelor of Science/Engineering in the field of Engineering and Technology in the discipline of Electrical, Electronic, Mechanical, Manufacturing, Computer or equivalent with Honor that is approved by UTM Senate.   OR   1. For those with lower first degree qualification must have at least two years working experience in the related field with minimum CPA of 2.70/4.00 or four years working experience in the related field with minimum CPA of 2.50/4.00. 2. English language requirement as stipulated by UTM (Lampiran 1N)   **English language requirement for international student:**  All international students applying to UTM must have a valid two-year old TOEFL or IELTS certificate. Students with a TOEFL score of 550 (or 79 IBT) or an IELTS Band 6. Starting from Semester II/2010/2011, students who applied for Master or PhD programme - Teaching English as a Second Language, must have a valid two-year certificate of TOEFL with a score of 600 and above or IELTS Band 7 and above (or IBT/CBT equivalent. | | | | | | | | |
| **12. Program Educational Objectives (PEO):**  This program will produce graduates who are able to:   1. demonstrate the engineering design knowledge obtained from this program when creating innovative solutions to industry-related problems (Knowledge - thinking skills and practical skills) 2. exhibit effective communication skill among multi-disciplinary team members.(Communication, team work, social skills) 3. uphold professional ethics when executing responsibilities and taking into account society, environment and global issues. (Leadership, professionalism, humanities, ethics, managerial skills) 4. enhance related knowledge in engineering design via sound information management and life-long learning. (Information Management, Life-long learning) | | | | | | | | | | |
| **13. Program Learning Outcomes** | | | | | | | | | | |
| **Intended Learning Outcomes** | | **Teaching and Learning Methods** | | | | | | **Assessment** | | |
| **PO1: Integrate and generate advanced knowledge to innovate** | | | | | | | | | | |
| Ability to integrate and generate advanced engineering design knowledge to develop or create innovative product and process solution in a new situation or context. | | Lectures, Case studies, Cooperative Learning, Independent learning, Lectures, Student-centred Learning, Self-directed Learning | | | | | | Test, Group Assignment, Individual Assignment, Project. | | |
| **PO2: Apply problem-solving and critical thinking skills** | | | | | | | | | | |
| Ability to analyze and evaluate problems critically and provide solutions through the use of appropriate tool and techniques. | | Case studies, Cooperative Learning, Problem solving, Lectures,  Student-centred Learning, Self-directed Learning | | | | | | Test, Group Assignment, Individual Assignment, Project, Case study. | | |
| **PO3: Demonstrate communication skills, leadership and team working skills** | | | | | | | | | | |
| Ability to assess situation and to communicate effectively in relation to research outcome, knowledge and give suggestion rationally to peers and experts in related area as well as to lead and work in team. | | Cooperative Learning, Individual and group discussion, Lectures, Student-centred Learning, Self-directed Learning | | | | | | Group Assignment, Individual Assignments, Project Report, Presentations, Case Study, Self and Peer Assessment. | | |
| **PO4: Apply Professional Ethics and Demonstrate Social Responsibility** | | | | | | | | | | |
| Ability to plan and execute design work/project professionally, ethically and responsibly, taking into consideration the interest of pemegang taruh and the environment. | | Cooperative Learning, Case studies, Portfolio, Lectures, Student-centred Learning, Self-directed Learning | | | | | | Group Assignment, Individual Assignment, Project Report. Presentation, Problem-based Project. | | |
| **PO5: Demonstrate Life-long Learning and Information Management** | | | | | | | | | | |
| Ability to organize and adapt contemporary knowledge in engineering design and manage obtained information effectively. | | Cooperative Learning, Case studies, Portfolio, Lectures, Student-centred Learning, Self-directed Learning | | | | | | Group Assignment, Individual Assignments, Problem-based Project. | | |
| **PO6: Manage complex matters (project / study / experiment), and identify business opportunities** | | | | | | | | | | |
| Ability to manage complex matters in engineering design and identify  Entrepreneurship opportunities. | | Group discussion, Independent Learning, Lectures, Student-centred Learning, Self-directed Learning | | | | | | Group Assignment, Individual Assignmnent. | | |
| **14. Classification of Courses** | | | | | | | | | | |
| **No.** | **Classification** | | | | **Credit Hours** | | | | **Percentage (%)** | |
| i. | Core ( including Masters Project) | | | | 31 | | | | 67.4% | |
| ii. | Electives | | | | 12 | | | | 26.1% | |
| iii. | Compulsory University Courses | | | | 3 | | | | 6.5% | |
|  | **Total** | | | | **46** | | | | **100 %** | |

|  |
| --- |
| **15. Program structures and features, curriculum and award requirements** |
| |  |  | | --- | --- | | This program is offered on full-time basis and based on a 3-Semester Academic Year with several subjects being delivered and assessed in each semester. Assessment is based on tests, assignment, presentation, case studies and project presentation conducted throughout the semester. Students are required to take all subjects comprised in the **ram Core** | MRSM1213 Engineering Design Optimization  MRSM 1223Technovation Management  MRSM 1233 Engineering Design Process and Methodology  MRSM 1243 Materials Selection and manufacturing Process  MRSM 1253 Computer Aided Design (CAD) / Computer Aided Engineering (CAE)  MRSE 2603 Creativity and Innovation Management | | **Masters Project** | MRSM 1914 Master Project 1 | | MRSM 2926 Master Project 2 | | **Electives (any FOUR subjects from a chosen elective)** | **Mechanical System Design Elective** | | MRSM 2213 Automotive Engineering Design  MRSM 2223 Design for Reliability  MRSM 2233 Fluid Power  MRSM 2243 New Product Development  MRSM 2253 Mechatronics System Design  MRSM 2263 Metrology and Measurement  MRSM 1823 Special Topic | | **Products Design Elective** | | MRSM 2273Life Cycle Cost Analysis For Engineers  MRSM 2283 Design for Sustainabiliy  MRSM 2293Entrepreneurship And Marketing  MRSM 2303Theory Of Inventive Problem Solving (Triz)  MRSM 2313 Robust Product Design  MRSM 2323 Industrial Design and Human Factors  MRSM 1823 Special Topic | | **Electronics System Design Elective** | | MKEL 1173 Advanced Digital System Design  MKET 1423 Wireless Communications Systems  MKET 1463 Advanced Communications Electronics  MRSL 1443 Advanced Sensor System  MANN 1053 System Processors and Peripherals  MRSM 1823 Special Topic | | **Compulsary University General Course** | URSP 0013 Research Methodology | | **University General Courses**  **(Choose One)** | URSP 6013 Environmental Ethics (Etika Alam Sekitar)  URSP 6023 Information and Communication Technology Ethics and Society (Etika Teknologi Informasi Serta Komunikasi dan Masyarakat)  UHAP 6013 Seminar on Global Development, Economic and Social Issues (Seminar Isu Pembangunan Global, Ekonomi dan Sosial)  UHAW 6023 Philosophy of Science and Social Development (Falsafah Sains dan Pembangunan Sosial)  UHAF 6033 Dynamics of Leadership (Dinamika Kepimpinan)  UHAZ 6123 Malaysian Society and Culture (Masyarakat dan Budaya Malaysia)  UHAZ 6323 Malay Language for Postgraduates (Bahasa Malaysia Penulisan Ilmiah)  UDPE 1123 Organizational Behavior and Development (Tabiat dan Pembangunan Organisasi)  UCSM 1263 IT Project Management (Pengurusan Projek IT)  ULAJ 1163 Japanese Language (Bahasa Jepun) |   **Award requirements:**  ***Students should:***   * Pass all courses. * Achieve a total of 46 credit hours with a minimum of cumulative ‘B’ grade or CGPA of 3.0 |
| **Example of Courses taken by Full-Time Students** |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **YEAR 1** | | | | | | | **SEMESTER 1** | | | **SEMESTER 2** | | | | **Code** | **Course Name** | **Credit** | **Code** | **Course Name** | **Credit** | | MRSM 1213 | Engineering Design Optimization | 3 | MRSM 1253 | Computer-Aided Design (CAD) / Computer-Aided Engineering (CAE) | 3 | | MRSM 1243 | Materials Selection and Manufacturing Process | 3 | MRSM 1223 | Technovation Management | 3 | | MRSM 1233 | Engineering Design Process & Methodology | 3 | MXXX XXX3 | Elective 2 | 3 | | URSP 0013 | Research Methodology | 3 | UXXX XXX3 | (University General Course) | 3 | | MXXX XXX3 | Elective 1 | 3 | MRSM 1914 | Master Project 1 | 4 | |  | **Total** | **15** |  | **Total** | **16** |  |  |  |  | | --- | --- | --- | | **SEMESTER 3** | | | | **Code** | **Course Name** | **Credit** | | MRSE 2603 | Creativity and Innovation Management | 3 | | MXXX XXX3 | Elective 3 | 3 | | MXXX XXX3 | Elective 4 | 3 | | MRSM 2926 | Master Project 2 | 6 | | **Total** | | **15** |   **\*Total credits accumulated for this course is 46 credits** |
| **Example of courses taken by Part-Time Students:**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **YEAR 1** | | | | | | | **SEMESTER 1** | | | **SEMESTER 2** | | | | **Code** | **Course Name** | **Credit** | **Code** | **Course Name** | **Credit** | | MRSM 1213 | Engineering Design Optimization | 3 | MRSM 1233 | Engineering Design Process & Methodology | 3 | | MRSM 1243 | Materials Selection and Manufacturing Process | 3 | MRSM 1223 | Technovation Management | 3 | |  |  |  | MRSM 2XX3 | Elective 1 | 3 | |  | **Total** | **9** |  | **Total** | **9** | |  | | | | | | | **YEAR 2** | | | | | | | **SEMESTER 1** | | | **SEMESTER 2** | | | | **Code** | **Course Name** | **Credit** | **Code** | **Course Name** | **Credit** | | MRSM 2XX3 | Elective 2 | 3 | MRSM 1914 | Master Project 1 | 6 | | MRSM 1253 | Computer-Aided Design (CAD) / Computer-Aided Engineering (CAE) | 3 | UXXX XXX3 | (University General Course) | 3 | | URSP 0013 | Research Methodology | 3 |  |  |  | |  | **Total** | **9** |  | **Total** | **6** | |  |  |  |  |  |  | | **YEAR 3** | | | | | | | **Code** | **Course Name** | **Credit** | **Code** | **Course Name** | **Credit** | | MRSM 2XX3 | Elective 3 | 3 | MRSM 2926 | Master Project 2 | 6 | | MRSM 1XX3 | Elective 4 (Free Elective) | 3 |  |  |  | |  | **Total** | **6** |  | **Total** | **6** |   **\*Total credits accumulated for this course is 46 credits** |

**LAMPIRAN 1B**

**HASIL PEMBELAJARAN PROGRAM**

**LAMPIRAN 1B**

|  |  |  |  |
| --- | --- | --- | --- |
| **FAKULTI** | **:** |  | **SEKOLAH RAZAK UTM DALAM KEJURUTERAAN DAN TEKNOLOGI TERMAJU** |
| **PROGRAM** | **:** |  | **SARJANA SAINS (REKA BENTUK KEJURUTERAAN)** |
| **JENIS PENGAJIAN** | **:** |  | **KERJA KURSUS** |
| **TEMPOH MINIMUM** | **:** |  | **1 ½ TAHUN (SEPENUH MASA) DAN 3 TAHUN(SEPARUH MASA)** |

**JADUAL 1: HASIL PEMBELAJARAN PROGRAM (LEARNING OUTCOMES)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | **HASIL PEMBELAJARAN PROGRAM** | | | | | |
| **BIL** | **KURSUS** | | Mengintegrasi dan menjana (C5) pengetahuan lanjutan reka bentuk kejuruteraan bagi membangun(P4) atau mencipta (P5) produk inovatif danpenyelesaian proses dalam situasi atau konteks baru | menganalisis dan menilai masalah secara kritis (C4) dan menyediakan(A4) penyelesaian melalui penggunaan alatan dan teknik yang sesuai. | menilai(A4) situasi dan berkomunikasi dengan jelas (P5)berkaitan hasil kajian, pengetahuan dan cadangan secara rasional kepada rakan dan pakar dalambidang berkaitan serta berupaya memimpin dan bekerjasamadalam pasukan. | merancang(A4) dan menjalankan (P3) kerja-kerja reka bentuk / projek secara profesional, beretika dan bertanggungjawab, dengan mengambil kira kepentingan pemegang taruh dan persekitaran. | menilai dan mengadaptasi(A4) pengetahuan kontemporari secaraberdikari serta menguruskanmaklumat (C5) dengan berkesansepanjang hayat. | mengurus(P5) perkara kompleks (projek / kajian / eksperimen) dan mengenalpasti peluang perniagaan. |
|  | **KOD** | **NAMA** | **PO1**  **(Knowledge)** | **P02**  **(CTPS)** | **PO3**  **(CS,TS,LS)** | **PO4**  **(EM)** | **PO5**  **(LL)** | **PO6**  **(KK)** |
|  | **KURSUS TERAS (wajib SEMUA)** | | | | | | | |
| 1 | MRSM 1213 | Engineering Design Optimization | X | X |  |  | X |  |
| 2 | MRSM 1223 | Technovation Management |  | X | X |  |  | X |
| 3 | MRSM 1233 | Engineering Design Process & Methodology |  | X | X | X | X |  |
| 4 | MRSM 1243 | Materials Selection and Manufacturing Process | X | X |  |  |  |  |
| 5 | MRSM1253 | Computer Aided Design (CAD) /  Computer Aided Engineering (CAE) | X | X |  |  |  |  |
| 6 | MRSE 2603 | Creativity and Innovation Management | X | X | X |  |  |  |
| 8 | MRSM 1914 | Master Project 1 | X | X | X |  | X |  |
| 9 | MRSM 2926 | Master Project 2 | X | X | X | X | X |  |
|  | **KURSUS ELEKTIF (EMPAT kursus di dalam SATU elektif yang dipilih)** | | | | | | | |
|  | **Elektif 1 (Reka Bentuk Sistem Mekanikal)** | | | | | | | |
| 1 | MRSM 2213 | Automotive Engineering Design | X | X |  | X |  |  |
| 2 | MRSM 2223 | Design for Reliability | X | X | X |  |  |  |
| 3 | MRSM 2233 | Fluid Power |  | X | X |  | X |  |
| 4 | MRSM 2243 | New Product Development | X | X | X |  |  |  |
| 5 | MRSM 2253 | Mechatronics System Design | X | X | X |  |  |  |
| 6 | MRSM 2263 | Metrology and Measurement | X | X | X |  |  |  |
| 7 | MRSM 1823 | Special Topic |  | X | X |  | X |  |
|  | **Elektif 2 (Reka Bentuk Produk)** | | | | | | | |
| 1 | MRSM 2273 | Life Cycle Cost Analysis for Engineers | X |  | X | X |  |  |
| 2 | MRSM 2283 | Design for Sustainability, Manufacturing and Assembly |  | X |  | X | X |  |
| 3 | MRSM 2293 | Entrepreneurship and Marketing | X | X | X |  |  | X |
| 4 | MRSM2303 | Theory of Inventive Problem Solving (TRIZ) |  | X | X |  | X |  |
| 5 | MRSM 2313 | Robust Product Design | X | X | X |  |  |  |
| 6 | MRSM 2323 | Industrial Design & Human Factors |  | X | X | X |  |  |
| 7 | MRSM 1823 | Special Topic |  | X | X |  | X |  |
|  | **Elektif 3 (Reka Bentuk Sistem Elektronik)** | | | | | | | |
| 1 | MKEL 1173 | Advanced Digital System Design | X |  | X |  | X |  |
| 2 | MKET 1423 | Wireless Communications Systems | X |  | X |  | X |  |
| 3 | MKET 1463 | Advanced Communications Electronics | X |  | X |  | X |  |
| 4 | MRSL 1443 | Advanced Sensor System | X |  | X |  | X |  |
| 5 | MANN 1053 | System Processors and Peripherals | X |  | X |  | X |  |
| 6 | MRSM 1823 | Special Topic |  | X | X |  | X |  |
|  | **KURSUS UNIVERSITI (Wajib)** | | | | | | | |
| 6 | URSP 0013 | Research methodology | X | X | X |  |  |  |
|  | **KURSUS UNIVERSITI (Pilih SATU Sahaja)** | | | | | | | |
| 1 | URSP 6013 | Environmental Ethics |  | X | X | X |  |  |
| 2 | URSP 6023 | Information and Communication Technology Ethics and Society |  |  | X | X |  |  |
| 3 | UHAP 6013 | Seminar on Global Development, Economic and Social Issues |  |  | X | X |  |  |
| 4 | UHAZ 6123 | Malaysian Society and Culture |  |  | X | X |  |  |
| 5 | UHAW 6033 | Dynamics of Leadership |  |  | X | X |  |  |
| 6 | UHAZ 6323 | Malay Language for Postgraduates |  |  | X | X |  |  |
| 7 | UDPE 1123 | Organizational Behavior and Development |  |  | X | X |  |  |
| 8 | UCSM 1263 | IT Project Management |  |  | X | X |  |  |
| 9 | ULAJ 1163 | Japanese Language |  |  | X | X |  |  |
|  | **JUMLAH** | | **20** | **24** | **34** | **15** | **15** | **2** |

**LAMPIRAN 1C**

**MATRIKS TAKSONOMI PEMBELAJARAN**

**LAMPIRAN 1C**

|  |  |  |  |
| --- | --- | --- | --- |
| **FAKULTI** | **:** |  | **SEKOLAH RAZAK UTM DALAM KEJURUTERAAN DAN TEKNOLOGI TERMAJU** |
| **PROGRAM** | **:** |  | **SARJANA SAINS (REKA BENTUK KEJURUTERAAN)** |
| **JENIS PENGAJIAN** | **:** |  | **KERJA KURSUS** |
| **TEMPOH MINIMUM** | **:** |  | **1/2 TAHUN (SEPENUH MASA)&3 TAHUN (SEPARUH MASA)** |

**JADUAL 2 : MATRIKS TAKSONOMI PEMBELAJARAN PROGRAM**

|  |  | | **ARAS TAKSONOMI PEMBELAJARAN** | | | | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | **DOMAIN KOGNITIF** | | | | | | **DOMAIN PSIKOMOTOR** | | | | | | | | **DOMAIN AFEKTIF** | | | | |
| **BIL** | **KURSUS** | | **Pengetahuan** | **Pemahaman** | **Aplikasi** | **Analisis** | **Sintesis** | **Penilaian** | **Persepsi** | **Set** | **Respons berpandu** | **Mekanisme** | **Respons ketara kompleks** | **Adaptasi** | | **Lakuan Tulen** | **Menerima** | **Memberi maklum balas** | **Menilai** | **Mengorganisasi** | **Menghayati nilai** |
|  | **KOD** | **NAMA** | **C1** | **C2** | **C3** | **C4** | **C5** | **C6** | **P1** | **P2** | **P3** | **P4** | **P5** | **P6** | | **P7** | **A1** | **A2** | **A3** | **A4** | **A5** |
| **KURSUS TERAS** | | | | | | | | | | | | | | | | | | | | | |
| 1 | MRSM 1213 | Engineering Design Optimization | X | X | X | X | X |  | X | X | X |  |  |  | |  | X | X | X |  |  |
| 2 | MRSM 1223 | Technovation Management | X | X | X | X | X | X | X | X | X | X |  |  | |  | X | X | X | X |  |
| 3 | MRSM 1233 | Engineering Design Process & Methodology | X | X | X | X | X |  | X | X | X | X | X |  | |  | X | X | X | X |  |
| 4 | MRSM 1243 | Materials Selection and Manufacturing Process | X | X | X | X |  |  | X | X | X | X |  |  | |  | X | X | X |  |  |
| 5 | MRSM 1253 | Computer Aided Design (CAD) / Computer Aided Engineering (CAE) | X | X | X | X |  |  |  |  |  |  |  |  | |  | X | X | X | X |  |
| 6 | MRSE 2603 | Creativity and Innovation Management | X | X | X | X |  |  | X | X | X | X |  |  | |  | X | X | X | X |  |
| 7 | MRSM 1914 | Master Project 1 | X | X | X | X | X | X | X | X | X | X | X |  | |  | X | X | X | X |  |
| 8 | MRSM 2926 | Master Project 2 | X | X | X | X | X | X | X | X | X | X | X |  | |  | X | X | X | X |  |
|  |  |  | 8 | 8 | 8 | 8 | 5 | 3 | 7 | 7 | 7 | 6 | 3 |  | |  | 8 | 8 | 8 | 6 |  |
| **KURSUS ELEKTIF (REKA BENTUK SISTEM MEKANIKAL)** | | | | | | | | | | | | | | | | | | | | | |
| 1 | MRSM 2213 | Automotive Engineering Design | X | X | X | X |  |  | X | X | X | X |  |  | |  | X | X | X | X |  |
| 2 | MRSM 2223 | Design for Reliability | X | X | X | X | X |  |  |  |  |  |  |  | |  | X | X | X | X |  |
| 3 | MRSM 2233 | Fluid Power | X | X | X | X | X |  |  |  |  |  |  |  | |  | X | X | X | X |  |
| 4 | MRSM 2243 | New Product Development | X | X | X | X | X |  |  |  |  |  |  |  | |  | X | X | X | X |  |
| 5 | MRSM 2253 | Mechatronics System Design | X | X | X | X |  |  | X | X |  |  |  |  | |  | X | X |  |  |  |
| 6 | MRSM 2263 | Metrology and Measurement | X | X | X | X | X |  |  |  |  |  |  |  | |  | X | X | X | X |  |
| 7 | MRSM 1823 | Special Topic | X | X | X | X | X |  |  |  |  |  |  |  | |  | X | X | X | X |  |
|  |  |  | 7 | 7 | 7 | 7 | 5 |  | 2 | 2 | 1 | 1 |  |  | |  | 7 | 7 | 6 | 6 |  |
| **KURSUS ELEKTIF (REKA BENTUK PRODUK)** | | | | | | | | | | | | | | | | | | | | | |
| 1 | MRSM 2273 | Life Cycle Cost Analysis for Engineers | X | X | X | X | X |  | X | X | X | X |  | |  |  | X | X | X | X |  |
| 2 | MRSM 2283 | Design for Sustainability, Manufacturing and Assembly | X | X | X | X |  |  |  |  |  |  |  | |  |  | X | X | X | X |  |
| 3 | MRSM 2293 | Entrepreneurship and Marketing | X | X | X | X | X |  | X | X | X | X |  | |  |  | X | X | X | X |  |
| 4 | MRSM 2303 | Theory of Inventive Problem Solving (TRIZ) | X | X | X | X | X | X |  |  |  |  |  | |  |  |  |  |  |  |  |
| 5 | MRSM 2313 | Robust Product Design | X | X | X | X | X |  |  |  |  |  |  | |  |  | X | X | X | X |  |
| 6 | MRSM 2323 | Industrial Design & Human Factors | X | X | X | X | X |  | X | X | X | X | X | |  |  | X | X | X | X |  |
| 7 | MRSM 1823 | Special Topic | X | X | X | X | X |  |  |  |  |  |  | |  |  | X | X | X | X |  |
|  |  |  | 7 | 7 | 7 | 7 | 6 | 1 | 3 | 3 | 3 | 3 | 1 | |  |  | 6 | 6 | 6 | 6 |  |
| **KURSUS ELEKTIF (REKA BENTUK SISTEM ELEKTRONIK)** | | | | | | | | | | | | | | | | | | | | | |
| 1 | MKEL 1173 | Advanced Digital System Design | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X |  |
| 2 | MKET 1423 | Wireless Communications Systems | X | X | X | X | X | X | X | X | X | X | X |  | |  | X | X | X | X |  |
| 3 | MKET 1463 | Advanced Communications Electronics | X | X | X | X | X | X | X | X | X | X | X |  | |  | X | X | X | X |  |
| 4 | MRSL 1443 | Advanced Sensor System | X | X | X | X | X |  | X | X | X | X | X |  | |  | X | X | X | X |  |
| 5 | MANN 1053 | System Processors and Peripherals | X | X | X | X | X |  | X | X | X | X | X |  | |  | X | X | X | X |  |
| 6 | MRSM 1823 | Special Topic | X | X | X | X | X |  |  |  |  |  |  |  | |  | X | X | X | X |  |
|  |  |  | 6 | 6 | 6 | 6 | 6 | 3 | 5 | 5 | 5 | 5 | 5 | 1 | | 1 | 6 | 6 | 6 | 6 |  |
| **KURSUS UMUM UNIVERSITI (Wajib)1** | | | | | | | | | | | | | | | | | | | | | |
| 1 | URSP 0013 | Research Methodology | X | X | X | X |  |  | X | X | X | X |  |  | |  | X | X | X |  |  |
|  |  |  | 1 | 1 | 1 | 1 |  |  | 1 | 1 | 1 | 1 |  |  | |  | 1 | 1 | 1 |  |  |
| **KURSUS UMUM UNIVERSITI (Pilih 1)** | | | | | | | | | | | | | | | | | | | | | |
| 1 | URSP 6013 | Environmental Ethics | X | X | X | X |  |  | X | X | X | X |  |  | |  | X | X | X |  |  |
| 2 | URSP 6023 | Information and Communication Technology Ethics and Society | X | X | X | X |  |  | X | X | X | X |  |  | |  | X | X | X |  |  |
| 3 | UHAP 6013 | Seminar on Global Development, Economy and Social Issues | X | X | X | X |  |  | X | X | X | X |  |  | |  | X | X | X |  |  |
| 4 | UICW 6023 | Philosophy of Science and Civilization | X | X | X | X | X |  | X | X | X |  |  |  | |  | X | X | X |  |  |
| 5 | UHAF 6033 | Dynamics of Leadership | X | X | X | X | X |  | X | X | X | X | X |  | |  | X | X | X |  |  |
| 6 | UHAZ 6123 | Malaysian Society and Culture | X | X | X | X |  |  | X | X | X | X |  |  | |  | X | X | X |  |  |
| 7 | ULAM 6323 | Malay Language for Postgraduates | X | X | X | X | X |  | X | X | X | X |  |  | |  | X | X | X |  |  |
| 8 | UIBE 1123 | Organizational Behavior and Development | X | X | X | X |  |  | X | X | X |  |  |  | |  | X | X | X |  |  |
| 9 | UCCM 1263 | IT Project Management | X | X | X | X | X |  | X | X |  |  |  |  | |  | X | X | X |  |  |
| 10 | ULAJ 1163 | Japanese Language | X | X | X |  |  |  | X | X | X |  |  |  | |  | X | X | X | X | X |
|  |  |  | 10 | 10 | 10 | 9 | 4 |  | 10 | 10 | 9 | 6 | 1 |  | |  | 10 | 10 | 10 | 1 | 1 |
| **JUMLAH** | | | 39 | 39 | 39 | 38 | 26 | 7 | 28 | 28 | 26 | 22 | 10 | 1 | | 1 | 38 | 38 | 37 | 25 | 1 |

**LAMPIRAN 1D**

**TABURAN JUMLAH KURSUS YANG DITAWARKAN MENGIKUT ARAS TAKSONOMI PEMBELAJARAN**

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**ARAS TAKSONOMI PEMBELAJARAN YANG MERANGKUMI DOMAIN KOGNITIF, PSIKOMOTOR DAN AFEKTIF**

**LAMPIRAN 1E**

**MATRIKS KEMAHIRAN INSANIAH**

|  |  |  |  |
| --- | --- | --- | --- |
| **FAKULTI** | **:** |  | **SEKOLAH RAZAK UTM DALAM KEJURUTERAAN DAN TEKNOLOGI TERMAJU** |
| **PROGRAM** | **:** |  | **SARJANA SAINS REKA BENTUK KEJURUTERAAN** |
| **JENIS PENGAJIAN** | **:** |  | **KERJA KURSUS** |
| **TEMPOH MINIMUM** | **:** |  | **1 ½ TAHUN (SEPENUH MASA) DAN 3 TAHUN (SEPARUH MASA)** |

**LAMPIRAN 1E**

**JADUAL 3 : MATRIKS KEMAHIRAN INSANIAH PROGRAM**

|  |  |  |  |
| --- | --- | --- | --- |
| **FAKULTI** | **:** |  | **SEKOLAH RAZAK UTM DALAM KEJURUTERAAN DAN TEKNOLOGI TERMAJU** |
| **PROGRAM** | **:** |  | **SARJANA SAINS REKA BENTUK KEJURUTERAAN** |
| **JENIS PENGAJIAN** | **:** |  | **KERJA KURSUS** |
| **TEMPOH MINIMUM** | **:** |  | **1 ½ TAHUN (SEPENUH MASA) DAN 3 TAHUN (SEPARUH MASA)** |

|  | **KOD** | **NAMA KURSUS** | **CS –**  **Kemahiran Komunikasi** | | | | | | | | **CTPS –**  **Pemikiran Kritis dan Penyelesaian Masalah** | | | | | | | | **TS –**  **Kerja Berpasukan** | | | | | | | | | **LL –**  **Pembelajaran Berterusan &**  **pengurusan maklumat** | | | **KK –**  **Kemahiran Keusahawanan** | | | | **EM –**  **Etika Profesional dan Moral** | | | **LS –**  **Kemahiran Kepemimpinan** | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CS1 | CS2 | CS3 | CS4 | CS5 | CS6 | CS7 | CS8 | CTPS1 | CTPS2 | CTPS3 | | CTPS4 | CTPS5 | CTPS6 | CTPS7 | TS1 | | TS2 | | TS3 | | TS4 | | TS5 | LL1 | LL2 | LL3 | KK1 | KK2 | KK3 | KK4 | EM1 | EM2 | EM3 | LS1 | LS2 | LS 3 | LS 4 |
| **KURSUS TERAS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | MRSM 1213 | Engineering Design Optimization |  |  |  |  |  |  |  |  |  |  | | X |  |  |  |  |  | |  | |  | |  | |  |  | X |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 | MRSM 1223 | Technovation Management |  |  |  |  |  |  |  |  |  |  | |  |  | X |  |  |  | |  | |  | | X | |  |  |  |  | X |  |  |  |  |  |  |  |  | X |  |
| 3 | MRSM  1233 | Engineering Design Process and Methodology |  |  |  | X |  |  |  |  |  |  | |  | X | X |  |  |  | |  | |  | | X | |  |  |  |  |  |  |  |  |  |  |  |  |  | X |  |
| 4 | MRSM 1243 | Materials Selection and Manufacturing Process |  |  |  |  |  |  |  |  |  |  | | X | X |  |  |  |  | |  | |  | |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 | MRSM 1253 | Computer Aided Design (CAD) / Computer Aided Engineering (CAE) |  | X |  |  |  |  |  |  |  |  | | X |  |  |  |  | X | |  | |  | |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 | MRSE 2603 | Creativity and Innovation |  |  | X |  |  |  |  |  |  |  | | X |  |  |  |  |  | |  | | X | |  | |  |  |  |  | X |  |  |  |  |  |  |  | X |  |  |
| 7 | MRSM 1914 | Master Project 1 |  |  |  |  | X |  |  |  |  |  | | X |  |  |  |  |  | |  | |  | |  | |  |  | X |  |  |  |  |  |  |  |  |  |  |  |  |
| 8 | MRSM 2926 | Master Project 2 |  |  |  |  | X |  |  |  |  |  | |  |  |  | X |  |  | |  | |  | |  | |  |  | X |  |  |  |  |  |  | X |  |  |  |  |  |
|  |  |  |  | 1 | 1 | 1 | 2 |  |  |  |  |  | | 5 | 2 | 2 | 1 |  | 1 | |  | | 1 | | 2 | |  |  | 3 |  | 2 |  |  |  |  | 1 |  |  | 1 | 2 |  |
| **KURSUS ELEKTIF 1 (Pilih 4 Sahaja)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | MRSM 2213 | Automotive Engineering Design |  |  |  |  |  |  |  |  |  |  | | X | X |  |  |  |  |  | |  | |  | |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 10 | MRSM  2223 | Design for Reliability |  | X |  |  |  |  |  |  |  |  | | X |  |  |  |  | X |  | |  | |  | |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 11 | MRSM 2233 | Fluid Power |  |  |  | X |  |  |  |  |  | X | |  |  |  |  |  | X |  | |  | |  | |  | |  | X |  |  |  |  |  |  |  |  | X |  |  |  |
| 12 | MRSM 2243 | New Product Development |  | X |  |  |  |  |  |  |  |  | | X |  |  |  |  | X |  | |  | |  | |  | |  |  |  | X |  |  |  |  |  |  |  |  |  |  |
| 13 | MRSM 2253 | Mechatronics System Design |  |  |  | X |  |  |  |  |  |  | | X |  |  |  |  |  |  | | X | |  | |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 14 | MRSL 1113 | Metrology and Measurement |  | X |  |  |  |  |  |  |  |  | | X |  |  |  |  | X |  | |  | |  | |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 15 | MRSM 1823 | Special Topic |  |  | X |  |  |  |  |  |  | X | | X |  |  |  |  |  |  | |  | |  | |  | |  | X |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 3 | 1 | 2 |  |  |  |  |  | 2 | | 6 | 1 |  |  |  | 4 |  | | 1 | |  | |  | |  | 2 |  | 1 |  |  |  |  |  |  | 1 |  |  |  |
| **KURSUS ELEKTIF 2 (Pilih 4 Sahaja)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16 | MRSM 2273 | Life Cycle Cost Analysis for Engineers |  |  |  |  | X |  |  |  |  |  | |  |  |  |  |  | X | |  | |  | |  | |  |  |  |  |  |  |  |  | X |  |  |  |  |  |  |
| 17 | MRSM 2283 | Design for Sustainability, Manufacturing and Assembly |  |  |  |  |  |  |  |  |  |  | | X |  |  |  |  |  | |  | |  | |  | |  |  | X |  |  |  |  |  |  | X |  |  |  |  |  |
| 18 | MRSM 2293 | Entrepreneurship and Marketing |  |  | X |  |  |  |  |  |  |  | | X |  |  |  |  |  | |  | |  | |  | |  |  |  |  |  | X |  |  |  |  |  |  |  |  |  |
| 19 | MRSM 2303 | Theory of Inventive Problem Solving (TRIZ) |  |  |  |  |  |  |  |  |  |  | | X |  |  |  |  |  | | X | |  | |  | |  |  | X |  |  |  |  |  |  |  |  |  |  | X |  |
| 20 | MRSM 2313 | Robust Product Design |  |  |  |  |  |  |  |  |  | X | |  |  |  |  |  |  | | X | |  | |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | X |  |
| 21 | MRSM 2323 | Industrial Design & Human Factors |  |  |  | X |  |  |  |  |  |  | |  | X |  |  |  |  | |  | |  | |  | |  |  |  |  |  |  |  |  |  | X |  |  |  |  |  |
| 22 | MRSM 1823 | Special Topic |  |  | X |  |  |  |  |  |  | X | | X |  |  |  |  |  | |  | |  | |  | |  |  | X |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 2 | 1 | 1 |  |  |  |  | 2 | | 4 | 1 |  |  |  | 1 | | 2 | |  | |  | |  |  | 3 |  |  | 1 |  |  | 1 | 2 |  |  |  | 2 |  |
| **KURSUS ELEKTIF 3 (Pilih 4 Sahaja)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 23 | MKEL 1173 | Advanced Digital System Design |  |  | X |  | X |  |  |  | X | X | | X | X | X |  |  | X | |  | | X | | X | | X | X | X |  |  |  |  |  |  |  |  |  |  |  |  |
| 24 | MKET 1423 | Wireless Communications Systems |  |  | X |  | X |  |  |  | X | X | | X | X | X |  |  | X | |  | | X | | X | | X | X | X |  |  |  |  |  |  |  |  |  |  |  |  |
| 25 | MKET 1463 | Advanced Communications Electronics |  |  | X |  | X |  |  |  | X | X | | X | X | X |  |  | X | |  | | X | | X | | X | X | X |  |  |  |  |  |  |  |  |  |  |  |  |
| 26 | MRSL 1443 | Advanced Sensor System |  |  | X |  | X |  |  |  | X | X | | X | X | X |  |  | X | |  | | X | | X | | X | X | X |  |  |  |  |  |  |  |  |  |  |  |  |
| 27 | MANN 1053 | System Processors and Peripherals |  |  | X |  |  |  |  |  | X | X | | X |  |  |  |  |  | |  | |  | |  | |  | X | X |  |  |  |  |  |  |  |  |  |  |  |  |
| 28 | MRSM 1823 | Special Topic |  |  | X |  |  |  |  |  |  | X | | X |  |  |  |  |  | |  | |  | |  | |  |  | X |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | 6 |  | 4 |  |  |  | 5 | 6 | | 6 | 4 | 4 |  |  | 4 | |  | | 4 | | 4 | | 4 | 5 | 6 |  |  |  |  |  |  |  |  |  |  |  |  |
| **KURSUS UNIVERSITI (Wajib)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 29 | URSP 0013 | Research Methodology | X | X | X | X |  |  |  |  | X | X | | X | X |  |  |  |  | |  | |  | |  | |  | X | X |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 1 | 1 | 1 | 1 |  |  |  |  | 1 | 1 | | 1 | 1 |  |  |  |  | |  | |  | |  | |  | 1 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |
| **KURSUS UNIVERSITI (Pilih 1)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | URSP 6013 | Environmental Ethics | X | X | X | X |  |  |  |  |  |  |  | |  |  |  |  | X | | X | | X | |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 32 | URSP 6023 | Information and Communication Technology Ethics and Society | X | X | X | X |  |  |  |  |  |  |  | |  |  |  |  | X | | X | | X | |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 33 | UHAP 6013 | Seminar on Global Development, Economy and Social Issues | X | X | X | X |  |  |  |  |  |  |  | |  |  |  |  | X | | X | | X | |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 34 | UICW 6023 | Philosophy of Science and Civilization | X | X | X |  |  |  |  |  |  |  |  | |  |  |  |  |  | |  | |  | |  | |  |  |  |  |  |  |  |  | X | X |  |  |  |  |  |
| 35 | UPPF 6033 | Dynamics of Leadership | X | X | X |  | X |  |  |  |  |  |  | |  |  |  |  |  | |  | |  | |  | |  |  |  |  |  |  |  |  | X |  |  | X | X | X |  |
| 36 | UHAZ 6123 | Malaysian Society and Culture | X | X |  |  |  | X |  |  |  |  |  | |  |  |  |  |  | |  | |  | |  | |  |  |  |  |  |  |  |  | X | X |  |  |  |  |  |
| 37 | ULAM 6323 | Malay Language for Postgraduates | X | X | X |  |  |  |  |  |  |  |  | |  |  |  |  | X | | X | | X | |  | |  | X | X |  |  |  |  |  |  |  |  |  |  |  |  |
| 38 | UIBE 1123 | Organizational Behavior and Development | X | X | X |  |  |  |  |  | X | X | X | |  |  |  |  |  | |  | |  | |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 39 | UCCM 1263 | IT Project Management | X | X | X |  |  |  |  |  |  |  |  | |  |  |  |  |  | |  | |  | |  | |  | X | X |  |  |  |  |  |  |  |  |  |  |  |  |
| 40 | ULAJ 1163 | Japanese Language | X | X | X |  |  |  |  |  |  |  |  | |  |  |  |  |  | |  | |  | |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 10 | 9 | 9 | 3 | 1 | 1 |  |  | 1 | 1 | 1 | |  |  |  |  | 4 | | 4 | | 4 | |  | |  | 2 | 2 |  |  |  |  |  | 3 | 2 |  | 1 | 1 | 1 |  |
| **Jumlah** | | | **11** | **14** | **10** | **8** | **8** | **1** | **0** | **0** | **7** | **12** | **23** | | **8** | **6** | **1** | **0** | **14** | | **6** | | **10** | | **6** | | **4** | **8** | **17** | **0** | **3** | **1** | **0** | **0** | **4** | **5** | **0** | **1** | **2** | **5** |  |

**LAMPIRAN 1F**

**JUMLAH JAM PEMBELAJARAN PELAJAR (JPP)**

**LAMPIRAN 1F**

|  |  |  |  |
| --- | --- | --- | --- |
| **FAKULTI** | **:** |  | **SEKOLAH RAZAK UTM DALAM KEJURUTERAAN DAN TEKNOLOGI TERMAJU** |
| **PROGRAM** | **:** |  | **SARJANA SAINS (REKA BENTUK KEJURUTERAAN)** |
| **JENIS PENGAJIAN** | **:** |  | **KERJA KURSUS** |
| **TEMPOH MINIMUM** | **:** |  | **1 ½ TAHUN (SEPENUH MASA) DAN 3 TAHUN (SEPARUH MASA)** |

**JADUAL 4 : JUMLAH JAM PEMBELAJARAN PELAJAR (JPP) MENGIKUT PROGRAM**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Bil** | **Kod Kursus** | **Nama Kursus** | **Kredit** | **Pembelajaran Bersemuka (PB)** | | | **Aktiviti Pembelajaran Kendiri** | | | **Penilaian Formal** | | **Jumlah JPP** |
| **Pembelajaran Berpusatkan Pensyarah** | **Pembelajaran Berpusatkan Pelahjar** | | **Pembelajaran Tak Bersemuka (PTM) atau SCL spt manual, tugasan, modul dll** | **Ulangkaji / Pencarian Bahan** | **Persediaan Penilaian** | **Penilaian berterusan** | **Laporan tugasan dan persembahan projek** |
| **Syarahan / Perbincangan** | **Amali/**  **Tutorial** | **Aktiviti SCL** |
| **KURSUS TERAS (Wajib SEMUA)** | | | | | | | | | | | | |
| 1 | MRSM 1213 | Engineering Design Optimization | 3 | 24 | 4 | 14 | 34 | 20 | 20 | 3 | 1 | **120** |
| 2 | MRSM 1223 | Technovation Management | 3 | 30 |  | 12 | 30 | 20 | 20 | 5 | 3 | **120** |
| 3 | MRSM 1233 | Engineering Design Process & Methodology | 3 | 30 | 7 | 5 | 30 | 20 | 20 | 5 | 3 | **120** |
| 4 | MRSM 1243 | Materials Selection  and Manufacturing Processes | 3 | 30 | 6 | 6 | 30 | 20 | 20 | 5 | 3 | **120** |
| 5 | MRSM 1253 | Computer-Aided Design (CAD) / Computer-Aided Engineering (CAE) | 3 | 30 | 6 | 6 | 30 | 20 | 20 | 5 | 3 | **120** |
| 6 | MRSM 1914 | Master Project 1 | 4 | 15 |  | 41 | 63 |  | 40 |  | 1 | **160** |
| 7 | MRSM 2926 | Master Project 2 | 6 | 15 |  | 69 | 105 |  | 50 |  | 1 | **240** |
| **KURSUS ELEKTIF REKA BENTUK SISTEM MEKANIKAL (Pilih 4 kursus)** | | | | | | | | | | | | |
| 8 | MRSM 2213 | Automotive Engineering Design | 3 | 30 |  | 12 | 22 | 24 | 25 | 5 | 2 | **120** |
| 9 | MRSM 2223 | Design for Reliability | 3 | 30 | 6 | 6 | 30 | 20 | 20 | 5 | 3 | **120** |
| 10 | MRSM 2233 | Fluid Power | 3 | 30 | 6 | 6 | 30 | 20 | 20 | 5 | 3 | **120** |
| 11 | MRSM 2243 | New Product Development | 3 | 28 | 4 | 10 | 30 | 20 | 20 | 5 | 3 | **120** |
| 12 | MRSM 2253 | Mechatronics System Design | 3 | 24 |  | 14 | 48 | 10 | 20 | 3 | 1 | **120** |
| 13 | MRSM 2263 | Metrology and Measurement | 3 | 30 | 6 | 6 | 30 | 20 | 20 | 5 | 3 | **120** |
| 14 | MRSM 1823 | Special Topic | 3 | 30 | 6 | 6 | 30 | 20 | 20 | 5 | 3 | **120** |
| **KURSUS ELEKTIF REKA BENTUK PRODUK (Pilih 4 kursus)** | | | | | | | | | | | | |
| 15 | MRSM 2273 | Life Cycle Cost Analysis for Engineers | 3 | 24 |  | 16 | 48 | 10 | 20 | 1 | 1 | **120** |
| 16 | MRSM 2283 | Design for Sustainability, Manufacturing and Assembly | 3 | 24 |  | 15 | 48 | 10 | 20 | 2 | 1 | **120** |
| 17 | MRSM 2293 | Entrepreneurship and Marketing | 3 | 24 |  | 11 | 48 | 10 | 20 |  | 8 | **120** |
| 18 | MRSM 2303 | Theory of Inventive Problem Solving (TRIZ) | 3 | 24 |  | 14 | 48 | 10 | 20 | 3 | 1 | **120** |
| 19 | MRSM 2313 | Robust Product Design | 3 | 24 |  | 13 | 48 | 10 | 20 | 4 | 1 | **120** |
| 20 | MRSM 2323 | Industrial Design & Human Factors | 3 | 28 |  | 14 | 30 | 20 | 20 | 5 | 3 | **120** |
| 21 | MRSM 1823 | Special Topic | 3 | 30 | 6 | 6 | 30 | 20 | 20 | 5 | 3 | **120** |
| **KURSUS ELEKTIF REKA BENTUK SISTEM ELEKTRONIK (Pilih 4 kursus)** | | | | | | | | | | | | |
| 22 | MKEL 1173 | Advanced Digital System Design | 3 | 30 | 6 | 6 | 22 | 20 | 20 | 4 | 12 | **120** |
| 23 | MKET 1423 | Wireless Communications Systems | 3 | 30 |  | 12 | 52 | 10 | 10 | 6 |  | **120** |
| 24 | MKET 1463 | Advanced Communications Electronics | 3 | 30 |  | 12 | 52 | 10 | 10 | 5 |  | **120** |
| 25 | MRSL 1443 | Advanced Sensor System | 3 | 30 |  | 12 | 43 | 20 | 10 | 2 | 3 | **120** |
| 26 | MANN 1053 | System Processors and Peripherals | 3 | 12 | 30 |  | 21 | 14 | 10 | 5 | 0 | **120** |
| 27 | MRSM 1823 | Special Topic | 3 | 30 | 6 | 6 | 30 | 20 | 20 | 5 | 3 | **120** |
| **KURSUS UMUM UNIVERSITI (Wajib)** | | | | | | | | | | | | |
| 28 | URSP 0013 | Reseach Methodology | 3 | 30 |  | 12 | 53 |  | 20 | 2 | 3 | **120** |
| **KURSUS UMUM UNIVERSITI (Pilih SATU sahaja)** | | | | | | | | | | | | |
| 29 | URSP 6013 | Environmental Ethics | 3 | 25 |  | 16 | 59 | 10 | 9 | 1 | - | **120** |
| 30 | URSP 6023 | Information and Communication Technology Ethics and Society | 3 | 32 |  | 10 | 42 | 18 | 12 | 6 | - | **120** |
| 31 | UHAP 6013 | Seminar on Global Development, Economy and Social Issues | 3 | 36 |  | 6 | 42 | 10 | 16 | - | 10 | **120** |
| 32 | UHAF 6033 | Dynamics of Leadership | 3 | 30 |  | 12 | 56 | 14 | 6 | 2 | - | **120** |
| 33 | UHAZ 6123 | Malaysian Society and Culture | 3 | 36 |  | 6 | 26 | 40 | 10 | 2 | - | **120** |
| 34 | UHAZ 6323 | Malay Language for Postgraduates | 3 | 30 |  | 12 | 49 | 14 | 10 | 5 | - | **120** |
| 35 | UDPE 1123 | Organizational Behavior and Development | 3 | 30 |  | 12 | 48 | 14 | 12 | 4 | - | **120** |
| 36 | UCSM 1263 | IT Project Management | 3 | 30 |  | 12 | 40 | 14 | 16 | 5 | 3 | **120** |
| 37 | ULAJ 1163 | Japanese Language | 3 | 30 |  | 12 | 42 | 10 | 12 | 12 | 2 | **120** |

**LAMPIRAN 1G**

**JUMLAH JAM PEMBELAJARAN PELAJAR (JPP) MENGIKUT AKTIVITI PENGAJARAN-PEMBELAJARAN BAGI KURSUS**

|  |  |  |  |
| --- | --- | --- | --- |
| **FAKULTI** | **:** |  | **SEKOLAH RAZAK UTM DALAM KEJURUTERAAN DAN TEKNOLOGI TERMAJU** |
| **PROGRAM** | **:** |  | **SARJANA SAINS (REKA BENTUK KEJURUTERAAN)** |
| **JENIS PENGAJIAN** | **:** |  | **KERJA KURSUS** |
| **TEMPOH MINIMUM** | **:** |  | **1 ½ TAHUN (SEPENUH MASA) DAN 3 TAHUN (SEPARUH MASA)** |

**JUMLAH JAM PEMBELAJARAN PELAJAR (JPP) MENGIKUTI AKTIVITI**

**PENGAJARAN – PEMBELAJARAN BAGI KURSUS**

**KURSUS TERAS**

1. **KURSUS: MRSM 1213 Engineering Design Optimization**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning 2. Lecture 3. Practical / Lab (Computer) | 24  4 |
| 1. Student-Centred Learning (SCL) 2. Student-centred learning activities – Active Learning | 14 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 34 |
| 1. Revision | 20 |
| 1. Assessment Preparations | 20 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 3 |
| 1. Report and Project Presentation | 1 |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

1. **KURSUS: MRSM 1223 Technovation Management**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning 2. Lecture | 30 |
| 1. Student-Centred Learning (SCL) 2. Group Work 3. Student-centred learning activities - Active Learning | 6  6 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 30 |
| 1. Revision | 20 |
| 1. Assessment Preparations | 20 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 5 |
| 1. Project Presentation | 3 |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

1. **KURSUS: MRSM 1233 Engineering Design Process & Methodology**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning | 30 |
| 1. Lecture-Centred Learning 2. Lecture |  |
| 1. Student-Centred Learning (SCL) 2. Laboratory / Tutorial 3. Student-centred learning activities - Active Learning | 7  5 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 30 |
| 1. Revision | 20 |
| 1. Assessment Preparations | 20 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 5 |
| 1. Project Presentation | 3 |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

1. **KURSUS: MRSM 1243 Materials Selection and Manufacturing Process**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning 2. Lecture | 30 |
| 1. Student-Centred Learning (SCL) 2. Laboratory / Tutorial 3. Student-centred learning activities - Active Learning | 6  6 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 30 |
| 1. Revision | 20 |
| 1. Assessment Preparations | 20 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 5 |
| 1. Project Presentation | 3 |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

1. **KURSUS: MRSM 1253 Computer-Aided Design (CAD) / Computer-Aided Engineering (CAE)**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning 2. Lecture | 30 |
| 1. Student-Centred Learning (SCL) 2. Laboratory / Tutorial 3. Student-centred learning activities - Active Learning | 6  6 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 30 |
| 1. Revision | 20 |
| 1. Assessment Preparations | 20 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 5 |
| 1. Project Presentation | 2 |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

1. **KURSUS: MRSM 1914 Master Project 1**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (hours)** |
| 1. Face-to-Face Learning |  |
| * 1. Lecturer-Centered Learning      1. Lecture | 15 |
| * 1. Student-Centered Learning (SCL)      1. Laboratory/Tutorial      2. Student-centered learning activities (discussion with supervisor, etc) | -  41 |
| 1. Self-Directed Learning |  |
| * 1. Non-face-to-face learning or student-centered learning (SCL) such as manual, assignment, module, e-Learning, etc. | 63 |
| b. Revision |  |
| c. Preparation of report and presentation | 40 |
| 1. Formal Assessment |  |
| * 1. Continuous Assessment | - |
| * 1. Oral Presentation | 1 |
| **Total (SLT)** | **160** |

1. **KURSUS: MRSM 2926 Master Project 2**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (hours)** |
| 1. Face-to-Face Learning |  |
| * 1. Lecturer-Centered Learning      1. Lecture | 15 |
| * 1. Student-Centered Learning (SCL)      1. Discussion with supervisor | 69 |
| 1. Self-Directed Learning |  |
| * 1. Case Study 1 and work | 105 |
| b. Preparation of final report and presentation | 50 |
| 1. Formal Assessment |  |
| * 1. Continuous Assessment | - |
| * 1. Oral Presentation | 1 |
| **Total (SLT)** | **240** |

1. **KURSUS: URSP 0013 Research Methodology**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning 2. Lecture | 30 |
| 1. Student-Centred Learning (SCL) 2. Student-centred learning activities    * Active Learning | 12 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 53 |
| 1. Revision |  |
| 1. Assessment Preparations | 20 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 2 |
| 1. Project Presentation | 3 |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

**KURSUS ELEKTIF : REKA BENTUK SISTEM MEKANIKAL**

1. **KURSUS: MRSM 2213 Automotive Engineering Design**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning 2. Lecture | 30 |
| 1. Student-Centred Learning (SCL) 2. Student-centred learning activities    * Active Learning | 12 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 22 |
| 1. Revision | 24 |
| 1. Assessment Preparations | 25 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 5 |
| 1. Project Presentation | 2 |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

1. **KURSUS: MRSM 2223 Design for Reliability**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning 2. Lecture | 30 |
| 1. Student-Centred Learning (SCL) 2. Student-centred learning activities    * Active Learning | 6  6 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 30 |
| 1. Revision | 20 |
| 1. Assessment Preparations | 20 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 5 |
| 1. Project Presentation | 3 |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

1. **KURSUS: MRSM 2233 Fluid Power**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning 2. Lecture | 30 |
| * 1. Student-Centered Learning (SCL)      1. Laboratory/Tutorial      2. Student-centered learning activities (eg. Case studies presentation, discussion etc) | 6  6 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 30 |
| 1. Revision | 20 |
| 1. Assessment Preparations | 20 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 5 |
| 1. Project Presentation | 3 |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

1. **KURSUS: MRSM 2243 New Product Development**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning 2. Lecture | 30 |
| 1. Student-Centred Learning (SCL)    1. Laboratory/Tutorial    2. Student-centered learning activities (eg. Case studies presentation, discussion etc) | 6  6 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 30 |
| 1. Revision | 20 |
| 1. Assessment Preparations | 20 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 5 |
| 1. Project Presentation | 3 |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

1. **KURSUS: MRSM 2253 Mechatronics System Design**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning 2. Lecture | 24 |
| 1. Student-Centred Learning (SCL) 2. Student-centred learning activities    * Active Learning | 14 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 48 |
| 1. Revision | 10 |
| 1. Assessment Preparations | 20 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 3 |
| 1. Project Presentation | 1 |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

1. **KURSUS: MRSM 2263 Metrology And Measurement**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning 2. Lecture | 30 |
| 1. Student-Centred Learning (SCL) 2. Laboratory/Tutorial 3. Student-centered learning activities (eg. Case studies presentation, discussion etc) | 6  6 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 30 |
| 1. Revision | 20 |
| 1. Assessment Preparations | 20 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 5 |
| 1. Project Presentation | 3 |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

1. **KURSUS: MRSM 1823 Special Topics**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning 2. Lecture | 14 |
| 1. Student-Centred Learning (SCL) 2. Student-centred learning activities    * Active Learning | 28 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 30 |
| 1. Revision | 20 |
| 1. Assessment Preparations | 20 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 5 |
| 1. Project Presentation | 3 |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

**KURSUS ELEKTIF : REKABENTUK PRODUK**

1. **KURSUS: MRSM 2273 Life Cycle Cost Analysis for Engineers**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning 2. Lecture | 24 |
| 1. Student-Centred Learning (SCL) 2. Student-centred learning activities    * Active Learning | 16 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 48 |
| 1. Revision | 10 |
| 1. Assessment Preparations | 20 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 1 |
| 1. Project Presentation | 1 |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

1. **KURSUS: MRSM 2283 Design for Sustainability, Manufacturing and Assembly**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning 2. Lecture | 24 |
| 1. Student-Centred Learning (SCL) 2. Student-centred learning activities    * Active Learning | 15 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 48 |
| 1. Revision | 10 |
| 1. Assessment Preparations | 20 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 2 |
| 1. Project Presentation | 1 |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

1. **KURSUS: MRSM 2293 Entrepreneurship and Marketing**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning 2. Lecture | 24 |
| 1. Student-Centred Learning (SCL) 2. Student-centred learning activities    * Active Learning | 11 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 48 |
| 1. Revision | 10 |
| 1. Assessment Preparations | 20 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 5 |
| 1. Project Presentation | 2 |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

1. **KURSUS: MRSM 2303 Theory of Inventive Problem Solving (TRIZ)**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning 2. Lecture | 24 |
| 1. Student-Centred Learning (SCL) 2. Student-centred learning activities    * Active Learning | 14 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 48 |
| 1. Revision | 10 |
| 1. Assessment Preparations | 20 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 3 |
| 1. Project Presentation | 1 |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

1. **KURSUS: MRSM 2313 Robust Product Design**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning 2. Lecture | 24 |
| 1. Student-Centred Learning (SCL) 2. Student-centred learning activities    * Active Learning | 13 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 48 |
| 1. Revision | 10 |
| 1. Assessment Preparations | 20 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 4 |
| 1. Project Presentation | 1 |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

1. **KURSUS: MRSM 2323 Industrial Design & Human Factors**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning 2. Lecture | 28 |
| 1. Student-Centred Learning (SCL) 2. Student-centred learning activities    * Active Learning | 14 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 30 |
| 1. Revision | 20 |
| 1. Assessment Preparations | 20 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 5 |
| 1. Project Presentation | 3 |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

1. **KURSUS: MRSM 1823 Special Topics**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning 2. Lecture | 14 |
| 1. Student-Centred Learning (SCL) 2. Student-centred learning activities    * Active Learning | 28 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 30 |
| 1. Revision | 20 |
| 1. Assessment Preparations | 20 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 5 |
| 1. Project Presentation | 3 |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

**KURSUS ELEKTIF : REKA BENTUK SISTEM ELEKTRONIK**

1. **KURSUS: MKEL 1173 Advanced Digital System Design**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning 2. Lecture | 30 |
| 1. Student-Centred Learning (SCL) 2. Student-centred learning activities    * Active Learning | 12 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 52 |
| 1. Revision | 10 |
| 1. Assessment Preparations | 10 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 6 |
| 1. Project Presentation | 2 |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

1. **KURSUS: MKET 1423 Wireless Communication System Design**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning 2. Lecture | 48 |
| 1. Student-Centred Learning (SCL) 2. Student-centred learning activities    * Active Learning | 14 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 24 |
| 1. Revision | 10 |
| 1. Assessment Preparations | 10 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 14 |
| 1. Assignment report and Project Presentation |  |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

1. **KURSUS: MKET 1463 Advanced Communications Electronics**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning 2. Lecture | 48 |
| 1. Student-Centred Learning (SCL) 2. Student-centred learning activities    * Active Learning | 14 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 24 |
| 1. Revision | 10 |
| 1. Assessment Preparations | 10 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 14 |
| 1. Project Presentation |  |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

1. **KURSUS: MRSL 1443 Advanced Sensor System**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning 2. Lecture | 48 |
| 1. Student-Centred Learning (SCL) 2. Student-centred learning activities    * Active Learning | 14 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 24 |
| 1. Revision | 10 |
| 1. Assessment Preparations | 10 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 14 |
| 1. Project and Presentation |  |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

1. **KURSUS: MANN 1053 System Processors and Peripherals**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning 2. Lecture | 12 |
| 1. Student-Centered Learning (SCL)    * Laboratory/Tutorial    * Student-centered learning activities – Active Learning, Project Based Learning | 30 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 21 |
| 1. Revision | 14 |
| 1. Assessment Preparations |  |
| 1. Formal Assessment | 10 |
| 1. Continuous Assessment | 2 |
| 1. Project Presentation | 3 |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

1. **KURSUS: MRSM 1823 Special Topics**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning 2. Lecture | 14 |
| 1. Student-Centred Learning (SCL) 2. Student-centred learning activities    * Active Learning | 28 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 30 |
| 1. Revision | 20 |
| 1. Assessment Preparations | 20 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 5 |
| 1. Project Presentation | 3 |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

**KURSUS UMUM UNIVERSITI (PILIHAN)**

1. **KURSUS: URSP 6013 Environmental Ethics**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning    * Lecture | 25 |
| 1. Student-Centred Learning (SCL)    * Student-centred learning activities (eg. Case studies presentation, discussion etc) | 16 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 59 |
| 1. Revision | 10 |
| 1. Assessment Preparations | 9 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 1 |
| 1. Final exam | - |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

1. **KURSUS: URSP 6023 Information and Communication Technology Ethics and Society**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Face to Face Learning |  |
| 1. Lecture-Centred Learning    * Lecture | 32 |
| 1. Student-Centred Learning (SCL)    * Student-centred learning activities (eg. Case studies presentation, discussion etc) | 10 |
| 1. Self-Directed Learning |  |
| 1. Non-face-to-face learning or student-centred learning (SCL) such as assignment and group project. | 42 |
| 1. Revision | 18 |
| 1. Assessment Preparations | 12 |
| 1. Formal Assessment |  |
| 1. Continuous Assessment | 6 |
| 1. Final exam | - |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

1. **KURSUS: UHAZ 6123 Malaysian Society and Culture**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Lecture 2. Student-centred learning | 36  6 |
| 1. Independence Study  * Self learning * Seeking information * Reading * Group discussion | 26 |
| 1. Group Assignment 2. Group discussion 3. Library search 4. Reading 5. Report writing 6. Presentation | 40 |
| 1. Case Study |  |
| 1. Preparation | 10 |
| 1. Discussion | 2 |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

1. **KURSUS: UHAP 6013 Seminar on Global Development, Economic and Social Issues**

|  |  |
| --- | --- |
| **Teaching and Learning Activities** | **Student Learning Time (Hours)** |
| 1. Lecture 2. Student-centered learning | 36  6 |
| 1. Independent Learning | 42 |
| 1. Preparation for Assignment |  |
| * Individual | 10 |
| * Group and Presentation | 16 |
| 1. Video-based Discussion | 10 |
| **Total (SLT)** | **120** |
| **Credit** | **120/40 = 3** |

1. **KURSUS : UDPE 1123 Organizational Behaviour and Development**

|  |  |  |
| --- | --- | --- |
| **No.** | **Aktiviti Pengajaran dan Pembelajaran** | **JPP** |
|  | Pembelajaran Berpusatkan Pensyarah | 30 |
|  | Pembelajaran Berpusatkan Pelajar | 12 |
|  | Pembelajaran Tidak Bersemuka (tugasan, kajian kes, etc). | 48 |
|  | Ulangkaji | 14 |
|  | Persediaan Ujian dan Peperiksaan | 12 |
|  | Penilaian Berterusan | 1 |
|  | Peperiksaan Akhir | 3 |
| **JUMLAH JPP** | | 120 |
| **KREDIT** | | 120 / 40 = 3 |

1. **KURSUS : UHAW 6023 Falsafah Sains Dan Pembangunan Sosial**

|  |  |  |
| --- | --- | --- |
| **No.** | **Aktiviti Pengajaran dan Pembelajaran** | **JPP** |
|  | Pembelajaran Berpusatkan Pensyarah | 30 |
|  | Pembelajaran Berpusatkan Pelajar | 12 |
|  | Pembelajaran Tidak Bersemuka (tugasan, kajian kes, etc). | 52 |
|  | Ulangkaji | 14 |
|  | Persediaan Ujian dan Peperiksaan | 8 |
|  | Penilaian Berterusan | 4 |
|  | Peperiksaan Akhir |  |
| **JUMLAH JPP** | | 120 |
| **KREDIT** | | 120 / 40 = 3 |

1. **KURSUS : UHAF 6033 Dynamics of Leadership**

|  |  |  |
| --- | --- | --- |
| **No.** | **Aktiviti Pengajaran dan Pembelajaran** | **JPP** |
|  | Pembelajaran Berpusatkan Pensyarah | 30 |
|  | Pembelajaran Berpusatkan Pelajar | 12 |
|  | Pembelajaran Tidak Bersemuka (tugasan, kajian kes, etc). | 56 |
|  | Ulangkaji | 14 |
|  | Persediaan Ujian dan Peperiksaan | 6 |
|  | Penilaian Berterusan | 2 |
|  | Peperiksaan Akhir |  |
| **JUMLAH JPP** | | 120 |
| **KREDIT** | | 120 / 40 = 3 |

1. **KURSUS : ULAJ 1163 Japanese Language**

|  |  |  |
| --- | --- | --- |
| **No.** | **Aktiviti Pengajaran dan Pembelajaran** | **JPP** |
|  | Pembelajaran Berpusatkan Pensyarah | 30 |
|  | Pembelajaran Berpusatkan Pelajar | 12 |
|  | Pembelajaran Tidak Bersemuka (tugasan, kajian kes, etc). | 42 |
|  | Ulangkaji | 10 |
|  | Persediaan Ujian dan Peperiksaan | 12 |
|  | Penilaian Berterusan | 12 |
|  | Peperiksaan Akhir | 2 |
| **JUMLAH JPP** | | 120 |
| **KREDIT** | | 120 / 40 = 3 |

1. **KURSUS : UCSM 1263 : IT Project Management**

|  |  |  |
| --- | --- | --- |
| **No.** | **Aktiviti Pengajaran dan Pembelajaran** | **JPP** |
|  | Pembelajaran Berpusatkan Pensyarah | 30 |
|  | Pembelajaran Berpusatkan Pelajar | 12 |
|  | Pembelajaran Tidak Bersemuka (tugasan, kajian kes, etc). | 40 |
|  | Ulangkaji | 14 |
|  | Persediaan Ujian dan Peperiksaan | 16 |
|  | Penilaian Berterusan | 5 |
|  | Peperiksaan Akhir | 3 |
| **JUMLAH JPP** | | 120 |
| **KREDIT** | | 120 / 40 = 3 |

**LAMPIRAN 1H**

**PERANCANGAN KULIAH DAN SINOPSIS KURSUS**

**PERANCANGAN KULIAH DAN SINOPSIS KURSUS**

1. **KURSUS TERAS**

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| **UTM RAZAK SCHOOL OF ENGINEERING & ADVANCED TECHNOLOGY** |  |
| **ENGINEERING DESIGN OPTIMIZATION**  **(MRSM 1213)** | **Revision :**  **Date of issue :**  **Last Amendment:**  **Edition:** |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **PRE-REQUISITE** | | **:** | **Nil** | | | | **EQUIVALENCE** | | **:** | **-** | | | | **LECTURE HOURS** | | **:** | **3 hour lectures per week** | | | | **Lecturers** | | **E-Mail** | | **Room No.** | **Phone No.** | | 1. | AP Dr Mohamad Kasim Abdul Jalil | kasim@fkm.utm.my | | C25-335 | 07-5534741 | | 2. | AP Dr. Robiah Ahmad | robiah@ic.utm.my | | N110 | 03-26154333 | | |
| **SYNOPSIS**  Optimisation involves finding the 'best' solution according to specified criteria. In Engineering Design, this might typically be minimum cost or weight, maximum quality or efficiency, or some of the performance index pertaining to a disciplinary objective. Realistic optimal design involves not only an objective function to be minimized or maximized, but also constraints that represent limitations on the design space. Numerical programming requires the mathematical representation of the design space (objective function and constraints) in terms of 'design variables- (parameters that signify some potential for change) Generally the problem of interest in engineering are of a non-linear nature, in that the dependence of the objective function and constraints on the design variables is non-linear.’ This course introduces the traditional non-linear optimisation methods that can be used to solve a wide range of problems across all engineering disciplines. By the end of the semester the student will have gained a basic knowledge of numerical optimisation algorithms and will have sufficient understanding of the strengths and weakness of these algorithms to apply them appropriately in engineering design. Students will write simple code as well as use off-the-shelf routines to gain experience and appreciation. | |
| **TEACHING METHODOLOGY**   1. Lectures and discussion 2. Students will be required to conduct a group work design project , write reports and present either the project or other related issues. 3. Videos and demonstration will be given on related topics.   **WEEKLY SCHEDULE**   |  |  | | --- | --- | | **Week** | **Topic / Content** | | 1 | Introduction to design  Engineering design vs engineering analysis  Conventional versus optimum design process | | 2 - 4 | Optimum design problem formulation  Graphical optimization  Optimum design concepts | | 5 -7 | Linear programming methods for optimum design  **Test 1** | | **8** | **MID SEMESTER BREAK** | | 9 - 10 | Numerical methods for unconstrained optimum design  Numerical methods fot constrained optimum design  Optimum design with MATLAB  **Test 2** | | 11 - 13 | Interactive design optimization  Design optimization applications with implicit functions  Discrete variable optimum design concepts and methods | | 14 - 15 | Genetic algorithm (GA) for optimum design – basic concepts, introduction to GA, Application  Multiobjective optimum design concepts  Global optimization concepts and methods fpr optimum design  **Project 1** | | **16-18** | **REVISION WEEK AND FINAL EXAMINATION** |   **REFERENCES**   1. Arora, Jasbir S. Introduction to optimum design. 3rd ed. Academic Press, Waltham, MA . 2012 2. Belegundu, Ashok D., Optimization concepts and applications in engineering, 2nd ed., Cambridge ; New York : Cambridge University Press, 2011. 3. Ong, S. K., Design reuse in product development modeling, analysis and optimization, Singapore ; Hackensack, N.J. : World Scientific Pub. Co., 2008 4. Kemper E. Lewis, Wei Chen and Linda C. Schmidt, Decision making in engineering design, New York, N.Y. : American Society of Mechanical Engineers, 2006.   **GRADING**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **No.** | **Assessment** | **Number** | **% each** | **% total** | **Dates** | | 1. | Test | 2 | 20 | 40 | W5, W10 | | 2. | Assignment | 5 | 6 | 30 | Various | | 3. | Project | 1 | 30 | 30 | W17 | | **Overall Total** | | | | **100** | |   **ATTENDANCE**  The student should adhere to the rules of attendance as stated in the University Academic Regulation :-   1. Student must attend not less than 80% of lecture hours as required for the subject 2. The student will be prohibited from attending any lecture and assessment activities upon failure to comply the above requirement. Zero mark will be given to the subject. | |

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| **UTM RAZAK SCHOOL OF ENGINEERING & ADVANCED TECHNOLOGY** | | | |  | | | |
| **TECHNOVATION MANAGEMENT**  **(MRSM 1233)** | | | | **Revision :**  **Date of issue :**  **Last Amendment:**  **Edition:** | | | |
| **PRE-REQUISITE** | | | **:** |  | | | |
| **EQUIVALENCE** | | | **:** | **-** | | | |
| **LECTURE HOURS** | | | **:** | **3 Hour lecture** | | | |
| **Lecturers** | | | **E-Mail** | | | **Room No.** | **Phone No.** |
| 1. | | Dr. Khairur Rijal Jamaluddin | khairur.kl@utm.my | | | 06-01-37 MJIIT | 03-22031349 |
| 2. | | Prof Dr Awaluddin Mohamed Shaharaoun | awaludin@ic.utm.my | | | Level 7, HEAMC |  |
| **SYNOPSIS**  This course explores how technological innovation can be managed to gain a competitive advantage for engineering design organizations, which have to compete with global customer demand. Innovation is important for fulfilling voice of customers in the product development and enables the organization to be able to compete in the world market. The course also focuses on different dimensions of innovation including process and service innovation, developing new services based on demand and improving the way the existing services are delivered. | | | | | | | |
| **COURSE LEARNING OUTCOMES**  By the end of the course, students should be able to :   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Course Learning Outcomes** | **Programme**  **Learning Outcome(s) Addressed** | **Learning Taxanomy** | **Assessment Methods** | | 1. | Evaluate the level and sophistication of technology and recommend improvement on technology concepts | P02 | C6  CTPS5 | Test, Projects | | 2. | Respond to the importance of technology and innovative orientation towards achieving competitive advantage | P03 | A4  TS4, LS3 | Case discussion and analysis | | 3. | Propose recommendations to solve innovation issues at different levels of organization entrepreneurial opportunities. | P06 | P4  KK1 | Test, Projects |   **STUDENT LEARNING TIME**   |  |  | | --- | --- | | **Teaching and Learning Activities** | **Student Learning Time (hours)** | | 1. Face-to-Face Learning | | | * 1. Lecturer-Centered Learning      1. Lecture | 30 | | * 1. Student-Centered Learning (SCL)      1. Group Work      2. Student-centered learning activities (eg. Case studies presentation, discussion etc) | 6  6 | | 1. Self-Directed Learning | | | * 1. Non-face-to-face learning or student-centered learning (SCL) such as assignment, analysis, case study. | 24 | | b. Revision and literature search | 30 | | c. Assessment Preparations | 18 | | 1. Formal Assessment | | | * 1. Continuous Assessment | 3 | | * 1. Assignment Report and Project with Presentation | 3 | | **Total (SLT)** | **120** |   **TEACHING AND LEARNING ACTIVITIES**   1. Lectures. 2. Individual reading and study of case studies on innovation strategies. 3. Individual assignments to enhance breadth of understanding.   **WEEKLY SCHEDULE**   |  |  | | --- | --- | | **Week** | **Topic / Content** | | 1-2 | Introduction to TMI  Wealth creation through innovation  New paradigm in TMI | | 3-4 | **HBS Case Study 1 (Case on Produt Innovation, i.e Elio Engineering case)**  Critical factors in managing technology and innovation  Technology planning | | 5-6 | Technology and strategy  Technology life cycle  Individual presentation | | 7-8 | Technology trajectories  Technology and competitiveness  Managing Intelectual Property | | 9-10 | The process of innovation  **HBS Case Study 2 (Case on Collaboration and Network, i.e Apple Inc and The Paradox of Samsung Rise Case)** | | 11 | **HBS Case Study 3 (Case on Service Innovation, i.e Innovative at Progressive: Pay-as-You-Go-Insurance Case)** | | 12 | Acquiring and exploiting technology  Transfer of technology  Management of R&D | | 13 | **HBS Case Study 4 (HBS Article Discussion: Creating Value Through Business Model Innovation)** | | 14 | Group presentation |   **TEXTS**   1. Burgelman, R.A, Christensen, C.M. and Wheelwright, S.C. (2012). Strategic Management of Technology and Innovation. New York: McGraw-Hill Irwin. 2. Melissa Schilling (2011). Strategic Mgt of Technological Innovation. McGraw Hill 3. Ahmed, P. and Shepherd, C. (2010). Innovation Management: Context, Strategies, Systems and Processes, Financial Times-Prentice Hall. 4. Schilling, M.A. (2010). Strategic Management of Technological Innovation, McGraw-Hill. 5. Technology Management Handbook CRCnetBASE CD-ROM (2000) (can be accessed from the PSZ Electronic database). 6. International Journal of Technology Management - various issues. 7. Technovation - various issues.   **GRADING**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Assessment** | **Number** | **% each** | **% total** | | 1. | Work-based Individual Project | 1 | 30 | 30 | | 2. | Project (group) | 1 | 30 | 30 | | 3. | Case Analysis | 2 | 10 | 20 | | 4. | Tests | 1 | 20 | 20 | | **Overall Total** | | | | **100** |   **ATTENDANCE**  The student should adhere to the rules of attendance as stated in the University Academic Regulation :-   1. Student must attend not less than 80% of lecture hours as required for the subject. 2. The student will be prohibited from attending any lecture and assessment activities upon failure to comply the above requirement. Zero mark will be given to the subject | | | | | | | |

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| **UTM RAZAK SCHOOL OF ENGINEERING & ADVANCED TECHNOLOGY** |  | |
| **ENGINEERING DESIGN PROCESS & METHODOLOGY**  **(MRSM 1233)** | **Revision**  **Date of issue**  **Last Amendment**  **Edition** | **:**  **:**  **:**  **:**  **:** |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **PRE-REQUISITE** | | **:** |  | | | | **EQUIVALENCE** | | **:** | **-** | | | | **LECTURE HOURS** | | **:** | **3 Hour lecture** | | | | **Lecturers** | | **E-Mail** | | **Room No.** | **Phone No.** | | 1. | AP Dr. Mohamad Kasim Abdul Jalil | kasim@fkm.utm.my | | C25-335 | 07-5534741 | | 2. | Dr. Khairur Rijal Jamaluddin | khairur@ic.utm.my | | 06-01-37 MJIIT | 03-22031349 |   **SYNOPSIS**  This course is designed for students to gain detailed topical exposure to design methodologies and principles specific to the practice of engineering design. Emphasis is on developing efficient and effective design techniques as well as project-oriented skills from both technical and non-technical consideration. At the end of this course, students should be able to identify and apply appropriate methodology in performing design tasks, recognize the fundamental principles of engineering design and practices, and formulate and apply general problem solving strategies in the analysis of situation, problem and potential problem. At the end of this course, students should be able to identify and apply industry standards in design communication.  **COURSE LEARNING OUTCOMES**  By the end of the course, students should be able to :   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Course Learning Outcomes** | **Programme**  **Learning Outcome(s) Addressed** | **LearningTaxanomy** | **Assessment Methods** | | 1. | creatively solve and critically analyze engineering design problems based on Total Design approach | P02 | C4, P5, A5  CTPS5 | Test, Project, Assignment | | 2. | apply appropriate design methods in solving various engineering design problems | P02 | C5, P5, A5  CTPS4 | Test, Project, Assignment | | 3. | use suitable engineering design tools and guidelines in solving design problems | P04 | A5  EM1 | Test, Project, Assignment | | 4. | Use appropriate design communication tools to produce winning design in doing group project | P03 | A4, P3  TS4, LS3, CS4 | Project |   **STUDENT LEARNING TIME**   |  |  | | --- | --- | | **Teaching and Learning Activities** | **Student Learning Time (hours)** | | 1. Face-to-Face Learning | | | * 1. Lecturer-Centered Learning      1. Lecture | 30 | | * 1. Student-Centered Learning (SCL)      1. Laboratory/Tutorial      2. Student-centered learning activities (eg. Case studies presentation, discussion etc) | 7  5 | | 1. Self-Directed Learning | | | * 1. Non-face-to-face learning or student-centered learning (SCL) such as manual, assignment, module, e-Learning, etc. | 30 | | b. Revision | 20 | | c. Assessment Preparations | 20 | | 1. Formal Assessment | | | * 1. Continuous Assessment | 5 | | * 1. Assignment Report and Project with Presentation | 3 | | **Total (SLT)** | **120** |   **TEACHING AND LEARNING ACTIVITIES**   1. Lectures. 2. Individual reading and study of engineering design process and methods. 3. Individual assignments to enhance breadth of understanding. 4. Group projects to enhance engineering design problem solving skills.   **WEEKLY SCHEDULE**   |  |  | | --- | --- | | **Week** | **Topic / Content** | | 1-2 | The Total Design Activity, The Nature of Design  The Design Process – Descriptive Models, Prescriptive Models, An Integrative Model  New Design Procedures – Systematic Procedures, Design Methods, Creative Methods, Rational Methods | | 3-4 | Design Core: Market/User Needs and Demands, The Product Design Specification  Clarifying Objectives: The Objective Tree Method  Setting Requirements – the Performance Specification Method  Determining Charateristics – The Quality Function Deployment Method (QFD) | | 5-6 | Design Core: Conceptual Design  Establishing Functions: The Function Analysis Method  Generating Alternatives: The Morphological Chart Method  Evaluating Alternatives: The Weighted Objectives Method | | 7-8 | Design Core: Detail Design (Technical Design), Manufacture  Improving Details: The Value Engineering Method  Design Core: Selling (Marketing)  Variation to the Total Design Activity Model | | 9-10 | Design Management  Aids to Total Design  Methods to Assist the Design Core  Design Strategies – framework of action, strategy control, setting strategies and choosing tactics | | 11 | **Project Discussion and Consultation** | | 12 | **Project Crit. Session** | | 13 | **Project Discussion and Consultation** | | 14 | **Group Project Presentation** |   **TEXTS**   1. Cross, N, Engineering Design Methods: Strategies for Product Design, John Wiley & Sons, 2008. 2. Pugh, S, Total Design: Integrated Methods for Succesful Product Engineering, Addison-Wesley, Pub. Co, 1993. 3. Pahl, G, Beitz, W, Feldhusen J, Grote KH, Engineering Design: A systematic approach, Springer, 2007 4. Cross, N. Engineering Design Methods: Strategies for Product Design. Wiley 2008 5. Ullman DG. The Mechanical Design Process. Mcgraw Hill Series in Mechanical Engineering. 2009   **REFERENCE**   1. Dieter, G E and L C Schmidt, Engineering Design, 4th edition, McGraw Hill, 2009   **GRADING**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **No.** | **Assessment** | **Number** | **% each** | **% total** | **Dates** | | 1. | Assignments (individual) | 6 | 5 | 30 | W1,W3,W5,W7,  W10, W12 | | 2. | Project (group) | 2 | 10, 20 | 30 | W12, W14 | | 3. | Tests | 2 | 20 | 40 | W7, W14 | | **Overall Total** | | | | **100** | |   **ATTENDANCE**  The student should adhere to the rules of attendance as stated in the University Academic Regulation :-   1. Student must attend not less than 80% of lecture hours as required for the subject. 2. The student will be prohibited from attending any lecture and assessment activities upon failure to comply the above requirement. Zero mark will be given to the subject. | | |

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| **UTM RAZAK SCHOOL OF ENGINEERING & ADVANCED TECHNOLOGY** | |  | |
| **MATERIALS SELECTION AND MANUFACTURING PROCESS**  **(MRSM 1243)** | **Revision**  **Date of issue**  **Last Amendment**  **Edition** | | **:**  **:**  **:**  **:** |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **PRE-REQUISITE** | | **:** | **Nil** | | | | **EQUIVALENCE** | | **:** | **-** | | | | **LECTURE HOURS** | | **:** | **3 hour lectures per week** | | | | **Lecturers** | | **E-Mail** | | **Room No.** | **Phone No.** | | 1. | AP Dr. Astuty Amrin | astuty@ic.utm.my | | N112 | 03-26154471 | | 2. | Dr. Mohamed Azlan Suhot | azlan@ic.utm.my | |  |  |   **SYNOPSIS**  This course is designed to provide students with understanding on materials selection and manufacturing processes. The first part covers principles of materials selection including review on materials properties, procedures of material selection, application of materials property chart as well as material indices. While in the second part, all type of manufacturing processes including casting, forming, machining, joining and surface engineering will be covered. The students are also introduced on processing of polymers, ceramics and composites materials and products.  **COURSE LEARNING OUTCOMES**  By the end of the course, students should be able to :   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Course Learning Outcomes** | **Programme**  **Learning Outcome(s) Addressed** | **Learning’s**  **Taxonomy** | **Assessment Methods** | | 1. | Illustrate the basic properties of materials for a particular component and reasons for selection of materials and manufacturing process | PO1 | C3  CTPS3 | Test, | | 2. | Recognise the basic principles of selecting manufacturing processes for a particular component | PO1 | C3  CTPS3 | Test, Assignment | | 3. | Explain materials characteristics and properties and relate them to performance, manufacturing process and environment | PO2 | C4  CTPS4 | Test, Assignment | | 4. | Select and recommend materials and manufacturing processes appropriate to a specific design | PO2 | C3  CTPS4 | Test, Project, | | 5 | Communicate critically the rationale of selecting a specific materials and manufacturing in oral or written | PO3 | P4  CS3 | Report, Presentation |   **STUDENT LEARNING TIME**   |  |  | | --- | --- | | **Teaching and Learning Activities** | **Student Learning Time (hours)** | | 1. Face-to-Face Learning | | | * 1. Lecturer-Centered Learning      1. Lecture | 30 | | * 1. Student-Centered Learning (SCL)      1. Laboratory/Tutorial      2. Student-centered learning activities (eg. Case studies presentation, discussion etc) | 6  6 | | 1. Self-Directed Learning | | | * 1. Non-face-to-face learning or student-centered learning (SCL) such as manual, assignment, module, e-Learning, etc. | 30 | | b. Revision | 20 | | c. Assessment Preparations | 20 | | 1. Formal Assessment | | | * 1. Continuous Assessment | 5 | | * 1. Assignment Report and Project with Presentation | 3 | | **Total (SLT)** | **120** |   **TEACHING METHODOLOGY**   1. Lectures and discussion 2. Students will be required to conduct a group work design project , write reports and present either the project or other related issues.   **WEEKLY SCHEDULE**   |  |  | | --- | --- | | **Week** | **Topic / Content** | | 1 | **Introduction**  Review of engineering materials and their properties, Review manufacturing process  Material Failure mechanisms | | 2 | **Basic of Materials Selection**  The selection Strategy, Materials Indices, The selection Procedures, Computer-aided selection | | 3 | **Materials Selection of Materials and Shape**  Materials selection in engineering design, Systematic materials selection procedures based on design requirements, Selecting materials with multiple constraints and conflicting objectives, Shape factors  Limits to Shape Shape Efficiency | | 4 | **Materials Selection Chart**  Mechanical Property chart   * Young’s Modulus vs Density * Young’s Modulus vs cost * Strength vs Density * Strength vs Toughness * Strength vs elongation * Specific Stiffness vs specific Strength * strength vs cost * electrical resisvity vc cost * -Recycle Fraction vs cost   Physical Property Chart, Chemical Property Chart | | 5 | **Materials Selection: Case Studies** | | 6 | **Casting Processes**  Fluid Flow and solidification, Mould Design , Prevention of casting defects, Development processes | | 7 | **Forming Processes**  Bulk Metal Forming, Sheet Metal Forming, Hot Working Process, Cold working Process  Stress-relief annealing | | **8** | **MID SEMESTER BREAK** | | 9 | **Machining Processes**  Metal cutting Processes**,** Cutting Tools Selection**,** Drilling and Related-hole making**,** Milling**,** Turning and Boring**,** Shaping, Planing , Broaching, Sawing**,** Abrasive Machining | | 10 | **Assembly and Joining Processes**  Review of assembly Processes, Welding, Brazing and Soldering, Adhesive Bonding and Mechanical Fastening, Joining for Polymers | | 11 | **Powder Metallurgy**  Basic Process, Powder Testing and Evaluation, Powder Mixing and Blending, Sintering, Hot Isostatic Pressing, Other Techniques to produce High Density PM products | | 12 | **Surface Engineering**  Mechanical Cleaning, Chemical cleaning, Coatings, Vaporized Metal coatings, Cladding, Edge finishing and Burrs, Surface Integrity | | 13 | **Processing of Polymer , Ceramic and Composites**  Plastic processing   * extrusion, sheet and film extrusion, blow molding, injection molding, heat forming, compression molding (composite manufacturing), calendaring   Fabrication of Ceramics, Fabrication of Composites, Case Study | | 14-15 | **Presentation of Group Project** | | **16-18** | **REVISION WEEK AND FINAL EXAMINATION** |   **REFERENCES**   1. Ashby, M.F., Materials Selection in Mechanical Design, Butterworth-Heinemann, 4th edition 2010 2. Ashby,M., Shercliff, H. & Crebon,.D., Materials Engineering, Science, Processing and Design, Butterworth-Heinemann, 2nd edition 2010 3. Kalpakjian,S. and Schmid, S. R., Manufacturing Processes for Engineering Materials, Pearson/Preentice Hall 5th edition, 2008 4. Black,JT. And Ronald A. Kohser, Degarmo’s Materials and Process in Manufacturing, John Wiley & Sons, 10th edition 2008 5. Pt L. Mangonon, The Principles of Materials Selection for Engineering Design, Prentice Hall.International edition,1999 6. Budinski. Engineering Materials: Properties and Selection, Prentice Hall, 2010     **GRADING**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **No.** | **Assessment** | **Number** | **% each** | **% total** | **Dates** | | 1. | Test | 2 | 15 | 30 | Week 5 & 10 | | 2. | Individual Assignment | 1 | 10 | 10 | Week 6 | | 3. | Group Project & Presentation | 1 | 20 | 20 | Week 12-14 | | 4. | Final Exam | 1 | 40 | 40 |  | | **Overall Total** | | | | **100** | |   **ATTENDANCE**  The student should adhere to the rules of attendance as stated in the University Academic Regulation :-   1. Student must attend not less than 80% of lecture hours as required for the subject 2. The student will be prohibited from attending any lecture and assessment activities upon failure to comply the above requirement. Zero mark will be given to the subject. | | | |

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| **UTM RAZAK SCHOOL OF ENGINEERING & ADVANCED TECHNOLOGY** |  | |
| **COMPUTER-AIDED DESIGN (CAD) / COMPUTER-AIDED ENGINEERING (CAE)(MRSM 1253)** | **Revision**  **Date of issue**  **Last Amendment**  **Edition** | **: 1**  **: 2 Nov 2012**  **::**  **: 1** |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **PRE-REQUISITE** | | **:** | **Nil** | | | | **EQUIVALENCE** | | **:** | **-** | | | | **LECTURE HOURS** | | **:** | **3 hour lectures per week** | | | | **Lecturers** | | **E-Mail** | | **Room No.** | **Phone No.** | | 1. | Dr. Shamsul Sarip | Shamsuls.kl@utm.my | | CW108 | 4265 | | 2. | AP Dr. Mohamad Kasim Abd Jalil | kasim@fkm.utm.my | | C25 335 | 34741 | | 3. | Dr. Jamaludin Mohd Taib | jamalt@fkm.utm.my | | C23 225 | 34654 |   **SYNOPSIS**  The principal objective of this course is to enable the students to use computer in all aspects of the engineering design process. At the end of the class, they should be able to use computers to understand the basic theories of CAD, model reasonably complex mechanical systems using a solid modelling tool, and perform basic engineering analysis using FEA to predict mechanical behaviour and modify designs for better performance.  **COURSE LEARNING OUTCOMES**  By the end of the course, students should be able to   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Course Learning Outcomes** | **Programme**  **Learning Outcome(s) Addressed** | **Taxonomy** | **Assessment Methods** | | 1 | Illutrate transformation matrices for various applications in CAD/CAE | PO1 | C4 | Assignment, Test | | 2 | Construct mechanical part using parametric modelling technique and Finite Element Analysis. | PO2 | C4  CTPS3 | Assignment, Test, Project | | 3 | Relate the foundation of CAD/CAE for research and design purposes in a group project | PO3 | A5  TS1, CS2 | Assignment, Test |   **STUDENT LEARNING TIME**   |  |  | | --- | --- | | **Teaching and Learning Activities** | **Student Learning Time (hours)** | | 1. Face-to-Face Learning | | | * 1. Lecturer-Centered Learning      1. Lecture | 30 | | * 1. Student-Centered Learning (SCL)      1. Laboratory/Tutorial      2. Student-centered learning activities (eg. Case studies presentation, discussion etc) | 6  6 | | 1. Self-Directed Learning | | | * 1. Non-face-to-face learning or student-centered learning (SCL) such as manual, assignment, module, e-Learning, etc. | 30 | | b. Revision | 20 | | c. Assessment Preparations | 20 | | 1. Formal Assessment | | | * 1. Continuous Assessment | 5 | | * 1. Assignment Report and Project with Presentation | 3 | | **Total (SLT)** | **120** |   **TEACHING METHODOLOGY**   1. Lectures and discussion 2. Students will be required to conduct a group work on project and write reports   **WEEKLY SCHEDULE**   |  |  | | --- | --- | | **Week** | **Topic / Content** | | 1 | Course information and introduction, Beyond CAD | | 2 | Application of Computer Graphics, Theory in Computer Graphics  CAD software: sketch and base model | | 3 | Foundation in CAD (Coordinate System), Model Representation: Wireframe and Curve  Explaination on Project  Assignment 1 | | 4 | Model Representation: Solid Modelling  CAD software: Parametric and feature based modelling, design intent  Assignment 2 | | 5 | Finite Element Formulation Techniques | | 6 | Element Properties  Analysis of Frame Structures | | 7 | FEM for Two and Three Dimensional Solids  Test 1 | | **8** | **MID SEMESTER BREAK** | | 9 | Research in geometric modelling and case study  Paper Review | | 10 - 13 | FEM to predict the behavior of mechanical stress, fatigue and motion  Group Project | | 14-15 | Additional Applications of FEM  Assignment 3 | | 15 | Test 2 | | **16-18** | **REVISION WEEK AND FINAL EXAMINATION** |   **Text Book**   1. Computer Graphics and Geometric Modeling for Engineers by Vera B. Anand, John Wiley, 1993. 2. SolidWorks Tutorial 2005 Tutorial: A Step-by-step Project Based Approach Utlizing 3D Solid Modeling, by David C. Planchard & Marie P. Planchard, SDC Publications, 2005. 3. Agoston, MK., Computer Graphics and Geometric Modeling, Springer, 2005 4. Goldman R. An Integrated Introduction to Computer Graphics and Geometric Modeling, Chapman & Hall, 2009 5. David V. Hutton, Fundamentals of Finite Element Analysis, McGraw Hill 6. Erik G. Thompson, Introduction to the Finite Element Method: Theory, Programming and Applications, John Wiley 7. H. C. Martin and G. F. Carey, Introduction to Finite Element Analysis - Theory and Application, New York, McGraw-Hill   **GRADING**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **No.** | **Assessment** | **Number** | **% each** | **% total** | **Dates** | | 1. | Test | 2 | 20 | 40 | W7 and W15 | | 2. | Assignment | 3 | 10 | 30 | W2, W4, W7, W11 | | 3. | Minor Project | 1 | 10 | 10 | W3 – W7 | | 4. | Major Project | 1 | 20 | 20 | W10 - W15 | | **Overall Total** | | | | **100** | |   ATTENDANCE  The student should adhere to the rules of attendance as stated in the University Academic Regulation :-  1. Student must attend not less than 80% of lecture hours as required for the subject.  2. The student will be prohibited from attending any lecture and assessment activities upon failure to comply the above requirement. Zero mark will be given to the subject. | | |

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| **RAZAK SCHOOL OF ENGINEERING & ADVANCED TECHNOLOGY** |  | |
| **AUTOMOTIVE ENGINEERING DESIGN**  **(MRSM 2213)** | **Revision**  **Date of issue**  **Last Amendment**  **Edition** | **:**  **:**  **:**  **:** |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **PRE-REQUISITE** | | **:** | **Nil** | | | | **EQUIVALENCE** | | **:** | **-** | | | | **LECTURE HOURS** | | **:** | **3 hour lectures per week** | | | | **Lecturers** | | **E-Mail** | | **Room No.** | **Phone No.** | |  | Norazmein bin Abdul Raman | norazmein.kl@utm.my | | F306J | 03-26154756 | |  |  |  | |  |  |   **SYNOPSIS**  Within this course, students are taught the technological basics and knowledge in the conception and the development of automotive. This comprises technical automotive design with regard to market, legislative and manufacturing requirements. Course content encompass all of the vehicle’s main domains such as chassis, body, drivetrain, safety, driver assistance systems and relevant technological areas like vehicle dynamics, energy efficiency, acoustics, mechatronics, structural fatigue and durability. The course provides knowledge of industrial design approaches and research topics with regard to real-world vehicle requirements, market developments and legislative constraints.  **COURSE LEARNING OUTCOMES**  By the end of the course, students should be able to : **PO1, PO2 & PO4**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Course Learning Outcomes** | **Programme**  **Learning Outcome(s) Addressed** | **Learning’s**  **Taxonomy** | **Assessment Methods** | | 1. | Comprehend the fundamental knowledge of scientific principles, technological developments and industrial practices in areas related to automotive design, performance, manufacturing, legislation and environment | PO1 | C2 | T | | 2. | Apply the fundamental knowledge and understanding to the analysis of vehicle performance such as powertrain, suspension systems and body structures. | PO2 | C3 | T, HW | | 3. | Analyse critically all the different aspects of vehicle systems, which includes key issues such as environmental and sustainability limitations and crashworthiness legislation | PO2, PO4 | C4 | PR |   Note :  (T – Test ; PR – Project ; Q – Quiz; HW – Homework/Assignment ; Pr – Presentation; F – Final Exam)  Notation: PO1:Knowledge; PO2: Critical Thinking & Problem Solving Skills; PO3: Leadership & Teamwork Skills; PO4: Professional Ethics & Moral; PO5:Communication & Entrepreneurial Skills; PO6: Life Long Learning & Information Management.  **STUDENT LEARNING TIME**   |  |  | | --- | --- | | **Teaching and Learning Activities** | **Student Learning Time (hours)** | | 1. Face-to-Face Learning | | | * 1. Lecturer-Centered Learning      1. Lecture | 39 | | * 1. Student-Centered Learning (SCL)      1. Student-centered learning activities (eg. Case studies presentation, discussion etc) | 25 | | 1. Self-Directed Learning | | | * 1. *Non-face-to-face learning* or student-centered learning (SCL) such as manual, assignment, module, e-Learning, etc. | 15 | | b. Revision | 15 | | c. Assessment Preparations | 20 | | 1. Formal Assessment | | | * 1. Continuous Assessment | 3 | | * 1. Project Presentation | 3 | | **Total (SLT)** | **120** |   **TEACHING METHODOLOGY**  Teaching method includes series of lectures, in-depth discussion on a number of case studies and knowledge sharing with invited expert speakers from related field on current issues. The student is expected to carry out a large amount of self study. Students will be required to conduct a group work design project , write reports and present either the project or other related issues.  **WEEKLY SCHEDULE**   |  |  | | --- | --- | | **Week** | **Topic / Content** | | 1 | Development of automotive engineering and design | | 2 | Fundamentals of automotive design | | 3 | | 4 | Automotive Engineering Systems | | 5 | | 6 | | 7 | Internal Combustion Engines | | 8 | **MID SEMESTER BREAK** | | 9 | Automotive Body Structures and Aerodynamics | | 10 | | 11 | Advanced vehicle materials technology | | 12 | Human factors in automotive design | | 13 | Safety and reliability in automotive design | | 14 | Green Technology in automotive | | 15 | Manufacturing management in automotive industry | | **16-18** | **REVISION WEEK AND FINAL EXAMINATION** |   **REFERENCE**   1. Crom, M. A. (2009). Automotive engineering : powertrain, chassis system and vehicle body. Oxford, UK: Butterworth-Heinemann. 2. Gabriel, M. G. (2004). Innovations in automotive transmission engineering. Warrendale, Pa: SAE International. 3. Goodsell, D. (1989). Dictionary of automotive engineering. London: Butterworths. 4. Liu, C. Q., & Huston, R. L. (2011). Principles of vibration analysis : with applications in automotive engineering. Warrendale, Pa.: SAE International. 5. Reimpell, J. (1996). The automotive chassis : engineering principles. London: Arnold. 6. Ribbens, W. B. (2013). Understanding automotive electronics : an engineering perspective. Waltham, MA: Butterworth-Heinemann. 7. Rowe, J. (2012). Advanced material in automotive engineering. Oxford: Woodhead.   **GRADING**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **No.** | **Assessment** | **Number** | **% each** | **% total** | **Dates** | | 1. | Test | 2 | 20 | 40 | W5, W10 | | 2. | Assignment | 2 | 10 | 20 | Various | | 3. | Project | 1 | 40 | 40 | W17 | | **Overall Total** | | | | **100** | |   **ATTENDANCE**  The student should adhere to the rules of attendance as stated in the University Academic Regulation :-   1. Student must attend not less than 80% of lecture hours as required for the subject. 2. The student will be prohibited from attending any lecture and assessment activities upon failure to comply the above requirement. Zero mark will be given to the subject. | | |

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| **UTM RAZAK SCHOOL OF ENGINEERING & ADVANCED TECHNOLOGY** |  | |
| **DESIGN FOR RELIABILITY**  **(MRSM 2223)** | **Revision**  **Date of issue**  **Last Amendment**  **Edition** | **: 1**  **: 2 October 2014**  **::**  **: 1** |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **PRE-REQUISITE** | | **:** | **Nil** | | | | **EQUIVALENCE** | | **:** | **-** | | | | **LECTURE HOURS** | | **:** | **3 hour lectures per week** | | | | **Lecturers** | | **E-Mail** | | **Room No.** | **Phone No.** | | 1. | Dr. Abd Rahman Abdul Rahim | rahmanar@utm.my | | 15-12-01 | 5335 | | 1. | Dr. Shamsul bin Sarip | shamsul@ic.utm.my | | CW108 | 34741 |   **SYNOPSIS**  Design reliability is crucial in order to ensure that the product will not have any difficulty during manufacturing as well as in use. Reliability is the extent to which a product continues to conform to requirements over its operational cycle. Designing reliability into the product requires some specific tools to be deployed. There are a variety of activities involved in an effective reliability program and in arriving at reliable products. Achieving the organization’s reliability goals requires strategic vision, proper planning, sufficient organizational resource allocation and the integration and institutionalization of reliability practices into development projects. Knowledge in reliability can be used to predict product/process failures and understanding why the failures occurred. Design reliability can also improve the product/process by reducing errors and create optimised test plans. Reliability must be designed into products and processes using the best available science-based methods. Reliability practices must begin early in the design process and must be well integrated into the overall product development cycle.  **COURSE LEARNING OUTCOMES**  By the end of the course, students should be able to :   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Course Learning Outcomes** | **Programme**  **Learning Outcome(s) Addressed** | **Taxonomy** | **Assessment Methods** | | 1. | Analyze the design and determine the reliability aspects of the system. | PO1 | C4 | Assignment, Test | | 2. | Develop a reliability based design in the product development cycle. | PO2 | C5  CTPS3 | Assignment, Test, Project | | 3. | Propose recommendations in order to increase reliability of the systems. | PO3 | A5  TS1, CS2 | Assignment, Test |   **STUDENT LEARNING TIME**   |  |  | | --- | --- | | **Teaching and Learning Activities** | **Student Learning Time (hours)** | | 1. Face-to-Face Learning | | | * 1. Lecturer-Centered Learning      1. Lecture | 30 | | * 1. Student-Centered Learning (SCL)      1. Laboratory/Tutorial      2. Student-centered learning activities (eg. Case studies presentation, discussion etc) | 6  6 | | 1. Self-Directed Learning | | | * 1. Non-face-to-face learning or student-centered learning (SCL) such as manual, assignment, module, e-Learning, etc. | 30 | | b. Revision | 20 | | c. Assessment Preparations | 20 | | 1. Formal Assessment | | | * 1. Continuous Assessment | 5 | | * 1. Assignment Report and Project with Presentation | 3 | | **Total (SLT)** | **120** |   **TEACHING METHODOLOGY**   1. Lectures, case studies and discussion. 2. Students will be required to conduct a group work on project and write reports.   **WEEKLY SCHEDULE**   |  |  | | --- | --- | | **Week** | **Topic / Content** | | 1 | Design for Reliability Paradigms | | 2 | Reliability Design Tools  Assignment 1 | | 3 | Reliability Models | | 4 | Design Failure Modes, Effects and Criticality Analysis  Assignment 2 | | 5 | Six Sigma Approach to Requirements Development | | 6 | Human Factors in Reliable Design  Project 1 | | 7 | Stress Analysis During Design to Eliminate Failures  Test 1 | | **8** | **MID SEMESTER BREAK** | | 9 | Highly Accelerated Life Testing | | 10 | Design for Extreme Environments | | 11 | Prognostics and Health Management Capabilities to Improve Reliability  Assignment 3 | | 12 | Reliability Management | | 13 | Risk Management, Exception Handling and Change Management | | 14 | Integrating Design for Reliability  Project 2 | | 15 | Organizational Reliability Capability Assessment  Test 2 | | **16-18** | **REVISION WEEK AND FINAL EXAMINATION** |   **Text Book**   1. [Dev G. Raheja](http://www.amazon.co.uk/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=Dev+G.+Raheja&search-alias=books-uk&text=Dev+G.+Raheja&sort=relevancerank) and [Louis J. Gullo](http://www.amazon.co.uk/Louis-J.-Gullo/e/B00A532X7U/ref=dp_byline_cont_book_2), Design for Reliability, John Wiley and sons, New Jersey, 2012. 2. [Daniel T. Daley](http://www.powells.com/s?author=Daniel%20T.%20Daley), Design for Reliability, Industrial Press, 2011. 3. [B.S. Dhillon](http://www.amazon.co.uk/B.S.-Dhillon/e/B001HPW5JG/ref=dp_byline_cont_book_1) , Design Reliability: Fundamentals and Applications Hardcover , CRC Press, Boca Raton, 1999. 4. [David J. Smith](http://www.amazon.co.uk/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=David+J.+Smith&search-alias=books-uk&text=David+J.+Smith&sort=relevancerank), Reliability, Maintainability and Risk: Practical Methods for Engineers, Elsevier Press, Oxford, 2007. 5. [Eric Bauer](http://www.amazon.co.uk/Eric-Bauer/e/B003VOC4NI/ref=dp_byline_cont_book_1), Design for Reliability: Information and Computer-Based Systems, John Wiley and Sons, New Jersey, 2010. 6. [Rudolph Frederick Stapelberg](http://www.amazon.co.uk/Rudolph-Frederick-Stapelberg/e/B004NA7WAE/ref=dp_byline_cont_book_1), Handbook of Reliability, Availability, Maintainability and Safety in Engineering Design, Springer-Verlag, London, 2009.   **GRADING**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **No.** | **Assessment** | **Number** | **% each** | **% total** | **Dates** | | 1. | Test | 2 | 20 | 40 | W7 and W15 | | 2. | Assignment | 3 | 10 | 30 | W2, W4, W11 | | 3. | Minor Project | 1 | 10 | 10 | W3 – W7 | | 4. | Major Project | 1 | 20 | 20 | W10 - W15 | | **Overall Total** | | | | **100** | |   **ATTENDANCE**  The student should adhere to the rules of attendance as stated in the University Academic Regulation :-   1. Student must attend not less than 80% of lecture hours as required for the subject. 2. The student will be prohibited from attending any lecture and assessment activities upon failure to comply the above requirement. Zero mark will be given to the subject. | | |

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| **UTM RAZAK SCHOOL OF ENGINEERING & ADVANCED TECHNOLOGY** |  | |
| **FLUID POWER**  **(MRSM 2233)** | **Revision**  **Date of issue**  **Last Amendment**  **Edition** | **:**  **:**  **::**  **:** |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **PRE-REQUISITE** | | **:** | **Nil** | | | | **EQUIVALENCE** | | **:** | **-** | | | | **LECTURE HOURS** | | **:** | **3 hour lectures per week** | | | | **Lecturers** | | **E-Mail** | | **Room No.** | **Phone No.** | | 1. | AP Dr. Khairur Rijal jamaludin | Khairur.kl@utm.my | |  |  | | 2. | Dr. Shamsul Sarip | shamsul@ic.utm.my | |  |  |   **SYNOPSIS**  This course aims at providing fundamental knowledge about the design and industrial application of fluid power system design. This involves developing an insight into applied fluid mechanics, and mechanical engineering design.  **COURSE LEARNING OUTCOMES**  By the end of the course, students should be able to :   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Course Learning Outcomes** | **Programme**  **Learning Outcome(s) Addressed** | **Learning’s**  **Taxonomy** | **Assessment Methods** | | 1. | Appraise how fluid power system is applied in various fields of industry application | PO2 | C4,  CTPS2 | Test, Assignment | | 2. | Explain the design parameter and attributes of fluid power machines and the transfer into the design | PO2 | C5,  CTPS2 | Test, Assignment | | 3. | Formulate fluid power system design criteria for a range of applications in a group project through oral and written report | PO3 | A4, P3  CS4, TS1, LS1 | Project,  Presentation | | 4. | Carry out preliminary design of fluid power machines | PO5 | A2,  LL2 | Project,  Presentation |   **STUDENT LEARNING TIME**   |  |  | | --- | --- | | **Teaching and Learning Activities** | **Student Learning Time (hours)** | | 1. Face-to-Face Learning | | | * 1. Lecturer-Centered Learning      1. Lecture | 30 | | * 1. Student-Centered Learning (SCL)      1. Laboratory/Tutorial      2. Student-centered learning activities (eg. Case studies presentation, discussion etc) | 6  6 | | 1. Self-Directed Learning | | | * 1. Non-face-to-face learning or student-centered learning (SCL) such as manual, assignment, module, e-Learning, etc. | 30 | | b. Revision | 20 | | c. Assessment Preparations | 20 | | 1. Formal Assessment | | | * 1. Continuous Assessment | 5 | | * 1. Assignment Report and Project with Presentation | 3 | | **Total (SLT)** | **120** |   **TEACHING METHODOLOGY**   1. Lectures and discussion 2. Students will be required to conduct a group work design project , write reports and present either the project or other related issues. 3. Videos and demonstration will be given on related topics   **WEEKLY SCHEDULE**   |  |  | | --- | --- | | **Week** | **Topic / Content** | | 1 | **Introduction to Fluid Power:**  **Introductions, Syllabus, Fluid Power Fundamentals** | | 2 | **Fluid Power Fundamentals:**  **Bernoulli's Equation, Flow Control Valves (Needle Valve, Pressure-Compensated Flow Control Valve), Direct and Pilot Operated Relief Valves** | | 3 | **Hydraulic Circuits:**  Series & Parallel Connections, Analogies to Electrical Circuits, Flow Control Circuits (Meter-in, Meter-out, Bleed-off), Check Valves | | 4-5 | **Hydraulic Fluids**  Roles of Hydraulic Fluid, Viscosity (Viscous Friction, Internal Pipe Flow, Leakage), Bulk Modulus, Fluid Inertia | | 6 - 7 | **Valve Modeling**  Flow Divider/Combiner Valve, Pressure Reducing Valve, Directional Control Valves  Test 1 (2 hours) | | **8** | **MID SEMESTER BREAK** | | 9 | **Hydraulic Pumps**  Power Steering Valve, Pump Classification (Positive vs. Non-Positive Displacement, Architectures), Pumping Theory (Flow Ripple, Inefficiencies, Cavitation), Hydrostatic Transmissions | | 10 | **System Dynamics Review & Sensors, Signal Conditioning, and DAQ Systems**  Review of System Dynamics and Controls, Overview of Sensing and Data Acquisition for Servo Hydraulic Test Stands | | 11 | **Servo Hydraulic Systems**  Servo-valve function, characteristics, sizing, and systems | | 12 | Closed-Loop Response, PID Control, Feedforward Control | | 13 | Internal Model & Adaptive Control  Test 2 (2 hours) | | 14-15 | Project Presentation | | **16-18** | **REVISION WEEK AND FINAL EXAMINATION** |   **REFERENCES:**   1. Lecture Notes made available during the course. 2. Introduction to Fluid Power, 2002, James Johnson, New York: Delmar Cengage Learning 3. Fluid Power with Applications (6th ed.) by Anthony Esposito (New Jersey: Prentice Hall, (2002) 4. Khairur Rijal Jamaludin, 2010, Reka Bentuk Sistem: Kuasa Bendalir, Penerbit UTM   **GRADING**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **No.** | **Assessment** | **Number** | **% each** | **% total** | **Dates** | | 1. | Test | 2 | 20 | 40 | W5, W10 | | 2. | Assignment | 1 | 20 | 20 | Various | | 3. | Project | 2 | 20 | 40 | W17 | | **Overall Total** | | | | **100** | |   **ATTENDANCE**  The student should adhere to the rules of attendance as stated in the University Academic Regulation :-   1. Student must attend not less than 80% of lecture hours as required for the subject. 2. The student will be prohibited from attending any lecture and assessment activities upon failure to comply the above requirement. Zero mark will be given to the subject. | | |

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| **UTM RAZAK SCHOOL OF ENGINEERING & ADVANCED TECHNOLOGY** |  | |
| **NEW PRODUCT DEVELOPMENT (NPD)**  **(MRSM 2243)** | **Revision**  **Date of issue**  **Last Amendment**  **Edition** | **: 1**  **: 2 October 2014**  **::**  **: 1** |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **PRE-REQUISITE** | | **:** | **Nil** | | | | **EQUIVALENCE** | | **:** | **-** | | | | **LECTURE HOURS** | | **:** | **3 hour lectures per week** | | | | **Lecturers** | | **E-Mail** | | **Room No.** | **Phone No.** | | 1. | Dr. Abd Rahman Abdul Rahim | rahmanar@utm.my | | 15-12-01 | 5335 | | 1. | Dr. Shamsul bin Sarip | shamsul@ic.utm.my | | CW108 | 34741 |   **SYNOPSIS**  New products and services are vital to all companies. Maximizing the success of new products and services can drive growth and shareholder value, lead to significant competitive advantage and leapfrog a company ahead of its competitors. However, innovation is risky and most new products fail in the marketplace. Often, failure is due to an ineffective process.  Thus, expertise in the design and marketing of new products is a critical skill for all managers, inside and outside of the marketing department. In this course, the first focus on the tools and techniques associated with analyzing market opportunities and then focus on designing, testing, and introducing new products and services. Both quantitative and qualitative approaches are covered. In particular, the course covers the new product development process, strategic opportunity identification, how to generate new product concepts and ideas, mapping customer perceptions, segmentation, product positioning, forecasting market demand, product design, market entry strategies, and testing. It emphasizes how to lead the organization in the process, incorporate consumers, customers and competitors into all of these aspects of new product development.  **COURSE LEARNING OUTCOMES**  By the end of the course, students should be able to :   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Course Learning Outcomes** | **Programme**  **Learning Outcome(s) Addressed** | **Taxonomy** | **Assessment Methods** | | 1 | Analyze the new produt development process and tools | PO1 | C4 | Assignment, Test | | 2 | Generate plan for activities related to new product development | PO2 | C5  CTPS3 | Assignment, Test | | 3 | Identify entrepreunal opportunities for proposed new product. | PO3 | A5  TS1, CS2, KK1 | Project |   **STUDENT LEARNING TIME**   |  |  | | --- | --- | | **Teaching and Learning Activities** | **Student Learning Time (hours)** | | 1. Face-to-Face Learning | | | * 1. Lecturer-Centered Learning      1. Lecture | 30 | | * 1. Student-Centered Learning (SCL)      1. Laboratory/Tutorial      2. Student-centered learning activities (eg. Case studies presentation, discussion etc) | 6  6 | | 1. Self-Directed Learning | | | * 1. Non-face-to-face learning or student-centered learning (SCL) such as manual, assignment, module, e-Learning, etc. | 30 | | b. Revision | 20 | | c. Assessment Preparations | 20 | | 1. Formal Assessment | | | * 1. Continuous Assessment | 5 | | * 1. Assignment Report and Project with Presentation | 3 | | **Total (SLT)** | **120** |   **TEACHING METHODOLOGY**   1. Lectures and discussion 2. Cases studies and class presentations 3. Students will be required to conduct a group work on project and write reports   **WEEKLY SCHEDULE**   |  |  | | --- | --- | | **Week** | **Topic / Content** | | 1 | **Introduction**   * [New Beetle](http://www.volkswagen.com/) * [Boeing 777](http://www.boeing.com/) * [Hewlett-Packard](http://www.hp.com/) * [Stanley Works](http://www.stanleyworks.com/) * [Rollerblade](http://www.rollerblade.com/)   **Development Processes and Organizations**   * [Tyco International](http://www.tyco.com/) | | 2 | **Opportunity Identification**   * [FroliCat](http://www.frolicat.com/) | | 3 | **Product Planning and Identifying Customer Needs**  [Xerox](http://www.xerox.com/)   * [Bad Product Designs](http://www.baddesigns.com/)   ***Project proposal*** | | 4 | **Product Specifications**   * [Specialized Bicycle Components](http://www.specialized.com/)   ***Assignment*** | | 5 | **Concept Generation**   * [Stanley Tools](http://www.stanleyworks.com/) * [TRIZ](http://www.aitriz.org/) * [Delphion Patent Database](http://www.delphion.com/) * [How Stuff Works](http://www.howstuffworks.com/)   ***Test 1*** | | 6 | **Concept Selection and Concept Testing**  [Novo Nordisk](http://www.novonordisk.com/) | | 7 | **Product Architecture**  [Hewlett-Packard](http://www.hp.com/) | | **8** | **MID SEMESTER BREAK** | | 9 | **Industrial Design**   * [Motorola](http://www.motorola.com/) * [Industrial Designers' Society of America](http://www.idsa.org/) | | 10 | **Design for Environment**   * [Herman Miller, Inc.](http://hermanmiller.com/) | | 11 | **Design for Manufacturing**   * [General Motors](http://www.gm.com/) * [Boothroyd-Dewhurst, Inc.](http://www.dfma.com/)   ***Test 2*** | | 12 | **Prototyping**   * [iRobot Corporation](http://www.irobot.com/) * [Wohlers Associates Links/Reports](http://www.wohlersassociates.com/) * [Dyson - The Ball](http://www.dyson.com/) | | 13 | **Robust Design**   * [Ford Motor Company](http://www.ford.com/)   [XPULT catapult exercise](http://www.xpult.com/) | | 14 | **Patents and Intellectual Property**   * [UCSD Patent Site](http://invent.ucsd.edu/index.shtml) * [Delphion Patent Database](http://www.delphion.com/) * [US Patent and Trademark Office](http://www.uspto.gov/) * [Free Patents Online](http://www.freepatentsonline.com/) * [MIT Invention Dimension](http://web.mit.edu/invent/invent-main.html) * [Google Patents](http://www.google.com/patents) * [Patent of the Week - amusing patents](http://www.patentoftheweek.com/index.html)   **Product Development Economics and Managing Projects** | | 15 | Project Presentation – The new product entrepreneurial opportunities. | | **16-18** | **REVISION WEEK AND FINAL EXAMINATION** |   **Text Book**   1. Karl T. Ulrich and Steven D. Eppinger, Product Design and Development, Fifth Edition, McGraw-Hill, New York, 2012. 2. Paul Trott, Innovation Management and New Product Development, Fourth Ed, Prentice Hall, London, 2011. 3. Mike Baxter, Product Design: Practical Methods for the Systematic Development of New Products (Design Toolkits), Chapman and Hall, UK, 2002. 4. [C. Merle Crawford](http://www.amazon.co.uk/C.-Merle-Crawford/e/B001H6P96Q/ref=dp_byline_cont_book_1) and [C. Anthony Di Benedetto](http://www.amazon.co.uk/s/ref=dp_byline_sr_book_2?ie=UTF8&field-author=C.+Anthony+Di+Benedetto&search-alias=books-uk&text=C.+Anthony+Di+Benedetto&sort=relevancerank), New Products Management Paperback, 10th Ed., McGraw Hills International Edition. 2011 5. [Kenneth B. Kahn](http://www.amazon.co.uk/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=Kenneth+B.+Kahn&search-alias=books-uk&text=Kenneth+B.+Kahn&sort=relevancerank), The PDMA Handbook of New Product Development, John Wiley and Sons, New Jersey, 2013 6. [Robert J. Thomas](http://www.amazon.co.uk/Robert-J.-Thomas/e/B001HD18TQ/ref=dp_byline_cont_book_1), New Product Development: Managing and Forecasting for Strategic Success, John Wiley and Sons, New Jersey, 1993.   **GRADING**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **No.** | **Assessment** | **Number** | **% each** | **% total** | **Dates** | | 1. | Test | 2 | 20 | 40 | W5 and W11 | | 2. | Assignment | 1 | 10 | 10 | W4 | | 3. | Project | 3 | 10 | 30 | W3 – W14 | | 4. | Project Presentation | 1 | 20 | 20 | W15 | | **Overall Total** | | | | **100** | |   **ATTENDANCE**  The student should adhere to the rules of attendance as stated in the University Academic Regulation :-   1. Student must attend not less than 80% of lecture hours as required for the subject. 2. The student will be prohibited from attending any lecture and assessment activities upon failure to comply the above requirement. Zero mark will be given to the subject. | | |

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| **UTM RAZAK SCHOOL OF ENGINEERING & ADVANCED TECHNOLOGY** |  | |
| **MECHATRONICS SYSTEM DESIGN**  **(MRSM 2253)** | **Revision**  **Date of issue**  **Last Amendment**  **Edition** | **:**  **:**  **:**  **:** |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **PRE-REQUISITE** | | **:** | **Nil** | | | | **EQUIVALENCE** | | **:** | **-** | | | | **LECTURE HOURS** | | **:** | **3 hour lectures per week** | | | | **Lecturers** | | **E-Mail** | | **Room No.** | **Phone No.** | | 1. | AP Dr, Robiah Ahmad | robiah@ic.utm.my | | N110 | 03-26154333 | | 2. | Dr. Hairi Zamzuri | hairi@ic.utm.my | | F306K | 03-26154674 | | 3. | Dr. Lim Meng Hee | mhlim@ic.utm.my | |  |  |   **SYNOPSIS**  This course begins with an introduction of mechatronics system as the combination of mechanical engineering, electronics, control engineering and computer systems. It starts with fundamental areas of technology on which successful mechatronic system designs are based on namely physical modelling, from design model to truth model, and mathemaatical modeling of dynamic multidisplinary physical system; analysis of mathematical models through analysis and computer simulation; measurement system (analog and digital), controller, actuator and finally validation and control.Other topics cover under this course are mechatronics principles, modeling, interfacing and signal conditioning of motion sensors and actuators; hardware-in-the-loop simulation and rapid prototyping of real-time closed-loop computer control of electromechanical systems; modeling, analysis and identification of discrete-time or samples-data dynamic systems; commonly used digital controller design methods; introduction to nonlinear effects and their compensation in mechatronic systems.  **COURSE LEARNING OUTCOMES**  By the end of the course, students should be able to :   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Course Learning Outcomes** | **Programme**  **Learning Outcome(s) Addressed** | **Learning’s**  **Taxonomy** | **Assessment Methods** | | 1. | Appraise the importance of the integration of modelling and controls in the design of mechatronic system | PO1 | C4 | Test,  Assignment | | 2. | Evaluate the importance of physical and mathematical modelling (from first principles and using system identification experimental techniques) in mechatronic system design | PO2 | P2  CTPS3 | Test,  Assignment | | 3. | Analyze complex mechatronics systems design to fulfill the industrial and other requirements in a group project | PO3 | A2  TS3, | Project,  Presentation | | 4. | Produce and present a mechatronics system design case study including process, tools and solution for the selected system | PO3 | A2  CS4 | Project,  Presentation |   **STUDENT LEARNING TIME**   |  |  | | --- | --- | | **Teaching and Learning Activities** | **Student Learning Time (hours)** | | 1. Face-to-Face Learning | | | * 1. Lecturer-Centered Learning      1. Lecture | 30 | | * 1. Student-Centered Learning (SCL)      1. Student-centered learning activities (eg. Case studies presentation, discussion etc) | 6  6 | | 1. Self-Directed Learning | | | * 1. *Non-face-to-face learning* or student-centered learning (SCL) such as manual, assignment, module, e-Learning, etc. | 30 | | b. Revision | 20 | | c. Assessment Preparations | 20 | | 1. Formal Assessment | | | * 1. Continuous Assessment | 5 | | * 1. Project Presentation | 3 | | **Total (SLT)** | **120** |   TEACHING METHODOLOGY   1. Lectures and discussion 2. Students will be required to conduct a group work design project ,write reports and present either the project or other related issues. 3. Videos and demonstration will be given on related topics.   **WEEKLY SCHEDULE**   |  |  | | --- | --- | | **Week** | **Topic / Content** | | 1 | Mechatronics System Design   * Definition of mechatronic system * Integrated design issues in mechatronics * Mechatronic system design process * Applications in mechatronics | | 2 - 3 | Modelling and simulation of physical systems   * Operator notation and transfer function * Block diagrams, manipulations and simulation * Review on electrical, mechanical – translation and rotation, fluid and thermal systems * Modelling and simulation of the systems | | 4 - 5 | Sensors and transducers  Actuators  **TEST 1** | | 6 - 7 | Control System Design   * State-space control system * Digital control design * PID type control * Controller tuning * Advanced control techniques | | **8** | **MID SEMESTER BREAK** | | 9 - 10 | Hardware in the loop   * Modelling * Experimental data * Mathlab and Simulink | | 11 - 12 | Mechatronics System Case Studies   * Inverted Pendulum * Other case studies | | 13 15 | **TEST 2**  **Project Group**  **Project Presentation** | | **16-18** | **REVISION WEEK AND FINAL EXAMINATION** |   **REFERENCES**   1. Shetty, Devdas (2010) Mechatronics system design : SI edition, 2nd ed. New York :CL-Engineering. 2. Janschek, Klaus (2012)Mechatronic Systems Design Methods, Models, Concepts, Springer-Verlag.   **GRADING**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **No.** | **Assessment** | **Number** | **% each** | **% total** | **Dates** | | 1. | Test | 1 | 10 | 10 | W5, W13 | | 2. | Assignment | 3 | 20 | 60 | Various | | 3. | Project | 1 | 30 | 30 | W13-15 | | **Overall Total** | | | | **100** | |   **ATTENDANCE**  The student should adhere to the rules of attendance as stated in the University Academic Regulation :-   1. Student must attend no less than 80% of lecture hours as required for the subject. 2. The student will be prohibited from attending any lecture and assessment activities upon failure to comply the above requirement. Zero mark will be given to the subject. | | |

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| **UTM RAZAK SCHOOL OF ENGINEERING & ADVANCED TECHNOLOGY** |  | |
| **METROLOGY AND MEASUREMENT**  **(MRSM 2263)** | **Revision**  **Date of issue**  **Last Amendment**  **Edition** | **: 1**  **: 2 October 2014**  **:**  **: 1** |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **PRE-REQUISITE** | | **:** | **Nil** | | | | **EQUIVALENCE** | | **:** | **-** | | | | **LECTURE HOURS** | | **:** | **3 hour lectures per week** | | | | **Lecturers** | | **E-Mail** | | **Room No.** | **Phone No.** | | 1. | Dr. Abd Rahman Abdul Rahim | rahmanar@utm.my | | 15-12-01 | 5335 | | 2. | Dr. Shamsul bin Sarip | shamsul@ic.utm.my | | CW108 | 34741 |   **SYNOPSIS**  Much of what designers or manufacturers do is accomplished through the use of accurate calibration and measurements. Measurement is the process of experimentally obtaining quantity values that can reasonably be attributed to a property of a body or substance. Metrology is the science of measurement. Testing is the technical procedure consisting of the determination of characteristics of a given object or process, in accordance with a specified method. Scientific or fundamental metrology concerns the establishment of [quantity systems](http://en.wikipedia.org/wiki/Quantity_calculus), unit systems, [units of measurement](http://en.wikipedia.org/wiki/Units_of_measurement), the development of new measurement methods, realisation of measurement standards and the transfer of traceability from these standards to users. This course provides a foundation for understanding basic metrology and calibration principles and practices. Metrology includes all theoretical and practical aspects of measurement. This course will also provides guidelines for proper use of instruments like auto-collimator, pyrometers, slip gauges and include equipment of latest trends such as electronic comparators, laser machine alignment techniques, co-ordinate measuring machines (CMM) and automated inspection. Geometric Dimensional Tolerancing (GDT) will also be covered in the course.  **COURSE LEARNING OUTCOMES**  **By the end of the course, students should be able to :**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Course Learning Outcomes** | **Programme**  **Learning Outcome(s) Addressed** | **Taxonomy** | **Assessment Methods** | | 1. | Analyze the design and determine the type of measurments most suitable to ensure that product specifications can be met. | PO1 | C4 | Assignment, Test | | 2. | Develop measurements techniques during manufacturing and test of the product based on product life cycle. | PO2 | C5  CTPS3 | Assignment, Test, Project | | 3. | Propose recommendations in setting up metrology systems or procedures for quality control purposes. | PO3 | A5  TS1, CS2 | Assignment, Test |   **STUDENT LEARNING TIME**   |  |  | | --- | --- | | **Teaching and Learning Activities** | **Student Learning Time (hours)** | | 1. Face-to-Face Learning | | | * 1. Lecturer-Centered Learning      1. Lecture | 30 | | * 1. Student-Centered Learning (SCL)      1. Laboratory/Tutorial      2. Student-centered learning activities (eg. Case studies presentation, discussion etc) | 6  6 | | 1. Self-Directed Learning | | | * 1. Non-face-to-face learning or student-centered learning (SCL) such as manual, assignment, module, e-Learning, etc. | 30 | | b. Revision | 20 | | c. Assessment Preparations | 20 | | 1. Formal Assessment | | | * 1. Continuous Assessment | 5 | | * 1. Assignment Report and Project with Presentation | 3 | | **Total (SLT)** | **120** |   **TEACHING METHODOLOGY**   1. Lectures and discussion 2. Students will be required to conduct a group work on project and write reports   **WEEKLY SCHEDULE**   |  |  | | --- | --- | | **Week** | **Topic / Content** | | 1 | Fundamentals of Error Analysis in Dimensiona Metrology | | 2 | Fundamentals of Dimensional and Geometrical Tolerances  Assignment 1 | | 3 | Measurement and Controls Using Linear and Angular Standards | | 4 | Surface Control  Assignment 2 | | 5 | Opto-Mechanical Metroogy | | 6 | Control of Surface States  Project 1 | | 7 | Computer Aided Metrology  Test 1 | | **8** | **MID SEMESTER BREAK** | | 9 | Control of Assembly and Transmission Elements | | 10 | Control of Materials Hardness Testing | | 11 | Geometric Dimensional & Tolerancing Fundamentals  Assignment 3 | | 12 | Form – Flatness Tolerance, Straightness Tolerance | | 13 | Orientation – Perpendicularity, Parallelism and Angularity | | 14 | Position – RFS, MMC, Special Applications  Project 2 | | 15 | Runout, Concentration, Symmetry and Profile  Test 2 | | **16-18** | **REVISION WEEK AND FINAL EXAMINATION** |   **Text Book**   1. [Raghavendra](http://www.amazon.com/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=Raghavendra&search-alias=books&text=Raghavendra&sort=relevancerank) and [Krishnamurthy](http://www.amazon.com/s/ref=dp_byline_sr_book_2?ie=UTF8&field-author=Krishnamurthy&search-alias=books&text=Krishnamurthy&sort=relevancerank), Engineering Metrology and Measurements, Oxford University Press, Oxford, 2013. 2. [Bucher](http://www.amazon.com/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=Bucher&search-alias=books&text=Bucher&sort=relevancerank), [Jay L.](http://www.amazon.com/Jay-L./e/B00MD20MX8/ref=dp_byline_cont_book_2), The Metrology Handbook, Second Edition, ASQ Quality Press, Milwaukee, 2012. 3. Ammar Grous, Applied Metrology for Manufacturing Engineering, John Wiley and Sons, New Jersey, 2011. 4. [Connie L Dotson](http://www.amazon.com/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=Connie+L+Dotson&search-alias=books&text=Connie+L+Dotson&sort=relevancerank), Fundamentals of Dimensional Metrology, Sixth Edition, Thomson Reuters, New York, 2015. 5. [Alex Krulikowski](http://www.amazon.com/Alex-Krulikowski/e/B001KI55C4/ref=dp_byline_cont_book_1), Fundamentals of Geometric Dimensioning and Tolerancing, Cengage, New York, 2012. 6. [Roger H. Harlow](http://www.amazon.com/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=Roger+H.+Harlow&search-alias=books&text=Roger+H.+Harlow&sort=relevancerank) and [Connie Dotson](http://www.amazon.com/Connie-Dotson/e/B001K8UZ1U/ref=dp_byline_cont_book_2), Fundamentals of Dimensional Metrology, 4th Edition, Thomson Reuters, New York, 2002.   **GRADING**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **No.** | **Assessment** | **Number** | **% each** | **% total** | **Dates** | | 1. | Test | 2 | 20 | 40 | W7 and W15 | | 2. | Assignment | 3 | 10 | 30 | W2, W4, W11 | | 3. | Minor Project | 1 | 10 | 10 | W3 – W7 | | 4. | Major Project | 1 | 20 | 20 | W10 - W15 | | **Overall Total** | | | | **100** | |   **ATTENDANCE**  The student should adhere to the rules of attendance as stated in the University Academic Regulation :-   1. Student must attend no less than 80% of lecture hours as required for the subject. 2. The student will be prohibited from attending any lecture and assessment activities upon failure to comply the above requirement. Zero mark will be given to the subject. | | |

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| **UTM RAZAK SCHOOL OF ENGINEERING & ADVANCED TECHNOLOGY** |  | |
| **SPECIAL TOPIC**  **(MRSM 1823)** | **Revision**  **Date of issue**  **Last Amendment**  **Edition** | **:**  **:**  **:** |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **PRE-REQUISITE** | | **:** | **Nil** | | | | **EQUIVALENCE** | | **:** | **-** | | | | **LECTURE HOURS** | | **:** | **3 hour lectures per week** | | | | **Lecturers** | | **E-Mail** | | **Room No.** | **Phone No.** | | 1. | Academic Manager PG Studies |  | |  |  | | 2. | Program Coordinator |  | |  |  |   **SYNOPSIS**  Courses of instruction involving material of timely, special, or unusual interest not contained in the regular course offerings of the University may be offered by faculty members with the approval of their head of department as Special Topic courses. These may be courses exploring areas of special interest to the proposing faculty member, department, or to the students. Special topics courses are not required to be submitted to curriculum committees and the UTM Senate for approval prior to their initial offerings. Prior to a new course receiving approval, the special topics procedure may be used for a "trial run" of the new course.  **LEARNING OUTCOMES**  **By the end of the course, students should be able to:**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Course Learning Outcomes** | **Programme**  **Learning Outcome(s) Addressed** | **Learning’s**  **Taxonomy** | **Assessment Methods** | | 1. | Select and apply the appropriate theory and knowledge to solve the problem | PO2 | C5, A3,  CTPS2 | Test,  Assignment | | 2. | Critically evaluates results and draw appropriate conclusions to answer problem | PO2 | C4, A4,  CTPS3 | Test, Assignment | | 3. | Organize and work independently and effectively to complete the assignment / project | PO5 | A4, P4,  LL2 | Assignment  And/or  Project | | 4. | Present (oral/written) facts and ideas confidently in a more matured manner | PO3 | A4,  CS3 | Assignment  And/or  Project |   **STUDENT LEARNING TIME**   |  |  | | --- | --- | | **Teaching and Learning Activities** | **Student Learning Time (hours)** | | 1. Face-to-Face Learning | | | * 1. Lecturer-Centered Learning      1. Lecture | 14 | | * 1. Student-Centered Learning (SCL)      1. Laboratory/Tutorial      2. Student-centered learning activities (eg. Case studies presentation, discussion etc) | 28 | | 1. Self-Directed Learning | | | * 1. Non-face-to-face learning or student-centered learning (SCL) such as manual, assignment, module, e-Learning, etc. | 30 | | b. Revision | 20 | | c. Assessment Preparations | 20 | | 1. Formal Assessment | | | * 1. Continuous Assessment | 5 | | * 1. Assignment Report and Project with Presentation | 3 | | **Total (SLT)** | **120** |   **Implementation Procedure**  **I. Policy**   1. Any special topics course proposed will be accompanied by sufficient documentation to provide academic validity. This documentation will be reviewed by the department head and the head of department of Graduate Studies and will reside with the department head. 2. The proposals for special topics course(s) will be submitted on the regular schedule of classes course description approved by the head of department of Graduate Studies . 3. Any special topics course can be offered up to three (3) times without being approved by the Faculty Curriculum Committee. After a third offering, it must either be approved as a regular course offering or be approved by the Faculty Curriculum Committee to continue as a special topics course for no more than two (2) additional times. If neither option is followed, the special topics course must be discontinued.   **II. Procedure of Offering**   1. Proposal to department head for special topics course. 2. Review of special topics course by departmental faculty in accordance with procedures established by that department. 3. Approval of special topics course by department head. 4. Approval of special topics course by the head of department of Graduate Studies | | |

**KURSUS ELEKTIF REKA BENTUK PRODUK**

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| **RAZAK SCHOOL OF ENGINEERING & ADVANCED TECHNOLOGY** |  | |
| **LIFE CYCLE COST ANALYSIS FOR ENGINEERS (MRSM 2273)** | **Revision**  **Date of issue**  **Last Amendment**  **Edition** | **:**  **:**  **:**  **:** |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **PRE-REQUISITE** | | **:** | **Nil** | | | | **EQUIVALENCE** | | **:** | **-** | | | | **LECTURE HOURS** | | **:** | **3 hour lectures per week** | | | | **Lecturers** | | **E-Mail** | | **Room No.** | **Phone No.** | | 1. | Prof. Dr. Awaluddin Mohamed Shaharoun | awaluddin@ic.utm.my | | Dean, UTM Razak School |  | | 2. | Dr. Habibah @ Norehan Hj. Haron | [habibah@ic.utm.my](mailto:habibah@ic.utm.my) | | F306A | 03-26154687 | | 3. | Norazmein Abd. Raman | [norazmein@ic.utm.my](mailto:norazmein@ic.utm.my) | | F306J | 03-26154756 |   **SYNOPSIS**  Life-cycle cost analysis (LCCA) is an economic method of product evaluation. Its main objective is to quantify the total cost of ownership of a product throughout its full life cycle, which includes research and development, construction, operation and maintenance, and disposal. The predicted LCC provides useful information for decision making in purchasing a product, in optimizing design, in selecting materials and processes, in scheduling maintenance, or in planning disposal. Included in this course is a LCC procedure consisting of six steps, which are “Problems definition”, “Cost elements definition”, “System modelling”, “Data collection”, “Cost profile development”, and “Evaluation”.  **COURSE LEARNING OUTCOMES**  By the end of the course, students should be able to :   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Course Learning Outcomes** | **Programme**  **Learning Outcome(s) Addressed** | **Learning’s**  **Taxonomy** | **Assessment Methods** | | 1. | Provide useful information for decision making, e.g., in purchasing a product, in optimizing design, or in scheduling maintenance. | PO1 | C5 | Assignment and test | | 2. | Decide on cost effective and optimized product design, product purchasing, maintenance scheduling, or disposal. | PO4 | A4  EM1 | Assignment and  Case study | | 3. | Present and justify proposal related to life cycle cost analysis for team decision making. | PO3 | A4, P4  CS5, TS1 | Case study  Presentation |   **STUDENT LEARNING TIME**   |  |  | | --- | --- | | **Teaching and Learning Activities** | **Student Learning Time (hours)** | | 1. Face-to-Face Learning | | | * 1. Lecturer-Centered Learning      1. Lecture | 18 | | * 1. Student-Centered Learning (SCL)      1. Laboratory/Tutorial      2. Student-centered learning activities (eg. Case studies presentation, discussion etc) | 19 | | 1. Self-Directed Learning | | | * 1. Non-face-to-face learning or student-centered learning (SCL) such as manual, assignment, module, e-Learning, etc. | 30 | | b. Revision | 20 | | c. Assessment Preparations | 20 | | 1. Formal Assessment | | | * 1. Continuous Assessment | 5 | | * 1. Assignment Report and Project with Presentation | 3 | | **Total (SLT)** | **120** |   **TEACHING METHODOLOGY**   1. Lecture and Discussion 2. Independent Study 3. Group Project, Presentation   **WEEKLY SCHEDULE**   |  |  | | --- | --- | | **Week** | **Topic / Content** | | Week 1 | Introduction | | Week 2 | Life Cycle Costing Economics | | Week 3 | Life Cycle Costing Fundamentals | | Week 4 | Life Cycle Cost Models and Cost Estimation Methods | | Week 5 | Reliability, Quality, Safety, and Manufacturing Costing | | Week 6 | Maintenance, Maintainability, Usability, and Warranty Costing | | Week 7 | Miscellaneous Cost Estimation Models | | Week 8 | LCCA process 1: Problems definition | | Week 9 | LCCA process 2: Cost elements definition | | Week 10 | LCCA process 3: System modelling | | Week 11 | LCCA process 4: Data collection | | Week 12 | LCCA process 5: Cost profile development | | Week 13 | LCCA process 6: Evaluation | | Week 14 | Case study presentation |   **REFERENCES**   * + - 1. B.S. Dhillon, Life Cycle Costing for Engineers, CRC Press, 2009.       2. Fabrycky, Wolter J., Benjamin S. Blanchard, Life-Cycle Cost and Economic Analysis, Prentice-Hall, Englewood Cliffs, NJ (1991)       3. Abernethy, Robert B., The New Weibull Handbook, 4th edition, 536 Oyster Road, North Palm Beach, FL 33408-4328, (2000).       4. Barringer, H. Paul, *“Download free Life-Cycle Cost Spreadsheet”*, http://www.barringer1.com (2002).       5. Greene,L.E. and Shaw,B.L.: The Steps for Successful Life Cycle Cost Analysis, CH2881-1/90/0000-1209,IEEE, pp. 1209-1216, (1990).       6. Marc J. Schniederjans and Stephen B. LeGrand,[Reinventing the Supply Chain Life Cycle: Strategies and Methods for Analysis and Decision Making (FT Press Operations Management)](http://www.amazon.com/Reinventing-Supply-Chain-Life-Cycle/dp/0132963876/ref=sr_1_3?s=books&ie=UTF8&qid=1360694131&sr=1-3&keywords=life+cycle+cost+analysis)(2012).   **GRADING**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **No.** | **Assessment** | **Number** | **% each** | **% total** | **Dates** | | 1. | Assignment | 3 | 20 | 60 | Week 4, 6, 13 | | 2. | Test | 1 | 20 | 20 | Week 7 | | 3. | Case Study Presentation | 1 | 20 | 20 | Week 14 | | **Overall Total** | | | | **100** | |   **ATTENDANCE**  The student should adhere to the rules of attendance as stated in the University Academic Regulation :-   1. Student must attend no less than 80% of lecture hours as required for the subject. 2. The student will be prohibited from attending any lecture and assessment activities upon failure to comply the above requirement. Zero mark will be given to the subject. | | |

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| **UTM RAZAK SCHOOL OF ENGINEERING & ADVANCED TECHNOLOGY** |  | |
| **DESIGN FOR SUSTAINABILITY, MANUFACTURING AND ASSEMBLY**  **(MRSM 2283)** | **Revision**  **Date of issue**  **Last Amendment**  **Edition** | **:**  **:**  **::**  **:** |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **PRE-REQUISITE** | | **:** | **Nil** | | | | **EQUIVALENCE** | | **:** | **-** | | | | **LECTURE HOURS** | | **:** | **3 hour lectures per week** | | | | **Lecturers** | | **E-Mail** | | **Room No.** | **Phone No.** | | 1. | AP Dr. Abd Rahman Abdul Rahim | rahmanar@ic.utm.my | | BATC | 03-26154819 | | 2. | Dr. Habibah@Norehan Harun | habibah@ic.utm.my | | F306A | 03-26154687 | | 3. | Prof. Dr. Nooh Abu Bakar | noohab@ic.utm.my | |  |  |   **SYNOPSIS**  Sustainable product design is increasingly gaining importance and considers the complete life cycle of products from the phases of development, menufacture, assembly, sales, service, operations and disposal. Sustainable design of product life cycles guatantee that the use and disposal of such product will give a minimum impact to the environment.Demand on engineering designshould utilized the latest green and sustainable technology in terms of material acquisition, production and assembly process as well as product disposal. Material and process selection is crucial in determining the level of sustainability and engineering design will dictate the properties of the material used in the product.  **COURSE LEARNING OUTCOMES**  By the end of the course, students should be able to :   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Course Learning Outcomes** | **Programme**  **Learning Outcome(s) Addressed** | **Learning’s**  **Taxonomy** | **Assessment Methods** | | 1. | Evaluate the appropriate design rules and guidelines and analyse design methods. | PO2 | C4  CTPS3 | Test, Assignment | | 2. | Propose design solutions for various industries by taking into account diverse issues on sustainability and the environment | PO4 | A4  EM2 | Project | | 3. | Search for and apply new knowledge in sustainable design and information beyond programme coverage. | PO5 | A4  LL2 | Project |   **STUDENT LEARNING TIME**   |  |  | | --- | --- | | **Teaching and Learning Activities** | **Student Learning Time (hours)** | | 1. Face-to-Face Learning | | | * 1. Lecturer-Centered Learning      1. Lecture | 30 | | * 1. Student-Centered Learning (SCL)      1. Laboratory/Tutorial      2. Student-centered learning activities (eg. Case studies presentation, discussion etc) | -  12 | | 1. Self-Directed Learning | | | * 1. Non-face-to-face learning or student-centered learning (SCL) such as manual, assignment, module, e-Learning, etc. | 43 | | b. Revision | 20 | | c. Assessment Preparations | 10 | | 1. Formal Assessment | | | * 1. Continuous Assessment | 2 | | * 1. Assignment Report and Project with Presentation | 3 | | **Total (SLT)** | **120** |   **TEACHING METHODOLOGY**   1. Lectures and discussion 2. Students will be required to conduct a group work design project ,write reports and present either the project or other related issues. 3. Videos and demonstration will be given on related topics.   **WEEKLY SCHEDULE**   |  |  | | --- | --- | | **Week** | **Topic / Content** | | 1 | The green movement  Business value drivers | | 2 | Managing environmental innovation | | 3 | Principles of design for environment | | 4 | Performance indicators and metrics | | 5 | Design rules and guidelines | | 6 | Analysis methods for design decisions  Case study presentation 2 | | 7 | Product life cycle management  Test 1 | | **8** | **MID SEMESTER BREAK** | | 9 | Electronic equipment industries | | 10 | Transportation industries  Medical and pharmaceutical industries | | 11 | Chemical industries | | 12 | Food and beverage industries | | 13 | Consumer products industries | | 14 | Materials production industries  Case study presentation 2 | | 15 | Energy production industries  Service industries  Test 2 | | **16-18** | **REVISION WEEK AND FINAL EXAMINATION** |   **TEXT**  Fiksel, J. (2009), Design for Enviornment: A Guide to Ssustainable Product Development, 2nd Edition, McGraw Hill Companies, USA  **REFERENCES**   1. [Reinders](http://www.amazon.com/Angele-Reinders/e/B008FQFTE8/ref=ntt_athr_dp_pel_1), A.,  [Diehl](http://www.amazon.com/s/ref=ntt_athr_dp_sr_2?_encoding=UTF8&field-author=Jan%20Carel%20Diehl&ie=UTF8&search-alias=books&sort=relevancerank), J.C. and Brezet, H. (2013). The Power of Design: Product Innovation in Sustainable Energy Technologies, John Wiley & Sons, West Sussex, UK. 2. Niemann, J, Tichkiewitch, S. and Westkamper, E. (2010). Design of Sustainable Product Life Cycles. Springer-Verlag, Berlin. 3. Govind, R. (2013). Products and Process Design: Sustainable Manufacturing, McGRaw Hills, USA   **GRADING**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **No.** | **Assessment** | **Number** | **% each** | **% total** | **Dates** | | 1. | Test | 2 | 20 | 40 | W7 and W15 | | 2. | Assignment | 2 | 15 | 30 | W6 and W14 | | 3. | Project | 1 | 30 | 30 | W15 | | **Overall Total** | | | | **100** | |   **ATTENDANCE**  The student should adhere to the rules of attendance as stated in the University Academic Regulation :-   1. Student must attend no less than 80% of lecture hours as required for the subject. 2. The student will be prohibited from attending any lecture and assessment activities upon failure to comply the above requirement. Zero mark will be given to the subject. | | |

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| **UTM RAZAK SCHOOL OF ENGINEERING & ADVANCED TECHNOLOGY** |  | |
| **ENTREPRENEURSHIP AND MARKETING**  **(MRSM 2293)** | **Revision**  **Date of issue**  **Last Amendment**  **Edition** | **:**  **:**  **:**  **:** |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | **PRE-REQUISITE** | **:** | **Nil** | | | | **EQUIVALENCE** | **:** | **-** | | | | **LECTURE HOURS** | **:** | **3 hour lectures per week** | | | | **Lecturers** | **E-Mail** | | **Room No.** | **Phone No.** | | 1. Dr. Khairur Rijal Jamaludin | [khairur.kl@utm.my](mailto:khairur.kl@utm.my) | |  |  | | 1. Dr. Hayati @ Habibah Abdul Talib | hayati@utm.my | |  |  | | 1. Prof. Dr. Mohd Hassan Osman | m-hassan@ic.utm.my | | Dean IBS | 03-21805032 |   **SYNOPSIS**  This course introduces the concepts and principles of marketing and entrepreneurship and the required skills to start and manage entrepreneurship start-ups. At the first stage, students are exposed to the concepts and principles of marketing, entrepreneurship and entrepreneurs, and the required skills to successfully manage business ventures. Then they are introduced to techniques and tools to analyse and assess business ideas and the procedures to set up business ventures. Finally, they are guided to develop business plan. In addition to guided T&L, students will be exposed to real life marketing and entrepreneurial activities. Moreover, the course content focuses on the critical role of opportunity creation and recognition of the marketing and entrepreneur, as the principle success factor in new enterprise formation and life cycle. Students will learn how marketing can help an organization gain and sustain competitive advantages, the various techniques for monitoring marketing performance and customer satisfaction, how marketing mix decisions are made and implemented, and how to develop and implement marketing plans.  **COURSE LEARNING OUTCOMES**  By the end of the course, students should be able to :   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Course Learning Outcomes** | **Programme**  **Learning Outcome(s) Addressed** | **Learning’s**  **Taxonomy** | **Assessment Methods** | | 1. | Formulate the concept of entrepreneurs and entrepreneurship and their importance to current business and economic development | PO1 | C5 | Test | | 2. | Analyze the fundamental issues related to venturing | PO1 | C4,  CTPS3 | Case study | | 3. | Develop, write and present a formal strategic marketing plan including financial implications | PO3 | A4, P4,  CS3 | Project  Presentation | | 4. | Use appropriate methods and tools to analyse and evaluate marketing strategy in diverse organisational and marketing situations | PO6 | P4,  KK2 | Project |   **STUDENT LEARNING TIME**   |  |  | | --- | --- | | **Teaching and Learning Activities** | **Student Learning Time (hours)** | | 1. Face-to-Face Learning | | | * 1. Lecturer-Centered Learning      1. Lecture | 28  14 | | * 1. Student-Centered Learning (SCL)      1. Laboratory/Tutorial      2. Student-centered learning activities (eg. Case studies presentation, discussion etc) | | 1. Self-Directed Learning | | | * 1. Non-face-to-face learning or student-centered learning (SCL) such as manual, assignment, module, e-Learning, etc. | 44 | | b. Revision | 10 | | c. Assessment Preparations | 10 | | 1. Formal Assessment | | | * 1. Continuous Assessment |  | | * 1. Assignment Report and Project with Presentation | 8 | | **Total (SLT)** | **120** |   **TEACHING METHODOLOGY**  Lecture and Discussion, Independent Study, Co-operative Learning, Group Assignment/Project, Group Presentation, Seminar/ Talks  **WEEKLY SCHEDULE**   |  |  | | --- | --- | | **Week** | **Topic / Content** | | 1 | * Introduction to entrepreneurship concepts * Introduction to marketing concepts | | 2 - 4 | * Enterpreneurship Opportunities * Cognitive foundations of entrepreneurship: Creativity and opportunity recognition * Assembling the resources | | 5 -7 | * Planning for competitive advantage * Preparing for and attaining growth: Strategies for building lasting success * Managing new venture for growth | | **8** | **MID SEMESTER BREAK** | | 9 - 10 | * Marketing in new venture * Marketing in an entrepreneurial context * Finding and evaluating the right marketing opportunity * Understanding customers and competitors | | 11 - 13 | * Developing new products and services * Building and sustaining the entrepreneurial brand * entrepreneurial channel development and supply chain management * Entrepreneurial promotion | | 14 - 15 | Project Presentation – The entrepreneurial marketing plan | | **16-18** | **REVISION WEEK AND FINAL EXAMINATION** |   **TEXT**   1. Baron, Robert A. and Shane, Scott A. 2008. Entrepreneurship: A Process Perspective. Second Edition. Thomson South-Western. United States of America. 2. Crane, Federick G. 2012. Marketing for entrepreneurs: Concepts and applications for new ventures. Second Edition. Sage Publication. United States of America.   **REFERENCES**   1. Mellor, Robert. 2008. Entrepreneurship for everyone: A student textbook.Sage Publication. United States of America. 2. Hisrich, Robert. D., Peters, Michael. P. and Shepherd, Dean. A. 2010. Entrepreneurship. Eight Edition. International Edition. McGraw Hill. Singapore.   **GRADING**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **No.** | **Assessment** | **Number** | **% each** | **% total** | **Dates** | | 1. | Marketing/Business Plan Report | 1 | 20% | 20% |  | | 2. | Marketing/Business Plan Presentation | 1 | 10% | 10% |  | | 3. | Case Study | 3 | 10% | 30% |  | | 4. | Seminar/ Talks | 1 | 20% | 20% |  | | 5. | Test | 1 | 20% | 20% |  | | **Overall Total** | | | | **100** | |   ATTENDANCE  The student should adhere to the rules of attendance as stated in the University Academic Regulation :-   1. Student must attend not less than 80% of lecture hours as required for the subject. 2. The student will be prohibited from attending any lecture and assessment activities upon failure to comply the above requirement. Zero mark will be given to the subject. | | |

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| **UTM RAZAK SCHOOL OF ENGINEERING & ADVANCED TECHNOLOGY** | |  | |
| **THEORY OF INVENTIVE PROBLEM SOLVING (TRIZ)**  **(MRSM 2303)** | **Revision**  **Date of issue**  **Last Amendment**  **Edition** | | **:**  **:**  **:**  **:** |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **PRE-REQUISITE** | | **:** | **Nil** | | | | **EQUIVALENCE** | | **:** | **-** | | | | **LECTURE HOURS** | | **:** | **3 hour lectures per week** | | | | **Lecturers** | | **E-Mail** | | **Room No.** | **Phone No.** | | 1. | AP Dr. Abdul Rahman Abd Rahim | rahmanar@ic.utm.my | | BATC | 03-26154819 | | 2. | AP Dr. Robiah Ahmad | robiah@ic.utm.my | | N110 | 03-26154333 | | 3. | Prof. Dr. Sha’ri Mohd Yusof | shari@fkm.utm.my | | SPS |  |   **SYNOPSIS**  This course begins with a review of all the TRIZ tools and the TRIZ process. The theory of inventive problem solving (Teoriya Resheniya Izobretatelskikh Zadatch - TRIZ) process offers a rigorous and systematic approach for understanding and solving any problem. Its principal tools enable students to uncover the most effective route to practical solutions. TRIZ provides a systematic approach to generating solution concepts, speeds up creative thinking, and significantly expands the range of problem solving options. Topics covered in this course include introduction to TRIZ and its process and tools such as Function Model, Cause Effect Chain, Trimming, Engineering contradiction, Inventive Principles and S-curve.  **COURSE LEARNING OUTCOMES**  By the end of the course, students should be able to :   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Course Learning Outcomes** | **Programme**  **Learning Outcome(s) Addressed** | **Learning’s**  **Taxonomy** | **Assessment Methods** | | 1. | Evaluate the appropriate TRIZ process and tools for problem solving | PO2 | C6  CTPS3 | Test, Assignment | | 2. | Propose TRIZ solutions to realistic problems in a group project | PO3 | A5  TS2, LS3 | Project | | 3. | Report a TRIZ solving process, tools and solution for a project | PO5 | A4  LL2 | Project |   **STUDENT LEARNING TIME**   |  |  | | --- | --- | | **Teaching and Learning Activities** | **Student Learning Time (hours)** | | 1. Face-to-Face Learning | | | * 1. Lecturer-Centered Learning      1. Lecture | 30 | | * 1. Student-Centered Learning (SCL)      1. Laboratory/Tutorial      2. Student-centered learning activities (eg. Case studies presentation, discussion etc) | -  12 | | 1. Self-Directed Learning | | | * 1. Non-face-to-face learning or student-centered learning (SCL) such as manual, assignment, module, e-Learning, etc. | 34 | | b. Revision | 20 | | c. Assessment Preparations | 10 | | 1. Formal Assessment | | | * 1. Continuous Assessment | 5 | | * 1. Assignment Report and Project with Presentation | 3 | | **Total (SLT)** | **120** |   **TEACHING METHODOLOGY**   1. Lectures and discussion 2. Students will be required to conduct a group work design project , write reports and present either the project or other related issues. 3. Videos and demonstration will be given on related topics.   **WEEKLY SCHEDULE**   |  |  | | --- | --- | | **Week** | **Topic / Content** | | 1 | Introduction to Systematic Innovation / TRIZ   * TRIZ methodology, history and adoption * Structured Problem Solving Process * Introduction to TRIZ Models and Tools | | 2 - 4 | TRIZ Models and Tools   * Function Analysis * Product Analysis * Component Analysis * Product Diagnostic Analysis | | 5 -7 | * Cause and Effect Chain Analysis * Trimming * Engineering Contradiction * Physical Contradiction * 36 Systems Parameter * Contradiction Matrix * 40 Inventive Principles | | **8** | **MID SEMESTER BREAK** | | 9 - 10 | TRIZ Application in Manufacturing   * Manufacturing case studies * Application of contradictions and inventive problem * Substance-Field Model * Zone of Conflict * 76 standard inventive solution | | 11 - 13 | Introduction to S-curve & Trends of Engineering System Evolution  Project Presentation | | 14 - 15 | Using TRIZ for Competitive Patent Circumvnavigation and Other Patent Strategies   * TRIZ for patent strategies * Case studies | | **16-18** | **REVISION WEEK AND FINAL EXAMINATION** |   **TEXT**  John Terninko, Alla Zusman, Boris Zlotin. Systematic Innovation: An Introduction to TRIZ (Theory of Inventive Problem Solving). St Lucie Press. 1998  **REFERENCES**   1. Genrich Altshuller, Lev Shulyak, Uri Fedoseev. 40 Principles: TRIZ Keys to Technical Innovation . Technical Innovation Center, MA, USA, 2001. 2. Genrich Altshuller. Innovation Algorithm:TRIZ, systematic innovation and technical creativity. Technical Innovation Center, MA, USA, 2000   **GRADING**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **No.** | **Assessment** | **Number** | **% each** | **% total** | **Dates** | | 1. | Test | 3 | 10, 20, 20 | 50 | W5, W10 | | 2. | Assignment | 2 | 10 | 20 | Various | | 3. | Project | 1 | 30 | 30 | W17 | | **Overall Total** | | | | **100** | |   **ATTENDANCE**  The student should adhere to the rules of attendance as stated in the University Academic Regulation :-   1. Student must attend not less than 80% of lecture hours as required for the subject. 2. The student will be prohibited from attending any lecture and assessment activities upon failure to comply the above requirement. Zero mark will be given to the subject. | | | |

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| **UTM RAZAK SCHOOL OF ENGINEERING & ADVANCED TECHNOLOGY** |  | | |
| **ROBUST PRODUCT DESIGN**  **(MRSM 2313)** | | **Revision**  **Date of issue**  **Last Amendment**  **Edition** | **:**  **:**  **:**  **:** |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **PRE-REQUISITE** | | **:** | **Nil** | | | | **EQUIVALENCE** | | **:** | **-** | | | | **LECTURE HOURS** | | **:** | **3 hour lectures per week** | | | | **Lecturers** | | **E-Mail** | | **Room No.** | **Phone No.** | | 1. | Dr. Khairur Rijal Jamaludin | khairur.kl@utm.my | | 06-01-37 MJIIT | 03-22031349 | | 2. | Prof. Dr. Sha'ri Mohd Yusof | shari@fkm.utm.my | | SPS,  UTMKL |  |   **SYNOPSIS**  Robustness is the state where the technology, product, or process performance is minimally sensitive to factors causing variability (either in the manufacturing or users environment) and aging at the lowest unit manufacturing cost. The course covers: Concept of Robust product design, experimental design, customer quality and engineered quality, energy thinking including ideal function, steps in robust design, noise strategy (control vs noise factors), dynamic and static signal to noise ratio, achieving additivity, constructing orthogonal arrays, design of dyamic systems, with case studies. The course includes a number of completed case studies using these methods.  **COURSE LEARNING OUTCOMES**  By the end of the course, students should be able to :   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Course Learning Outcomes** | **Programme**  **Learning Outcome(s) Addressed** | **Learning's**  **Taxonomy** | **Assessment Methods** | | 1. | Construct the energy function, inner array and outer array for design problems. | PO1 | C5 | Test | | 2. | Distinguish the control factor and the noise factor to the inner array and outer array | PO2 | C4  CTPS2 | Test, Assignment | | 3. | Formulate robust design problem for static and dynamic response | PO2 | C4  CTPS2 | Test, Assignment | | 4. | Formulate robust assessment and validation for the ideal function based on design constraint | PO3 | A5  TS2, LS3 | Project |   **STUDENT LEARNING TIME**   |  |  | | --- | --- | | **Teaching and Learning Activities** | **Student Learning Time (hours)** | | 1. Face-to-Face Learning | | | * 1. Lecturer-Centered Learning      1. Lecture | 28 | | * 1. Student-Centered Learning (SCL)      1. Laboratory/Tutorial      2. Student-centered learning activities (eg. Case studies presentation, discussion etc) | -  14 | | 1. Self-Directed Learning | | | * 1. Non-face-to-face learning or student-centered learning (SCL) such as manual, assignment, module, e-Learning, etc. | 44 | | b. Revision | 10 | | c. Assessment Preparations | 10 | | 1. Formal Assessment | | | * 1. Continuous Assessment |  | | * 1. Assignment Report and Project with Presentation | 8 | | **Total (SLT)** | **120** |   **TEACHING METHODOLOGY**   1. Lectures and discussion 2. Students will be required to conduct a group work robust design project, write reports and present either the project or other related issues.   **WEEKLY SCHEDULE**   |  |  | | --- | --- | | **Week** | **Topic / Content** | | 1 | Introduction | | 2 | Principle of Robust Product Design | | 3 | Orthogonal Array | | 4 | Steps in Robust Design | | 5 | Robust Design Case study Discussion | | 6 | Signal-to-noise ratios | | 7 | Achieving Additivity | | **8** | **MID SEMESTER BREAK** | | 9 | Constructing of Orthogonal Arrays | | 10 | Computer aided Robust Design | | 11 | Design of Dynamic Systems | | 12 | Robust Design Case study Discussion | | 13 | Tuning Computer Systems for High Performance | | 14 | Reliability Improvement | | 15 | Project Presentation | | **16-18** | **REVISION WEEK AND FINAL EXAMINATION** |   **TEXT**  Madhav S. Pradke. 1989. Quality Engineering Using Robust Design. Prentice Hall Inc  **REFERENCES**   1. Genichi Taguchi, Subir Chowdhury, Shin Taguchi. 1999. Robust Engineering: Learn How to Boost Quality While Reducing Costs & Time to Market. The American Supplier Institute 2. Genichi Taguchi, Subir Chowdhury, Yuin Wu. 2000. The Mahalanobis-Taguchi System: Case Studies from Fuji Photo Film, Mitsubishi Software, Nissan, Seiko Epson, Sharp, Xerox and more. The American Supplier Institute   **GRADING**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **No.** | **Assessment** | **Number** | **% each** | **% total** | **Dates** | | 1. | In-class assessment | 2 | 10 | 20 | W5, W12 | | 2. | Test | 2 | 20 | 40 | W6, W13 | | 3. | Project | 1 | 40 | 40 | W14 | | **Overall Total** | | | | **100** | |   **ATTENDANCE**  The student should adhere to the rules of attendance as stated in the University Academic Regulation :-   1. Student must attend not less than 80% of lecture hours as required for the subject. 2. The student will be prohibited from attending any lecture and assessment activities upon failure to comply the above requirement. Zero mark will be given to the subject. | | | |

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| **RAZAK SCHOOL OF ENGINEERING & ADVANCED TECHNOLOGY** |  | |
| **INDUSTRIAL DESIGN & HUMAN FACTORS**  **(MRSM 2323)** | **Revision**  **Date of issue**  **Last Amendment**  **Edition** | **:**  **:**  **:**  **:** |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **PRE-REQUISITE** | | **:** | **Nil** | | | | **EQUIVALENCE** | | **:** | **-** | | | | **LECTURE HOURS** | | **:** | **3 hour lectures per week** | | | | **Lecturers** | | **E-Mail** | | **Room No.** | **Phone No.** | | 1. | AP Dr. Abdul Rahman Abdul Rahim | rahmanar@ic.utm.my | | BATC |  | | 2. | Dr. Habibah @ Norehan Haron | habibah@ic.utm.my | | F306A | 03-26154687 | | 3. | Norazmein Abdul Raman | norazmein@ic.utm.my | | F306J | 03-26154756 |   **SYNOPSIS**  The design of consumer products ranging from alarm clocks, cell phones, and aircraft cockpits to logos, and web sites requires the knowledgeof Industrial Design and Human Factors. Industrial Design (imagining how) relates to the art of creating innovative solutions that integrate technology, usability, and aesthetics of products and systems. Human Factors (defining what) is the science of understanding human capabilities and behavior and translating their impact on the design of products and systems, including the physics and perception of color, sound, and touch, as well as familiarity with case studies and contemporary practices in interface design and usability testing. This course integrates the knowledge in industrial design and human factors into the product-development process to build easy-to-use and control elements that are simpler for consumers to understand and operate.  **COURSE LEARNING OUTCOMES**  By the end of the course, students should be able to :   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Course Learning Outcomes** | **Programme**  **Learning Outcome(s) Addressed** | **Learning’s**  **Taxonomy** | **Assessment Methods** | | 1. | Design a creative (out of the box), innovative and aesthetic solutions that are easy to use, operate and control. | PO2 | C5,  CTPS4 | Project | | 2. | Incorporate environmental, socio-economic and regulatory standards regarding human performance in consumer product design group project. | PO4 | A5,  EM1 | Group Project | | 3. | Presenting a design project. | PO3 | P5,  CS4 | Presentation |   **STUDENT LEARNING TIME**   |  |  | | --- | --- | | **Teaching and Learning Activities** | **Student Learning Time (hours)** | | 1. Face-to-Face Learning | | | * 1. Lecturer-Centered Learning      1. Lecture | 28 | | * 1. Student-Centered Learning (SCL)      1. Student-centered learning activities (eg. Case studies presentation, discussion etc) | 14 | | 1. Self-Directed Learning | | | * 1. Non-face-to-face learning or student-centered learning (SCL) such as manual, assignment, module, e-Learning, etc. | 30 | | b. Revision | 20 | | c. Assessment Preparations | 20 | | 1. Formal Assessment | | | * 1. Continuous Assessment | 5 | | * 1. Project Presentation | 3 | | **Total (SLT)** | **120** |   **TEACHING METHODOLOGY**  Teaching method includes series of lectures, in-depth discussion on a number of case studies and knowledge sharing with invited expert speakers from related field on current issues. The student is expected to carry out a large amount of self study. Students will be required to conduct a group work design project , write reports and present either the project or other related issues. Design projects will be analyzed through series of critique sessions. The goals of the course are to familiarize students with fundamentals of human factors, increase student awareness of design in everyday experience, and enhance student skills in creativity and presentation.  **WEEKLY SCHEDULE**   |  |  | | --- | --- | | **Week** | **Topic / Content** | | 1 | Introduction | | 2 | Human factors in industrial design | | 3 | Principles of ergonomics | | 4 | Applied ergonomics in design– serviceability, security, vandalism, safety, physically disadvantaged, environment. | | 5 | Methods for consumer product design | | 6 | Design process | | 7 | Digital design | | 8 | **MID SEMESTER BREAK** | | 9 | User-centred design, inclusive design | | 10 | Visualization and displays | | 11 | Human information processing, skill and performance | | 12 | Human-computer interaction, memory and language | | 13 | Interface design | | 14 | Legal issues in industrial design | | 15 | Design project presentation | | **16-18** | **REVISION WEEK AND FINAL EXAMINATION** |   **REFERENCE**   1. [Waldemar Karwowski](http://www.amazon.com/s/ref=rdr_ext_aut?_encoding=UTF8&index=books&field-author=Waldemar%20Karwowski), [Marcelo M. Soares](http://www.amazon.com/s/ref=rdr_ext_aut?_encoding=UTF8&index=books&field-author=Marcelo%20M.%20Soares), "[Human Factors and Ergonomics in Consumer Product Design: Methods and Techniques](http://www.crcpress.com/product/isbn/9781420046281)Human Factors and Ergonomics in Consumer Product Design: Methods and Techniques”, Taylor and Francis Group, LLC, 2011. 2. Guastello, Stephen J. , “Human factors engineering and ergonomics : a systems approach”, Mahwah, NJ :Lawrence Erlbaum Associates, 2006 3. Mark S Sanders, “Human Factors in Engineering and Design”, McGraw Hill, New York, 1993. 4. Bridger R S, “Introduction to Ergonomics”, Taylor and Francis, London, 2003. 5. Cross, Nigel, ”Engineering design methods : strategies for product design”, 4th edChichester, England ;J. Wiley, 2008 6. Ulrich, Karl T., “Product design and development” Boston :McGraw-Hill, 2000.   **GRADING**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **No.** | **Assessment** | **Number** | **% each** | **% total** | **Dates** | | 1. | Test | 2 | 20 | 40 | W5, W10 | | 2. | Assignment | 2 | 10 | 20 | Various | | 3. | Project | 1 | 40 | 40 | W17 | | **Overall Total** | | | | **100** | |   **ATTENDANCE**  The student should adhere to the rules of attendance as stated in the University Academic Regulation :-   1. Student must attend not less than 80% of lecture hours as required for the subject. 2. The student will be prohibited from attending any lecture and assessment activities upon failure to comply the above requirement. Zero mark will be given to the subject. | | |

**KURSUS ELEKTIF REKA BENTUK SISTEM ELEKTRONIK**

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| |  |  | | --- | --- | | **Department** | **:** Engineering Department | | **Faculty/**  **School** | **:** Razak School of Engineering and Advanced Technology | |  |
| |  |  | | --- | --- | | **Code &**  **Course Name** | **:**MKEL 1173 - Advanced Digital System Design | | **Total Contact Hour** | **:** 42 hours | | **Semester :** I  **Academic Session :** 2014/2015 |
| |  |  | | --- | --- | | **Lecturer** | : Prof. Dr Mohamed Khalil Hani | | **Room No.** | : P05-207 | | **Phone No.** | : 07 5535223 | | **E-mail** | : [khalil@fke.utm.my](mailto:khalil@fke.utm.my) | | **Synopsis** | :This course exposes digital circuit modelling with hardware description languages (HDLs), which is the key technique to modern design of integrated circuits (ICs). The technique involves a CAD approach in which a high-level, text-based, abstract description of the circuit is created, then synthesized to a hardware implementation in a selected technology, and finally verified for its functionality and timing. The course teaches the use of ASM flowcharts and algorithms to design a finite state machine to control a complex datapath in a digital machine. The design of hardware units, including a CPU, are among the case studies of the application of RTL design methodology. |   Learning outcomes: By the end of the course, students should be able to:   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Course Learning Outcomes** | **Programme Outcomes** | **Taxonomy Level** | **Assessment Methods** | | 1. | Appraise the use of Verilog HDL in modelling of digital systems. | PO1 | C6 | Test  Assignment  Summative Assessment | | 2. | Synthesize the basics of digital systems for implementation in FPGA-based hardware. | PO3 | P5  CS5  TS5 | Test  Summative Assessment | | 3. | Analyze the treatment of RTL modelling and design methodology of complex digital systems. | PO5 | A4  LL2 | Test  Assignment  Summative Assessment | | 4. | Demonstrate the internals and design of basic CPU architectures. | PO3 | C5  A3, CS3 | Test  Assignment  Summative Assessment |  |  |  | | --- | --- | | **STUDENTS LEARNING TIME (SLT)** | | | **Teaching and Learning Activities** | **Students Learning Time (Hour)** | | 1. Face to Face Learning | | | 1. Lecturer Centered Learning   i. Lecture  ii. Post Lecture Discussion | 40  6 | | 1. Student Centered Learning (SCL) 2. Practical/ Tutorial 3. Student centered learning activities (SCL) 4. Assignment, Case study | 14 | | 1. Self-Directed Learning | | | 1. Non Face to Face Learning or Student Centered Learning (SCL) such as manual, assignment, module, e-Learning etc. | 24 | | 1. Revision | 10 | | 1. Assessment Preparation | 10 | | 1. Formal Assessment | | | 1. Continuous Assessment | 11 | | 1. Hourly Test | 2 | | 1. Final Exam – Summative Assessment | 3 | | **TOTAL SLT** | **120** |   **TEACHING METHODOLOGY**  Lecture and Discussion, Independent Study and Group Assignment  **WEEKLY SCHEDULE**   |  |  | | --- | --- | | **Week 1-2** | **Intro to Digital Design & CAD Techniques**  a) Design abstraction, Hierarchical Modular approach  b) System hardware modelling, interfaced-based design in embedded systems.  c) Design Methodology with HDL  d) Logic Synthesis & Using synthesis tools | | **Week 3 – 5** | **Modelling & Design of Digital Circuits in HDL**  a) Hardware design language – fundamentals.  b) Basic digital modules in HDL.  c) Sequential Logic & FSM modelling in HDL.  d) Introduction to Verilog. | | **Week 6 - 7** | **RTL Modelling & Design Methodology**  a) Modelling at the RT level.  b) RTL Architecture.  c) RTL code and RTL control sequence  d) DU & CU. | | **Week 8** | ***Mid-Semester Break*** | | **Week 9 - 11** | Digital Systems: Designing at RT Level  a) Design of Datapath & Control units  b) Case Study I – Arithmetic processing Units  c) Case Study 2 – More complex digital system. | | **Week 12 - 14** | Digital System Design – Case Study of a CPU  a) Basic computer architecture  b) CISC & RISC architecture  c) Instruction Set Architecture, Specifying a CPU  d) Case Study 3 – RTL Design of a CPU | | **Week 14** | Logic & RTL Synthesis Issues  a)Logic synthesis, RTL synthesis, synthesis issue with Verilog  b)Implementation of FPGA and SoC designs, Technology mapping techniques. |   **REFERENCES**   1. Mohamed Khalil Hani, “Starter’s Guide to Digital Systems VHDL & Verilog Design”, Second Edition, 2000. 2. S. Brown & Z. Vraesic, “Fundamentals of Digital Logic with Verilog Design”, McGraw-Hill, 2004. 3. Micheal D. Celetti, “Advanced Digital Design with the Verilog HDL”, Pearson Prentice Hall, 2003.   **GRADING**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Assessment** | **Number** | **% each** | **% total** | | 1. | Test | 2 | 10 | 20 | | 2. | Assignment | 2 | 15 | 30 | | 3. | Final Exam – Summative Assessment | 1 | 50 | 50 | | **Overall Total** | | | | **100%** | | |

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| |  |  | | --- | --- | | **Department** | **:** Engineering Department | | **Faculty/**  **School** | **:** Razak School of Engineering and Advanced Technology | |  |
| |  |  | | --- | --- | | **Code &**  **Course Name** | **:** MKET 1423 – Wireless Communications Systems | | **Total Contact Hour** | **:** 42 hours | | **Semester :** 1  **Academic Session :** 2014/2015 |
| |  |  | | --- | --- | | **Lecturers** | **:** Prof. Dr. Tharek Abd Rahman  Dr. Leow Chee Yen  Dr. Noor Hamizah Hussain | | **Room No.** | : P15A | | **Phone No.** | : 07-5535305 | | **E-mail** | **:** [tharek@fke.utm.my](mailto:tharek@fke.utm.my) | | **Synopsis** | **:** This course covers comprehensive knowledge of advanced level in wireless communication. Students will be exposed to the concept of wireless communication systems. Then the cellular concepts which include frequency reuse and cell splitting. This topic will be extended to the interference issues, system capacity, trunking and grade of service. The topic of mobile propagation will include large scale and small scale mobile propagation follows by different multiple access techniques used in wireless communication systems. Finally different wireless systems and standards will also be covered. |   Learning outcomes: By the end of the course, students should be able to:   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Course Learning Outcomes** | **Programme Outcomes** | **Taxonomy Level** | **Assessment Methods** | | 1. | Integrate the concept of wireless communications systems and propagation channels into mobile and radio communication system | PO1 | C6 | Test, Summative Assessment | | 2. | Compare mobile radio propagation channel using empirical and statistical models. | PO5 | A4, LL2 | Summative Assessment, Assignment. | | 3. | Organize the performance between different wireless systems and standards. | PO3 | P5, CS5, TS5 | Summative Assessment, Assignment, presentation and report. |   **STUDENTS LEARNING TIME (SLT)**   |  |  | | --- | --- | | **Teaching and Learning Activities** | **Students Learning Time (Hour)** | | 1. Face to Face Learning | | | 1. Lecturer Centered Learning   i. Lecture  ii. Post Lecture Discussion | 40  8 | | 1. Student Centered Learning (SCL) 2. Practical/ Tutorial 3. Student centered learning activities (SCL) | 14 | | 1. Self-Directed Learning | | | 1. Non Face to Face Learning or Student Centered Learning (SCL) such as manual, assignment, module, e-Learning etc. | 24 | | 1. Revision | 10 | | 1. Assessment Preparation | 10 | | 1. Formal Assessment | | | 1. Continuous Assessment | 10 | | 1. Hourly Test | 1 | | 1. Final Exam - Summative Assessment | 3 | | **TOTAL SLT** | 120 |   **TEACHING METHODOLOGY**  Lecture and discussion, independent study and individual/group assignment.  **WEEKLY SCHEDULE**   |  |  | | --- | --- | | **Week 1** | **Introduction to Wireless Communication Systems**  a) Evolution of Mobile Radio Communication  b) Basic Definitions  c) Example of Wireless Communication Systems | | **Week 2** | **Mobile Radio Propagation: Large- Scale Path Loss**  a) Free Space Propagation Model  b) Basic Propagation Mechanism  c) Outdoor Propagation Models | | **Week 3** | | **Week 4** | **Mobile Radio Propagation: Small -Scale Fading and Multipath**  a) Small Scale Multipath  b) Parameters of Mobile Multipath Channels  c) Types of Small Scale Fading  d) Rayleigh and Ricean Distributions | | **Week 5** | | **Week 6** | **Modulation Techniques for Mobile Communication**  a) Analogue Modulations  b) Digital Modulation  c) ASK, FSK and PSK  d) GMSK, QPSK  e) 16QAM and 64QAM | | **Week 7** | | **Week 8** | | **Week 9** | Semester Break | | **Week 10** | Mobile Communication Systems  a) Second Generation (2G) GSM/GPRS/EDGE  b) Third Generation (3G) WCDMA/HSPA/HSPA+  c) Fourth Generation (4G) Long Term Evolution (LTE)  d) Wireless Local Area Network (WLAN) and Bluetooth | | **Week 11** | | **Week 12** | | **Week 13** | Multiple Access Techniques for Wireless Communications  a) Frequency Division Multiple Access (FDMA)  b) Time Division Multiple Access (TDMA)  c) Code Division Multiple Access (CDMA)  Orthogonal Frequency Division Multiple Access (OFDMA) | | **Week 14** | | **Week 15** | **Revision Week** |   **REFERENCES:**   1. Jorge Olenewa, Guide to Wireless Communications, 2013 2. Victor L. Granatstein, Physical Principles of Wireless Communications, 2012 3. Fette, Aiello, Chandra etc.RF& Wireless Technologies, Newnes, 2008. 4. David Tse and Pramod Viswanath, Fundamentals of Wireless Communication, 2005 5. William Stallings, Wireless Communications and Networks, 2004 6. Theodore S. Rappaport. Wireless Communications: Principles and Practice. Prentice Hall, 2002   **GRADING**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Assessment** | **Number** | **% each** | **% total** | | 1 | Test | 1 | 25 | 25 | | 2 | Assignments, Project and Presentation | 1 | 25 | 25 | | 3 | Final exam - Summative assessment | 1 | 50 | 50 | | **Overall Total** | | | | **100%** | | |

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| |  |  | | --- | --- | | **Department** | **:** Engineering Department | | **Faculty/**  **School** | **:** Razak School of Engineering and Advanced Technology | |  |
| |  |  | | --- | --- | | **Code &**  **Course Name** | **:** MKET 1463 – Advanced Communications Electronics | | **Total Contact Hour** | **:** 42 hours | | **Semester :** 1  **Academic Session :** 2014/2015 |
| |  |  | | --- | --- | | **Lecturers** | **:** Prof. Dr. Mohamad Kamal A Rahim  Dr. Norliza Mohamed  Dr. Nelidya Md. Yusoff | | **Room No.** | : P18 | | **Phone No.** | : 07-5536088 | | **E-mail** | **:** [mkamal@fke.utm.my](mailto:mkamal@fke.utm.my) | | **Synopsis** | **:**  This course covers comprehensive knowledge ofadvanced level in RF communication electronics design. Students will be exposed to the concept of transmitter and receiver in communications system. The design parameter for transmitter and receiver will be discussed. The effect of noise towards the design parameters. Then the students will be exposed to the design of filters, amplifiers, oscillators and mixers. |   Learning outcomes: By the end of the course, students should be able to:   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Course Learning Outcomes** | **Programme Outcomes** | **Taxonomy Level** | **Assessment Methods** | | 1. | Appraise the concept of transmitter and receiver in communication electronics. | PO1 | C6 | Test, Summative Assessment | | 2. | Design the filters in communication system. | PO1 | C5 | Test,  Summative Assessment, Assignment and presentation | | 3. | Adapt the topics related to the communication electronics devices and the importance of the relevant technologies and their trends and development. | PO5 | A4, LL2 | Test, Assignment, Summative Assessment | | 4. | Organize new knowledge in designing the amplifier, mixers and oscillators in RF/microwave communication system. | PO3 | P5, CS5, TS5 | Test,  Summative Assessment, Assignment and presentation |   **STUDENTS LEARNING TIME (SLT)**   |  |  | | --- | --- | | **Teaching and Learning Activities** | **Students Learning Time (Hour)** | | 1. Face to Face Learning | | | 1. Lecturer Centered Learning   i. Lecture  ii. Post Lecture Discussion | 40  8 | | 1. Student Centered Learning (SCL) 2. Practical/ Tutorial 3. Student centered learning activities (SCL) | 14 | | 1. Self-Directed Learning | | | 1. Non Face to Face Learning or Student Centered Learning (SCL) such as manual, assignment, module, e-Learning etc. | 24 | | 1. Revision | 10 | | 1. Assessment Preparation | 10 | | 1. Formal Assessment | | | 1. Continuous Assessment | 10 | | 1. Hourly Test | 1 | | 1. Final Exam - Summative Assessment | 3 | | **TOTAL SLT** | 120 |   **TEACHING METHODOLOGY**  Lecture and discussion, independent study and individual/group assignment.  **WEEKLY SCHEDULE**   |  |  | | --- | --- | | **Week 1** | **Introduction to RF Communication Electronics**  a) Transmitter Parameters and Characteristics  b) Receiver Parameter and characteristics  c) Noise parameter in RF communication | | **Week 2** | | **Week 3** | **Filters Design**  a) Introduction to filters response  b) Types of filters  c) Filters transformation  d) Low pass design  e) High pass design  f) Band pass design  g) Band stop design  h) Filters realization | | **Week 4** | | **Week 5** | | **Week 6** | **RF Amplifiers Design**  a) Gain definition of the amplifiers  b) Matching network  c) Stability of amplifiers  d) Single stage design | | **Week 7** | | **Week 8** | Semester Break | | **Week 9** | RF Amplifiers Design  (a) Gain method design  (b) Low Noise Amplifier Design  (c) Broadband design | | **Week 10** | | **Week 11** | **Oscillators Design**  a) Oscillator characteristic and theory  b) oscillator using gunn and IMPATT devices  c) small signal design for transistor oscillators  d) large signal design for transistor oscillator  e) Transistor oscillator circuits – feedback oscillator, dielectric resonator, voltage tunable oscillator, crystal oscillator and PLL. | | **Week 12** | | **Week 13** | **Mixers Design**  a) Mixer fundamental  b) down converting and up converting mixers  c) system consideration  d) device for mixers  e) mixer classifications  single ended mixers, balanced mixers, image reject mixers | | **Week 14** | | **Week 15** | ***Revision Week*** | | |

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| |  |  | | --- | --- | | **Department** | **:** Engineering Department | | **Faculty/**  **School** | **:** Razak School of Engineering and Advanced Technology | |  |
| |  |  | | --- | --- | | **Code &**  **Course Name** | **:**MRSL 1443  Advanced Sensor System | | **Total Contact Hour** | **:** 42 hours | | **Semester : I**  **Academic Session :** 2014/2015 |
| |  |  | | --- | --- | | **Lecture** | **:** Assoc. Prof. Dr. Robiah Ahmad  Dr Hairi Zamzuri | | **Room No.** | Dr Rudziatul Akman Dziyuddin  : Bilik 20, Aras 14, Menara Razak | | **Phone No.** | : 5237 | | **E-mail** | : [norliza@ic.utm.my](mailto:norliza@ic.utm.my) | | **Synopsis** | **:** The course aims at describing the principles and practices of quantitative perception (sensing) illustrated by the devices and algorithms (sensors) that implement. The course will first deal with the physics of measurement technology. Then sensors and sensing technologies applied to vision, monitoring and control will be considered in more detail with examples from past and ongoing industry research projects. |   Learning outcomes: By the end of the course, students should be able to:   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Course Learning Outcomes** | **Programme Outcomes** | **Taxonomy Level** | **Assessment Methods** | | 1. | Determine the principles of quantitative perception (sensing) devices and algorithms (sensors) | PO1 | C5 | Test, Assignment, Summative Assessment | | 2. | Identify an application based on sensors / method / algorithm. | PO3 | A4, LL2 | Case study, Summative Assessment | | 3. | Organize new knowledge and information beyond course coverage | PO5 | P5, CS5, TS5 | Group project with presentation and report |   STUDENTS LEARNING TIME (SLT)   |  |  | | --- | --- | | **Teaching and Learning Activities** | **Students Learning Time (Hour)** | | 1. Face to Face Learning | | | 1. Lecturer Centered Learning   i. Lecture  ii. Post Lecture Discussion | 40  8 | | 1. Student Centered Learning (SCL) 2. Practical/ Tutorial 3. Student centered learning activities (SCL) | 14 | | 1. Self-Directed Learning | | | 1. Non Face to Face Learning or Student Centered Learning (SCL) such as manual, assignment, module, e-Learning etc. | 24 | | 1. Revision | 10 | | 1. Assessment Preparation | 10 | | 1. Formal Assessment | | | 1. Continuous Assessment | 10 | | 1. Hourly Test | 1 | | 1. Final Exam - Summative Assessment | 3 | | **TOTAL SLT** | 120 |   TEACHING METHODOLOGY  Lecture and discussion, Test, independent study and individual/group assignment.  WEEKLY SCHEDULE   |  |  | | --- | --- | | **Week 1** | Sensor overview | | **Week 2** | Signal and modulation, passive sensors | | **Week 3** | Infrared radiometers | | **Week 4** | Active Imaging sensors | | **Week 5** | Signal propagation | | **Week 6** | Target and clutter characteristics | | **Week 7** | Detection of Targets in Noise | | **Week 8** | ***Mid-Semester Break*** | | **Week 9** | High range resolution techniques  High Angular Resolution Techniques | | **Week 10** | Range and Angle tracking | | **Week 11** | Doppler measurement | | **Week 12** | Tracking moving targets | | **Week 13** | Radio Tags and transponders | | **Week 14** | Data acquisition and hardware interface | | **Week 15** | ProjectPresentation | | **Week 16 - 18** | ***Revision Week & Final Examination*** |   REFERENCES :   1. J. S Wilson, Sensor Technology Handbook, Newnes, 2005 2. G.Meijer, Smart Sensor Systems, Vol 10, John Wiley & Sons, 2008 3. N. V. Kirianaki, S. Y. Yurish, N. O. Shpak, V. P. Deynega, Data Acquisition and Signal 4. J. W. Gardner, V. K. Varadan, O. O. Awadelkarim, Microsensors, MEMS and Smart Devices, Wiley, 2001. 5. R. Rogers, J. Lombardo, Z. Mednieks, G. B. Meike, Android Application Development: Programming with the Google SDK, O'Reilly Media, 2009. 6. S. Soloman, Sensors Handbook, McGraw-Hill Companies Incorporated, 2009. 7. D. Huston, Structural Sensing, Health Monitoring, and Performance Evaluation, Taylor & Francis Group, 2010.   **GRADING**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Assessment** | **Number** | **% each** | **% total** | | 1. | Test | 1 | 20% | 20% | | 2. | Assignment | 1 | 15% | 15% | | 3. | Case study and Report | 1 | 15% | 15% | | 4. | Project Report and Presentation | 1 | 20% | 20% | | 5. | Final Exam – Summative Assessment | 1 | 30% | 30% | | **Overall Total** | | | | **100%** | | |

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| Jabatan: Kejuruteraan PerisianSekolah: Advanced Informatics School (UTM AIS)Universiti Teknologi Malaysia | |  | |
| |  |  | | --- | --- | | **Kod &**  **Nama Kursus** | : MANN 1053 & System Processors and Peripherals | | **Jam Pertemuan** | **:** 42 | | | **Semester :** 1  **Sesi :** 2014/2015 | |
| **Teaching and Learning Activities** | **Student Learning Time (hours)** | |
| 1. Face-to-Face Learning | | |
| * 1. Lecturer-Centered Learning      1. Lecture | | 12 |
| * 1. Student-Centered Learning (SCL)      1. Laboratory/Tutorial      2. Student-centered learning activities – Active Learning, Project Based Learning | | 30  - |
| 1. Self-Directed Learning | | |
| 1. Non-face-to-face learning or student-centered learning (SCL) such as manual, assignment, module, e-Learning, etc. | | 21 |
| 1. Revision | | 14 |
| 1. Assessment Preparations | | 10 |
| 1. Formal Assessment | | |
| * 1. Continuous Assessment | | 2 |
| * 1. Final Exam | | 3 |
| **Total (SLT)** | | **120** |
| **TEACHING METHODOLOGY** | | |
| Lecture, discussion, multimedia presentation, lab works | | |

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| **Hours** | **Topics** |
| 6 | Overview  Processor Architecture: Introduction, Processor Model, Programmer’s model,  Designer’s Model: 8086 hardware details, Clock generator 8284A, Bus buffering and  latching, Processor Read & Write bus cycles, Ready and wait state generation,  Minimum versus Maximum mode operation.  . |
| 6 | Memory Interfacing: 80x86 processor-Memory interfacing, Address decoding  techniques, Memory Devices – ROM, EPROM, SRAM, FLASH, DRAM devices,  Memory internal organization, Memory read and write timing diagrams, DRAM  Controller |
| 6 | Basic I/O Interfacing: Parallel I/O, Programmed I/O, I/O port address decoding, The 8255A Programmable Peripheral Interface (PPI), programming 8255, Operation modes, Interface examples – Keyboard matrix, LCD/7-Segment Display, Printer, stepper motor, A/D and D/A converter. |
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| 6 | Timer Interfacing: The 8254 Programmable Interval Timer (PIT), Timing applications.  Serial I/O Interface: Asynchronous communication, Physical communication  standard-EIA RS232, Programmable Communication Interface - UART 8251,  Interfacing serial I/O devices- mouse, modem, PC Keyboard. |
| 6 | Interrupts: Interrupt driven I/O, Software & Hardware interrupts, Interrupt vectors  and vector table, Interrupt processing, The 8259A Programmable Interrupt Controller  (PIC)- cascading of 8259s, programming 8259, Interrupt examples – Printer, Real-  Time Clock, PC Keyboard. |
| 6 | Direct Memory Access: Basic DMA operation, DMA Controlled I/O, The 8237 DMA  Controller, Disk Memory Systems- Floppy disk, Hard disk, optical disk memory systems, video displays  Bus Interfaces: PC bus standards & interfaces – PCI, USB, Firewire, AGP |
| 3 | Presentation and Examination Review |
| Week 16 | Study Break |
| Week 17 | Final Exam |

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| REFERENCES |
| Barry B. Brey, Intel Microprocessors, (8th Edition), 2008, Prentice Hall, ISBN-10: 9780135026458, ISBN-13: 978-0135026458[Ran Giladi](http://www.amazon.com/Ran-Giladi/e/B001J95A5G/ref=ntt_athr_dp_pel_1) , Network Processors: Architecture, Programming, and Implementation (Systems on Silicon). Morgan Kaufmann, July 30, 2008, ISBN-10: 0123708915, ISBN-13: 978-0123708915[David A. Patterson](http://www.amazon.com/s/ref=ntt_athr_dp_sr_1?_encoding=UTF8&sort=relevancerank&search-alias=books&field-author=David%20A.%20Patterson) and [John L. Hennessy](http://www.amazon.com/s/ref=ntt_athr_dp_sr_2?_encoding=UTF8&sort=relevancerank&search-alias=books&field-author=John%20L.%20Hennessy). Computer Organization and Design, Fourth Edition: The Hardware/Software Interface (The Morgan Kaufmann Series in Computer Architecture and Design). Morgan Kaufmann; 4 edition, November 10, 2008. ISBN-10: 0123744938, ISBN-13: 978-0123744937.[Abraham Silberschatz](http://www.amazon.com/Abraham-Silberschatz/e/B000APPDZ2/ref=ntt_athr_dp_pel_1) , [Peter B. Galvin](http://www.amazon.com/s/ref=ntt_athr_dp_sr_2?_encoding=UTF8&sort=relevancerank&search-alias=books&field-author=Peter%20B.%20Galvin) and [Greg Gagne](http://www.amazon.com/s/ref=ntt_athr_dp_sr_3?_encoding=UTF8&sort=relevancerank&search-alias=books&field-author=Greg%20Gagne). Operating System Concepts. Wiley; 8 edition, July 29, 2008. ISBN-10: 0470128720, ISBN-13: 978-0470128725[Stephen D. Burd](http://www.amazon.com/Stephen-D.-Burd/e/B001JS1RHW/ref=ntt_athr_dp_pel_1), Systems Architecture. Course Technology, 6 edition, August 13, 2010. ISBN-10: 0538475331, ISBN-13: 978-0538475334 |

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| **GRADING** | | | | |
| **No** | **Assessment** | **Quantity** | **% Each** | **%Total** |
| 1 | Assignment | 1 | 15 | 15 |
| 2 | Lab reports | 5 | 7 | 35 |
| 3 | Test | 1 | 10 | 10 |
| 4 | Final Exam | 1 | 40 | 40 |
|  | **TOTAL** | | | 100% |

**KURSUS UMUM UNIVERSITI (WAJIB)**

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| |  |  | | --- | --- | | **Department** | **:** Department of Engineering | | **Faculty/**  **School** | **:** UTM Razak School of Engineering and Advanced Technology | |  |
| |  |  | | --- | --- | | **Code &**  **Course Name** | : URSP 0013  Research Methodology | | **Total Contact Hour** | : 42 Hours | | **Semester :** 2  **Academic Session :** 2013/2014 |
| |  |  | | --- | --- | | **Lecture** | **:**  PM Dr Astuty Amrin  Dr. Noor Hamizah Hussein  Dr. Habibah @ Norehan Haron | | **Room No.** | : Menara Razak  CW110  Menara Razak | | **Phone No.** | **:** 03-2180  03-26154393  03-2180 | | **E-mail** | **:** [astuty@ic.utm.my](mailto:astuty@ic.utm.my), [hamizah@ic.utm.my](mailto:hamizah@ic.utm.my), habibah@ic.utm.my | | **Synopsis** | : This course covers the general principles of Research Methodology that are applicable to any discipline. It discusses the fundamental process in conducting an academic research. The theoretical and practical aspects of preparing a research proposal presented. Amongst topics that will be covered are introduction to research and its philosophy, problem formulation and research objective, literature review, research methodology and design, data collection procedures, data analysis, research proposal and thesis preparation. | | |

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| Learning outcomes: By the end of the course, students should be able to:   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Course Learning Outcomes** | **Programme Outcomes** | **Taxonomy Level** | **Assesment Methods** | | 1. | Compare some concepts of research and its methodologies | PO1 | C4 | Presentation,  Proposal | | 2. | Select and appraise appropriate research topics, research problems and objectives | PO2 | C4, A3,  CTPS3 | Presentation,  Proposal | | 3. | Determine research design and methodology, and research analysis tools | PO2 | C4, A4,  CTPS4 | Presentation,  Proposal | | 4. | Prepare a project proposal (written and presentation) | PO3 | A4, P4  CS4 | Presentation,  Proposal | |

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| |  |  | | --- | --- | | **STUDENTS LEARNING TIME (SLT)** | | | **Teaching and Learning Activities** | **Students Learning Time (Hour)** | | 1. Face to Face Learning | | | 1. Lecturer Centered Learning 2. Lecture 3. Practical / Lab (Computer) | 30 | | 1. Student Centered Learning (SCL) 2. Practical/ Tutorial 3. Student centred learning activities (SCL) | 12 | | 1. Self-Directed Learning | | | 1. Non Face to Face Learning or Student Centred Learning (SCL) such as manual, assignment, module, e-Learning etc. | 53 | | 1. Revision |  | | 1. Assesment Preparation | 20 | | 1. Formal Assesment | | | 1. Continuous Assesment | 3 | | 1. Final Exam | - | | **TOTAL SLT** | 120 | |  | | | |  | | --- | | TEACHING METHODOLOGY | | 1. Lectures and discussion 2. Students will be required to conduct a group work design project , write reports and present either the project or other related issues. 3. Videos and demonstration will be given on related topics. | | |  |  |  | | --- | --- | | **WEEKLY SCHEDULE** | | | **Week 1** | INTRODUCTION   1. Importance of research. 2. Research practice at universities, research institutions and companies. 3. Components of research – Conceptual framework and action. 4. Criteria for problem selection. 5. Purpose and objectives (Research problems and research questions). 6. Underlying assumption, research scope and limitation. | | **Week 2** | | **Week 3** | LITERATURE REVIEW   1. Purpose of literature review. 2. How to conduct literature review. 3. Common flaws in literature review. | | **Week 4** | | **Week 5** | | **Week 6** | RESEARCH DESIGN   1. Types of research – Fundamental, applied and mixed. 2. Research design – Physical / numerical modelling. 3. Materials and methods. 4. Sampling design / experimentation. 5. Variables and indicators. Instrumentation and data collection. | | **Week 7** | | **Week 8** | ***Mid-Semester Break*** | | **Week 9** | RESULTS AND ANALYSIS   1. Observation and interpretation. 2. Error analysis and validity of results. 3. Significance of findings, 4. Conclusions and recommendation for further work. | | **Week 10** | | **Week 11** | | **Week 12** | | **Week 13** | WRITING AND PRESENTATION   1. Presentation / Publication of research finding. 2. Writing of technical papers / technical reports. 3. Writing of thesis / dissertation. 4. Writing techniques / skill. 5. Seminar and conference presentation. Preparation of research proposal. | | **Week 14** | | **Week 15** | PROBLEM SOLVING   1. Problem solving methodology 2. Decision making outline 3. Data collection process 4. Action planning 5. Proposal Presentation (oral and written) | | **Week 16 - 18** | Revision Week & Final Examination |  |  |  | | --- | --- | | **REFERENCES :** | 1. R. V. Smith, “Graduate Research – A guide for students in the sciences”, ISI Press, 1984. 2. D. Madsen, “Successful Dissertation and theses”, 2nd Edition, Jossey Bass Pub., 1992. 3. E. M. Phillips and D. S. Pugh, “How to get PhD – Managing the peaks and trough of research”, Open University Press, Milton Keynes, Philadelphia, 1987. 4. S. Pokras, “Systematic Problem-Solving and Decision-Making”, Kogan Page Ltd., London, UK, 1990. 5. R. B. Maddux, “Team Building – An Exercise in Leadership”, Kogan Page Ltd., London, UK, 1988. |  |  |  |  |  |  | | --- | --- | --- | --- | --- | | **GRADING** | | | | | | **No.** | **Assesment** | **Number** | **% each** | **% total** | | 1 | Project proposal | 1 | 60 | 60 | | 2 | Project presentation | 1 | 40 | 40 | | **Overall Total** | | | | **100%** | |

**KURSUS UMUM UNIVERSITI (PILIHAN)**

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| **Department & Faculty:**  **Razak School of Engineering and Advanced Technology, Universiti Teknologi Malaysia** |  |
| **Course Code: URSP 6013**  **Course Name: Environmental Ethics**  **Total Contact Hours: 42 hours** | **Semester: I**  **Academic Session:** |
| |  |  |  |  | | --- | --- | --- | --- | | **Lecturer** | PM Dr. Abd Rahman Abd Rahim, Prof Yussof Wahab | PM Dr Shuhana Shamsuddin;  Dr Shreesivadasan |  | | **Room No.** | UTM KL |  |  | | **Telephone No.** | 03-26154819 |  |  | | **E-mail** | rahmanar@ic.utm.my |  |  | |  |  |  | |  |  |  | | Synopsis : | Environmental ethics is the discipline in philosophy that studies the moral relationship of human beings to, and also the value and moral status of, the environment and its nonhuman contents. It covers the challenge of environmental ethics to the anthropocentrism (i.e., human-centeredness) embedded in traditional western ethical thinking; the early development of the discipline in the 1960s and 1970s; the connection of deep ecology, feminist environmental ethics, and social ecology to politics; and the attempt to apply traditional ethical theories, and virtue ethics, to support contemporary environmental concerns. It focus on environmental literature on wilderness, and possible future developments of the discipline. | | | **LEARNING OUTCOMES**  By the end of the course, students should be able to:   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Course Learning Outcome** | **Programme**  **Outcome** | **Taxonomies**  **and**  **Soft-Skills** | **Assessment Methods** | | 1. | **Evaluate** the issues in the environmental ethics and current business practice. | PO2 | C6, P4, A2  *CTPS5* | Case, PMA | | 2. | **Prepare** action plan to develop a sustainable business operations. | PO2 | C4, P3, A4  *CTPS5* | Case, PMA | | 3. | **Follow** ethical and professional boundaries by considering environmental issues. | PO4 | C3, P3, A3  *EM2* | Case, PMA | | 4. | **Organize and analyze** feasibility and implementation of sustainable development program. | PO2, PO6 | C4, P5, A2  *CTPS5*  *KK1* | Case, PMA | | | | | |
| **STUDENT LEARNING TIME (SLT)**   |  |  | | --- | --- | | **Teaching and Learning Activities** | **Student Learning Time (hours)** | | 1. Face-to-Face Learning | | | * 1. Lecturer-Centered Learning      1. Lecture | 25 | | * 1. Student-Centered Learning (SCL) |  | | 1. Laboratory/Tutorial |  | | 1. Student-centered learning activities – Active Learning, Project Based Learning | 13 | | 1. Case / Assignment Presentation & Discussion | 3 | | 1. Self-Directed Learning | | | 1. Non-face-to-face learning or student-centered learning (SCL) such as manual, assignment, module, e-Learning, etc. | 59 | | 1. Revision | 10 | | 1. Assessment Preparations | 9 | | 1. Formal Assessment | | | * 1. Continuous Assessment | 1 | | * 1. Final Exam | - | | **Total (SLT)** | **120** |  |  | | --- | | **TEACHING METHODOLOGY** | | Lectures and Discussion, Case study, Final (Project), PMA Report |   **WEEKLY SCHEDULE**   |  |  |  | | --- | --- | --- | | Week 1 | : Dimensions of Sustainability, Ecosystems and Ecosystem Services | | | Week 2 | : Genetically modified organism: Origins of genetically modified plants, unexpected political backlash, future of GMO’s. | | | Week 3 | : Skunked; too many boats chasing too few fish, captain courageous and present and future | | | Week 4 | : Ingenuity of bugs; thinking like an eco system, down on the pharmacy, nuclear solution | | | Week 5 | : Oil on the rocks, the wreck of the Exxon Valdez, the event: ships meet reefs and so it will never happen again | | | Week 6 | : The extended family, the traditional food of the indigenous population, apes in the laboratory, ecotourism and respect | | | Week 7 | : Human Conditions : Population; Public Health; The Built Environment | | | Week 8 | : | Mid-Semester Break | | Week 9 | : Climate Change: Detection and Attribution; Prediction; Planning for Change, Greenhouse gases and Freezers: Current concern over global warming, litany of disaster and national policy options. | | | Week 10 | : Chlorine sunrise: better living through chemistry, classic environmental debate and construction of a sustainable industry. | | | Week 11 | : Addressing the new population dilemma; China – four faces of population, the role of the international community and US policy. | | | Week 12 | : Resources - Energy; Fueling the world; black hole question of conventional fuel, alternative fuels: an overview and tides, geothermal. | | | Week 13 | : Biological diversity and conservation; why does biodiversity matters? response, legislative and otherwise and actions to save species. | | | Week 14 | **:** Case Study: Environmental Impacts and Ethics in Practice - Industry Speaker | | | Week 15 | :Application and Implementation Issues | |   **REFERENCES :**   1. Newton, L.H., Dillingham, CK. And Choly, J (2006). Watersheds 4: 10 Cases in Environmental Ethics, 4th Edition, Wadsworth, Cengage Learning, Belmont, USA  Miller, G.T., Brewer, R. and, Spoolman S. (2008), Environmental Science: Problems, Connections and Solutions, Thomson Learning Inc, Belmont, USA.  1. Sally J. Goerner, [Robert G. Dyck](http://www.amazon.com/s/ref=ntt_athr_dp_sr_2?_encoding=UTF8&sort=relevancerank&search-alias=books&field-author=Robert%20G.%20Dyck) and [Dorothy Lagerroos](http://www.amazon.com/s/ref=ntt_athr_dp_sr_3?_encoding=UTF8&sort=relevancerank&search-alias=books&field-author=Dorothy%20Lagerroos) (2008) *The New Science of Sustainability* Triangle Center for Complex Systems 2. 2. Hideaki Shiroyama, Hiroshi Komiyama, Kazuhiko Takeuchi and Takashi Mino(2011) *Sustainability Science: A Multidisciplinary Approach, UNU* Press Pub*.*  [Victor I. Danilov-Danil'yan](http://www.amazon.com/s/ref=rdr_ext_aut?_encoding=UTF8&index=books&field-author=Victor%20I.%20Danilov-Danil%27yan), [K. S. Losev](http://www.amazon.com/s/ref=rdr_ext_aut?_encoding=UTF8&index=books&field-author=K.%20S.%20Losev) (2009) [*Sustainable Development and the Limitation of* *Growth*: *Future Prospects for World Civilization*.](javascript:void(0))1 edition Springer.  1. [Donald Gray](http://www.routledge.com/books/search/author/donald_gray/)**,** [Laura Colucci-Gray](http://www.routledge.com/books/search/author/laura_colucci_gray/)**,** [Elena Camino](http://www.routledge.com/books/search/author/elena_camino/) **(2009*)*** *Science, Society**and Sustainability -Education and Empowerment for an Uncertain World* **:** [Routledge Research in Education](http://www.routledge.com/books/series/routledge_research_in_education_SE0393/)   **GRADING:**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | No. | Assessment | Number | % each | % total | |  | Case Study, Group Assignments | 2 | 5 % | 10 % | |  | Test, Individual Assignment | 1 | 10 % | 10 % | |  | Final Post Module Assessment | 1 | 80% | 80% | |  | Overall Total |  |  | 100% | | |

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| **Department & Faculty: Razak School of Engineering and Advanced Technology** |  |
| **Course Code: URSP 6023**  **Information and Communication Technology Ethics and Society**  **Total Contact Hours: 42 hours** | **Semester:**  **Academic Session:** |
| |  |  |  | | --- | --- | --- | | **Lecturer/s** | : | Assoc. Prof. Dr. Maslin Masrom  Prof. Dr. Christopher Preece | | **Room No.** | : | J2 207B / N202 D | | **Telephone No.** | : | ext. 4672 / 016 6654091 | | **E-mail** | : | [maslin@ic.utm.my](mailto:maslin@ic.utm.my) / chrispreece@ic.utm.my | | Synopsis | : | This course exposes students with a comprehensive overview of the current ethical issues in information and communication technology (ICT) use including social and humanistic studies of computing. It aims to provide students with a broader knowledge background on ICT ethics and understanding of problems and solutions in developing ethical environment for public and private organizations. Topics that are being discussed, among others, are knowledge foundation in ICT ethics, issues and trends in ICT ethics, emerging issues facing ICT users ranging from privacy, intellectual property, security and crime to ethics in social networking. The course will discuss the ethical responsibilities of professionals and promote the critical examination and responsible use of ICT include social media. | | **LEARNING OUTCOMES**  At the end of the course, students should be able to:   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Course Learning Outcome** | **Programme Learning Outcome(s) Addressed** | **Taxonomy** | **Assessment Methods** | | 1  2  3  4 | Describe the ethical theories, current issues in the ICT use emerged in the society including social media and ICT policy.  Discuss the ethical principles, ethical decision making models, professional responsibilities and codes of conduct via examining the professional’s obligations to society.  Apply appropriately decisions around ethical issues in an array of information and communication technology practices.  Communicate effectively through report and presentation of ICT ethics including social media cases and projects across a wide range of contexts and audiences. | PO1  PO2  PO2  PO3 | C2  C4  C4  P4  CS4, TS3 | T, Q, Assign  T, PR, Q, Pr, Assgn  T, PR, Q, Pr, Assgn  PR, Assgn, Pr | | | |   **STUDENT LEARNING TIME (SLT)**   |  |  | | --- | --- | | **Teaching and Learning Activities** | **Student Learning Time (hours)** | | 1. Face-to-face Learning | | | * 1. Lecturer-Centred Learning      1. Lecture | 32 | | * 1. Student-Centred Learning (SCL)      1. Practical/Tutorial      2. Student-centred learning activities | 10 | | 1. Self-Directed Learning | | | 1. Non-face-to-face learning or student-centred learning (SCL) such as group project and assignments. | 42 | | 1. Revision | 18 | | 1. Assessment Preparations | 12 | | 1. Formal Assessment | | | * 1. Ongoing Assessment | 6 | | * 1. Final Exam | - | | **Total (SLT)** | 120 |  |  | | --- | | **TEACHING METHODOLOGY** | | Lectures and discussions, co-operative learning, independent study, group project, presentation. |   **WEEKLY SCHEDULE**   |  |  |  | | --- | --- | --- | | **Week 1** | : | **What is ICT Ethics?**   * Philosophical Ethics Basic Concepts: Responsibility, Accountability and Liability * Ethical Theories and Principles * Ethical Analysis – Ethical Decision Making Process | | **Week 2** | : | **Society and the Need for ICT Ethics**   * Two Way Relationship Between Society and Technology * The Impacts of ICT; Optimistic, Pessimistic and Contextualist Views * Why Computer Ethics * The Task of Computer Ethics | | **Week 3** | : | **Ethics in ICT Societies**   * Technology as the Instrumentation of Human Action Features of ICT Configured Activities and Society * Ethical Dilemma for Computer Users * Ethics and the Professionals | | **Week 4** | : | **Accuracy**   * Virtual Environments**,** Virtual Community**,** Virtual Action   **Security**   * Cyber Crime and Abuse   **Intellectual Property Rights**   * Trade Secrets, Copyrights, Patents, Trademarks | | **Week 5** | : | **Privacy**   * Privacy Legislation, Privacy at Risk, Privacy and the Instrumentation of Efficiency * Slamming Spam, Assuring Authentication   **Democracy and the Internet**   * Is the Internet a Democratic Technology?   **Access and the Digital Divide** | | **Week 6** | : | **Ethics of Social Networking**   * Ethics and the Internet * Ethics Online * Social Implications and Social Value | | **Week 7** | : | **Cyber and Computer Law**   * Legal implications of social media platforms * Business risks of using social media * International legal differences | | **Week 8** | : | **Computer-related Codes of Ethics**   * [ACM Code of Ethics and Professional Conduct](http://www.acm.org/constitution/code.html#sect1) * [Software Engineering Code of Ethics and Professional Practice](http://www.acm.org/about/se-code#full) * [Ten Commandments of Computer Ethics](http://www.cs.biu.ac.il/home/leagal/netguide/ten.html) | | **Week 9** | : | **Social Media and Its Application in Business and Engineering**   * What is social media, * Why it is important for business and engineering in an international context. * The historical development of social media   + From Six Degrees.com, LiveJournal, Friendster to Facebook (1996 – present)   + How social media has developed internationally. | | **Week 10** | : | **The Social Media Technologies**   * Web- and mobile-based technologies forinteractive dialogue among organizations, communities, and individuals, Internet forums**,** Web blogs**,** Social blogs**,** Microblogging**,** Wikis, and Podcasts   - The different types of social media   * Online personal branding, Twitter and its applications, and professional social networking, Facebook, and Linkedin | | **Week 11** | : | **Social Media and Business Strategy**   * Social media and the business plan for engineering related companies. * Risks and resources for social media business strategies. * Organisation for using the social media * Internal analysis of the use of social media by employees * External use of professional and business related social media to communicate with pemegang taruh. * Cultural influences and change as a result of social media in the engineering business. | | **Week 12** | : | * Implementing a social media strategy for an engineering related business * Determining objectives * Find an internal champion * Consider employees role and human development needs * Check the appropriate technologies * See what the competition is doing.   **Branding and social media**   * How social media can be harnessed to improve brand awareness * Reputation and image building an defence using social media and networking * Social media for brand research and development. * Customers and their preferences for social media. * Choosing appropriate social media to communicate with engineering customers and clients. * Social media for market research. * Social media for advertising and public relations. * Social media and the sales/business development team. * Using social media for gathering customer/client feedback. | | **Week 13** | : | **Personal professional use of social media to advance career and business prospects:**   * Use of social media and networking to advance career prospects. * Personal online branding strategies through professional blogs and networking | | **Week 14** | : | **Ethics Case Analysis and Class Presentation** |   **TEXT BOOK (s):**   1. Deborah G. Johnson (2009), **“Computer Ethics”**, 4th. Edition, Pearson Education, Inc.   **REFERENCES:**   1. Maslin Masrom (2012), **“Etika Dalam Penggunaan Komputer”**, Dewan Bahasa dan Pustaka. 2. Tavani, H. (2011), **“Ethics and Technology: Controversies, Questions, and Strategies for Ethical Computing**, 3rd. Edition, John Wiley and Sons, Boston. 3. Michael, J.Q. (2010), **“Ethics for the Information Age”**, 4th. Edition, International Version, Pearson Education, Oxford. 4. Kenneth, E.H. & Herman, T.T (2009), **“The Handbook of Information and Computer Ethics”**, John Wiley and Sons, New Jersey. 5. Chris, R. John, A. (2007), **“Computer Law: The Law and Regulation of Information Technology”**, 4th. Edition, Oxford University Press, USA. 6. Kaplan, Andreas M.; Michael Haenlein (2010) **"Users of the world, unite! The challenges and opportunities of Social Media"**. Business Horizons 53(1): 59–68. 7. Kietzmann, J.H., Hermkens, K., McCarthy, I.P., Silvestre, B.S., 2011**. Social media? Get serious! Understanding the functional building blocks of social media**. Business Horizons 54, 241–251. 8. Rheingold, Howard (2002). [Smart mobs: The next social revolution](http://www.amazon.co.uk/Smart-Mobs-Next-Social-Revolution/dp/0738206083) (1st printing ed.). Cambridge, MA: Perseus Pub.. p. 288. [ISBN](http://en.wikipedia.org/wiki/International_Standard_Book_Number) [978-0-7382-0608-0](http://en.wikipedia.org/wiki/Special:BookSources/978-0-7382-0608-0). <http://www.amazon.co.uk/Smart-Mobs-Next-Social-Revolution/dp/0738206083>. 9. Watts, Duncan J. (2003). [Six degrees: The science of a connected age](http://www.amazon.co.uk/Six-Degrees-Science-Connected-Age/dp/0099444968). London: Vintage. p. 368. [ISBN](http://en.wikipedia.org/wiki/International_Standard_Book_Number) [978-0-09-944496-1](http://en.wikipedia.org/wiki/Special:BookSources/978-0-09-944496-1). <http://www.amazon.co.uk/Six-Degrees-Science-Connected-Age/dp/0099444968>. 10. [Benkler, Yochai](http://en.wikipedia.org/wiki/Yochai_Benkler) (2006). [The Wealth of Networks](http://en.wikipedia.org/wiki/The_Wealth_of_Networks)**.** New Haven: Yale University Press. [ISBN](http://en.wikipedia.org/wiki/International_Standard_Book_Number) [0-300-11056-1](http://en.wikipedia.org/wiki/Special:BookSources/0-300-11056-1). [OCLC](http://en.wikipedia.org/wiki/Online_Computer_Library_Center) [61881089](http://www.worldcat.org/oclc/61881089). 11. Gentle, Anne (2009). **Conversation and Community: The Social Web for Documentation**. Fort Collins, CO: XML Press. [ISBN](http://en.wikipedia.org/wiki/International_Standard_Book_Number) [978-0-9822191-1-9](http://en.wikipedia.org/wiki/Special:BookSources/978-0-9822191-1-9). [OCLC](http://en.wikipedia.org/wiki/Online_Computer_Library_Center) [464581118](http://www.worldcat.org/oclc/464581118). 12. [Johnson, Steven Berlin](http://en.wikipedia.org/wiki/Steven_Berlin_Johnson) (2005). [Everything Bad Is Good for You](http://en.wikipedia.org/wiki/Everything_Bad_Is_Good_for_You)**.** New York: Riverhead Books. [ISBN](http://en.wikipedia.org/wiki/International_Standard_Book_Number) [1-57322-307-7](http://en.wikipedia.org/wiki/Special:BookSources/1-57322-307-7). [OCLC](http://en.wikipedia.org/wiki/Online_Computer_Library_Center) [57514882](http://www.worldcat.org/oclc/57514882). 13. Li, Charlene; Bernoff, Josh (2008). [Groundswell: Winning in a World Transformed by Social Technologies](http://en.wikipedia.org/wiki/Groundswell_(book)). Boston: Harvard Business Press. [ISBN](http://en.wikipedia.org/wiki/International_Standard_Book_Number) [978-1-4221-2500-7](http://en.wikipedia.org/wiki/Special:BookSources/978-1-4221-2500-7). [OCLC](http://en.wikipedia.org/wiki/Online_Computer_Library_Center) [423555651](http://www.worldcat.org/oclc/423555651). 14. 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New York: Penguin Press. [ISBN](http://en.wikipedia.org/wiki/International_Standard_Book_Number) [978-1-59420-153-0](http://en.wikipedia.org/wiki/Special:BookSources/978-1-59420-153-0). [OCLC](http://en.wikipedia.org/wiki/Online_Computer_Library_Center) [458788924](http://www.worldcat.org/oclc/458788924). 16. [Surowiecki, James](http://en.wikipedia.org/wiki/James_Surowiecki) (2004). [The Wisdom of Crowds](http://en.wikipedia.org/wiki/The_Wisdom_of_Crowds)**.** New York: Anchor Books. [ISBN](http://en.wikipedia.org/wiki/International_Standard_Book_Number) [0-385-72170-6](http://en.wikipedia.org/wiki/Special:BookSources/0-385-72170-6). [OCLC](http://en.wikipedia.org/wiki/Online_Computer_Library_Center) [156770258](http://www.worldcat.org/oclc/156770258). 17. [Tapscott, Don](http://en.wikipedia.org/wiki/Don_Tapscott); [Williams, Anthony D.](http://en.wikipedia.org/wiki/Anthony_D._Williams) (2006). [Wikinomics](http://en.wikipedia.org/wiki/Wikinomics). New York: Portfolio. [ISBN](http://en.wikipedia.org/wiki/International_Standard_Book_Number) [1-59184-138-0](http://en.wikipedia.org/wiki/Special:BookSources/1-59184-138-0). [OCLC](http://en.wikipedia.org/wiki/Online_Computer_Library_Center) [318389282](http://www.worldcat.org/oclc/318389282). 18. [Powell, Guy R.](http://en.wikipedia.org/w/index.php?title=Guy_R._Powell&action=edit&redlink=1); [Groves, Steven W.](http://en.wikipedia.org/w/index.php?title=Steven_W._Groves&action=edit&redlink=1); [Dimos, Jerry](http://en.wikipedia.org/w/index.php?title=Jerry_Dimos&action=edit&redlink=1) (2011). [ROI of Social Media: How to improve the return on your social marketing investment](http://en.wikipedia.org/w/index.php?title=ROI_of_Social_Media:_How_to_improve_the_return_on_your_social_marketing_investment&action=edit&redlink=1)**.** New York: John Wiley & Sons. [ISBN](http://en.wikipedia.org/wiki/International_Standard_Book_Number) [978-0-470-82741-3](http://en.wikipedia.org/wiki/Special:BookSources/978-0-470-82741-3). [OCLC](http://en.wikipedia.org/wiki/Online_Computer_Library_Center) [0470827416](http://www.worldcat.org/oclc/0470827416).   **GRADING:**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **No** | **Assessment** | **Number** | **Each (%)** | **Total (%)** | **Week** | | 1 | Group Project Paper | 1 | 20 | 20 | 14 | | 2 | Quizzes / Assignments / Participation / Cases | 5 | 10 | 50 | Weekly | | 3 | Test | 2 | 15 | 30 | 5, 9 | | 4 | Final Examination | - | - | - | - | |  | **Total** |  |  | **100** |  | | | |

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| Department & Faculty: Department Of Human Resource Development, Faculty Of Management And Human Resource Development |  |
| **Course Code: UHAP 6013**  **Total Lecture Hours: 3 Hours X 14 Hours**  **(42 Hours)**  **Seminar On Global Development, Economic And Social Issues** | **Semester: Ii**  **Academic Session: 2008/2009** |
| **Lecturer :**   1. ASSOC. PROF. DR. ROSMAN MD YUSOFF 2. ASSOC. PROF. DR. ESA KHALID 3. ASSOC. PROF. DR. NORHANI BAKRI   **Room No** : D06 311/D05 443/D05 315  **Telephone No.** 07-5531912/07-5531778  **E-mail** : [dr\_rosman@mel.utm.my/m-esa@utm.my/m-nhani@utm.my](mailto:dr_rosman@mel.utm.my/m-esa@utm.my/m-nhani@utm.my)  **Synopsis:**  Discussion on this subject includes issues related to globalization and development, economic and social crisis that has become a global concern. It aims in developing skills in understanding and analyzing global issues and recommending relevant solutions. Issues will be discussed in details. | |
| **STUDENT LEARNING TIME**   |  |  | | --- | --- | | **Teaching and Learning Activities** | **Student Learning Time (Hours)** | | 1. Lecture 2. Student-centred learning | 36  6 | | 1. Independent Learning | 42 | | 1. Preparation for Assignment |  | | * Individual | 10 | | * Group * Presentation | 15  1 | | 1. Video-based Discussion | 10 | | **Total (SLT)** | **120** | | **Credit** | **120/40 = 3** |   **TEACHING METHODOLOGY**  Lectures , discussion on global issues, presentation of group and individual assignment  **WEEKLY SCHEDULE**   |  |  |  | | --- | --- | --- | | Week 1 | : | Economic Development and Economic Growth | | Week 2 & 3 | : | Economic System and Development | | Week 4 | : | Rich Vs Poor in the Global Economy | | Week 5 | : | Globalisation, the Engine of Globalisation and the Anti Globalisation Movement | | Week 6 | : | Conflict and war | | Week 7 | : | Racism | | **Week 8** | **:** | **Mid-Semester Break** | | Week 9 | : | Knowledge Economy, Digital Divide | | Week 10 | : | Environmental Issues | | Week 11 | : | Cross-Cultural Business | | Week 12 | : | Politics and Law in Business | | Week 13 | : | International Trade | | Week 14 | : | Regional Economic Integration |   **REFERENCES :**   1. Anup Shah (2001). **“Free Trade and Globalisation: The WTO and Free Trade”.** [www.globalissues.org/TradeRelated/FreeTrade/asp](http://www.globalissues.org/TradeRelated/FreeTrade/asp) 2. Buckman, G. (2004). **“Globalization: Tame it or Scrap it?”.** New York: Zed Books 3. Daniels, J.D., Radebaugh, L.H. and Sullivan, D.P. (2002**). “Globalization and Business”**. New Jersey: Prentice Hall 4. Khor, M. (2000). **“Globalisation and The South: Some Critical Issues.”** Penang: Third World Network. 5. Starr, A., H. (2005). **“Global Revolt.”** New York: Zed Books. 6. Wild, J.J., Wild, K.L and Han, C.Y.J. (2008). **“International Business”.** 4th ed., New Jersey: Pearson Prentice-Hall   **GRADING:**   1. Video-based Discussion 30% 2. Assignment (Individual) 20% 3. Group Project 30% 4. Presentation (Group) 20%   **------------**  **TOTAL 100%**  **=======** | |

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| **Department & Faculty: Department Of Modern Languages, Faculty Of Management And Human Resourse** |  |
| **Course Code: UHAZ 6123 (Malaysian Society And Culture)**  **Total Lecture Hours: 3 Hours X 14 Weeks (42 Weeks)** | **Semester: Ii**  **Academic Session: 2008/2009** |
| |  |  |  | | --- | --- | --- | |  | |  | |  | |  | | **Lecturer** | : | 1. Puan Halimah binti Ma’alip 2. Puan Zaliza binti Mohd. Nasir | | **Room No.** | : | 1. D05-329 2. S44-B03-04 | | **Telephone No.** | : | 1. 075532543 2. 075535111 | | **E-mail** | : | 1. ajeng\_sari@hotmail.com  2. ezafy68@hotmail.com | | **Synopsis** | : | This course is designed for international postgraduates from countries of non-Malay origins. Students will be exposed to various aspects of the Malaysian culture such as belief system, religious festivals, customs and etiquettes of different ethnic groups in Malaysia. Emphasis will be given to the Malay culture as it makes the core for the *Dasar Kebudayaan Kebangsaan*. Students will also be briefly introduced to basics of Malay language as the national language of Malaysia. | | **LEARNING OUTCOMES**  By the end of the course, students should be able to:   |  |  |  | | --- | --- | --- | | **Course Learning Outcome** | **Programme Learning Outcome(s) Addressed** | **Assessment Methods** | | 1. explain briefly the multi-cultural aspects of Malaysian culture 2. differentiate different cultures of the major ethnic groups in Malaysia 3. explain how to interact with local people of Malaysia. 4. work with students from different background and culture. | PO1, C2, A1,  PO4, C4, A2, EM1, EM2  PO4, C2, P2, A3 EM1  PO3, P4, A3, EM1, EM3, CS1, CS2 | T, Q, F, HW  PR, HW, Pr, F  PR, HW, Pr  PR, Pr  (T – Test ; PR – Project ; Q – Quiz; HW – Homework ; Pr – Presentation; F – Final Exam) | | | |   **STUDENT LEARNING TIME**   |  |  | | --- | --- | | **Teaching and Learning Activities** | **Student Learning Time (Hours)** | | 1. Lecture 2. Student-centred learning | 36  6 | | 1. Independence Study  * Self learning * Seeking information * Reading * Group discussion | 26 | | 1. Group Assignment 2. Group discussion 3. Library search 4. Reading 5. Report writing 6. Presentation | 40 | | 1. Case Study |  | | 1. Preparation | 10 | | 1. Discussion | 2 | | **Total (SLT)** | **120** | | **Credit** | **120/40 = 3** |   **TEACHING METHODOLOGY**  This course is taught through lectures, discussion and project work/presentation  **WEEKLY SCHEDULE**   |  |  |  | | --- | --- | --- | | Week 1 | : | Introduction | | Week 2-4 | : | The historical background of the ethnic groups in Malaysia  - Malay  - Chinese  - Indian  - Other ethnic groups | | Week 5-6 | : | The Colonization of the Malay Peninsular by the British  Malayan Nationalism towards Independence of Malaysia | | Week 7-8 | : | Malaysia nowadays   * + 1. The political aspects     2. The social aspects     3. The economical aspects   Test (20%) | | Week 9 | : | **Mid Semester Break (One Week)** | | Week 10-11  Week 12-13 | : | Malaysian Ways of Life   * - Main religious festivals and celebrations * Hari Raya * Deepavali * Chinese New Year * Hari Gawai * Pesta Keamatan * -Main Customs * Wedding System * Burial system * Superstitions   Malaysian culture  Traditional Games  Arts and Crafts  Food | | Week 14-15 |  | Group presentation | |  |  |  |   **REFERENCES :**   1. Abd. Rashid Melebek dan Juhari Moain. (2006). Sejarah Bahasa Melayu. Kuala Lumpur: Utusan Publiser and Distributors. 2. Abdullah Sukor Shaari, Nuraini Yusoff dan Mohd. Ishak Awang. (2003). Bahasa Melayu Komunikasi. Pahang: PTS Publication and Distributors. 3. Ann, Wan Seng (1994). *Adat dan Pantang Larang Orang Cina.* Kuala Lumpur: Penerbitan Fajar Bakti. 4. Asmad (1990). *Kesenian, Adat, Kepercayaan dan Petua.* Kuala Lumpur: Associated Educational Distributors (M) Sdn. Bhd. 5. Aziz Deraman (1975). *Masyarakat dan Kebudayaan Malaysia.* Kuala Lumpur: Kementerian Belia dan Sukan. 6. Aziz Deraman dan Wan Ramli Wan Mohamad (1994). *Permainan Tradisi Orang Melayu.*  Kuala Lumpur : Penerbitan Fajar Bakti. 7. \_\_\_\_\_\_\_ (1995). *Perayaan Orang Melayu, Adat dan Pantang Larang Orang India.*  Kuala Lumpur : Penerbitan Fajar Bakti. 8. M. Rajantheran dan S. Manimaran (1994). *Adat dan Pantang Larang Orang India.*  Kuala Lumpur : Penerbitan Fajar Bakti. 9. \_\_\_\_\_\_\_ (1994). *Perayaan Orang India.* Kuala Lumpur : Penerbitan Fajar Bakti. 10. Mokhtar Md. Dom (1979). *Malay Wedding Customs.* Petaling Jaya : Federal Publications Sdn. Bhd. 11. Nik Safiah Karim et. al. (1987) *Tata Bahasa Dewan Jilid 1* : Ayat. Kuala Lumpur : Dewan Bahasa dan Pustaka. 12. \_\_\_\_\_\_\_\_\_\_ (1987). *Tata Bahasa Dewan Jilid II* : Perkataan. Kuala Lumpur : Dewan Bahasa dan Pustaka. 13. Noor Aini Syed Amir (1991). *Malaysian Customs & Etiquette.* Kuala Lumpur : Times Editions Pte. Ltd. 14. Taha Abd. Karim (1985). *Hari Perayaan Penduduk Malaysia.* Kuala Lumpur : Pelanduk Publications. 15. Welch, Patricia Bjaaland (1997). *Chinese New Year.* Hong Kong: Oxford University Press.   **GRADING:**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | No. | Assesment | Number | % each | % total | | 1. | Group Project | 1 | 20 | 20 | | 2. | Assignment | 2 | 10 | 20 | | 3. | Test | 2 | 10 | 20 | | 4. | Presentation | 1 | 10 | 10 | | 5. | Final Exam | 1 | 30 | 30 | |  | **Total** |  |  | **100** | | |

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| **Department & Faculty: Department Of Educational Foundations, Faculty Of Education** |  |
| **Course Code: UHAW 6033 Dynamics Of Leadership**  **Total Lecture Hours: 42 Hours** | **Semester:**  **Academic Session:** |
| |  |  |  | | --- | --- | --- | | **Lecturer** | : | Prof. Abu Bakar Hashim | | **Room No.** | : | C14 – 311, Faculty of Education | | **Telephone No.** | : | 07 – 5534452 / 019 – 6667624 | | **E-mail** | : | [p-bakar@utm.my](mailto:p-bakar@utm.my) / [Drabhashim@gmail.com](mailto:Drabhashim@gmail.com) | |  |  |  | |  |  |  | | **Synopsis** | : | This course is intended to encourage students discover and develop their personal leadership qualities. They will be exposed to leadership theories so that they could develop an insight that leadership itself is a dynamic relationship based on mutual influence and common purpose between leaders and followers. Levels of analysis of leadership theory: individual, group and organizational. | | **LEARNING OUTCOMES**  By the end of the course, students should be able to:   |  |  |  | | --- | --- | --- | | **Course Learning Outcome** | **Programme Learning Outcome(s) Addressed** | **Assessment Methods** | | 1. Summarize the importance of leadership role in every field of human endeavour 2. Develop an understanding of how leaders nurture leadership qualities and skills, 3. Identify leadership challenges and provide appropriate leadership responses to such challenges. 4. Be sensitive to issues of ethics and values in leadership 5. Plan a continuous personal development program to enhance leadership skills and effectiveness for future leadership roles | PO3, C2, CS1, CS2, CS3  PO3, C5, CS1, CS2, LS1  PO3, C2, P5, CS1,  CS2, LS1, LS2, LS3  PO4, A3, EM1 | PR, LP, RP  LP  LP, RP  LP, PR  LP, PR  **KEY:**  LP – Learning  Portfolio  PR – Presentation  RP – Role Play | | | |   **STUDENT LEARNING TIME**   |  |  |  | | --- | --- | --- | | No. | Aktiviti Pengajaran dan Pembelajaran | JPP | |  | Pembelajaran Berpusatkan Pensyarah | 30 | |  | Pembelajaran Berpusatkan Pelajar | 12 | |  | Pembelajaran Tidak Bersemuka (tugasan, kajian kes, etc). | 56 | |  | Ulangkaji | 14 | |  | Persediaan Ujian dan Peperiksaan | 6 | |  | Penilaian Berterusan | 2 | |  | Peperiksaan Akhir |  | | JUMLAH JPP | | 120 | | KREDIT | | 120 / 40 = 3 |  |  | | --- | | **TEACHING METHODOLOGY** | | 1. Lectures: lecture outlines are provided. Students develop each topic in ways that learning becomes meaningful to them. They are required to write personal reflections and develop personal learning portfolios.  2. Peer Teaching & Class Leadership Role: Students take turn to be responsible for leading the class. They work in pairs on a given topic and lead in class discussion and class activity. Each pair shall submit a written plan which outlines specific discussion and activity to be accomplished. They also plan for the learning outcome during the week they lead. This exercise enables students to discover their dominant leadership traits and styles, as well as their strengths and shortcomings as leaders. |   **WEEKLY SCHEDULE**   |  |  |  | | --- | --- | --- | | Week 1 | : | Course Introduction | | Week 2 | : | Introduction To Leadership.  Does leadership really make a difference? | | Week 3 | : | Leadership Traits & Ethics | | Week 4 | : | Leadership Behavior and Motivation | | Week 5 | : | Influencing: Power, Politics, Networking, and Negotiation | | Week 6 | : | Contingency Leadership Theories | | Week 7 | : | Communication, Coaching, and Conflict Skills | | Week 8 | : | Mid-Semester Break | | Week 9 | : | The Leader-Follower Relationship | | Week 10 | : | Team Leadership | | Week 11 | : | Leading Self-Managed Teams | | Week 12 | : | Transformational Leadership | | Week 13 | : | Short Talk (Assessment of Personal Leadership Development) | | Week 14 | : | Performance Leadership | | Week 15 | : | Study Week | | Week 16-18 | : | Final Examination |   **REFERENCES :**  **Reading List**   1. Alder, H. (1995). *Think like a leader.* London: Judy Piatkus (Publishers) Ltd. 2. Barnes, T. (1996). *Kaizen strategies for successful leadership.* London: Pitman Publishing. 3. Blanchard, K. (2006). *Leading at a higher level.* Upper Saddle River, NJ: Prentice Hall. 4. Bolman, L. G., & Deal, T. E. (2003). *Reframing organizations: Artistry, choice, and leadership*. (3rd ed.). San Francisco: Jossey-Bass Pub. 5. Charney, C. (2006). *The leader’s tool kit.* New York: American Management Association. 6. Collins, J. (2001). *Good to great: Why some companies make the leap…and others don’t.* New York: Harper Collins Pub. Inc. 7. Covey, S. R. (1989). *The 7 habits of highly effective people.* New York: Free Press. 8. Covey, S. R. (2004). *The 8th habit: From effectiveness to greatness.* New York: Free Press. 9. Daft, R. L. (1999). *Leadership: Theory and practice.* Orlando: Harcourt Brace College Pub. 10. Daft, R. L. (2005). *The leadership experience.* (3rd ed.). Mason, OH: South-Western / Thomson. 11. Donaldson, Jr., G. A. (2001). *Cultivating leadership in schools: Connecting people purpose, and practice.* New York: Teachers College Press. 12. Glaser, J. E. (2006). *The DNA of leadership.* Avon, MA: Platinum Press. 13. Hesselbein, F., & Shrader, A. (Eds.). (2008). *Leader to leader: Enduring insights on leadership.* San Francisco: Jossey-Bass. 14. Hughes, R. L., Ginnett, R. C., & Curphy, G. J. (2006). *Leadership: Enhancing the lesson of experience.* Boston: McGraw-Hill. 15. Lussier, R. N., & Achua, C. F. (2005). *Leadership: Theory, application, skill development.* (2nd ed.). Mason, OH: Thomson, 16. Northouse, P. G. (2006). *Leadership: theory and practice.* (5th ed.). Thousand Oaks, CA: Sage. 17. Palmer, R. E. (2008). *Ultimate leadership.* Upper Saddle River, NJ: Wharton School Publishing. 18. Pierce, J. L., & Newstrom, J. W. (2006). *Leaders & the leadership process: Readings, self-assessment & applications.* (4th ed.). New York: McGraw-Hill. 19. Yukl, G. (2006). *Leadership in organizations.* (5th ed.). Upper Saddle River, NJ: Prentice-Hall.   **Journals**  *Leadership & Organization Development Journal*  *Academic Leadership*  *Journal of Leadership & Organizational Studies*  *Leadership Journal*  *International Journal of Leadership Studies*  *International Journal of Education Policy and Leadership*  **GRADING:**  (Provide details on the allocation of marks and the time schedule for all quizzes, tests, assignments, etc.)  **Assessment of Student Learning**  Class Leadership Responsibility 15% Weekly Rotation  Class Presentation 15%  Short Talk (Assessing Personal Leadership 10% Week 13  Development)  Learning Portfolio 60% Progressive; Due Week 14 | |

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| **Nama Jabatan Dan Fakulti : Jabatan Bahasa Moden, Fakulti Pengurusan Dan Pembangunan Sumber Manusia** |  |
| **Nama Dan Kod Kursus: UHAZ 6323 Malay Language For Postgraduates**  **Jumlah Jam Pertemuan: 3 Jam X 14 Minggu [42 Jam]** | **SEMESTER: 1**  **SESI: 2008/9** |
| |  |  |  | | --- | --- | --- | | **Nama Pensyarah** | : | Puan Halimah binti Ma’alip | | **No. Bilik** | : | D05-329 | | **No. Telefon Bilik** | : | 075532543 | | **E-mel** | : | ajeng\_sari@hotmail.com | |  |  |  | | Sinopsis | : | Mata Pelajaran ini ditawarkan kepada pelajar Sarjana Lanjutan dan Doktor Falsafah Luar Negara dari rumpun Melayu seperti Indonesia, Brunei, Selatan Thailand dan Singapura. Dalam kursus ini pelajar diberi pendedahan tentang penulisan karya ilmiah. Mereka juga akan diajar tentang kaedah penulisah ilmiah khususnya tatacara menulis perenggan. Di sampin itu mereka akan didedahkan dengan gaya penulisan ilmiah. Selain itu format-format penulisan seperti kutipan, bibliografi dan suntingan diterangkan agar sesuai dengan format penulisan ilmiah UTM. | | **HASIL PEMBELAJARAN**  Pada akhir kursus pelajar berkebolehan untuk:   |  |  |  |  | | --- | --- | --- | --- | | **No.** | **Hasil Pembelajaran Kursus** | **Hasil Pembelajaran Program yang Berkaitan** | **Kaedah Penilaian** | | 1.  2.  3. | Menulis menggunakan kaedah penulisan ilmiah yang betul.  Menganalisis cara yang sesuai untuk bersosialisasi dan menyesuaikan diri dengan orang lain dengan lebih baik  Menyampaikan idea dalam bentuk lisan serta penulisan dengan menggunakan tatabahasa dan laras bahasa yang betul. | PO5, C5, P4, A2,  LL1  PO3, C4, P3, A3, CS1, CS3  PO3, C5, P3, A3, TS1, TS4, CS1, CS2 | PA, PR, Pm, T  Pr, T  PA, PR, Pm, T  (U – Ujian ; PR – Projek ; K – Kuiz ; T – Tugasan ; Pm – Pembentangan, PA – Peperiksaan Akhir) | | | |   **JAM BELAJAR PELAJAR**   |  |  |  | | --- | --- | --- | | **No.** | **Aktiviti Pengajaran dan Pembelajaran** | **JPP** | |  | **Pembelajaran Berpusatkan Pensyarah** | **30** | |  | **Pembelajaran Berpusatkan Pelajar** | **12** | |  | **Pembelajaran Tidak Bersemuka (tugasan, kajian kes, etc).** | **49** | |  | **Ulangkaji** | **14** | |  | **Persediaan Ujian dan Peperiksaan** | **10** | |  | **Penilaian Berterusan** | **2** | |  | **Peperiksaan Akhir** | **3** | | **JUMLAH JPP** | | **120** | | **KREDIT** | | **120 / 40 = 3** |  |  | | --- | | **KAEDAH PENGAJARAN** | | Syarahan menerusi *power point*/buku teks, perbincangan, projek, pembentangan dan tugasan |   **PERANCANGAN MINGGUAN**   |  |  |  | | --- | --- | --- | | Minggu 1 | : | Pengenalan Pendekatan Penulisan Ilmiah | | Minggu 2 | : | Rampai Penulisan Ilmiah | | Minggu 3 | : | Pola Penulisan Ilmiah | | Minggu 4 |  | Penanda Wacana dan Kata Hubung | | Minggu 5 | : | Kutipan | | Minggu 6 | : | Bibliografi | | Minggu 7 |  | Kesimpulan | | Minggu 8 | : | Cuti Pertengahan Semester | | Minggu 9 | : | Penyuntingan | | Minggu 10 | : | Penulisan Laporan | | Minggu 11&12 | : | Penulisan Kertas Kerja | | Minggu 13&14 | : | Pembentangan |   **RUJUKAN**   1. Ismail Ahmad (Ed.) (1990). *Gaya Dewan.* Kuala Lumpur:Dewan Bahasa dan Pustaka. 2. Mohd. Azhar Abd. Hamid et al. (2001). *Pengenalan kepada Penulisan Ilmiah.* Skudai: Penertbit Universiti Teknologi Malaysia. 3. Mohd. Khusairi Abdullah (1983*). Pelaksanaan Bahasa Malaysia Sebagai Bahasa Pengantar Pelajaran.* Kuala Lumpur:Dewan Bahasa dan Pustaka. 4. Mohd Saidin Ahmad Ishak (1992). *Ketrampilan Menulis.* Kuala Lumpur:Dewan Bahasa dan Pustaka. 5. Rahman Saari (1993). *Memahami Gaya Bahasa. Kuala* Lumpur:Dewan Bahasa dan Pustaka. 6. Sulaiman Masri (1990). *Penulisan Dalam Bahasa Malaysia Baku.* Kuala Lumpur:Dewan Bahasa dan Pustaka.   **PENILAIAN**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Bil.. | Penilaian | Jumlah | % setiap satu | % keseluruhan | | 1. | Tugasan (Individu) | 1 | 10 | 10 | | 2. | Projek (Kumpulan) | 1 | 40 | 40 | | 3. | Kuiz | 2 | 10 | 20 | | 4. | Peperiksaan Akhir | 1 | 30 | 30 | |  | **Jumlah Keseluruhan** |  |  | **100** | | |

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| **COURSE OUTLINE** | | |
| **International Business School (IBS)** | | **Page: 1 of 3** |
| **Course:** Organizational Behavior and Development (UDPE 1123)  **Lecture Hours**: 30 hours | | **Semester: I**  **Session: 2010/2011** |
| **Lecturer:** Lecturer(s) from BATC/FPPSM, UTM  **Synopsis:**  This course helps students integrate behavioral science theories, tools, concepts, and techniques learned in the lab to an OB application in a "real" organization. Participants are exposed to the important topics central to organizational development and change. Some of the topics include multiple views of organizations that influence organizational change, the evolution of organizational development and its challenges. The course also covers the nature of planned change, theories and types of change, the role of values and ethics in organizational change, and the concept of emergent change to enable participants to have an overall view of how available approaches to planned change management can be applied in organizational settings.  **Learning Outcomes:** At the end of the course, students will be able to:   |  |  |  |  | | --- | --- | --- | --- | | **No.** | **Course Learning Outcome** | **Programme Learning Outcome(s) Addressed** | **Assessment Methods** | | 1. | Describe the multiple views of organizations that influence organizational change | PO5, C2, LL1 | IP | | 2. | Apply the approaches to planned change management in practical situations. | PO5, C3, P3, LL1 | IP | | 3. | Analyse the perspectives of the individual in organizational change | PO4, C4, A2, P2, EM1 | IP,GP | | 4. | Apply the process of organizational development including initiating change and OD relationships, diagnosing organizational issues, and collecting and analyzing data as well as change implementation processes | PO2, PO5, C3, A2, P2,  CS1-CS3, CTPS1-CTPS3, | IP,GP, FE  **IP**-Individual Project/Assign  **GP**-Group Project/Assign | | | |
| **Prepared by:**  **Name: Prof. Dr. Ismail Rejab**  **Date: 27 June 2009** | **Certified by:**  **Name:**  **Date:** | |

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| Name of Faculty: FSKSM *Faculty of Computer Science and Information Systems, Universiti Teknologi Malaysia* | | | |  | | | |  | |
| **Name and Subject Code:**  *IT Project Management* ***(UCSM 1263)***  **Lecture hours:** *42 hours*  **Name of Lecturer(s):**  *Prof Dr Ahmad Zaki Abu Bakar* | | | | **Review:** | | | |  | |
| **Initial Date:** | | | | 2009 | |
| **Last Update:** | | | | 2 Jan 2010 | |
| **Edition:** | | | | 1 | |
| **Procedure:** | | | |  | |
|  | **LECTURERS’ DETAILS** | | | | | | | | |
|  | **Lecturer’s Name: Prof. Dr. Ahmad Zaki Abu Bakar**  **Room Number: Level 4, N28, Information Systems Dept, FSKSM, UTM Skudai**  **Room Telephone Number: +607-5532404/ +6012-7081170**  **E-mail:** zaki@utm.my | | | | | | | | |
|  | **SYNOPSIS** | | | | | | | | |
|  | This subject presents a hands-on perspective to Information Technology project management in an organization. This subject will assist post-graduate students to plan and implement their post-graduate projects as well as other IT projects effectively. The subject is organized into three main sections, which covers I) Basic concepts, life cycle and framework of project management II) Detailed description of each project management knowledge areas under the Project Management Institute (PMI) Body of Knowledge (PMBOK) and its applications and III) other project management methodologies such as Prince II, Adaptive and Extreme Project Management. The Project Management areas include – project integration, scope, time, cost, quality, human resource, communications, risk and procurement management. | | | | | | | | |
|  | **LEARNING OUTCOMES (LO)** | | | | | | | | |
|  | At the end of the semester, the student will have the: | | | | | | | | |
| **No.** | **Subject LO** | | | | | **Programme Learning Outcome(s) Addressed** | | | **Evaluation Method** |
| 1. | Ability to interpret and appreciate the knowledge of project management and its context to IT projects | | | | | PO5, C2, A3, LL1 | | | A |
| 2. | Ability to analyze the various knowledge of IT project management and communicate to others. | | | | | PO3, C4, CS1, CS3 | | | PR, SA, FA, E |
| 3. | Ability to apply concepts, tools and techniques in project integration, scope, time, cost, quality, human resource, communication, risk and procurement management in project management | | | | | PO5, C3, A2, P2, LL1, LL2 | | | PR, Prs, FA, E |
| 4. | Ability to transform resources criteria of IT project management into computer based project management tools | | | | | PO5, C5, P2, LL1 | | | A, Prs, FA, E |
|  | (**E** – Exam ; **PR** – Project ; **Q** – Quiz ; **A** – Assignment; **Prs** – Presentation ; **FA** – Final Exam;  **SA** – Scenario Analysis) | | | | | | | | |
|  | **GENERIC SKILLS ADDRESSED** | | | | | | | | |
|  | Identify and solve business problems | | | | | | | | |
|  | Ability to communicate expectations to team members | | | | | | | | |
|  | Ability to manage organizational constraints | | | | | | | | |
| **STUDENT LEARNING TIME** | | | | | | | | | |
| |  |  |  | | --- | --- | --- | | **No.** | **Aktiviti Pengajaran dan Pembelajaran** | **JPP** | |  | Pembelajaran Berpusatkan Pensyarah | 30 | |  | Pembelajaran Berpusatkan Pelajar | 12 | |  | Pembelajaran Tidak Bersemuka (tugasan, kajian kes, etc). | 40 | |  | Ulangkaji | 14 | |  | Persediaan Ujian dan Peperiksaan | 16 | |  | Penilaian Berterusan | 5 | |  | Peperiksaan Akhir | 3 | | **JUMLAH JPP** | | 120 | | **KREDIT** | | 120 / 40 = 3 | | | | | | | | | | |
|  | **TEACHING METHODS** | | | | | | | | |
|  | * Lecture by lecturers and guest speaker * Scenario analysis/Case studies and field assignments * In-class game & simulations * Laboratory and hands-on activities using current Project Management tools. | | | | | | | | |
|  | **WEEKLY PLAN** | | | | | | | | |
| **Week 1** | |  | * Introduction to Project Management * Project Types, Characteristics, Life Cycle & Stake Holders * Information Technology Context and Process * Project Management Process Groups | | | | | | |
| **Week 2** | |  | * Project Conceptualization- Project Definition, Selection, ToR, Vision, Mission, Objective & Scope | | | | | | |
| **Week 3** | |  | * Project Visual Communication & Road Mapping * Project Negotiation * Scenario Planning, Risk Analysis & Management * Group Presentation | | | | | | |
| **Week 4** | |  | * Computer Based Project Management Tools * Project Planning-Tools & Charts, Network Diagrams & Gantt Charts * Project Scheduling, Resource Allocation & Task Assignments on Project Management information system * Group Presentation | | | | | | |
| **Week 5** | |  | * Work Breakdown Structure (WBS) & task boarding * Group Presentation | | | | | | |
| **Week 6** | |  | * Project Cost Management- Budgeting, Cost Estimation * Project Procurement Management * Group Presentation | | | | | | |
| **Week 7** | |  | * Group Presentation and **Mid Term Exam** | | | | | | |
| **Week 8** | |  | **Mid-Semester Break** | | | | | | |
| **Week 9** | |  | * Project Organization & Control- Project Structures, Organizational Breakdown Structure (OBS) | | | | | | |
| **Week 10** | |  | * Project Human Management- Project Team & Leadership * Project Communication & Information Systems | | | | | | |
| **Week 11** | |  | * Project Implementation- Rollout, Monitoring, Control, Re-planning * Project Quality Management- Performance Measure & Quality * Project Integration Management | | | | | | |
| **Week 12** | |  | * Project Termination, Close-out & Auditing | | | | | | |
| **Week 13** | |  | * Project Management Issues – Prince II | | | | | | |
| **Week 14** | |  | * Project Management Issues – Adaptive & Extreme Project Management | | | | | | |
| **Week 15** | |  | * Final Project Presentation, Summary & Discussion | | | | | | |
| **Week 16 – 18** | |  | **Revision Week and Final Examination Week** | | | | | | |
|  | **ASSESSMENT** | | | | | | | | |
| Group Projects and Presentations (5) | | | | |  | | 50% | | |
| Individual Assignments and Presentation (1) | | | | |  | | 5% | | |
| One Mid-Term Exam | | | | |  | | 10% | | |
| Class Attendance, Active Participation & Involvement | | | | |  | | 5% | | |
| Final Examination | | | | |  | | 30% | | |
|  | **REFERENCES** | | | | | | | | |
|  | * Schwalbe, K. (2010). *Information Technology Project Management* (6th Ed. ed.): Course Technology. * Garton, C., & McCulloch (2005). E. *Fundamentals of Technology Project Management*. Lewisville, TX: Mc Press Online. * Douglas De Carlo (2004). eXtreme Project Management: Using Leadership, Principles, and Tools to Deliver Value in the Face of Volatility, Jossey Bas. ISBN: 978-0-7879-7409-1 * Joel Henry (2004). *Software Project Management*, Addison Wesley. * Larry Raymond (1994), “Reinventing Communication”, Toppan Company (S) Pte Ltd, ASQC Quality Press. ISBN 9810074328 * McConnell, S (2006)., *Software Estimation: Demystifying the Black Art*. Redmond, Wa: Microsoft Press. * Microsoft Project Tutorial * Richard Murch (2001), *Project Management-Pest Practices for Professionals*. * Stephen Covey, The 7 Habits of Highly Effective People * Project Management Institute, A Guide to the Project Management Body of Knowledge, available on PMI’s Web site at [www.pmi.org](http://www.pmi.org). * OGC (2005), Managing Successful Projects in PRINCE2. UK: TSO. * Thomsett, Rob (2002), “Radical Project Management”. Prentice Hall, Upper Saddle River. ISBN 0130094862. | | | | | | | | |

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| --- | --- |
| **Department/Faculty : Language Academy,UTM** |  |
| |  |  |  | | --- | --- | --- | | **Course Code** | **:** | **ULAJ 1163** | | **Course Name** | **:** | **Japanese Language for Postgraduates** | | **Total Meeting Hour** | **:** | **42 Hours** | | **Semester : 2**  **Academic Session : 2011/2012** |
| |  |  |  | | --- | --- | --- | | **Lecturer** | : | R.Kumaraguru | | **Room No.** | : | S44 B 01-04 | | **Telephone No.** | : | 07-5535157 | | **E-mail Address** | : | kumar@utm.my | | **Synopsis** | : | The ability to converse using foreign languages is an asset that is highly demanded in this era of globalization. This “***Japanese Language for Postgraduates***” course is specially designed to equip postgraduates with the basic skills of learning Japanese Language. This course is designed using the Y3K formula consisting of: Yomi (Reading), Kaki(Writing)-Hiragana & Katakana, Kiku(Listening) and Kaiwa (Speaking). Cultural elements will be incorporated in each lesson and students will be required to do a presentation about Japanese culture and work ethics. By the end of this course, the postgraduates will be able to read, write and converse in basic Japanese Language and this will benefit them in their future career.  . | | **LEARNING OUTCOMES**  By the end of the course, students should be able to:   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **No.** | **Course Learning Outcome** | **Programme Learning**  **Outcome**  **Addressed** | **Cognitive, Psychomotor and Affective Level** | **Assessment Method** | | **1** | pronounce and write Hiragana and Katakana | PO3 | C1 P3  CS1 | Q, Ex, T | | **2** | carry out basic daily conversation in Japanese | PO3 | C3 P3 A2  CS1 | Ex | | **3** | identify main ideas in short texts | PO1 | C3 | Q, T, Ex | | **4** | write a short essay | PO3 | C3 P3  CS1 | Q, T, Ex | | **5** | present the results of a study on Japanese culture / work ethics | PO3 | C3 P3 A3  CS3 | A, P | | | |   **STUDENT LEARNING TIME**   |  |  |  | | --- | --- | --- | | **No.** | **Aktiviti Pengajaran dan Pembelajaran** | **JPP** | |  | Pembelajaran Berpusatkan Pensyarah | 30 | |  | Pembelajaran Berpusatkan Pelajar | 12 | |  | Pembelajaran Tidak Bersemuka (tugasan, kajian kes, etc). | 42 | |  | Ulangkaji | 10 | |  | Persediaan Ujian dan Peperiksaan | 12 | |  | Penilaian Berterusan | 12 | |  | Presentation | 2 | | **JUMLAH JPP** | | 120 | | **KREDIT** | | 120 / 40 = 3 |  |  | | --- | | **TEACHING METHODOLOGY** | | Lecture and discussion  Communicative exercise in groups  Presentation |   **WEEKLY SCHEDULE**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Week 1 | : | 1.0  1.1  1.2 | | Introduction to Japanese Language for postgraduates course  Introduction–Sound System, writing & sentence structure of Japanese Language  Communicative Exercise / Quiz 1 | | | Week 2 | : | 2.0  2.1  2.2 | | Greetings 1  Hiragana あ - か  Exercise komunikasi /Quiz 2 | | | Week 3 | : | 3.0  3.1  3.2 | | Greetings 2  Hiragana さ - た  Vocabulary, Communicative Exercise / Quiz 3 | | | Week 4 | : | 4.0  4.1  4.2 | | Greetings 3  Hiragana な – は　/ Usage of ‘ はい・いいえ’  Vocabulary, Communicative Exercise / Quiz 4 | | | Week 5 | : | 5.0  5.1  5.2 | | Greetings 4  Self-Introduction 1  Hiragana ま – や　/ Vocabulary, Communicative Exercise / Quiz 5 | | | Week 6 | : | 6.0  6.1  6.2 | | Greetings 5  Self-Introduction 2  Hiragana らーん/ Vocabulary / Quiz 6 / Exercise Jexs 1 | | | Week 7 | : | 7.0  7.1  7.2 | | Number 0 – 100  Introducing Friend / Exercise Jexs 2  **TEST 1** | | | Week 8 | : | **Mid Semester Break (Yasumi)** | | | | | Week 9 | : | 9.0  9.1  9.2 | | Number 100 – 10 000  Particle ‘は ‘  Hiragana が - ぽ / Communicative Exercise / Quiz 7  ***Presentation & Discussion*** | | | Week 10 | : | 10.0  10.1  10.2 | | Particle ‘も’ & ‘の’  Question & Answer “なん、なんの、だれ、どこ”  Hiragana きゃ - ぴょ / Vocabulary/ Quiz 8  ***Presentation & Discussion*** | | | Week 11 | : | 11.0  11.1  11.2 | | Naming objects 1- これ・それ・あれ  Hiragana はつおん・長音 / Vocabulary  Quiz 9 / Exercise Jexs 3  ***Presentation & Discussion*** | | | Week 12 | : | | 12.0  12.1  12.2 | | Naming objects 2- この・その・あの  Question & Answer “だれの、どなた”  Revision for Hiragana / Vocabulary / Quiz 10  ***Presentation & Discussion*** | | Week 13 | : | | 13.0  13.1 | | Reading Number – Age/ Year/ Telephone Number  Exercise Jexs 4  ***Presentation & Discussion*** | | Week 14 | : | | 14.0  14.1 | | Verbs 1 / Particle ‘ を’ / Exercise Jexs 5  Revision | | Week 15 | : | | 15.0  15.1 | | Verbs 2  **Test 2** |   **REFERENCES**  1. Tada Yone etc (1998). *Minna No Nihongo*. Tokyo: Surie Network  2. Tsuyako Coveney ets (1993). *Japanese In Modules*. Tokyo : ALC Press Japanese Textbook Series  3. Yasuko Kosaka Mitamura (2003). Let’s Learn Hiragana.Tokyo: Kodansha International    **GRADING**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **No.** | **Assessment** | **Quantity** | **Percentage (%)** | **Total Percentage (%)** | **Assessment week** | | 1. | Attendance | 14 | ½ | 7 | Week 1 - 15 | | 2. | Quiz (Q)  Writing | 10 | 1 | 10 | Week 1 - 12 | | 3. | Exercise JEXs (Ex) | 5 | 2 | 10 | Week 6, 7, 11, 13, 14 | | 4. | Assignment / Visit (A) | 1 | 10 | 10 | Week 13-16 | | 5. | Test (T) | 2 | 25 | 50 | Week 8 & 15 | | 6. | Presentation (P) | 1 | 13 | 13 | Week 9 -13 | | **Total** | | | | **100** |  | | |

**LAMPIRAN 1I**

**SENARAI KURSUS/KURIKULUM MENGIKUT SEMESTER**

**Jadual 5**

**Contoh Skema Pengajian Bagi Pelajar Sepenuh Masa**

| **Semester** | **Kod** | **Kursus** | **Kredit** |
| --- | --- | --- | --- |
| **TAHUN 1** | | | |
| **I**  **(LAZIM)** | MRSM1213 | Engineering Design Optimization | 3 |
| MRSM 1243 | Materials Selection and Manufacturing Process | 3 |
| MRSM 1233 | Engineering Design Process & Methodology | 3 |
| URSP 0013 | Research Methodology | 3 |
| MXXX XXX3 | Elective 1 | 3 |
|  |  | **Jumlah Kredit** | **15** |
| **II**  **(LAZIM)** | MRSM 1253 | Computer-Aided Design (CAD) / Computer-Aided Engineering (CAE) | 3 |
| MRSM 1223 | Technovation Management | 3 |
| MXXX XXX3 | Elective 2 | 3 |
| MRSM 1914 | Master Project 1 | 4 |
| UXX XXX3 | (University General Course) | 3 |
|  |  | **Jumlah Kredit** | **16** |
| **TAHUN 2** | | | |
| **I**  **(LAZIM)** | MRSE 2603 | Creativity and Innovation Management | 3 |
| MXXX XXX3 | Elective 3 | 3 |
| MXXX XXX3 | Elective 4 | 3 |
| MRSM 2926 | Master Project 2 | 6 |
|  |  | **Jumlah Kredit** | **15** |
|  | **Jumlah Kredit Keseluruhan** | | **46** |

**Jadual 6**

**Contoh Skema Pengajian Bagi Pelajar Separuh Masa**

|  |  |  |  |
| --- | --- | --- | --- |
| **Semester** | **Kod** | **Kursus** | **Kredit** |
| **TAHUN 1** | | | |
| **I**  **(Lazim)** | MRSM 1213 | Engineering Design Optimization | 3 |
| MRSM 1243 | Materials Selection and Manufacturing Process | 3 |
| MRSE 2603 | Creativity and Innovation Management | 3 |
|  |  | **Jumlah Kredit** | **9** |
| **II**  **(Lazim)** | MRSM 1233 | Engineering Design Process & Methodology | 3 |
| MRSM 1223 | Technovation Management | 3 |
| MXXX XXX3 | Elective 1 | 3 |
|  |  | **Jumlah Kredit** | **9** |
| **TAHUN 2** | | | |
| **I**  **(Lazim)** | MXXX XXX3 | Elective 2 | 3 |
| MRSM 1253 | Computer-Aided Design (CAD) / Computer-Aided Engineering (CAE) | 3 |
| URSP 0013 | Research Methodology | 3 |
|  |  | **Jumlah Kredit** | **9** |
| **II**  **(Lazim)** | MRSM 1914 | Master Project 1 | 4 |
| UXX XXX3 | (University General Course) | 3 |
|  |  | **Jumlah Kredit** | **7** |
| **TAHUN 3** | | | |
| **I**  **(Lazim)** | MXXX XXX3 | Elective 3 | 3 |
| MXXX XXX3 | Elective 4 | 3 |
|  |  | **Jumlah Kredit** | **6** |
| **II**  **(Lazim)** | MRSM 1914 | Master Project 2 | 6 |
|  |  | **Jumlah Kredit** | **6** |
|  | **Jumlah Kredit Keseluruhan** | | **46** |

**LAMPIRAN 1J**

**SENARAI LEMBAGA PENGAJIAN DAN MINIT MESYUARAT PROGRAM**

**Keahlian Lembaga Pengajian:**

1. **Keahlian dari luar UTM**

|  |  |  |  |
| --- | --- | --- | --- |
| **Bil.** | **Ahli** | **Fakulti/ IPTA/ Industri** | **Jawatan** |
| 1 | Ir Md Khir Mohamad | Ikasuri Sdn Bhd/ The Institution of Engineer, Southern Region | Project/Executive Director |
| 2 | En. Norhizam Hamzah | Astronautic Technology (M) Sdn Bhd | Senior Vice President |
| 3 | Ahmad Nizar Harun | Mimos Bhd | Senior Staff Engineer |
| 4 | Dr. Zainal Fitri | PROTON | Section Manager |
| 5 | Prof. Dr. Norhamidi Muhamad | Universiti Kebangsaan Malaysia | Department of Mechanical & Materials Engineering, Faculty of Engineering and Built Environment |
| 6 | Assoc. Prof. Dr. Siti Zawiyah Md. Dawal | Universiti Malaya | Associate Professor, Department of Engineering Design and Manufacture, Faculty of Engineering |
| 7 | Prof. Dr. Roslan Abdul Rahman | Universiti Teknologi Malaysia | Dean /Professor, Faculty of Mechanical Engineering |
| 8 | En. Khairul Azli Khalid | Energy Quest Sdn. Bhd. | Senior Reservoir Engineer |

1. **Keahlian dari UTM:**

|  |  |  |
| --- | --- | --- |
| **Bil.** | **Ahli** | **Fakulti / Jabatan** |
| 1 | Prof. Dr. Awaluddin bin Mohamed Shaharoun | Dekan, Sekolah Razak UTM |
| 2 | Prof. Dr. Sha’ri bin Mohd Yusof | Timbalan Dekan,  Sekolah Pengajian Siswazah UTMKL |
| 3 | Prof. Madya Dr Zalina binti Mohd Daud | Timbalan Dekan Akademik,  Sekolah Razak UTM |
| 4 | Prof. Madya Dr. Abd. Rahman bin Abdul Rahim | Ketua Jabatan Kejuruteraan,  Sekolah Razak UTM |
| 5 | Prof. Madya Dr. Khairur Rijal bin Jamaluddin | Pengurus Akademik Pengajian Siswazah,  Sekolah Razak UTM |
| 6 | Dr. Mohd. Yusof bin Daud | Ketua Panel Mekanikal,  Sekolah Razak UTM |
| 7 | Dr. Kamilah binti Radin Salim | Ketua Panel Elektrik,  Sekolah Razak UTM |
| 8 | Prof. Madya Dr. Robiah binti Ahmad | Pensyarah Jabatan Kejuruteraan,  Sekolah Razak UTM |
| 9 | Prof. Madya Dr. Astuty binti Amrin | Pensyarah Jabatan Kejuruteraan,  Sekolah Razak UTM |
| 10 | Dr. Habibah @ Norehan binti Haron | Pensyarah Jabatan Kejuruteraan,  Sekolah Razak UTM |
| 11 | Dr. Hairi bin Zamzuri | Pensyarah Jabatan Kejuruteraan,  Sekolah Razak UTM |
| 12 | Dr. Norliza binti Mohamed | Pensyarah Jabatan Kejuruteraan,  Sekolah Razak UTM |
| 13 | En. Norazmein bin Abdul Raman | Pensyarah Jabatan Kejuruteraan,  Sekolah Razak UTM |

**Minit Mesyuarat Lembaga Pengajian**

**SEKOLAH RAZAK UTM DALAM KEJURUTERAAN DAN TEKNOLOGI TERMAJU**

**Tarikh : 22 Februari 2013**

**Masa : 9.00 – 12.15 petang**

**Tempat : Bilik Seminar 1, Canseleri, UTM Kuala Lumpur**

**Hadir:**

**Panel Luar**

|  |  |
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| 1. Ir. Md Khir Mohamad 2. En. Norhizam Mohamad 3. En. Ahmad Nizar Harun 4. Dr. Zainal Fitri 5. Prof. Dr. Norhamidi Muhamad 6. Assoc. Prof. Dr. Siti Zawiyah Md. Dawal 7. Prof. Dr. Roslan Abdul Rahman 8. En. Khairul Azli Khalid | Executive Director Ikasuri Sdn. Bhd. / IEM Southern Region  Senior Vice President / Astronautic Technology (M) Sdn. Bhd.  Senior Staff Engineer / MIMOS Bhd  Section Manager / Proton Malaysia  Professor / Faculty of Engineering and Built Environment  Department of Engineering Design and Manufacture, University Malaya  Dean / Faculty ofMechanical Engineering, UTM Skudai  Senior Reservoir Engineer/ Energy Quest Sdn. Bhd. |

**Panel UTM Kuala Lumpur:**

|  |  |
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| 1. Prof. Dr Awaludin Mohd Shaharoun 2. Prof. Sha’ri Mohd Yusof 3. Assoc. Prof. Dr. Abd. Rahman Abdul Rahim 4. Assoc. Prof. Dr Zalina Mod Daud 5. Assoc. Prof. Dr. Khairur Rijal Jamaluddin 6. Dr. Mohd Yusof Daud 7. Dr. Kamilah Radin Salim 8. Assoc. Prof. Dr. Robiah Ahmad 9. Dr. Habibah @ Norehan Haron 10. Dr. Norliza Mohamed 11. Dr. Hairi Zamzuri 12. En. Norazmein Abdul Raman | Dean / UTM Razak School, UTM Kuala Lumpur  Deputy Dean Sekolah Pengajian Siswazah / UTM Kuala Lumpur  Head of Engineering Department / UTM Razak School, UTM Kuala Lumpur  Deputy Dean Academic / UTM Razak School  Academic Manager Post Graduate Studies / UTM Razak School, UTM Kuala Lumpur  Head of Panel Mechanical Engineering / UTM Razak School, UTM Kuala Lumpur  Head of Panel Electrical Engineering / UTM Razak School, UTM Kuala Lumpur  Lecturer / UTM Razak School, UTM Kuala Lumpur  Lecturer / UTM Razak School, UTM Kuala Lumpur  Lecturer / UTM Razak School, UTM Kuala Lumpur  Lecturer / UTM Razak School, UTM Kuala Lumpur  Lecturer / UTM Razak School, UTM Kuala Lumpur |

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| **Bil.** | **Perkara** | **Makluman (M) / Tindakan (T)** |
| 1 | **Aluan Pengerusi**   * 1. Mesyuarat dimulakan dengan bacaan surah Al-Fatihah   2. Pengerusi mengalu-alukan kedatangan semua ahli Lembaga Pengajian program baru Master of Science (Engineering Design) (MSED)dan menerangkan tujuan mesyuarat adalah untuk mendapat maklumbalas, cadangan penambahbaikan dan seterusnya menyokong penubuhan program ini   3. Majlis takruf oleh kesemua ahli mesyuarat   4. Ketua Jabatan Kejuruteraan, Assoc. Prof. Dr. Abdul Rahman meyampaikan persembahan power point mengenai program MSED | M: Semua |
| 2 | **Maklumbalas dari Prof. Dr. Norhamidi**   * PO1 – aspek innovasi, mesti ada dalam kursus teras.   Mapping dalam kursus yang ditawarkan dan reflect dalam silibus / kandungan kursus. i.e. MRSM 1233. Rewrite CO4 to cater PO3. Move forward the lectures to 10 weeks and the rest of the weeks for students to finish their project.   * PO3 – aspek kepimpinan, mesti ada dalam kursus teras. Mapping dalam kursus yang ditawarkan dan reflect dalam silibus / kandungan kursus * Cadangan dimasukkan aspek penting dalam engineering design seperti (disokong En Nizar): * IP / Patent Filing * Legal issues * Ethics * Creativity and Innovative or Innovative Engineering Design dalam kursus teras * Innovative curriculum - Hands on experience from project planning, distribution of work among group members, budgeting/costing, marketing | T: Ahli JK MSED |
| 3 | **Maklumbalas dari Ir. Mohd. Khir**   * Program perlu focus kepada target market – adakah untuk broad application or focus * Will add value to the program if the program can co-corporate with IEM in helping fresh graduate to be graduate engineer i.e. tailored to professional qualified engineers | T: Ahli JK MSED |
| 4 | **Maklumbalas dari Dr. Zainal Fitri**   * Cadangan dimasukkan aspek penting dalam engineering design seperti: * New Product Design/Product development process * Product Life Cycle Management * Creativity * Will be good if the course could give CPD hours which other engineers/ beside students could attend * Entry requirement – Engineers / Fresh Graduates / Science Background | T: Ahli JK MSED |
| **5** | **Maklumbalas dari En. Nizar**   * Kursus yang menekan aspek generating ideas – process to follow in generating new ideas in come up with new product / process * New issues and trend to be included in the course: * Renewable energy * Internet of thing * Sensor technology * Good program – address current tools in engineering design. Some of the courses offered are attractive and hope to be opened to people outside UTM * Lab facilities – i.e. MRSM 2362 Microprocessor System Design | T: Ahli JK MSED |
| **6** | **Maklumbalas dari Assoc. Prof. Dr. Zawiyah**   * MRSM 2323 Industrial Design and Human Factors – a bit fundamental / undergraduate level. Suggested topics to be included: * Visualization and human factor * Inclusive design * Current design concept * Look for niche area and marketability of the program. Create UTM Razak School branding for the program * Manufacturing and statistics aspects should be included in any of the courses | T: Ahli JK MSED |
| **7** | **Maklumbalas dari En. Norhizam**   * Overall intention of the program is good * Cadangan dimasukkan aspek penting dalam curriculum seperti: - go towards real life situation: * Leadership Skill * Management Skill / Elements – legal, Scheduling, psychological issues,finance, costing * Communication Skills – Oral and Written (i.e. written technical skills) * Irrelevant courses – Advanced mathematics and Scientific Computing. Other courses are relevant to the program. Ada element mechanical, electrical, embedded system * Jemput penceramah luar i.e. engineers from industries / professors to share recent / currents tools and developments in related topics to the program | T: Ahli JK MSED |
| **8** | **Maklumbalas dari En. Khairul Azli**   * Irrelevant courses – Advanced Mathematics – should remove and place to electives * For multi-disciplinary background – students have the option to chooses some courses from other electives * Multi-displinary group project that combine students from diverse background – electrical, mechanical, etc. | T: Ahli JK MSED |
| **9** | **Maklumbalas dari Prof. Dr. Sha’ri**   * Each course should address maximum of 3 POs i.e. MRSM 1233 and MRSM 1253 * The course code for open elective course should be MXX XXXX | T: Ahli JK MSED |
| **10** | **Maklumbalas dari Prof. Dr. Roslan**   * The program should address UTM tag line – Innovative, entrepreneurial, global * Agrees with Prof. Dr. Shari and AP Dr. Zalina – each course should address maximum of 3 POs | T: Ahli JK MSED |

Mesyuarat berakhir jam 12.15 petang dan diakhiri dengan bacaan surah Al Asr.

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| Disediakan oleh: | Disemak oleh: |
| Prof. Madya Dr. Robiah Ahmad (Pencatat Minit) | Dekan, Sekolah Razak UTM (Pengerusi) |

**LAMPIRAN 1K**

**LAPORAN TINJAUAN RELEVANSI PROGRAM SARJANA KEJURUTERAAN REKA BENTUK**

**TINJAUAN RELEVANSI PROGRAM SARJANA KEJURUTERAAN REKA BENTUK**

1. **Pengenalan**

Format soal selidik kajian pasaran terbahagi kepada **TIGA** bahagian utama yang mengandungi sebilangan soalan di dalam setiap bahagian; **Bahagian I** (7 soalan), **Bahagian II** (5 soalan) dan **Bahagian III** (2 soalan). Bahagian I menyentuh kandungan program dan komen responden terhadap program yang ditawarkan.Bahagian II meliputi peluang kerjaya, keperluan organisasi, jangkaan pendapatan bakal graduan program ini.Bahagian III menyentuh kesediaan majikan member insentifkepada staf untuk menyertai program ini serta kebolehpasaran graduat program yang berkaitan.Umumnya, organisasi yang diwakili responden dikategorikan kepada **tiga** jenis; (i) milik kerajaan, (ii) milik asing dan (iii) milik tempatan.

1. **Objektif Tinjauan**
2. Untuk mengetahui potensi kebolehpasaran graduat bidang Sarjana Kejuruteraan Reka bentuk.
3. Untuk mendapatkan maklumbalas berkenaan cadangan kandungan kurikulum Sarjana Kejuruteraan Reka bentuk.
4. **Kaedah**
5. Mengedar maklumat program dan borang soal selidik.

*Kandungan borang soal selidik diolah berdasarkan borang soal selidik Kementerian Pengajian Tinggi, Malaysia.*

1. Analisis data daripada borang soal selidik yang telah dikumpulkan.
2. Mengemukakanrumusan dan saranan sebagai panduan menambah baik cadangan kurikulum Sarjana Kejuruteraan Reka bentuk.
3. **Keputusan**

Seramai **95 responden** berjaya diperolehi daripada organisasi yang disasarkan di mana nisbahnya 25% daripada milik kerajaan, 42% milik tempatan dan selebihnya 33% milik asing.

* 1. **Bahagian I (Kesesuaian Kandungan Program Yang Ditawarkan Dengan Keperluan Organisasi**

**71%** daripada kesemua responden berpendapat teori-teori asas menurut disiplin ilmu yang terkandung di dalam program telah dirangkum.Baki responden melihat hanya sebahagian sahaja teori-teori asas yang diutarakan memenuhi keperluan kandungan program.Walau bagaimanapun dari satu sudut pandangan **96%** responden bersetuju bahawa teori-teori tersebut relevan dengan permasalahan semasa dan ini menyumbang kepada kekuatan program.Kesesuaian subjek yang terkandung di dalam program ini mendapat respon positif daripada kebanyakan responden (**85%**). Terdapat juga cadangan supaya menambah subjek Pengurusan Projek di dalam kurikulum ini. Responden turut diminta untuk menyatakan sejauh mana tahap program ini dengan mengambil kira empat ciri seperti yang tertera di dalam **Jadual 1** yang berikut:

Jadual 1 Tahap program dengan mengambil kira keempat-empat ciri.

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| CIRI-CIRI | TAHAP | |
| SEPENUHNYA | SEBAHAGIAN |
| 1. Perundangan 2. Penggunaan teknologi komunikasi dan maklumat 3. Penggunaan analisis berangka 4. Bertepatan dengan kehendak industri | 40%  75%  55%  60% | 60%  25%  45%  40% |

Hampir kesemua (**94%**) responden bersetuju dengan tempoh masa pengajian (3 semester secara sepenuh masa) untuk program ini. Selebihnya mencadangkan sekurang-kurangnya 4 semester bagi mencapai tahap keperluan industri.

* 1. **Bahagian II (Prospek Kerjaya)**

Umumnya responden berpendapat graduat program ini sesuai bekerja di organisasi masing-masing. Sebahagian besar responden berpendapat tahap kesesuaian bidang kerja tertinggi dengan program ini ialah reka bentuk kejuruteraan disusuli bidang penyelidikan dan pembangunan, reka bentuk produk dan pembangunan produk (**Rajah 1**).Turutan kesesuaian jawatan yang terdapat di dalam organisasi responden didahului dengan Jurutera Reka bentuk diikuti dengan Jurutera Pembangunan Produk seterusnya Pengurus Teknikal (**Rajah 2**). Ada juga yang mencadangkan jawatan Jurutera Sistem dan Pembangunan Perniagaan.

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| Rajah 1 | Rajah 2 |

Prospek graduan program ini adalah positif seperti yang digambarkan oleh **Rajah 3** di mana setiap organisasi berupaya memperuntukkan sekurang-kurangnya satu jawatan dan anggaran pencapaian pendapatan sekurang-kurangnya RM 3,000 seperti yang ditunjukkan di dalam **Rajah 4** oleh sebahagian besar responden membuktikan graduat program ini mempunyai nilai tersendiri dan sangat diperlukan di dalam sektor kejuruteraan. Kelebihan graduat terus diiktiraf dengan kesediaan organisasi responden menawarkan kenaikan pangkat (**Rajah 5**).

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| Rajah 3 | Rajah 4 |
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| Rajah 5 | |

* 1. Bahagian III (Lain-lain)

Hanya satu pertiga (33%) daripada organisasi responden menaja pelajar di dalam bidang yang setara dengan program ini. Namun begitu program ini berpeluang mendapat sambutan baik berdasarkan kesediaan sebahagian besar organisasi responden (83%) memberi galakan kepada staf menyertai program ini. Sejumlah 98% responden bersetuju bahawa program ini berupaya meningkatkan kebolehan seseorang jurutera atau pengurus. Kesesuaian program ini dinaikkan taraf ke peringkat PhD dipersetujui oleh 75% daripada responden. Justeru, fleksibiliti program ini terserlah. Aspek keboleh pasaran graduat program ini diperakukan lebih 90% responden berdasarkan rumusan pendapat seperti yang berikut:

1. Dapat meningkatkan daya saing jurutera tempatan berbanding jurutera dari luar negara.
2. Mencadangkan elemen analisis risiko dimasukkan ke dalam program.
3. Menepati keperluan semasa dan nilai tambah kepada staf dari aspek keterampilan, kematangan, pengalaman dan pengetahuan.

**LAMPIRAN 1L**

**MATRIKS HASIL PEMBELAJARAN PROGRAM DAN HASIL PEMBELAJARAN KPT DAN MQA**

**MAPPING OF PROGRAM OUTCOMES OF**

**MASTER OF SCIENCE (ENGINEERING DESIGN) AGAINST MQA AND MOHE OUTCOMES**

1. Pengetahuan

2. Kemahiran teknikal/ praktikal/ psikomotor

3. Pendekatan kemahiran berfikir dan saintifik

4. Kemahiran berkomunikasi

5. Kemahiran sosial dan bertanggungjawab

6. Profesionalisme, nilai, sikap dan etika

7. Pendidikan sepanjang hayat dan pengurusan informasi

8. Kemahiran pengurusan dan keusahawanan

9. Kemahiran Kepemimpinan

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| **PO for MSED** | **MQA** | | | | | | | | **MOHE** | | | | | | | | |
|  | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
| 1. Demonstrate the ability to use advanced engineering design knowledge to develop or create innovative product and process solution in a new situation or context. | **√** | **√** |  |  |  |  |  |  | **√** | **√** |  |  |  |  |  |  |  |
| 1. Analyze and evaluate problems critically and provide solutions through the use of appropriate tool and techniques. |  |  |  |  |  | **√** |  |  |  |  | **√** |  |  |  |  |  |  |
| 1. Assess the situation and communicate clearly with findings, knowledge and rational recommendations to friends and experts in related fields and able to lead and work in teams |  |  |  |  | **√** |  |  |  |  |  |  | **√** |  |  |  |  | **√** |
| 1. Plan and carry out design work / project professionally, ethically and responsibly, taking into consideration the interest of taruh and the environment. |  |  | **√** | **√** |  |  |  |  |  |  |  |  | **√** | **√** |  |  |  |
| 1. Organize and adapt contemporary knowledge independently and manage information effectively throughout the life |  |  |  |  |  |  |  | **√** |  |  |  |  |  |  |  | **√** |  |
| 1. Manage complex matters (project / study / experiment), and identify business opportunities |  |  |  |  |  |  | **√** |  |  |  |  |  |  |  | **√** |  |  |
| **Total attributes matched** | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

**LAMPIRAN 1M**

**PROFIL PENSYARAH**

**SENARAI PENSYARAH YANG MENGAJAR BAGI PROGRAM MSED**

**SEKOLAH RAZAK UTM DALAM KEJURUTERAAN DAN TEKNOLOGI TERMAJU**

**Panel Mekanikal**

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| **Bil** | **Nama**  **Pensyarah** | **Jawatan** | **Kelulusan**  **Tertinggi** | **Bidang** | **Subjek yang diajar** |
| 1 | Dr. Awaluddin  Saharoun | Professor | PhD (Loughborough Univ., UK) | Manufacturing | * Technovation Management * Life Cycle Cost Analysis For Engineers |
| 2 | Dr. Sha’ari Yusof | Professor | PhD (Univ. of Birmingham, UK) | Quality Management | * Systematic Inventive Problem Solving And Innovation (TRIZ) * Robust Product Design |
| 3 | Dr. Abdul Rahman Abdul Rahim | Prof.  Madya | PhD (UTM) | Mechanical Engineering | * Design For Sustainability, Manufacturing And Assembly * Systematic Inventive Problem Solving And Innovation (TRIZ) * Industrial Design And Human Factors |
| 4 | Dr. Robiah Ahmad | Prof.  Madya | PhD (UTM) | Mechanical Engineering | * Mechatronics System Design * Systematic Inventive Problem Solving And Innovation (TRIZ) |
| 5 | Dr. Astuty Amrin | Prof.  Madya | PhD (UTM) | Mechanical Engineering | * Materials Selection and Manufacturing Process * Research Methodology |
| 6 | Dr. Khairur Rijal Jamaludin | Prof. Madya | PhD (UKM) | Mekanikal dan Bahan | * Technovation Management Engineering Design Process And Methodology * Entrepreneurship And Marketing * Robust Product Design * Fluid Power |
| 7 | Dr. Habibah [@ Norehan](mailto:@Norehan) Haron | Pensyarah  Kanan | PhD (UTM) | Engineering Education | * Life Cycle Cost Analysis For Engineers * Design For Sustainability, Manufacturing And Assembly * Industrial Design And Human Factors |
| 8 | Dr. Mohd. Yusof Daud | Pensyarah  Kanan | PhD (Glasgow Univ., UK) | Vibration Analysis | * New Product Development * Creativity and Innovation Management * Materials Selection and Manufacturing Process |
| 9 | Dr. Mohamed Azlan Suhot | Pensyarah  Kanan | PhD (Univ. of Southampton, UK) | Mechanical Engineering | * Materials Selection and Manufacturing Process |
| 10 | Dr. Shamsul Sarip | Pensyarah  Kanan | PhD (Univ. of Bradford, UK) | Mechanical Engineering | * Computer-Aided Design (CAD) / Computer-Aided Engineering (CAE) * Automotive Engineering Design * Fluid Power |
| 11 | Dr. Roslina Mohamad | Pensyarah  Kanan | PhD (Univ. of Adelaide, Australia) | Mechanical Engineering | * Metrology and Measurement * Automotive Engineering Design |
| 12 | Dr. Sa’ardin Abdul Aziz | Pensyarah  Kanan | PhD (Univ. of Glasgow, UK) | Mechanical Engineering | * Automotive Engineering Design * Engineering Design Process & Methodology * Metrology and Measurement |
| 13 | Dr. Lim Meng Hee | Pensyarah  Kanan | PhD (UTM) | Mechanical Engineering | * Computer-Aided Design (CAD) / Computer-Aided Engineering (CAE) * Mechatronics System Design |
| 14 | Dr. Abdelgadir Mohamed Mahmoud | Pensyarah Kanan | PhD (UTM) | Mechanical Engineering | * Computer Aided Design (CAD) / Computer Aided Engineering (CAE) * Design for Reliability * Engineering Design Optimization |
| 16 | Sallehuddin Muhamad | Prof. Madya | M. Eng. (UTM) | Mekanikal | * Engineering Design Optimization * Creativity and Innovation Management * Design for Sustainability, Manufacturing and Assembly |
| 17 | Norazmein Abdul Raman | Pensyarah |  | Mekanikal | * Design for Sustainability, Manufacturing and Assembly * Creativity and Innovation Management * Industrial Design & Human Factors |

**Panel Elektrik**

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| **Bil** | **Nama**  **Pensyarah** | **Jawatan** | **Kelulusan**  **Tertinggi** | **Bidang** | **Subjek Yang Diajar** |
| 1 | Dr. Liza Latiff | Prof. Madya | PhD (UTM) | Electrical Engineering | * Wireless Communications Systems |
| 2 | Dr. Norliza Mohd Noor | Prof. Madya | PhD (UTM) | Electrical Engineering | * Advanced Digital System Design |
| 3 | PM Dr. Morina binti Abdullah | Prof. Madya | PhD (UTM) | Engineering  Education | * Microprocessor System Design |
| 4 | Dr. Hairi Zamzuri | Pensyarah Kanan | PhD (Loughborough Univ., UK) | Control Engineering | * Mechatronics System Design * System Processors and Peripherals |
| 5 | Dr. Kamilah binti Radin  Salim | Pensyarah Kanan | PhD  (UTM) | Engineering  Education | * Research Methodology |
| 6 | Dr. Noor Hamizah  Hussain | Pensyarah Kanan | PhD  (UTM) | Engineering  Education | * Research Methodology |
| 7 | Dr. Norliza binti Mohamed | Pensyarah | PhD (UTM) | Electrical Engineering | * Advanced Communications Electronics |
| 8 | Dr. Rudzidatul Akmam binti Dziyauddin | Pensyarah | PhD (Univ. of Bristol, UK) | Elektrikal  dan  Elektronik | * Wireless Communications Systems * Advanced Sensor System |
| 9 | Dr. Siti Zura Abd Jalil | Pensyarah | PhD (UiTM) | Telecommunication | * Advanced Digital System Design |

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| 10 | Dr. Nelidya bt. Yusoff | Pensyarah | PhD (UPM) | Photonics | * Advanced Communications Electronics * Advanced Sensor System |
| 11 | Dr. Azri bin Mohd Izhar | Pensyarah | PhD (UTM) | Electrical engineering | * Advanced Communications Electronics * Wireless communications electronics |

**Jabatan Pengurusan, Sekolah Razak UTM**

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| **Bil** | **Nama**  **Pensyarah** | **Jawatan** | **Kelulusan**  **Tertinggi** | **Bidang** | **Subjek Yang Diajar** |
| 1 | Dr. Hayati @Habibah Abdul Talib | Pensyarah | PhD | Business Management | * Entrepreneurship and Marketing |

**LAMPIRAN 1N**

**GARIS PANDUAN SYARAT KEMASUKAN**

**GARIS PANDUAN PENILAIAN**

**SYARAT KEMASUKAN 1998 PINDAAN 1/2013 (Mod Kerja Kursus)**

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| **BIL.** | **KELAYAKAN** | **LAIN-LAIN IPT** | **GRADUAN UNIVERSITI BERTARAF DUNIA** |
| 1. | Kelas Pertama  Kelas Kedua Atas (II : I)  CPA 4.00 : > 3.00  Score 20 : > 15  CPA 5.00 : > 3.75  Marks 100 ( %) > 75%  Marks 1000 : > 750  Lulus dengan Cemerlang (Excellent Pass | Tidak Perlu Pengalaman  Pengiktirafan JPA | Tidak Perlu Pengalaman |
| 2. | Kelas Kedua Bawah (II : II)  CPA 4.00 : 2.70 < CPA < 3.00  Score 20 : 13.5 < CPA < 15  CPA 5.00: 3.38 < CPA < 3.75  Marks 100 (%) :67.5 % < CPA < 75%  Marks 1000 : 675 < CPA < 750  Lulus dengan Sangat Baik (Very Good Pass) | 2 tahun pengalaman pekerjaan dalam bidang berkaitan  Pengiktirafan JPA | 1 tahun pengalaman pekerjaan dalam bidang berkaitan  \* |
| 3. | Kelas Kedua Bawah (II : II)  CPA 4.00 : 2.50 < CPA < 2.70  Score 20 : 12.5 < CPA < 13.5  CPA 5.00 : 3.13 < CPA 3.38  Marks 100 (%) : 62.5% < CPA < 67.5%  Marks 1000 : 625 < CPA < 675  Lulus dengan Baik (Good Pass) | 4 Tahun pengalaman pekerjaan dalam bidang berkaitan  Pengiktirafan JPA | 3 tahun pengalaman  \* |

**\* Tertakluk kepada - LULUS IJAZAH SARJANA MUDA DENGAN JAYANYA**

**SYARAT BAHASA INGGERIS (BAGI MAHASISWA ANTARABANGSA):**

Semua pelajar antarabangsa yang memohon di UTM mesti mempunyai sijil IELTS band 6 ataupun TOEFL skor 550 (atau 79 IBT) yang tempoh sah laku 2 tahun dari tarikh lulus.

*(All international students applying to UTM must have a valid two-year old TOEFL or IELTS certificate. Students with a TOEFL score of 550 (or 79 IBT) or an IELTS Band 6.)*

Bermula dari ambilan semester II/2010/2011, pelajar yang memohon untuk program Sarjana atau Phd - Pengajaran Bahasa Inggeris sebagai Bahasa Kedua, mesti mempunyai sijil IELTS band 7 ke atas ataupun TOEFL skor 600 ke atas (atau IBT/CBT dengan markah setara) yang tempoh sah laku 2 tahun dari tarikh lulus.

(*Starting from Semester II/2010/2011, students who applied for Master or PhD programme - Teaching English as a Second Language, must have a valid two-year certificate of TOEFL with a score of 600 and above or IELTS Band 7 and above (or IBT/CBT equivalent).*

**LAMPIRAN 1O**

**PERBANDINGAN PROGRAM DENGAN IPTA/IPTS**

|  | **SEKOLAH RAZAK UTM** | **UPM** |
| --- | --- | --- |
| Nama Program | Sarjana Dalam Reka bentuk Kejuruteraan  (kerja kursus) | Sarjana dalam Inovasi dan Reka bentuk Kejuruteraan  (kerja kursus) |
| Nama Ijazah | Sarjana Sains | Sarjana Sains |
| Tempoh Pengajian | 1.5 tahun | 1.5 tahun |
| Perbandingan Kursus | **Kursus teras:**   * Engineering Design Optimization * Technovation Management * Engineering Design Process & Methodology * Materials Selection and Manufacturing Process * Computer Aided Design (CAD) / Computer Aided Engineering (CAE) * Creativity and Innovation Management * Research Methodology * Master Project 1 * Master Project 2 | **Kursus teras:**   * Global Design 1 * Global Design 2 * Innovation Studies 1 * Innovation Studies 2 * Engineering Materials and Characteristics * Computer Aided Design * Advanced Design Techniques * Group Design and Business Project |
|  | **Elektif Reka Bentuk Sistem Mekanikal:**   * Automotive Engineering Design * Design for Reliability * Fluid Power * New Product Development * Mechatronics System Design * Metrology and Measurement   **Elektif Reka bentuk Produk:**   * Life Cycle Cost Analysis for Engineers * Design for Sustainability, Manufacturing and Assembly * Entrepreneurship and Marketing * Theory of Inventive Problem Solving (TRIZ) * Robust Product Design * Industrial Design & Human Factors   **Elektif Reka bentuk Sistem Elektronik:**   * Advanced Digital System Design * Wireless Communications Systems * Advanced Communications Electronics * Advanced Sensor System * System Processors and Peripherals | **Kursus Elektif:**   * Aircraft Design * Design of Manufacturing Systems * Automation, Robotics and CAM * Manufacturing Operation Management |

**LAMPIRAN 1P**

**PERBANDINGAN PROGRAM DENGAN UNIVERSITI LUAR NEGARA**

LAMPIRAN 1P

Perbandingan Program yang Dicadangkan dengan Program Sarjanayang Sama/Berkaitan di Luar Negara

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Universiti | UTM Razak School Of Engineering & Advanced Technology | **Brunel Univ, UK** | **Western University**  **London, Ontario, Canada** | Chalmers University of Technology | California State University Long Beach | University of Bath, UK | Kingston University, UK | Loughborough University, UK |
| Nama Program | MSc in Engineering Design | **MSc Advanced Engineering Design** | **Master of Engineering in Design and Manufacturing** | MSc of Industrial Design Engineering | MSc Mechanical Engineering-Design and Manufacturing Area | MSc Engineering Design | MSc Advanced Product Design Engineering | MSc Engineering Design |
| Kursus | **Core:**  Engineering Design Optimization  Technovation Management  Engineering Design Process and Methodology  Materials Selection and Manufacturing Process  Computer-Aided Design (CAD) / Computer-Aided Engineering (CAE)  Creativity and Innovation Management  Research Methodology  **Electives- MechanicalSystem Design**  Automotive Engineering Design  Design for Reliability  Fluid Power  New Product Development  Mechatronics System Design  Metrology and Measurement  **Elective –Product Design**  Life Cycle Cost Analysis (LCCA)  Design for Sustainability,Manufacturing and Assembly  Entrepreneurship and Marketing  Theory of Inventive Problem Solving (TRIZ)  Robust Product Design  Industrial Design & Human Factors  **Elective – Electronics System Design** Design  Adanced DigitalSystem Design  Wireless Communication System  Advanced Communication Electronics  Advanced Sensor System  System Processors and Peripherals | **Core**:  Sustainable Design and Manufacture  Manufacturing Systems and Economics  Computer Aided Engineeering 1 & 2  Dissertation  **Electives**:  Microprocessors and Embedded Systems  Advanced Manufacturing Measurement  Human Factors in Design  Robotics and Automation  Design of Mechatronics | **Technology Stream:**  Intelligent Manufacturing  Design For Manufacturability  Finite Element Analysis For Design Engineers  Advanced Topics In Finite Element Analysis  Sensors, Actuators And Interfacing  Advanced Machining System  Geometric, Dimensioning & Tolerencing  Optimization Of Energy Efficiency In Industrial Process  Computer-Aided Design  Renewable Energy Systems  Lean Manufacturing - Principles, Applications And Implementation  Ergonomic Design  Dynamics And Vibration In Engineering Design  Design: Materials Selection  Mechatronic Engineering  System Maintenance  Rapid Mechanical Design  System Simulation  Design Methodologies  Product Design & Development  Forensic Engineering & Failure Analysis | **Core**:  Industrial Design Engineering  Physical Ergonomics  Materials, Manufacturing and Design Quality  Project Industrial Design Engineering  **Electives:**  Material Selection & Design  Cognitive Ergonomics  Human factors and Ergonomics for Engineers  Advanced Form Design 1 & 2  Copmuter Aided Industrial Design  Digital Sketching & Graphic Design  Business Marketing and Purchasing  Finite Element Simulation in Design   * Quality management, * Computer aided modeling, advanced course * Applied mechatronics design, * Project management * Risk management and safety   Manufacturing Process | **Core:**  Engineering Analysis 1 & 2  Computer-Aided Design in Mechanical Engineering  Metals and Plastics Manufacturing Process  Computer-Aided Manufacturing  **Electives:**  Nonlinear Optimized Structures  Design of Compposite Structures  Random and Nonlinear Vibrations  Stress Analysis in Design | * Biomimetics * Business processes * Computer aids for design * Electronics, signals and drives * Innovation and advanced design * Materials selection in engineering design   Product design and development | **Core modules**   * Integrated CAD/CAM Systems   Advanced Materials Processing   * E-Engineering with Internet Applications * Advanced CAD/CAM Systems * Computer Aided Product Design * Information Systems * Research Project (MSc Only)   **Option modules (choose two)**   * Total Quality * Finance Resource Management * Industrial Systems and Management * Systems Modelling and Simulation * Business Resources Management * Mechatronics and Automation Systems * Industrial Project Management | * The Innovation Process and Project Management * Engineering Design Methods * Computer Aided Engineering * Structural Analysis * Sustainable Development * **The Engineering Context** * Engineering Management and Business Studies * Product Design and Human Factors * Sustainable Product Design * Project |
| Jangka masa / Kos | 1 ½ tahun,  RM 22,000/prog | 1 tahun  RM 73,500/prog sepenuh masa, RM 36,750/ prog separuh masa | 2 tahun | 2 tahun  RM 126,750/prog | 2 tahun  RM 93.996/ prog | * 1 tahun | 1 tahun   * RM63,014 | * 1 tahun |

**LAMPIRAN 1Q**

**KEMUDAHAN FIZIKAL/BILIK KULIAH/MAKMAL**

**DI UTM KUALA LUMPUR**

|  |  |  |  |
| --- | --- | --- | --- |
| **Facilities** | | **Current** | |
|
| **No** | **Max Capacity** |
| 1 | **Lecture / Seminar Rooms**   1. Lecture Room UTMKL 2. Seminar Room BATC   **MENARA RAZAK**   1. Lecture rooms MENARA RAZAK | 4  3  4 | 160  120  4@20 = 80 |
| 2 | **Syndicate Room**   1. BATC 2. **MENARA RAZAK** | 4  4 | 4@4 = 20  4@8 = 32 |
| 3 | **Studio**   1. UTM KL | 3 | 3@40 = 120 |
| 4 | **Computer Labs**   1. BATC 2. **MENARA RAZAK** | 1  1 | 20  30 |
| 5 | **Labs / Workshops**   1. Product Design Workshop   **MENARA RAZAK**   1. Research Labs | 4  1 | 4@30 = 120  40 |
| 6 | **Postgraduate Room**   1. Room 1 BATC 2. Room MENARA RAZAK 3. UTM KL | 1  1  2 | 10  16  30 |
| 7 | **Library / Resource Centre ,** PSZ  **MENARA RAZAK**   1. Learning Resource Centre | 1 | 8000 collections |
| 8 | **Other Facilities**   1. Banquet 2 2. Masjid UTM KL 3. Surau 4. Meeting Room 1 5. Meeting Room 2 6. Rest Area 7. Student Social Space (lounge / TV area) 8. Free Discussion Area 9. Printing Room 10. Holding Room 11. Discussion Area / Lounge 12. Executive Lounge 13. File Room / Store 14. Fire Proof File Room   **MENARA RAZAK**   1. Dining Room 2. Prayer Room 3. Meeting Room 4. Lounge 5. Printing Room 6. File Room 7. Fire Proof Secure Room | 1  1  2  1  -  1  3  1  1  -  -  2  -  1  1  1  1 | 60  1000  20  25  10  -  6  10  -  -  30  -  -  -  50  5  10 |

**LAMPIRAN 1R**

**MAKLUMBALAS DAN TINDAKAN**

* + **DARIPADA LEMBAGA PENGAJIAN (BoS)**
  + **DARIPADA PROFESSOR PELAWAT**

**FEEDBACK FROM BoS MEMBERS – 22 FEBRUARY 2013**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Bil** | **BoS Members** | **Comments and Feedbacks** | **Actions taken** | **Notes** |
| 1 | Prof. Dr. Norhamidi, UKM | 1. Aspek innovasi, mesti ada dalam kursus teras.   POs - Mapping dalam kursus yang ditawarkan dan reflect dalam silibus / kandungan kursus  i.e. MRSM 1233. Rewrite CO4 to cater PO3. Move forward the lectures to 10 weeks and the rest of the weeks for students to finish their project. | **CORE:**  MRSM1213 PO1,2,6 MRSM1223 PO2,3,4 MRSM1233 PO2,4,5MRSM1243 PO1,2,5 MRSM1253 PO1,2,4  **ELECTIVES:**  Courses: 1to 6  -checked only 3 POs, course content tally with outcome  **FREE ELECTIVE:**  PO2,PO5,PO6 | All courses have been revised. POs and bloom taxonomy follow the guidelines below:  PO1 – knowledge – C  PO2 – critical thinking – C, CTPS  PO3 – leadership and team working – A, TS, LS  PO4 – ethics – A, EM  PO5 – communication skills – P, CS  PO6 – life-long learning – A, LL  **√** |
| 1. PO3 – aspek kepimpinan, mesti ada dalam kursus teras. Mapping dalam kursus yang ditawarkan dan reflect dalam silibus / kandungan kursus | Replace with new course  MRSM 1223 Technovation Management.  Outcomes addressed:  PO2, PO3, PO4  Text – Melissa Schilling: Strategic Mgt of Technological Innovation. McGraw Hill, 2011 | Refer to BS0820 Innovation Management, Imperial College  **√** |
| 1. Cadangan dimasukkan aspek penting dalam engineering design seperti (disokong En Nizar):  * IP / Patent Filing * Legal issues * Ethics |
| 1. Creativity and Innovative or Innovative Engineering Design dalam kursus teras |
| 1. Innovative curriculum:   Hands on experience from project planning, distribution of work among group members, budgeting/costing, marketing | Has been addressed in Master Project 1 and 2, MRSM1233 | **√** |
| 2 | Ir. Mohd Khir  Ikasuri Sdn Bhd/IEM | 1. Program perlu focus kepada target market – adakah untuk broad application or focus | Intakes / Target markets from diverse background /broad based application |  |
| 1. Will add value to the program if the program can co-corporate with IEM in helping fresh graduate to be graduate engineer i.e. tailored to professional qualified engineers | Will be considered once the program has been approved |  |
| 3 | Dr. Zainal Fitri  PROTON | 1. Cadangan dimasukkan aspek penting dalam engineering design seperti:  * New Product Design/Product development process * Product Life Cycle Management - MRSM2233 * Creativity – new MRSM1223 | * New Product Design/Product development process –in MRSM2233 * Product Life Cycle Management - MRSM2233 * Creativity – new MRSM1223 | **√** |
| 1. Will be good if the course could give CPD hours which other engineers/ beside students could attend | Will be considered once the program has been approved |  |
| 1. Entry requirement – Engineers / Fresh Graduates / Science Background | Engineering / Technology and Science Background  Fresh and Engineers.  - Edited and highlighted in entry requirement KK Section 15 –Spell out B Eng or B Sc  Addressed dalam Lampiran 1N | √ |
| 4 | Ahmad Nizar  MIMOS | 1. Kursus yang menekan aspek generating ideas – process to follow in generating new ideas in come up with new product / process | New MRSM 1223 | √ |
| 1. New issues and trend to be included in the course:  * Renewable energy * Internet of thing * Sensor technology | To be highlighted in courses for:   * Renewable energy –   MRSM2283   * Internet of thing –   Embedded inside MRSM2333   * Sensor Technology – MRSM2383 | √ |
| 1. Good program – address current tools in engineering design. Some of the courses offered are attractive and hope to be opened to people outside UTM | Makluman |  |
| 1. Lab facilities – i.e. MRSM 2362 Microprocessor System Design | Lab for Master Project –  - Microprocessor Lab, dalam perancangan | √ |
| 5 | PM Dr Zawiyah  UM | 1. MRSM2323 Industrial Design and Human Factors – a bit fundamental / undergraduate level. Suggested topics to be included:  * Visualization and human factor * Inclusive design * Current design concept/interface design | Review MRSM 2323 | √ |
| 1. Look for niche area and marketability of the program. Create UTM Razak School branding for the program | Makluman |  |
| 1. Manufacturing and statistics aspects should be included in any of the courses | Already inside the syllabus MRSM 2313/ MRSM1243 |  |
| 6 | Norhizam  Astronautic Technology | 1. Overall intention of the program is good | Makluman |  |
| 1. Suggestion to includes important aspects i.e. go towards real life situation:  * Leadership Skill * Management Skill / Elements – legal, Scheduling, psychological issues, finance, costing * Communication Skills – Oral and Written (i.e. written technical skills) | Courses that match:   * Leadership Skill – New MRSM1223 * Management Skill / Elements – legal New MRSM1223 * Scheduling MRSM1233 * psychological issues MRSM 2323, finance, costing MRSM2273 * Communication Skills – Oral and Written (i.e. written technical skills)   Besides Master Project 1 and 2, some courses require student to do technical report | √ |
| 1. Irrelevant courses – Advanced mathematics and Scientific Computing.   Other courses are relevant to the program. Ada element mechanical, electrical, embedded system | Replace with Engineering Design Optimization (Old MRSM2213) - – review content should match with Arora | √ |
| 1. Jemput penceramah luar i.e. engineers from industries / professors to share recent / currents tools and developments in related topics to the program | MRSM 1840  Graduate Seminar |  |
| 7 | Khairul Azli  Energy Quest | 1. Irrelevant courses – Advanced Mathematics – should remove to electives | Replace with Engineering Design Optimization (Old MRSM2213) – review content should match with Arora | √ |
| 1. For multi-disciplinary background – students have the option to chooses some courses from other electives | This program covers multi-disciplinary topics/case studies/class project | √ |
| 1. Multi-displinary group project that combine students from diverse background – electrical, mechanical, etc. | Class project i.e. MRSM1233, MRSM2313, MRSM2303 | √ |
| 8 | Prof. Dr. Roslan  FKM, UTM | 1. The program should address UTM tag line – Innovative, entrepreneurial, global | **Innovative n Entrepreneurial** – New MRSM1223  **Global** – UHP6013/UHZ6123 | Entrepreneurship also in MRSM 2293 (Marketing and Entrepreneurship)  √ |
| 1. Agrees with Prof. Dr. Shari and AP Dr. Zalina – each course should address maximum of 3 POs   i.e. MRSM 1233 and MRSM 1253 | Review all courses – CORE, Electives 1,2,3checked | √ |
| 9 | Prof. Dr. Sha’ri  SPS, UTM | 1. The course code for open elective course should be MXX XXXX | Changed | √ |

**Feedback from Prof. Gan, Brunel University, London**

|  |  |  |  |
| --- | --- | --- | --- |
| **No.** | **Comments / Feedback** | **Actions** | **Notes** |
| 1 | Very good program – gives wide exposure to students on current issues and tools | Good feedback | √ |
| 2 | MRSM1213 Adv Mathematics – should be in elective 1. This course may not be appropriate for other electives | Replace with Engineering Design Optimization (Old MRSM2213) | √ |
| 3 | MRSM1223 Scientific Computing –suitable for undergraduate level, advised to remove | Replace with MRSM1223:-  Technovation Management.  Remove to Elective 1 and the content has been revised | √ |
| 4 | MRSM2282 Design for Sustainability – is an important course and should be included in CORE | Maintain in Elective, the CORE covers all the Engineering design relevant courses | √ |
| 5 | MRSM2213 Engr. Design Optimization – is also important subject needed by other electives. Suggested to be included in CORE replacing Adv. Mathematics | Good feedback | √ |
| 6 | MRSM2382 Advanced Sensory System – should use the same course in Engr Maintenance Program that related on Sensor and Instrumentation – optimize resources | Engineering Maintenance – Sensor, Instrumentation and Control which relates to Maintenance Engineering  Engineering Design – Sensor Technology about the development of sensor technology for engineering design | √ |

**LAMPIRAN 1S**

**MESYUARAT DAN KERTAS KERJA PROGRAM BAHARU UTM SEKOLAH RAZAK UTM**

****

**KERTAS KERJA BAGI MEMOHON KELULUSAN**

**TIMBALAN NAIB CANSELOR (PEMBANGUNAN)**

**UNIVERSITI TEKNOLOGI MALAYSIA**

**BENGKEL PENYEDIAAN**

**KERTAS KERJA CADANGAN PEMBENTUKAN PROGRAM BARU PASCA IJAZAH**

**SEKOLAH RAZAK UTM DALAM KEJURUTERAAN DAN TEKNOLOGI TERMAJU**

**11 - 14 NOVEMBER 2012**

|  |  |  |
| --- | --- | --- |
| Disediakan oleh: | Disemak oleh: | Diluluskan oleh: |
| Aminah binti Abu Bakar  Timbalan Pendaftar  UTM RAZAK School of Engineering & Advanced Technology | Prof. Dr. Awaluddin Mohamed Shaharoun  Dekan, UTM RAZAK School of Engineering & Advanced Technology | Prof. Dr. Wahid Omar  Timbalan Naib Canselor  (Pembangunan)  Universiti Teknologi Malaysia |
| Tarikh: | Tarikh: | Tarikh: |

**BENGKEL PENYEDIAAN**

**KERTAS KERJA CADANGAN PEMBENTUKAN PROGRAM BAHARU PASCA IJAZAH**

**SEKOLAH RAZAK UTM DALAM KEJURUTERAAN DAN TEKNOLOGI TERMAJU**

1. **TUJUAN**
   1. Tujuan kertas kerja ini ialah untuk memohon kelulusan Timbalan Naib Canselor (Pembangunan) bagi melaksanakan Bengkel Penyediaan Kertas Kerja Cadangan Pembentukan Program Baharu Pasca Ijazah di Sekolah Razak UTM.
2. **LATAR BELAKANG**
   1. Sekolah Razak UTM adalah sebuah *Post Graduate School* yang juga menjalankan Program Diploma Eksekutif dan Sarjana Muda.
   2. Terdapat Sembilan Program yang dikendalikan oleh Sekolah Razak UTM di peringkat Sarjana/ Sarjana Eksekutif dan Doktor Falsafah / Doktor Kejuruteraan seperti berikut:-
3. Engineering Doctorate (Engineering Business Management)
4. Ph.D Generik
5. Ph.D Industri
6. Ph.D Fast Track
7. Master in Industrial Design
8. Master in Sustainable Urban Design
9. Master Generic
10. Master of Science (Engineering Business Management)
11. Excecutive Master in Occupational Safety & Health Management
    1. Untuk mencapai hasrat Universiti mencapai nisbah pelajar Pasca Ijazah: Pra Siswazah 70:30 menjelang tahun 2020, Sekolah Razak UTM mengambil inisiatif untuk memperbanyakkan penawaran Progran di peringkat Pasca Ijazah.
    2. Sekolah Razak UTM berhasrat untuk menawarkan beberapa program baru sarjana secara kerja kursus pada sesi akademik 2013/2014. Bagi merealisasikan hasrat ini, kertas cadangan yang lengkap perlu disediakan dengan kadar segera untuk dikemukakan kepada pihak Universiti untuk mendapatkan kelulusan. Senarai Program Baru dan jadual tempoh masa adalah seperti di LAMPIRAN.
12. **OBJEKTIF**
    1. Menyediakan Kertas Kerja lengkap untuk dimajukan kepada Jawatankuasa Pengajian Siswazah Sekolah Razak UTM sebelum ke Senat Universiti.
13. **TARIKH, TEMPAT DAN JADUAL AKTIVITI**
    1. Bengkel ini dicadang akan diadakan seperti butiran berikut :

**Tarikh : 11 hingga 14 November, 2012**

**Tempat : Avillion Legacy Hotel, Melaka**

* 1. Tentatif aturcara bengkel adalah seperti di LAMPIRAN 1.

1. **PESERTA**
   1. Bengkel ini akan disertai oleh Pentadbir Akademik dan semua staf akademik dari panel Kejuruteraan Mekanikal, Jabatan Kejuruteraan, Sekolah Razak UTM serta 6 orang peserta jemputan dari Fakulti Kejuruteraan Mekanikal, UTM Skudai. Senarai nama adalah seperti di LAMPIRAN 2.

5.2 Fasilitator Bengkel adalah Prof. Madya Dr. Mohd Hasbullah bin Idris dari Unit Kualiti Universiti dan Dr. Roselainy binti Abdul Rahman, Pensyarah Kanan di Sekolah Razak UTM.

1. **ANGGARAN PERBELANJAAN**
   1. Anggaran perbelanjaan adalah seperti berikut :

Pakej Bengkel RM 4,500.00

Fasilitator RM 3,000.00

Lain-lain RM 1,000.00

**Jumlah RM 8,500.00**

1. **SUMBER PERBELANJAAN**
   1. Peruntukan bagi membiayai kos bengkel ini adalah daripada Vot 29136 (Vot Mengurus Sekolah Razak UTM).
2. **PENUTUP**
   1. Bengkel ini sangat penting bagi menyiapkan kertas kerja untuk kelulusan Universiti sebelum Program Baharu Pasca Ijazah dapat dijalankan di Sekolah Razak UTM.
   2. Dengan hormatnya Fakulti memohon Y. Bhg. Timbalan Naib Canselor (Pembangunan) dapat mempertimbang dan meluluskan permohonan ini.

**LAMPIRAN 1**

**SENARAI PESERTA**

**BENGKEL PENYEDIAAN KERTAS KERJA CADANGAN PEMBENTUKAN PROGRAM BARU PASCA IJAZAH**

**PADA 11 – 14 NOVEMBER 2012**

|  |  |  |  |
| --- | --- | --- | --- |
| **BIL** | **NAMA** | **JAWATAN** | **SEKOLAH RAZAK UTM** |
| 1. | PROF. DR. AWALUDDIN BIN MOHAMED SHAHAROUN | DEKAN | 🗸 |
| 2. | PROF. MADYA DR. MOHD HASBULLAH BIN IDRIS | FASILITATOR | UKU, UTMJB |
| 3. | DR. ROSELAINY BINTI ABDUL RAHMAN | FASILITATOR/ PENSYARAH KANAN | 🗸 |
| 4. | PROF. DR. MOHD NASIR BIN TAMIN | PROFESOR | FKM, UTMJB |
| 5. | PROF. MADYA DR. MOHAMAD KASIM BIN ABDUL JALIL | PROF. MADYA | FKM, UTMJB |
| 6. | PROF. MADYA DR. ABU HASSAN BIN ABDULLAH | PROF. MADYA | FKM, UTMJB |
| 7. | PROF. MADYA DR. KAHAR BIN OSMAN | PROF. MADYA | FKM, UTMJB |
| 8. | DR. MOHD FOAD BIN ABDUL HAMID | PENSYARAH KANAN | FKM, UTMJB |
| 9. | EN. MOHSIN BIN MOHD SIES | PENSYARAH KANAN | FKM, UTMJB |
| 10. | PROF. MADYA DR. ZALINA BINTI MOHD. DAUD | TIM. DEKAN (A) | 🗸 |
| 11. | PROF. MADYA DR. ABD RAHMAN BIN ABD RAHIM | KETUA JABATAN KEJURUTERAAN | 🗸 |
| 12. | DR. KHAIRUR RIJAL BIN JAMALUDIN | PENGURUS, PENGAJIAN SISWAZAH | 🗸 |
| 13. | PROF. MADYA DR. ASTUTY BINTI AMRIN | PROFESOR MADYA | 🗸 |
| 14. | PROF. MADYA DR. ROBIAH BINTI AHMAD | PROFESOR MADYA | 🗸 |
| 15. | PROF. MADYA SALLEHUDIN BIN MOHAMED | PROFESOR MADYA | 🗸 |
| 16. | DR. MOHAMED AZLAN BIN SUHOT | PENSYARAH KANAN | 🗸 |
| 17. | DR. MOHD YUSOF BIN MOHD DAUD | PENSYARAH KANAN | 🗸 |
| 18. | DR. ROSLINA BINTI MUHAMAD | PENSYARAH KANAN | 🗸 |
| 19. | DR. SHAMSUL BIN SARIP | PENSYARAH KANAN | 🗸 |
| 20. | DR. HAIRI BIN ZAMZURI | PENSYARAH KANAN | 🗸 |
| 21. | DR. ABDELGADIR MOHAMED MAHMOUD | PENSYARAH KANAN | 🗸 |
| 22. | DR. MOHD. KHAIRI BIN ABU HUSAIN | PENSYARAH KANAN | 🗸 |
| 23. | DR. SAARDIN BIN ABD AZIZ | PENSYARAH | 🗸 |
| 24. | DR. HABIBAH@ NOREHAN BINTI HARUN | PENSYARAH KANAN | 🗸 |
| 25. | EN. NORAZMEIN BIN ABD RAMAN | PENSYARAH KANAN | 🗸 |
| 26. | CIK NURUL HUDA BINTI AHMAD | TUTOR | 🗸 |
| 27. | PUAN AMINAH BINTI ABU BAKAR | TIMBALAN PENDAFTAR | 🗸 |
| 28. | PUAN FAZIAH BINTI JAMALUDIN | PEMBANTU TADBIR | 🗸 |
| 29. | ENCIK ZULKAFLI MAT HASSAN | JURUTEKNIK TEKNOLOGI MAKLUMAT | 🗸 |
| 30. | ADY SALEHIN BIN AKMAD | PEMANDU | 🗸 |
| 31. | MOHD. SHAFIE BIN MOHAMAD WAHI | PEMANDU | 🗸 |

**SEKOLAH RAZAK UTM DALAM KEJURUTERAAN DAN TEKNOLOGI TERMAJU**

LAMPIRAN 2

**ATURCARA TENTATIF: BENGKEL PENYEDIAAN KERTAS KERJA CADANGAN PEMBENTUKAN**

**PROGRAM BARU PASCA IJAZAH**

**Tarikh : 11- 14 November 2012**

**Tempat : Avillion Legacy Hotel, Melaka**

|  |  |  |  |
| --- | --- | --- | --- |
| **MASA** | **DAY 1: 11 Nov 2012 (Ahad)** | **MASA** | **DAY 2: 12 Nov 2012 (Isnin)** |
| 11.00 am | Bertolak ke Avillion Legacy Hotel, Melaka | 7.30 am | Sarapan |
| 2.00 pm | Check-In | 8.30 am | **Sesi 2: Ceramah 2** |
| 4.15 pm | Minum petang | 10:30 am | Minum Pagi |
| 4.30 pm | Taklimat Dekan | 11.00 am | **Sesi 3 : Bengkel 1**  Penyediaan Dokumen: PeOs, POs dan Spesifikasi Program |
| 5.00 pm | Riadah | 1.00 pm | Makan Tengahari/Solat |
| 7.30 pm | Makan Malam | 2:30pm | **Sesi 4: Sambungan Bengkel 1**  Penyediaan Dokumen: PeOs, POs dan Spesifikasi Program |
| 8.30 pm | **Sesi 1: Ceramah 1** | 4.45pm | Minum Petang |
| 10.30 pm | Minum Malam/Rehat | 5.00pm | Riadah |
|  |  | 7.30 pm | Makan Malam |
|  |  | 8.30 pm | **Sesi 5**: **Pembentangan 1** |
|  |  | 10.30 pm | Minum Malam/Rehat |

|  |  |  |  |
| --- | --- | --- | --- |
| **MASA** | **DAY 3: 13 Nov 2012 (Selasa)** | **MASA** | **DAY 4: 14 Nov 2012 (Rabu)** |
| 7.30 am | Sarapan | 7.30 am | Sarapan |
| 8.30 am | **Sesi 6 : Bengkel 2**  Penyediaan ‘Course Outline’ Setiap Program | 8.30 am | **Sesi 10: Sambungan Pembentangan 2** |
| 10:30 am | Minum Pagi | 10:30 am | Minum Pagi |
| 11.00 am | **Sesi 7: Sambungan Bengkel 2**  Penyediaan ‘Course Outline’ Setiap Program | 11.00 am | **Sesi 11 : Pemurnian Dokumen**  **dan Rumusan Bengkel** |
| 1.00 pm | Makan Tengahari/Solat | 12.00 pm | Makan Tengahari |
| 2:30pm | **Sesi 8 : Bengkel 3**  Pemetaan (Mapping) PeOs dan POs | 1.00pm | **Check-out** |
| 4.45pm | Minum Petang | 1.30pm | Bertolak Balik Ke KL |
| 5.00pm | Riadah |  |  |
| 7.30 pm | Makan Malam |  |  |
| 8.30 pm | **Sesi 9**: **Pembentangan 2** |  |  |
| 10.30 pm | Minum Malam/Rehat |  |  |

**LAMPIRAN 1T**

**MINIT MESYUARAT JAWATAN KUASA PROGRAM BERSAMA FAKULTI KEJURUTERAAN MEKANIKAL, UTM**

**MINIT MESYUARAT JAWATAN KUASA PROGRAM BERSAMA FAKULTI KEJURUTERAAN MEKANIKAL, UTM**

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**Tarikh : 21 Ogos 2014**

**Masa : 2.30 – 3.30 petang**

**Tempat : Bilik Mesyuarat Jabatan, Fakulti Kejuruteraan Mekanikal, UTM Skudai**

Kehadiran:

Fakulti Kejuruteraan Mekanikal, UTM Skudai

1. Prof. Dr. Musa b. Mailah
2. Dr. Muhammad bin Hussin
3. Dr. Mohd. Foad b. Abd. Hamid
4. Prof. Madya Ir. Razali Sulaiman

Delegasi Sekolah Razak UTM

## Prof. Madya Dr. Abd Rahman Abdul Rahim

## Prof. Madya Dr. Robiah Ahmad

## Dr. Norliza Mohamed

## Dr. Habibah@Norehan Haron

## En. Norazmein Abdul Raman

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| **Bil.** | **Perkara** | **Makluman (M) / Tindakan (T)** |
| 1 | **Aluan Pengerusi**   1. Mesyuarat dimulakan dengan bacaan surah Al-Fatihah 2. Prof. Dr. Musa Mailah selaku Pengerusi mengalu-alukan kedatangan delegasi Sekolah Razak UTM dan memulakan sesi ta’aruf kesemua ahli mesyuarat. 3. Ketua delegasi Sekolah Razak UTM, Prof. Madya Dr. Abdul Rahman menerangkan tujuan mesyuarat adalah untuk mendapat maklumbalas pensyarah pakar dari FKM ke atas kandungan program selepas melakukan penambahbaikan berdasarkan cadangan lembaga pengajian. 4. Sesi mesyuarat diteruskan dengan taklimat latarbelakang dan kandungan program MSED yang disampaikan oleh Prof. Madya Dr. Robiah Ahmad. | M: Semua |
| 2 | **Maklumbalas dari Prof. Dr. Musa Mailah**   1. Beliau mencadangkan :-    1. Kod dan kandungan yang berbeza dengan kursus yang seumpamanya di FKM.    2. Penambahan “kejuruteraan dan sains” di dalam matlamat program muka surat 2    3. Tahap kandungan kursus elektif perlu disesuaikan dengan latarbelakang calon pelajar. 2. Beliau memberi izin nama staf FKM tertera di dalam kandungan kursus MSED | T: Ahli JK MSED |
| 3 | **Maklumbalas dari Dr. Mohd. Foad bin Abdul Hamid**  Beliau mencadangkan memberi sokongan kepada calon pelajar atau meringankan tahap kandungan kursus yang mengandungi tahap matematik tinggi seperti Advance Engineering Mathematics, Computational Methods in Solid Mechanics, Scientific Computing for Engineers serta Computer Aided Design. | T: Ahli JK MSED |
| 4 | **Maklumbalas dari Prof. Madya Dr. Mohamed bin Hussein**   1. Beliau mencadangkan kursus MSED ini dilaksanakan secara modular dengan kod yang berbeza daripada kursus-kursus yang ditawarkan di FKM. 2. Bertanyakan sejauh mana penglibatan staf akademik FKM dan Sekolah Razak UTM yang tertera di dalam penyediaan dan perlaksanaan kandungan kursus MSED dibimbangi memberi kesan kepada penjadualan beban staf akademik FKM. | T: Ahli JK MSED |
| 5 | **Maklumbalas dari Ir. Razali bin Sulaiman**   1. Beliau menjelaskan perbezaan kurikulum yang mengandungi elemen rekabentuk. 2. Mencadangkan asas pengetahuan kejuruteraan rekabentuk ditawarkan kepada calon-calon yang tiada latarbelakang kejuruteraan tanpa menjejaskan jumlah kredit | T: Ahli JK MSED |

Mesyuarat berakhir jam 3.30 petang dan disudahi dengan bacaan surah Al Asr.

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| Disediakan oleh: |  |
| Prof. Madya Dr. Robiah Ahmad (Pencatat Minit) |  |