2u2i:
Bachelor of Computer Science (Data Engineering)
Tingkat kemahiran graduan

» Penuntut belajar 2 tahun, timba pengalaman industri 2 tahun

Oleh Baharom Bakar

Kementerian Pendidikan Tinggi (KPT) akan memperluas program Dua Tahun Universiti dan Dua Tahun Industri (2U2I) di beberapa universiti di seluruh negara mulai September depan, menurut Dato' Dr Abidin bin Johari bertutur, penuntut di universiti itu akan mengalami latihan bekerja dalam bebas pada masa puasa selama dua tahun, sementara menghafal pengalaman selama dua tahun.

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Belajar bersama bekerja

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Lima UA laksana program 2U2i mulai September

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Program 2U2i penuhi permintaan, tingkat kebolehhasan graduan.

Jalalun kerjasama bolehkan industri latih pekerja ikut kepelbagaian semasa.

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Bachelor of Computer Science (Data Engineering)
Malaysia needs additional 12,000 data scientists: Idris Jusoh

PUTRAJAYA: An additional 12,000 big data scientists are needed within the next five years to spur Malaysia’s data-driven economy, said Higher Education Minister Datuk Seri Idris Jusoh (pix).

He said in 2014, there were 4,000 big data scientists in this country and the government was fully aware of the increase in demand for their services from the commercial and pub sectors.

To address the shortage, he said the government has embarked on various initiatives, including establishing digital competency centres in institutions of higher learning nationwide.

"Ultimately, we envision a data economy on a global scale," he said at the launch of the International Conference on Soft Computing in Data Science 2015 at the 2nd International Conference on Statistics in Science Business and Engineering 2015 organised by Univen.

<table>
<thead>
<tr>
<th>Bidang Ilmu</th>
<th>Teknologi Big Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sistem Maklumat</td>
<td>Aplikasi (Kepintaran business) dan Visualisasi</td>
</tr>
<tr>
<td>Matematik</td>
<td>Model Analisa (Prediktif atau Deskriptif)</td>
</tr>
<tr>
<td>Sistem Maklumat</td>
<td>Pangkalan Data</td>
</tr>
<tr>
<td>Sains Komputer</td>
<td>Sistem Operasi</td>
</tr>
<tr>
<td>Sains Komputer</td>
<td>Platform/Server</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Teknologi Big Data</th>
<th>Kursus Ditawar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aplikasi (Kepintaran Business)</td>
<td>Intelligent Decision Support System (Elektif Program)</td>
</tr>
<tr>
<td>Model Analisa (Prediktif atau Deskriptif)</td>
<td>Application Development (Elektif Program)</td>
</tr>
<tr>
<td>Model Analisa (Prediktif atau Deskriptif)</td>
<td>Enterprise System Design and Modelling (Elektif Program)</td>
</tr>
<tr>
<td>Pangkalan Data</td>
<td>Data Structure and Algorithm (Teras)</td>
</tr>
<tr>
<td>Sistem Operasi</td>
<td>Probability &amp; Statistical Data Analysis (Teras)</td>
</tr>
<tr>
<td>Platform/Server</td>
<td>Artificial Intelligence (Elektif)</td>
</tr>
<tr>
<td>Platform/Server</td>
<td>Data Mining (Elektif)</td>
</tr>
<tr>
<td>Sistem Operasi</td>
<td>Database (Teras)</td>
</tr>
<tr>
<td>Platform/Server</td>
<td>Operating Systems (Teras)</td>
</tr>
<tr>
<td>Platform/Server</td>
<td>Network Communication (Teras)</td>
</tr>
</tbody>
</table>
ICT Jobs | Kursus Ditawar
---|---
Database Administrators | Database Administration (SCD3713)
 | Database (SCD2523)
 | Database Programming (SCD2623)
Big Data Analysts | Probability & Statistical Data Analysis (SCI2143)
 | Data Mining (SCD3753)
 | Intelligent Decision Support System (SCD4813)
SAP/ERP | Enterprise System Design & Modeling (SCD4743)
Business Process Improvement | Web Programming (SCV1223)
Web Developer | System Development Technology (SCD3723)
IT Security | Information Security & Data Recovery (SCD4833)

71% graduates from the first cohort secured ICT related jobs before convocation due to professional certifications.
INDUSTRY FEEDBACKS

<table>
<thead>
<tr>
<th>No</th>
<th>Components</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Managing and manipulating data is important to the industry?</td>
<td>5</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Knowledge in Database is important to IT company?</td>
<td>5</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Designing Information Systems requires good database skills</td>
<td>6</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Knowledge of database is required in Information System development</td>
<td>2</td>
<td>5</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Knowledge of database is fundamental to data analysis and data visualization</td>
<td>1</td>
<td>4</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Database skills is fundamental to big data management</td>
<td>1</td>
<td>2</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Graduate with high database skills gets better chance to secure a job in IT company</td>
<td>1</td>
<td>2</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Database field in system development is continuously needed in IT company</td>
<td>1</td>
<td>4</td>
<td>10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Koperasi Permodelan Felda Malaysia Berhad

In my opinion, I think database contribute a huge advantage for my company. For your information, our company just like bank. We handle investment, withdraw, deposit, ar-rahm and many more. So, our data need to be consistent in order to balance in balancing sheet for audit’s session soon. As a IT Department, we need to solve all the problems regarding data loss. I am very proud to be database student because what I had learnt in Information System’s module helping me a lot in growing up my company.

PERODUA HQ

For most company, whether we have knowledge about the language (coldfusion,C++,C#), we must have some knowledge about how to manage the data manage the database sql query,package,function ,procedure ,cursor as it is more crucial than the software itself. So i can say student that have knowledge about database make the student more versatile and have market value.
Engagement with Industries

ADAX
ASEAN Data Analytics
eXchange
COMPARISON

Jobs in Data Science

Data Scientist vs Data Engineer vs Statistician

Data Scientist: These people use their analytical and technical capabilities to extract meaningful insights from data.

Data Engineer: These people ensure uninterrupted flow of data between servers and applications. They are responsible for data architecture.

Statistician: These people understand statistics theoretically and apply them to real-life problems.
<table>
<thead>
<tr>
<th><strong>Data Scientist</strong></th>
<th><strong>Data Engineer</strong></th>
<th><strong>Statistician</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Responsibilities</strong></td>
<td><strong>Responsibilities</strong></td>
<td><strong>Responsibilities</strong></td>
</tr>
<tr>
<td>Develop and plan required analytic projects in response to business needs.</td>
<td>Design, construct, install, test and maintain highly scalable data management systems</td>
<td>Apply statistical theories and methods to solve practical problems of various industries</td>
</tr>
<tr>
<td>Contribute to data mining architectures, modeling standards, reporting, and data analysis methodologies.</td>
<td>Improve data foundational procedures, guidelines and standards</td>
<td>Determine methods for finding or collecting data</td>
</tr>
<tr>
<td>Collaborate with stakeholders to integrate data mining results with existing systems.</td>
<td>Integrate new data management technologies and software engineering tools into existing structures</td>
<td>Design surveys or experiments or opinion polls to collect data</td>
</tr>
<tr>
<td>Monitor data mining system performance and implement efficiency improvements.</td>
<td>Create custom software components (e.g. specialized UDFs) and analytics applications</td>
<td>Analyze, interpret &amp; undertake data analysis</td>
</tr>
<tr>
<td><strong>Skills</strong></td>
<td><strong>Skills</strong></td>
<td><strong>Skills</strong></td>
</tr>
<tr>
<td>Programming, Mathematics, Business Understanding, Statistics, Data Visualization, Machine Learning, Attention to detail</td>
<td>Database design, Production coding, Data collection, data warehousing, Data transformation, Work diligently with data</td>
<td>Technical and Analytics Skills, Mathematics, Operational Research, Writing skills, Ability to Analyze, Model and interpret data, Flair of explaining difficult concepts in simple manner</td>
</tr>
</tbody>
</table>
Data Engineer vs Data Scientist vs Business Analyst

Data Engineer vs Data Scientist vs Business Analyst

Ritika Trikha, The Biggest Misconception about Data Scientists
**Business Analyst:**

Business analysts’ strengths lie in their business acumen. They can communicate well with both the data scientist and C-suite to help drive data-driven decisions faster. They typically work across sales and marketing teams to make data-driven decisions. The best business analysts also have skills in statistics to be able to glean interesting insights from past behavior.

**Data Engineer:**

While data scientists dig into the research and visualization of data, data engineers ensure the data is powered and flows correctly through the pipeline. They’re typically software engineers who can engineer a strong foundation for data scientists or analysts to think critically about the data.

**Data Scientist:**

Data science is largely rooted in statistics, data modeling, analytics and algorithms. They focus on conducting research, asking open-ended questions and optimizing data to help companies get better at what they do. For instance, top-tiered data scientists are the minds behind recommended products on Amazon. Data mining (the most in-demand skill on LinkedIn) is a subset of data science as the means to the end of extracting value from data using techniques, like pattern recognition, algorithm design and clustering, to name a few, to better predict future behavior.
Data engineers are the designers, builders and managers of the "big data" infrastructure. They develop the architecture that helps analyze and process data in the way the organization needs it. And they make sure those systems are performing smoothly.
## Data Science Teams

**Data Analysts**
- Strong data skills and the ability to use existing data analysis tools
- Able to communicate and tell a story using data

**Data Engineers**
- Usually a background in computer science or engineering
- Very good programming and DevOps skills

**Data Scientists**
- Strong math/stats background in addition to programming ability
- Understanding of machine learning algorithms
2u2i through Work-based Learning

**WBL Day Release**
Classes or WBL experiences *can be conducted at the workplace* by either academic staff or qualified industry coach.

Schedule hours or days within the course when the students are released to attend a credit earned WBL experience or to practice knowledge learned from educational courses with the industry.

**WBL Block Release**
Classes or WBL experiences *must be held at the workplace* that provide structure of WBL agreed by both University and Industry partner and conducted by qualified industry coaches and/or academic staff from University.

Practical training at a workplace for a specified period (block) each year to undertake a structure skill practice with a selected industry partner for a block of time (eg. Full-time for 4 months).
Work-based Learning Components (MQA Standard)

- **Theory and Work**
  - Through work activities, students are expected to practice theories learned from previous or current semesters.
  - Time calculated for theory is divided into 2 components; Dependent learning (DL) and Independent Learning (IL).

- **Industrial Guidance**
  - Total number of hours allocated for courses guided, mentored and assessed by industry coach at the industry workplace.
  - Eg. 8 hours X 5 days X 16 weeks of WBL programme = 640 hours

- **Assessment Hours**
  - The total student learning hours allocated at the workplace (WBL) is inclusive of the assessment hours.
  - Recommended to include these components for SLT & credits calculation:
    a) Effective Learning Time (ELT)
    b) Credits
Effective Learning Time (ELT) = (Theory + Industrial Guidance + Assessment) x 80%

Note: It is estimated that around 20% of the time at work cannot be determined as ELT.

Credits = Effective Learning Time (ELT)/40 Malaysian Notional Hour (ELT/40)

Example of SLT and credits calculation for Editing and Composition Course

The SLT for Theory component is learned outside of work (class). Using the formula, the credits for this subject:

16 (Dependent Learning) + 16 (Independent Learning) + 200 (Industrial Guidance) + 22.5 (Assessment Outside Work) = 254.5

(254.5 x 80%)/40 = 5 credits
### Characteristics

- Comply and above national (MQA) and international (ACM) standards
- Structured Industry-Academia Collaboration
- Work based Learning (WBL)
- Design, delivery and assessment based on UTM New Academia Learning Innovation (NALI)

### Advantages

- Balanced between theory and practice
- Synergistic effort with smart partners
- UTM Degree, Professional Cert, and Real Work Experience
- High graduate employability
UTM Bachelor of Computer Science (Data Engineering) + Professional Certification*

1st Year
- Technology & Information Systems (W)
- Programming Technique 1
- Digital Logic
- Discrete Structure
- Programming Technique 2
- Network Communication
- Probability & Statistics
- Operating Systems
- * University Courses

2nd Year
- Databases
- System Analysis & Design
- Data Structure & Algorithm
- Computer Organization & Arch.
- Artificial Intelligence
- High Performance Data Processing
- Object-Oriented Programming
- Human Computer Interface
- Data Mining
- Information Retrieval
- Database Administration (W)
- Special Topics in Database (W)

3rd Year
- Software Engineering (W)
- Web Programming (W)
- Appl Development (W)
- Fundamentals of Technopreneurship (W)
- Technop Seminar (W)
- Innovation & Creativity (W)
- Database Programming (W)
- Business Intelligence (W)
- Mgmt Info Systems (W)
- MM Data Modelling (W)
- Enterprise Sys Design (W)
- Syst. Development Technology (W)

4th Year
- Professional Development & Practice (W)
- Professional Development & Practice Report (W)
- Industry Integrated Project (W)
- Industry Integrated Project Report (W)

Professional Certification

Oracle
# Distribution of credits

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Credits</th>
<th>Conventional Approach</th>
<th>WBL Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Credits</td>
<td>Percentage</td>
</tr>
<tr>
<td>1</td>
<td>36 (18 +18)</td>
<td>33</td>
<td>92%</td>
</tr>
<tr>
<td>2</td>
<td>35 (17+18)</td>
<td>23</td>
<td>66%</td>
</tr>
<tr>
<td>3</td>
<td>33 (15+18)</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>4</td>
<td>24 (12+12)</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Total Credits</td>
<td>56</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Percentage</td>
<td>56/128 = 44%</td>
<td></td>
</tr>
</tbody>
</table>

Mode: DR (Day Release); BR (Block Release)
Issues and Challenges

- Increase in fees
- Sustainable industry partnership
- Industry-recognised Labs
- Cost for professional certification exams
- UTM New Academia Learning Innovation
- Incentives for students and industry partners
- Academic staff development
Possible Terms of Collaboration (MDEC & i2m)

• Provide advice and assistance in the design of the curriculum;
• Bridge the faculty with industries for UTM students attending day-release (short-period) and/or block-release (long-period) programs;
• Facilitate UTM in establishing Teaching and Learning Laboratories including hardware equipment, software and training materials for education purposes;
• Provide incentives for academic staff and students to attend professional certification trainings and examinations;
• Assist UTM graduates in seeking jobs or becoming entrepreneurs;
• Provide constructive feedbacks for continuous quality improvement of 2u2i curriculum;
Possible Terms of Collaboration (Industry Partners)

• Provide advice and assistance in the design of the curriculum;
• Provide placements for UTM students for attending day-release and/or block-release programs;
• Host academic visits for the enhancement of teaching and learning;
• Expose students with the latest related methodologies and technologies;
• Provide students with real tasks for experiential learning;
• Provide students with basic working space, necessary resources and support services;
• Assess students’ performance and provide report and feedbacks to the faculty;
• (Optionally) provide allowance while they are in industry;
• Provide constructive feedbacks for continuous quality improvement of 2u2i curriculum;
Current Graduate Employability Programmes

- Oracle Training and Certifications (in collaboration with VTC)

- Microsoft Certified Technology Specialist: Microsoft Project 2013
- Oracle Database 11g Administrator Certified Associate
- Certified Ethical Hacker
- Embedded System Design - ARM Controller
- AutoCAD Certified Associate
- Revit Architecture Certified Associate
- Autodesk Maya Certified Associate (MAYA)
- Huawei Certified Datacom Associate
• Benefits of WBL for students:
  – STUDENTS have the opportunity to:
    i. foster learning autonomy, self-development, self-appraisal, and synthesise theory with practice by developing skills of critical reflection;
    ii. develop specialist knowledge, theory and skills by using the workplace as a context for project-based or practice evidenced learning;
    iii. obtain an understanding of employment opportunities and responsibilities through direct on-the-job experience;
    iv. achieve a positive attitude toward work and co-workers as well as improve interpersonal skills resulting from WBL with experienced workers;
    v. learn, both in class and on-the-job, through significant workplace experiences and able to link academic study and theory to real industrial practice;
    vi. acquire attitudes, skills and knowledge necessary for success in chosen career;
    vii. develop a greater sense of responsibility and work habits necessary for individual maturity and job competency;
    viii. develop employability skills and knowledge that are better taught in the work setting, with minimal loss of personal time or workplace time;
From GGP:WBL

• Benefits of WBL for students:
  – STUDENTS have the opportunity to:
  ix. obtain WBL that can lead to full-time employment for the students after graduation;
  x. enter the full-time employment marker with work experience, thus enhancing chances of success and advancement;
  xi. enhance professional development and future career paths; and
  xii. Engender ethical understanding and promote ethically aware practice at individual and corporate levels.
  xiii. aid progression for students after graduation; and
  xiv. be assisted in clarifying career goals and provided a practical means of reaching them
Benefits of WBL for higher education providers (HEP):

- HEPs have the opportunity to:
  
i. allow utilisation of community resources to expand the curriculum and provide individualised instruction;
  
ii. enrich the curriculum by providing school-to-work experiences needed in the effective preparation of specific career major goals;
  
iii. improve a means of evaluating the efficiency and success of the curriculum;
  
iv. enable HEP personnel to stay up-to-date on constantly changing industry’s procedures and practices; thus, course content can be updated accordingly;
  
v. use the facilities of cooperating organisations in the community as a laboratory for practical WBL;
  
vi. enable a stronger school-to-work system to be developed by combining the efforts of employers and HEP personnel in WBL;
  
vii. further maintain a close relationship between school and community;
Benefits of WBL for industries or employers:

- INDUSTRIES or EMPLOYERS have the opportunity to:
  
  i. bring in fresh enthusiasm and new ideas to the organisations through students;
  
  ii. have a good way to test a potential new recruit which will lead to a cost effective solution to an organisation’s recruitment needs;
  
  iii. meet skills shortages and able to grow the organisation’s workforce;
  
  iv. have direct links to further qualifications and continuing professional development for their employees;
  
  v. create a pool of skilled and motivated potential employees with the ability to adapt to an ever-changing, global job market;
  
  vi. reduce future recruiting/training/cost for new employees;
  
  vii. increase employee morale, motivation and retention; and
  
  viii. improve the public image of the industries/employers through participation in a community
  
  ix. endeavour to prepare people for occupation and adult citizenship.
  
  x. be furnished with an excellent method of giving students a better understanding of the elements to good human relations in the work environment; and
  
  xi. achieve graduates’ employability targets.
From GGP:WBL

• WBL Key Player:
  - Roles and responsibilities of industry coach:
    i. provide training and development to WBL students according to specific programme/course curriculum to meet students’ learning outcomes;
    ii. establish positive relationships with students; guiding, mentoring and supporting the students through the WBL;
    iii. provide problem solving and follow-up activities to facilitate on-going business and industry participation in WBL;
    iv. assist in developing WBL instructional manual for teaching and learning;
    v. ensure safety and health provisions are being adhered at the workplace as per required by legislation;
    vi. monitor and assess WBL students’ progress and attainment;
    vii. maintain regular communication and report any concerns observed to WBL tutor and coordinator to ensure smooth implementation of WBL;
    viii. assist tutor and coordinator in diagnosing curricular weaknesses through interim assessment;
    ix. assist and counsel students in familiarising with the working environment;
    x. provide career counselling support to students within the scope of their interest and programme placement; and
    xi. participate in coaching training and professional development.
WBL Key Player:

Roles and responsibilities of the students:

i. achieve programme/course learning outcomes;

ii. attend all briefing session, teaching and learning activities, assessment activities conducted by HEP and industry;

iii. adhere to rules and regulations of HEP/industry;

iv. establish positive relationship with peers and superiors at the workplace;

v. submit all assignments, reports, etc. within time given;

vi. provide inputs and feedback to tutor/coach for CQI of WBL;

vii. be fully responsible towards HEP/industry;

viii. follow the occupational safety and health provisions as per required by the industry;

ix. comply with the business secrecy/intellectual property/product innovation; and

x. maintain a record of their hours of work by updating weekly.