جامعة الزقازيق

كلية الحاسبات والمعلومات

اللائحة الداخلية لكلية الحاسبات والمعلومات

جامعة الزقازيق بنظام الساعات المعتمدة

(مرحلة البكالوريوس)

2019

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تمهيد

تم إنشاء كلية الحاسبات والمعلومات بجامعة الزقازيق بموجب قرار رئيس الجمهورية رقم (84) لسنة 1997م، حيث تم إصدار اللائحة الداخلية للكلية بموجب القرار الوزاري رقم (1209) بتاريخ 1998/9/17م. كما تم تعديل اللائحة الداخلية للكلية (مرحلتي البكالوريوس والدراسات العليا) بموجب القرار الوزاري رقم (2645) بتاريخ 2006/10/10م. واخيراً تم تعديل اللائحة الداخلية للكلية (مرحلة الدراسات العليا) بموجب القرار الوزاري رقم (4290) بتاريخ 2018/9/17م.

اللائحة الداخلية لمرحلة البكالوريوس

بنظام الساعات المعتمدة

رؤية الكلية

أن تكون كلية الحاسبات والمعلومات جامعة الزقازيق مؤسسة رائدة في التعليم العالي والبحث العلمي في مجالات الحوسبة والمعلوماتية ودعم القرار على المستوى المحلى والإقليمي والدولي.

رسالة الكلية

تلتزم كلية الحاسبات والمعلومات جامعة الزقازيق بتقديم خدمه تعليمية وبحثية متميزة لتخريج كوادر ذات قدرات تنافسيه عالية من المتخصصين في مجالات الحوسبة والمعلوماتية ودعم القرار لديهم الدافعية للتعلم مدى الحياة والقدرة على مواجهة متطلبات العصر واحتياجات سوق العمل الحالية والمستقبلية وكذلك تقديم بحوث علمية تطبيقية تساهم في خدمة المجتمع.

أهداف الكلية

تهدف كلية الحاسبات والمعلومات جامعة الزقازيق إلى:

1. إعداد المتخصصين في علوم الحاسبات والمعلومات والشبكات والوسائط المتعددة وبحوث العمليات ودعم القرار والمؤهلين بالأسس النظرية ومنهجيات التطبيق بما يمكنهم من المنافسة العالمية في تطوير تقنيات الحاسبات والمعلومات.
2. إجراء الدراسات والبحوث العلمية والتطبيقية في مجال الحاسبات والمعلومات التي لها أثر مباشر على التنمية المتكاملة في المجتمع.
3. تقديم الاستشارات والمساعدات العلمية والفنية للهيئات والجهات التي تستخدم تقنيات الحاسبات والمعلومات وتهتم بصناعة ودعم اتخاذ القرار.
4. إعادة تأهيل شباب الخريجين طبقا لحاجة سوق العمل في المجالات المتعلقة بالحاسبات والمعلومات.

5. تعميق الوعي التكنولوجي من خلال استخدام تقنيات الحاسبات والمعلومات في قطاعات ومؤسسات الدولة ورفع كفاءة استخدامها.
6. الاشتراك مع الجهات المتخصصة من اجل تطوير وتعريب برمجيات النظم والتطبيقات المختلفة بها.
7. تنظيم الندوات وعقد المؤتمرات العلمية في مجال علوم الحاسبات والمعلومات بهدف تعميق المفاهيم والارتقاء بالمستوى العلمي بين الكوادر المتخصصة.
8. عقد الاتفاقيات العلمية مع الهيئات والمؤسسات المناظرة على المستوى المحلى والإقليمي والعالمي بهدف تبادل الخبرات وإجراء البحوث المتعلقة بتخصصات علوم الحاسب وتكنولوجيا المعلومات.
9. إنشاء وحدات بحثية متخصصة في الفروع المختلفة لعلوم الحاسب ونظم المعلومات.
10. توفير وتدعيم وسائل النشر والبحث العلمي في شتى مجالات التخصص.

الأقسام العلمية

تتكون الكلية من الأقسام العلمية التالية:

(1) قسم علوم الحاسب (Computer Science)

يدخل في اختصاصه تدريس وإجراء البحوث المتعلقة بالموضوعات والتخصصات العلمية التالية:

(أساسيات ومفاهيم علوم الحاسب – أساسيات لغات البرمجة– البرمجة الهيكلية – البرمجة الشيئية – البرمجة المنطقية – نظرية وتصميم المترجمات – تحليل وتصميم الخوارزميات – اللغات الصورية ونظرية الآليات – نظم التشغيل – بناء وتنظيم الحاسبات – هياكل البيانات وتنظيم الملفات – المعالجة على التوازي والحاسبات الموزعة – طرق اتصال الإنسان بالحاسب – الذكاء الاصطناعي – نظم الوكلاء المتعددة – الخوارزميات الجينية – الشبكات العصبية – الخوارزميات التطورية – معالجة اللغات الطبيعية – الترجمة الآلية – نظم التعليم بالحاسب – المعلوماتية الحيوية – نظم التعليم الذكية – تعريب الحاسبات – برمجة التطبيقيات – التشفير – امن البرمجيات – اختبار البرمجيات – الحوسبة فائقة الأداء – الحوسبة المرنة – نظرية الحاسبات).

(2) قسم نظم المعلومات (Information Systems)

يدخل في اختصاصه تدريس وإجراء البحوث المتعلقة بالموضوعات والتخصصات العلمية التالية:

(نظم المعلومات – تحليل وتصميم النظم – تخزين واسترجاع المعلومات – نظم قواعد البيانات – استخلاص البيانات – قواعد البيانات الموزعة – نظم المعلومات الذكية – نظم معلومات الوسائط المتعددة – النظم الخبيرة – النظم المبنية على المعرفة – هندسة المعرفة – نظم دعم القرار– نظم المعلومات الإدارية – هندسة البرمجيات – نظم ميكنة العمل المكتبي – نظم ميكنة المكتبات – نظم معلومات إدارة الأزمات – اقتصاديات نظم المعلومات – نظم معلومات المؤسسات الافتراضية و الشركات الرقمية – التجارة الإلكترونية – نظم معلومات الإنترنت – نظم المعلومات الإستراتيجية – إدارة مراكز المعلومات – مستودعات البيانات – التنقيب في البيانات – منهجيات تطوير نظم المعلومات – تأكيد جودة البرمجيات ونظم المعلومات – نظم أمان المعلومات – هندسة النظم – الجيومعلوماتية – نظم المعلومات الجغرافية – الاستشعار عن بعد – تحليل الصور الجوية – نظم تحديد المواقع الأرضية باستخدام الأقمار الصناعية – قواعد البيانات الجغرافية – الكارتوجرافيا الرقمية والتجسيد المرئي – تقنيات جمع البيانات الجغرافية – التحليل والنمذجة الجغرافية – برمجة نظم المعلومات الجغرافية والاستشعار عن بعد – نظم المعلومات الجغرافية المحمولة – تخطيط وإدارة نظم المعلومات الجغرافية– علوم البيانات – تحليل البيانات – البيانات الضخمة – التحليل والتنقيب في شبكات التواصل الاجتماعي – مراجعة وتدقيق نظم المعلومات – تقنية سلسلة الكتل – تطبيقات نظم المعلومات في كافة المجالات: الإدارية، المحاسبية، الطبية، الزراعية، العسكرية، الجغرافية ... الخ).

(3) قسم تكنولوجيا المعلومات (Information Technology)

يدخل في اختصاصه تدريس وإجراء البحوث المتعلقة بالموضوعات والتخصصات العلمية التالية:

(شبكات الحاسب وإداراتها – امن الشبكات – برمجة الشبكات – تراسل البيانات – تكنولوجيا الاتصالات – معالجة الإشارات الرقمية والضوئية – التعرف على الكلام وتوليده – معالجة الصور – نظم الرسم بالحاسب – الرسوم المتحركة – الواقع الافتراضي – الوسائط المتعددة – تكنولوجيا الإنترنت وبرمجتها – ضغط البيانات – معماريات الحاسب – النظم الرقمية – فيزياء الإلكترونيات – المعالجات الدقيقة وتطبيقاتها – النظم المدمجة – الإنسان الآلي والرؤية بالحاسب – الحوسبة السحابية – حوسبة الكم – انترنت الأشياء – الامن السيبراني – الحوسبة المتنقلة).

(4) قسم بحوث العمليات ودعم القرار (Operations Research and Decision Support)

يدخل في اختصاصه تدريس وإجراء البحوث المتعلقة بالمقررات والتخصصات التالية:

(أساسيات ومفاهيم ونظريات اتخاذ القرار– بحوث العمليات ومنهجية دعم القرار– البرمجة الخطية وغير الخطية – البرمجة العشوائية والديناميكية – نظرية الشبكات وتخطيط المشروعات – نظم صفوف الانتظار– البرمجة متعددة الأهداف والمعايير– أدوات وأساليب دعم القرار – نظم مراقبة المخزون والإنتاج – إدارة المشروعات – إدارة الأزمات والمخاطر– تطبيقات بحوث العمليات ودعم القرار – تطبيقات الحسابات الذكية في بحوث العمليات ودعم القرار – أساسيات ومفاهيم علم الإدارة – علوم البيانات – تحليل البيانات – إدارة اللوجستيات وسلاسل الامداد – النماذج الكمية في علم الإدارة والاقتصاد – الاقتصاد الهندسي – الإدارة الاستراتيجية – نظرية المباريات – النمذجة والمحاكاة – إدارة الموارد البشرية والسلوك التنظيمي – علوم الدراسات المستقبلية – منهجيات التنبؤ – النماذج التطبيقية لبحوث العمليات في كافة المجالات الاقتصادية، السياسية، الاجتماعية، العسكرية، ... الخ).

ويجوز أن تنشأ بالكلية أقسام أخرى وفقاً لقانون تنظيم الجامعات

المتطلبات الاكاديمية واللوائح المنظمة

مادة (1): الدرجة العلمية

تمنح جامعة الزقازيق بناء على طلب مجلس الكلية درجة بكالوريوس الحاسبات والمعلومات في إحدى التخصصات التالية:

1- علوم الحاسب. Computer Science.

2- نظم المعلومات. Information Systems.

3- الجيومعلوماتية. Geoinformatics.

4- تكنولوجيا المعلومات. Information Technology.

5- بحوث العمليات ودعم القرار. Operations Research and Decision Support

مادة (2): قواعد القبول

- يتم قبول الطلاب للدراسة بالكلية بناء على القواعد التي يحددها مكتب تنسيق القبول بالجامعات كل عام من بين الطلاب الحاصلين على الثانوية العامة أو ما يعادلها على أن يكون قد درس مقرر الفيزياء ومقرر رياضة (2).
- يتم قبول طلاب الشهادات المعادلة والوافدين حسب القواعد المنظمة لذلك والتي تضعها الجهات المختصة
- يجوز أن يعفى الطالب المحول للكلية من كلية جامعية أو معهد علمي مناظر معترف به من أداء الامتحان في بعض المقررات الدراسية بعد إجراء مقاصة بمعرفة الأقسام المختصة واعتمادها من مجلس الكلية إذا ثبت انه أدى بنجاح امتحانات تعادلها في الكلية أو المعهد المنقول منه.

مادة (3): نظام الدراسة

أ- تعتمد الدراسة بالكلية على نظام الساعات المعتمدة، ويقسم العام الدراسي الى فصلين دراسين نظاميين، وتكون الساعة المعتمدة هي وحدة قياس دراسية لتحديد وزن المقرر الدراسي.

ب–يجوز لمجلس الكلية الموافقة على عقد فصول صيفية مكثفة في بعض المقررات بناء على اقتراح لجنة شئون التعليم والطلاب ووفقا لما تسمح به إمكانيات وظروف الكلية.

ج– الدراسة في المستوى الأول والثاني عامة لجميع التخصصات بالكلية ويبدأ التخصص في المستوى الثالث عند اجتياز الطالب أكثر من 60 ساعة. ولكل قسم أن يضع الشروط المؤهلة للالتحاق به بعد إقرارها من مجلس الكلية.

د– يتطلب الحصول على البكالوريوس ان يجتاز الطالب بنجاح 138 ساعة معتمدة وذلك على مدى ثمانية فصول دراسية على الاقل، مقسمة الى اربعة مستويات دراسية.

مادة (4): لغة التدريس

الدراسة في الكلية باللغة الإنجليزية (عدا مقرر حقوق الانسان ومكافحة الفساد باللغة العربية).

مادة (5): الإرشاد الأكاديمي

تحدد الكلية لكل مجموعة من الطلاب مرشدا أكاديميا من أعضاء هيئة التدريس، يقوم بمهام الإرشاد الأكاديمي للطالب ومساعدته على اختيار المقررات التي يدرسها والتسجيل فيها وتوجيهه طوال فترة دراستها بالكلية، ويعتبر رأى المرشد الأكاديمي استشاريا والطالب هو المسئول عن المقررات التي يقوم بالتسجيل فيها بناء على رغبته بشرط ان يكون الطالب قد اجتاز بنجاح متطلب التسجيل لهذا المقرر.

مادة (6): التسجيل والحذف والإضافة

أ– مع بداية كل فصل دراسي يقوم الطالب بتسجيل المقررات الدراسية التي يختارها، وذلك في الاوقات التي تحددها إدارة الكلية قبل بدء انتظام الدراسة.

ب–يحدد مجلس الكلية الحد الأدنى لعدد الطلاب للتسجيل في كل مقرر بناء على اقتراح لجنة شئون التعليم والطلاب.

ج– عدد ساعات التسجيل

بالنسبة للفصول النظامية:

- الحد الأدنى للساعات المعتمدة للتسجيل (9) ساعات، ويجوز التجاوز عن الحد الادنى إذا كان عدد الساعات المتبقية للطالب للتخرج اقل من 9 او في حالة عدم طرح مقررات باقية للطالب لدراستها في ذات الفصل فقط.
- الحد الاقصى للساعات المسجلة للطلاب 18 ساعة معتمدة.
- الحد الاقصى للساعات المسجلة للطلاب المراقبين علميا (المتعثرين دراسيا والحاصلين على متوسط نقاط تراكمية CGPA في بداية الفصل الدراسي أقل من 2) هو 12 ساعة معتمدة.
- يمكن زيادة الحد الاقصى للساعات المسجلة للطلاب الحاصلين على متوسط نقاط تراكمية CGPA في بداية الفصل الدراسي أعلى من او يساوى 2 الى 21 ساعة معتمدة وذلك لدواعي تخرج الطالب.

بالنسبة للفصل الصيفي:

- الحد الاقصى للساعات المسجلة للطلاب هو 6 ساعات معتمدة.
- يمكن زيادة الحد الاقصى للساعات المسجلة للطلاب الى 9 ساعات معتمدة وذلك لدواعي تخرج الطالب.

د- يجوز للطالب بعد إكمال إجراءات التسجيل ان يحذف او يضيف مقررا او أكثر وذلك خلال فترة تحددها الكلية للحذف والإضافة، ويتم ذلك بالتنسيق مع المرشد الأكاديمي للطالب.

هـ-يسمح للطالب بدراسة المقررات المختلفة والتسجيل في مقررات المستويات الاعلى بناء على قيامه باختيار المقررات المطلوبة كمتطلبات للمقررات الاعلى في فصل دراسي سابق، ولا يتم تسجيل الطالب في مقرر اعلى الا إذا نجح في متطلباته.

مادة (7): الانسحاب من المقرر

أ- يجوز للطالب بعد تسجيل المقررات التي اختارها ان ينسحب من مقرر او أكثر خلال فترة محددة يعلنها مجلس الكلية بحيث لا يقل عدد الساعات المسجلة للطالب عن الحد الادنى للتسجيل في الفصل الدراسي الواحد وفى هذه الحالة لا يعد الطالب راسبا في المقررات التي انسحب منها ويحسب له تقدير "منسحب" وتسجل ضمن سجله الأكاديمي.

ب- إذا انسحب الطالب من مقرر او أكثر بعد الفترة المحددة لذلك دون عذر قهري يقبله مجلس الكلية يحتسب له تقدير "راسب" في المقررات التي انسحب منها.

مادة (8): المواظبة والغياب

أ- الدراسة في الكلية نظامية وتخضع عملية متابعة حضور الطلاب لشروط ولوائح تحددها ادارة الكلية.

ب-يتطلب دخول الطالب الامتحان النهائي تحقيق نسبة حضور لا تقل عن 75% من المحاضرات والتمارين داخل الحرم الجامعي في كل مقرر، وإذا تجاوزت نسبة غياب الطالب – دون عذر مقبول – في أحد المقررات 25% يكون لمجلس الكلية حرمانه من دخول الامتحان النهائي بعد انذاره وفقا للقواعد المنظمة لذلك، ويعتبر راسب ويسجل حرمان. اما إذا تقدم الطالب بعذر يقبله مجلس الكلية (وفى الفترة المحددة) يحتسب له تقدير "منسحب" في المقرر الذي قدم عنه العذر.

ج- الطالب الذي يغيب عن الامتحان النهائي لأي مقرر – دون عذر مقبول – يعتبر راسب ويسجل غياب في ذلك المقرر، ويتعين عليه اعادة دراسة المقرر مرة اخرى.

د- إذا تقدم الطالب بعذر قهري بعد عرضه على مجلس الكلية عن عدم حضور الامتحان النهائي لأي مقرر خلال يومين من إجراء الامتحان يحتسب له تقدير "غير مكتمل" في هذا المقرر بشرط أن يكون حاصلا على 60% على الأقل من درجات الأعمال الفصلية، وألا يكون قد تم حرمانه من دخول الامتحانات النهائية. وفى هذه الحالة يتاح للطالب الحاصل على تقدير "غير مكتمل" فرصة أداء الامتحان النهائي في أول مرة يتم عرض هذا المقرر للتسجيل، وإلا اعتبر راسباً في المقرر. وتحتسب الدرجة النهائية للطالب على أساس الدرجة الحاصل عليها في الامتحان النهائي إضافة إلى الدرجة السابق الحصول عليها في الأعمال الفصلية.

مادة (9): الانقطاع عن الدراسة

أ- يعتبر الطالب منقطعاً عن الدراسة إذا تغيب عن الحضور في جميع مقررات الفصل الدراسي بدون عذر مقبول أو لم يسجل المقررات في فصل دراسي خلال مواعيد التسجيل المقررة.

ب- يجوز للطالب ان يتقدم بطلب لإيقاف القيد بالكلية حسب الشروط والضوابط التي تضعها الجامعة.

مادة (10): الفصل من الكلية

أ- إذا انخفض المعدل التراكمي للطالب الى اقل من 2 في أي فصل دراسي رئيسي يوجه له انذار أكاديمي، يقضى بضرورة رفع الطالب لمعدله التراكمي الى 2 على الاقل.

ب-يفصل الطالب المنذر أكاديميا من الدراسة بالكلية في الحالات التالية:

- إذا تكرر انخفاض معدله التراكمي عن 2 في اربعة فصول دراسية رئيسية متتابعة.
- إذا انقطع عن الدراسة لمدة اطول من فصلين دراسيين نظاميين متتاليين او ثلاث فصول دراسية نظامية غير متتالية دون عذر يقبله مجلس الكلية.

ج- يجوز لمجلس الكلية ان ينظر في امكانية منح الطالب المعرض للفصل نتيجة عدم تمكنه من رفع معدله التراكمي الى 2 فرصه واحده واخيره مدتها فصليين نظاميين متتالين لرفع معدله الى 2 وتحقيق متطلبات التخرج إذا كان قد اتم بنجاح دراسة 70% على الاقل من الساعات المعتمدة المطلوبة للتخرج.

مادة (11): نظام الامتحانات

أ- الدرجة العظمى لكل مقرر هي 100 درجة.

ب-الحد الادنى للنجاح في المقرر الدراسي هو 50% من مجموع درجات المقرر، و30% على الاقل من درجات الامتحان التحريري.

ج- توزيع درجات الامتحان في كل مقرر على النحو التالي:

- 60% للامتحان التحريري نهاية الفصل الدراسي.
- 40% يتم توزيعها لتشمل الأعمال الفصلية على النحو التالي:
  - 15% للامتحانات التي يجريها الأستاذ بصفة دورية والامتحانات العملية أو الأعمال التي يكلف بها الطلاب أثناء الفصل الدراسي
  - 15 % لامتحان منتصف الفصل الدراسي
  - 10% امتحانات شفوية

د- يكون لمجلس الكلية تحديد مواعيد امتحانات منتصف الفصل الدراسي، الامتحانات الشفوية والعملية، والامتحانات النهائية وكذا طريقة الامتحان طبقا لطبيعة المقرر واعلانها للطلاب في وقت مناسب.

هـ-الامتحان النهائي امتحانا تحريرياً في جميع المقررات ويجوز لمجلس الكلية وبناء على اقتراح الأقسام المختصة، الموافقة على عقد الامتحان النهائي بنظام الكتاب المفتوح (Open Book) أو الامتحان الإلكتروني (Computer- Based Exam) وتكون عدد ساعات الامتحان مساوية لعدد الساعات المعتمدة للمقرر.

مادة (12): نظام التقويم

أ- يكون نظام التقييم على اساس التقدير في كل مقرر دراسي بنظام النقاط والذي يحدد طبقا للجدول التالي:

النسبة المئوية (%)	الرمز	النقاط	التقدير
من 90% إلى 100%	A^+	4.0	ممتاز
من 85% إلى أقل من 90%	A	3.7	
من 80% إلى أقل من 85%	B+	3.3	جيد جدا
من 75% إلى أقل من 80%	B	3	
من 70% إلى أقل من 75%	C+	2.7	جيد
من 65% إلى أقل من 70%	C	2.4	
من 60% إلى أقل من 65%	D+	2.2	مقبول
من 50% إلى أقل من 60%	D	2	
أقل من 50%	F	صفر	راسب

ب-تحسب أوزان تقديرات المقررات على النحو التالي:

- يتم حساب مجموع نقاط المقرر على أساس حاصل ضرب عدد النقاط التي يحصل عليها الطالب في عدد الساعات المعتمدة للمقرر وذلك لأقرب رقمين عشريين.

- المعدل الفصلي (GPA) هو متوسط ما يحصل عليه الطالب من مجموع نقاط في الفصل الدراسي، ويحسب على أساس حاصل قسمة مجموع النقاط للمقررات المسجلة في الفصل الدراسي على إجمالي عدد الساعات المعتمدة للمقررات المسجلة في نفس الفصل وذلك لأقرب رقمين عشريين.

ج- يتم حساب تقدير/ المعدل التراكمي كما يلي:

- يتم حساب متوسط ما يحصل عليه الطالب من مجموع نقاط المقررات التي درسها، ويتم حسابه على أساس مجموع نقاط جميع المقررات المسجلة خلال الفترات الدراسية السابقة لحساب المعدل مقسوماً على مجموع عدد الساعات المعتمدة المسجلة خلال الفترات السابقة وذلك لأقرب رقمين عشريين.

المعدل التراكمي (CGPA) = مجموع النقاط / أجمالي الساعات المسجلة.

د- يتم حساب التقدير العام للتخرج طبقا للجدول التالي:

التقدير العام		المعدل التراكمي	
الرمز	التقدير	النسبة المئوية	النقاط
A	ممتاز	85 فأكثر	3.7 فأكثر
B	جيد جدا	75 – أقل من 85	3 – أقل من 3.7
C	جيد	65 – أقل من 75	2.4 – أقل من 3
D	مقبول	50 – أقل من 65	2 – أقل من 2.4
F	ضعيف	أقل من 50	أقل من 2

هـ-تمنح مرتبة الشرف للطالب عند تخرجه بشرط ألا يقل متوسط نقاط أي مستوى دراسي عن (3.00) وألا تزيد فترة الدراسة عن أربع سنوات والا يكون الطالب قد رسب في أي مقرر خلال سنوات الدراسة.

مادة (13): الرسوب والاعادة

أ- يسمح للطالب الذي يرسب في أحد المقررات ان يعيد تسجيل ذلك المقرر (دراسة وامتحاناً) يحتسب له التقدير بحد أقصى (+D) وبنسبة 64% كحد اقصى (أعلى درجة للمقبول) وإذا كان

مقرر اختياري فعليه إعادة دراسة ذلك المقرر أو اختيار مقرر اخر بديل وفي هذه الحالة يحتفظ الطالب بالدرجة والتقدير الحاصل عليهما في المقرر الاختياري الجديد.

ب–الطالب الذي يرسب في مقرر أكثر من مرة يكتفى باحتساب المقرر مرة واحده في معدله التراكمي مهما تعددت مرات الرسوب وتسجل مرات الرسوب في سجله الأكاديمي.

مادة (14): الانتقال بين المستويات

يتحدد مستوى الطالب في بداية العام الدراسي كالتالي:

أ– يقيد الطالب بالمستوى الأول عند التحاقه بالكلية ويظل الطالب مقيد بالمستوى الأول طالما لم يجتاز 28 ساعد معتمدة.

ب–ينتقل الطالب من المستوى الاول للمستوى الثاني عند اجتيازه 28 ساعة معتمدة.

ج– ينتقل الطالب من المستوى الثاني للمستوى الثالث عند اجتيازه 60 ساعة معتمدة.

د– ينتقل الطالب من المستوى الثالث للمستوى الرابع عند اجتيازه 100 ساعة معتمدة.

مادة (15): متطلبات الحصول على الدرجة

للحصول على درجة البكالوريوس يجب ان يجتاز الطالب 138 ساعة معتمدة على الاقل من المقررات وكذلك التدريب العملي والميداني حسب البرنامج الموضوع وبمعدل تراكمي لا يقل عن 2.00 (مقبول).

أولا: المتطلبات العامة (متطلبات الجامعة) (12) ساعة معتمدة

أ– المقررات الاجبارية (6 ساعات معتمدة اجبارية)

ب–المقررات الاختيارية (6 ساعات معتمدة)

ثانيا: متطلبات الكلية (66) ساعة معتمدة

أ– علوم أساسية (24 ساعة معتمدة اجبارية)

ب–علوم حاسب أساسية (42 ساعة معتمدة اجبارية)

ثالثا: متطلبات التخصص (60) ساعة معتمدة

ج– المقررات الاجبارية (42 ساعات معتمدة اجبارية)

د– المقررات الاختيارية (12 ساعات معتمدة)

هـ-مشروع التخرج (6 ساعات معتمدة)

رابعا: التدريب العملي والميداني

خامسا: مقرر حقوق الانسان ومكافحة الفساد (مادة نجاح ورسوب ولا تحسب في المجموع الكلي او المعدل التراكمي للطالب) ويدرس طبقا للقواعد التي يقرها مجلس الجامعة في هذا الشأن.

مادة (16): التدريب العملي والميداني

أ- التدريب العملي والميداني:

- يجب على الطالب حضور التدريب العملي والميداني لمدة شهر قبل التخرج خلال اي عطلة صيفية بعد اجتيازه 60 ساعة معتمدة.
- وذلك تحت إشراف أعضاء هيئة التدريس والهيئة المعاونة وذلك لمتابعة المشاركين في التدريب ووضع التقييم الخاص بكل منهم طبقا للمعايير التي يتم تحديدها من قبل مجالس الأقسام المختصة ويعتمدها مجلس الكلية.
- يلتزم الطالب بكتابة تقرير عن فترة تدريبه وتسليمه لعضو هيئة التدريس المسؤول عنه.
- يجب عدم تسجيل أي مقررات خلال الترم الصيفي بالكلية اثناء حضور التدريب العملي والميداني.

ب-يشترط نجاح الطالب في التدريب العملي والميداني للحصول على درجة البكالوريوس.

مادة (17): مشروع التخرج والتقرير والمناقشة

أ- يقوم طلاب المستوى الرابع بإعداد مشروع بكالوريوس في موضوعات متعلقة بتخصصهم تحددها مجالس الأقسام المختصة وذلك خلال العام الدراسي كله. ويجوز تخصيص فترة إضافية للمشروع تبدأ عقب الانتهاء من امتحان الفصل الدراسي الثاني ولمدة أربع أسابيع على الأكثر وتكون تحت إشراف أعضاء هيئة التدريس لتنظيم إعداد المشاريع وإخراجها في صورتها النهائية لمناقشتها.

ب-يقدم الطالب تقريرا علميا عن موضوع مشروع التخرج في نهاية الفترة المخصصة للمشروع.

ج- يشكل مجلس الكلية لجنة مناقشة وتقييم التقارير الخاصة بالمشروعات المقدمة من الطلاب.

د- يقدر المشروع بقيمة (6) ساعات معتمدة ويمتد لفصلين دراسيين.

مادة (18): الإشراف العلمي على تدريس المقررات

أ- يختص كل قسم من الأقسام العلمية المشار إليها بتدريس المقررات التخصصية طبقا لما يقرره مجلس الكلية ويشرف عميد الكلية على المقررات التي ليس لها أقسام علمية بالكلية.

ب-يقوم كل قسم بإعداد توصيف كامل لمحتويات المقررات التي يقوم بتدريسها، وتعرض هذه المحتويات على مجالس الأقسام المختصة وبعد اعتمادها من مجلس الكلية تصبح هذه المحتويات ملزمة لأعضاء هيئة التدريس القائمين بتدريس تلك المقررات.

ج- يجوز لمجلس الكلية بناء على اقتراح مجالس الأقسام المختصة تعديل متطلبات التسجيل والمحتوي العلمي بما لا يزيد عن 25% من المحتوى لأي مقرر من المقررات الدراسية.

د- يجوز لمجلس الكلية ومجلس الجامعة وبناء على اقتراح مجالس الأقسام المختصة اضافة مقررات لقوائم المقررات الاختيارية لمواكبة التطور السريع في التخصص وامكانية الاستجابة الى التغير في متطلبات سوق العمل وخطط التنمية.

هـ-يقوم مجلس الكلية ومجالس الأقسام المختصة بمتابعة الطلاب دوريا من خلال التنسيق مع المرشد الأكاديمي، ويعطي كل طالب بيانا بحالته الدراسية إذا ظهر تدني مستواه ويضع الضوابط التي يمكن من خلالها متابعة وتحسين حالة الطالب.

و- لمجلس الكلية أن ينظم دورات تدريبية أو دراسات تنشيطية للطلاب في الموضوعات التي تدخل ضمن تخصصات الكلية بناء على اقتراح مجالس الأقسام المختصة.

مادة (19): التعليم عن بعد والإلكتروني

يسمح النظام الدراسي بالكلية بتدريس بعض المقررات بطريقة التعليم المدمج عن طريق الانترنت او الفيديو كونفرانس او أي وسيلة من وسائل التعليم عن بعد وذلك بعد موافقة مجالس الأقسام المختصة ومجلس الكلية على ألا تزيد نسبة ما يتم تدريسه باستخدام اسلوب التعليم عن بعد عن 25% من المقرر، وفى جميع الأحوال يجرى الامتحان النهائي والتدريب العملي داخل الحرم الجامعي

مادة (20): بيان الدرجات

أ- يحق للطالب ان يحصل على بيان بدرجات سجله الأكاديمي.

ب–يحق للطالب الذي أنهى دراسته وحصل على درجة البكالوريوس أو الذي انسحب من الكلية ان يحصل على بيان بدرجات سجله الأكاديمي.

ج– يجوز إعطاء الطالب الوافد بيان بدرجات سجله الأكاديمي متى احتاج اليه لظروف التأشيرة أو الإقامة.

د– لا يعطى بيان بدرجات الطالب في حالة عدم تسديده الرسوم الدراسية.

مادة (21): نظام الاستماع

يجوز لمجلس الكلية بعد اخذ رأي مجالس الأقسام المختصة ان يقبل طلاب من كليات او جامعات أخرى من مصر او الخارج كمستمعين لبعض المقررات بالكلية وفقا لشروط وقواعد يحددها مجلس الكلية وتمنح الكلية افادة بهذه المقررات مبينا فيها تقدير الطالب ولا يتبع ذلك أي درجة جامعية وذلك بعد سداد الرسوم الدراسية التي يحددها مجلس الكلية.

مادة (22): تطبيق اللائحة

أ– تطبق هذه اللائحة من تاريخ صدور القرار الوزاري باعتمادها على الطلاب المستجدين، أما الطلاب المقيدين قبل هذا التاريخ فتسرى عليهم اللائحة الداخلية لعام 2006 والقواعد المتبعة المكملة لها.

ب–يطبق فيما لم يرد بشأنه نص في هذه اللائحة أحكام قانون تنظيم الجامعات رقم (49) لسنة 1972 ولائحته التنفيذية والقوانين المعدلة لهما وكذلك القرارات الوزارية المبنية على قرارات صادرة من المجلس الأعلى للجامعات.

مادة (23): قواعد النظام الكودي للمقررات الدراسية

أ– يتكون كود أي مقرر من الرمز الكودي للقسم او البرنامج ويلي ذلك عدد مكون من ثلاثة أرقام تفصيلها كالآتي:

- الرقم في خانة المئات يمثل المستوى الدراسي
- الرقم في خانتي الآحاد والعشرات يستخدم لتمييز مقررات القسم او البرنامج والتي تدرس لنفس المستوى الدراسي

ب–النظام الرمزي للأقسام العلمية / البرامج

مسلسل	اسم القسم / البرنامج		الرمز
1	علوم الحاسب	Computer Sciences	CS
2	نظم المعلومات	Information Systems	IS
3	الجيومعلوماتية	Geoinformatics	GI
4	تكنولوجيا المعلومات	Information Technology	IT
5	دعم القرار	Decision Support	DS

ج– النظام الرمزي لمقررات العلوم الإنسانية، العلوم الأساسية.

	اسم المقرر		الرمز
1	العلوم الانسانية	Humanities	HU
2	العلوم الاساسية	Basic Science	BS

د– أكواد المستويات الدراسية

المستوى الدراسي (Academic Level)		الكود (Level Code)
الأول	First	1
الثاني	Second	2
الثالث	Third	3
الرابع	Fourth	4

مادة (24): مقررات اللائحة الدراسية

الجدول التالي يلخص النوعيات المختلفة لمقررات اللائحة الدراسية وموضح به أجمالي عدد الساعات المعتمدة لكل نوعية والنسبة المئوية لها مقارنة بالنسبة المناظرة لها في National Academic Reference Standards (NARS)

رمز النوعية	نوعية المقرر	إجمالي عدد الساعات النوعية	نسبة ساعات النوعية	NARS (2010)
A	Humanities, ethical and Social Sciences (Univ. Req.)	12	9.35%	8-10%
B	Mathematics and Basic Sciences	24	17.27%	16-18%
C	Basic Computing Sciences (institution req.)	42	30.22%	26-28%
D	Applied Computing Sciences (specialization)	42	30.22%	28-30%
E	Training	(تكافئ 6 ترم صيفي)	4.32%	3-5%
F	Projects	6	4.32%	3-5%
	Subtotal	127	91.37%	84-96%
G	Optional (Institution character-identifying subjects)	12	8.63%	16-4%
	Total	138	100.00%	100%

تشتمل القوائم التالية على المقررات الدراسية المختلفة موضحا بها عدد الساعات المعتمدة لكل مقرر وما يناظرها من الساعات الفعلية من المحاضرات وما يدعمها من المعامل والتمارين.

الجداول الدراسية

أولا: المتطلبات العامة (متطلبات الجامعة)

(12) ساعة معتمدة (6 ساعة اجباري و6 ساعة اختياري)

أ. المقررات الاجبارية

(6) ساعات معتمدة اجبارية مقسمة كما يلي:

رقم المقرر	اسم المقرر	عدد الساعات المعتمدة	محاضرة	تمارين / عملي	المتطلب السابق
HU100	English اللغة الإنجليزية	2	2	-	---
HU101	Report Writing and Presentation Skills كتابة التقارير ومهارات العرض	2	2	-	HU100
HU102	Social, Ethical, and Professional Issues in Computing القضايا الاجتماعية والأخلاقية والمهنية في الحوسبة	2	2	-	---
*HU103	Human Rights and Anticorruption حقوق الانسان ومكافحة الفساد	0	2	-	---

ب. المقررات الاختيارية

(6) ساعات معتمدة يختارها الطالب من بين المقررات الاختيارية التالية

رقم المقرر	اسم المقرر	عدد الساعات المعتمدة	محاضرة	تمارين / عملي	المتطلب السابق
HU104	Organizational Behavior السلوك التنظيمي	2	2	-	---
HU105	Communication and Negotiation Skills مهارات الاتصال والتفاوض	2	2	-	---
HU106	Strategic Planning التخطيط الاستراتيجي	2	2	-	---
HU107	Fundamentals of Management أساسيات الإدارة	2	2	-	---
HU108	Fundamentals of Economics and Feasibility Study أساسيات الاقتصاد ودراسات الجدوى	2	2	-	---

* مادة نجاح ورسوب ولا تحسب في المجموع الكلي او المعدل التراكمي للطالب

HU109	Business Management إدارة الاعمال	2	2	-	---
HU110	Entrepreneurship and Innovation ريادة الاعمال والابتكار	2	2	-	---
HU111	Digital Marketing التسويق الرقمي	2	2	-	---
HU112	Fundamentals of Accounting مبادئ المحاسبة	2	2	-	---
HU113	Fundamentals of Grant Writing أساسيات كتابة المنح	2	2	-	---

ثانيا: متطلبات الكلية (66) ساعة معتمدة

أ- علوم أساسية (24 ساعة معتمدة اجبارية)

رقم المقرر	اسم المقرر	عدد الساعات المعتمدة	محاضرة	تمارين / عملي	المتطلب السابق
BS100	Mathematics I الرياضيات I	3	2	2	---
BS101	Mathematics II الرياضيات II	3	2	2	BS100
BS102	Physics for Computing فيزياء الحاسب	3	2	2	---
BS103	Probability and Statistics الإحصاء والاحتمالات	3	2	2	BS100
BS201	Mathematics III الرياضيات III	3	2	2	BS101
IT100	Digital Logic Design التصميم المنطقي	3	2	2	---
DS100	Operations Research بحوث العمليات	3	2	2	---
CS103	Discrete Structures تراكيب محددة	3	2	2	BS100

ب- علوم حاسب أساسية (42 ساعة معتمدة اجبارية)

رقم المقرر	اسم المقرر	عدد الساعات المعتمدة	محاضرة	تمارين / عملي	المتطلب السابق
CS100	Introduction to Computational Thinking مقدمة في التفكير الحسابي	3	2	2	---
CS101	Computer Programming I برمجة الحاسب I	3	2	2	---
CS102	Computer Programming II برمجة الحاسب II	3	2	2	CS101

CS200	Data Structures هياكل البيانات	3	2	2	CS102
IT200	Computer Organization and Architecture معمارية وتنظيم الحاسب	3	2	2	IT100
IS200	Database Systems نظم قواعد البيانات	3	2	2	CS102
IT201	Computer Graphics الرسم بالحاسب	3	2	2	BS101
CS201	Operating Systems نظم التشغيل	3	2	2	CS100
IS201	Systems Analysis and Design تحليل وتصميم النظم	3	2	2	IS200
CS202	Analysis and Design of Algorithms تحليل وتصميم الخوارزميات	3	2	2	CS200
IT203	Multimedia الوسائط المتعددة	3	2	2	IT201
CS203	Artificial Intelligence الذكاء الاصطناعي	3	2	2	CS200
IT202	Computer Networks شبكات الحاسب	3	2	2	CS201
IT301	Web and Network Programming برمجة الشبكات والانترنت	3	2	2	CS200

ثالثا: متطلبات التخصص

60 ساعة معتمدة (42 ساعة إجباري + 12 ساعة اختياري + 6 مشروع تخرج)

اولاً: علوم الحاسب.

أ- المقررات الاجبارية

(42) ساعات معتمدة اجبارية مقسمة كما يلي:

رقم المقرر	اسم المقرر	عدد الساعات المعتمدة	محاضرة	تمارين / عملي	المتطلب السابق
CS300	Human Computer Interaction التفاعل بين الانسان والالة	3	2	2	CS200
CS301	Systems Programming برمجة النظم	3	2	2	CS201
CS302	Formal Languages اللغات الصورية	3	2	2	CS200
CS303	Machine Learning تعلم الآلة	3	2	2	CS203

IS201	2	2	3	Software Testing and Maintenance اختبار وصيانة البرمجيات	CS304
DS100	2	2	3	Software Project Management إدارة مشروعات البرمجيات	DS300
IS200	2	2	3	Introduction to Big Data مقدمة في البيانات الضخمة	IS303
CS200	2	2	3	Introduction to Cloud Computing مقدمة في الحوسبة السحابية	IT303
CS200	2	2	3	Introduction to Cybersecurity مقدمة في الأمن السيبراني	IT304
CS200	2	2	3	Introduction to Internet of Things مقدمة في إنترنت الأشياء	IT302
CS201	2	2	3	High Performance Computing الحوسبة فائقة الأداء	CS400
CS200	2	2	3	Compiler Design تصميم المترجمات	CS401
CS202	2	2	3	Distributed and Concurrent Algorithms الخوارزميات الموزعة والمتزامنة	CS402
CS203	2	2	3	Neural networks and deep learning الشبكات العصبية والتعلم العميق	CS403

ب-المقررات الاختيارية

(12) ساعات معتمدة يختارها الطالب من بين المقررات الاختيارية التالية

رقم المقرر	اسم المقرر	عدد الساعات المعتمدة	محاضرة	تمارين / عملي	المتطلب السابق
CS404	Bioinformatics المعلوماتية الحيوية	3	2	2	CS202
CS405	Fuzzy Logic and Intelligent Systems المنطق الضبابي والأنظمة الذكية	3	2	2	CS203
CS406	Software Design and Architecture معمارية وتصميم البرمجيات	3	2	2	IS201
CS407	Natural Language Processing معالجة اللغات الطبيعية	3	2	2	CS303
CS408	Soft Computing الحوسبة المرنة	3	2	2	CS203
IT305	Mobile Application Development تطوير تطبيقات الهاتف المحمول	3	2	2	CS200
CS409	Introduction to Cryptography مقدمة في التشفير	3	2	2	IT304
CS410	Theory of Computation نظرية الحسابات	3	2	2	CS302

CS411	Programming Language Design تصميم لغات البرمجة	3	2	2	CS200
CS412	Intelligent Agents عملاء أذكياء	3	2	2	CS203
CS413	Computer Systems Performance أداء نظم الحاسب الالي	3	2	2	CS201
CS425	Selected Topics in Computer Science I موضوعات مختارة في علوم الحاسب I	3	2	2	---
CS426	Selected Topics in Computer Science II موضوعات مختارة في علوم الحاسب II	3	2	2	---

ج–مشروع التخرج (6 ساعات معتمدة)

رقم المقرر	اسم المقرر	عدد الساعات المعتمدة	محاضرة	تمارين / عملي	المتطلب السابق
CS430	Project I المشروع I	3	1	4	---
CS431	Project II المشروع II	3	1	4	CS430

ثانياً: نظم المعلومات.

أ– المقررات الاجبارية

(42) ساعات معتمدة اجبارية مقسمة كما يلي:

رقم المقرر	اسم المقرر	عدد الساعات المعتمدة	محاضرة	تمارين / عملي	المتطلب السابق
IS300	Database Management Systems نظم إدارة قواعد بيانات	3	2	2	IS200
GI300	Geographical Information Systems نظم المعلومات الجغرافية	3	2	2	IS200, IS201
IS301	Intelligent Systems and Business Intelligence الأنظمة الذكية وذكاء الاعمال	3	2	2	IS201
DS300	Software Project Management إدارة مشروعات البرمجيات	3	2	2	DS100
IS303	Introduction to Big Data مقدمة في البيانات الضخمة	3	2	2	IS200
IT303	Introduction to Cloud Computing مقدمة في الحوسبة السحابية	3	2	2	CS200
IT304	Introduction to Cybersecurity مقدمة في الأمن السيبراني	3	2	2	CS200
IT302	Introduction to Internet of Things مقدمة في إنترنت الأشياء	3	2	2	CS200

IS201	2	2	3	E-Business الأعمال الإلكترونية	IS304
IS303	2	2	3	Big Data Analytics تحليلات البيانات الضخمة	IS400
IT304	2	2	3	Information Security أمن المعلومات	IS401
IS200	2	2	3	Distributed and Mobile Databases نظم قواعد البيانات الموزعة والمحمولة	IS402
IS201	2	2	3	Information Retrieval استرجاع المعلومات	IS406
IS201	2	2	3	Data Mining and Machine Learning التنقيب في البيانات والتعلم الآلة	IS405

ب-المقررات الاختيارية

(12) ساعات معتمدة يختارها الطالب من بين المقررات الاختيارية التالية

رقم المقرر	اسم المقرر	عدد الساعات المعتمدة	محاضرة	تمارين / عملي	المتطلب السابق
IS403	Blockchain Technologies تقنية سلسلة الكتل	3	2	2	IT304
IS404	Web and Social Media Analytics تحليلات الويب والوسائط الاجتماعية	3	2	2	IS400
IS407	Data Visualization عرض مرئي للبيانات	3	2	2	IS303
IS408	Software Engineering هندسة البرمجيات	3	2	2	IS201
IS409	Database Administration إدارة قواعد البيانات	3	2	2	IS201
IS410	Managing Digital Firms إدارة الشركات الرقمية	3	2	2	IS200
IS411	Data Warehousing مستودعات البيانات	3	2	2	IS300
IS412	Business Process Management إدارة عمليات الأعمال	3	2	2	IS201
IS413	Web-based Information Systems نظم المعلومات على شبكة الإنترنت	3	2	2	IT301
CS300	Human Computer Interaction التفاعل بين الانسان والالة	3	2	2	CS200
IS414	Business Analytics Programming برمجة تحليل الأعمال	3	2	2	CS200
IS415	Enterprise Information Systems نظم معلومات المؤسسة	3	2	2	IS201

IS201	2	2	3	Information Systems Auditing تدقيق نظم المعلومات	IS416
IS201	2	2	3	Multimedia Information Systems نظم معلومات الوسائط المتعددة	IS417
IS201	2	2	3	Software Requirements Analysis تحليل متطلبات البرمجيات	IS418
IS201	2	2	3	Systems Design Patterns أنماط تصميم النظم	IS419
IS201	2	2	3	Knowledge Management إدارة المعرفة	IS420
IT303	2	2	3	Cloud Databases قواعد البيانات السحابية	IS421
IS201	2	2	3	Information Systems Quality Assurance ضمان جودة نظم المعلومات	IS422
---	2	2	3	Selected Topics in Information Systems I موضوعات مختارة في نظم المعلومات I	IS425
---	2	2	3	Selected Topics in Information Systems II موضوعات مختارة في نظم المعلومات II	IS426

ج–مشروع التخرج (6 ساعات معتمدة)

رقم المقرر	اسم المقرر	عدد الساعات المعتمدة	محاضرة	تمارين / عملي	المتطلب السابق
IS430	Project I المشروع I	3	1	4	---
IS431	Project II المشروع II	3	1	4	IS430

ثالثاً: الجيومعلوماتية.

أ– المقررات الاجبارية

(42) ساعات معتمدة اجبارية مقسمة كما يلي:

رقم المقرر	اسم المقرر	عدد الساعات المعتمدة	محاضرة	تمارين / عملي	المتطلب السابق
IS300	Database Management Systems نظم إدارة قواعد بيانات	3	2	2	IS200
GI300	Geographical Information Systems نظم المعلومات الجغرافية	3	2	2	IS200, IS201
DS300	Software Project Management إدارة مشروعات البرمجيات	3	2	2	DS100

IS303	Introduction to Big Data مقدمة في البيانات الضخمة	3	2	2	IS200
IT303	Introduction to Cloud Computing مقدمة في الحوسبة السحابية	3	2	2	CS200
IT304	Introduction to Cybersecurity مقدمة في الأمن السيبراني	3	2	2	CS200
IT302	Introduction to Internet of Things مقدمة في إنترنت الأشياء	3	2	2	CS200
GI301	Principles of Remote Sensing مبادئ الاستشعار عن بعد	3	2	2	GI300
GI302	Spatial Database قواعد البيانات المكانية	3	2	2	GI300
GI400	Digital Cartography and Visualization الكارتوجرافيا الرقمية والتجسيد المرئي	3	2	2	GI300
GI401	Spatial Analysis and Modeling التحليل والنمذجة المكانية	3	2	2	GI300
GI402	GIS Programming برمجة نظم المعلومات الجغرافية	3	2	2	GI300
GI403	Spatial Decision Support Systems نظم دعم القرارات المكانية	3	2	2	GI300
GI404	Web and Mobile GIS نظم المعلومات الجغرافية على الويب والمحمول	3	2	2	GI300, IT301

ب–المقررات الاختيارية

(12) ساعات معتمدة يختارها الطالب من بين المقررات الاختيارية التالية

رقم المقرر	اسم المقرر	عدد الساعات المعتمدة	محاضرة	تمارين / عملي	المتطلب السابق
GI405	Spatial Statistics الاحصاء المكاني	3	2	2	GI300
GI406	Open and Distributed GIS Infrastructures البنية التحتية لنظم المعلومات الجغرافية الموزعة والمفتوحة	3	2	2	GI300
GI407	Medical GIS نظم المعلومات الجغرافية الطبية	3	2	2	GI300
GI408	GIS Network Modeling نمذجة الشبكات باستخدام نظم المعلومات الجغرافية	3	2	2	GI300
GI409	Spatial Data Mining التنقيب في البيانات المكانية	3	2	2	IS201

IS403	Blockchain Technologies تقنية سلسلة الكتل	3	2	2	IT304
GI410	Remote Sensing Application تطبيقات الاستشعار عن بعد	3	2	2	GI301
GI411	Spatial Big Data البيانات المكانية الضخمة	3	2	2	IS303
GI412	GIS and Cyber Security نظم المعلومات الجغرافية والأمن السيبراني	3	2	2	IT304
GI413	Cloud GIS نظم المعلومات الجغرافية السحابية	3	2	2	IT303
GI414	Spatial Data Acquisition Techniques تقنيات جمع البيانات المكانية	3	2	2	GI300
GI425	Selected Topics in Geoinformatics I موضوعات مختارة في الجيومعلوماتية I	3	2	2	---
GI426	Selected Topics in Geoinformatics II موضوعات مختارة في الجيومعلوماتية II	3	2	2	---

ج–مشروع التخرج (6 ساعات معتمدة)

رقم المقرر	اسم المقرر	عدد الساعات المعتمدة	محاضرة	تمارين / عملي	المتطلب السابق
GI430	Project I المشروع I	3	1	4	---
GI431	Project II المشروع II	3	1	4	GI430

رابعاً: تكنولوجيا المعلومات.

أ– المقررات الاجبارية

(42) ساعات معتمدة اجبارية مقسمة كما يلي:

رقم المقرر	اسم المقرر	عدد الساعات المعتمدة	محاضرة	تمارين / عملي	المتطلب السابق
IS303	Introduction to Big Data مقدمة في البيانات الضخمة	3	2	2	IS200
IT303	Introduction to Cloud Computing مقدمة في الحوسبة السحابية	3	2	2	CS200
IT304	Introduction to Cybersecurity مقدمة في الأمن السيبراني	3	2	2	CS200
IT302	Introduction to Internet of Things مقدمة في إنترنت الأشياء	3	2	2	CS200
DS300	Software Project Management إدارة مشروعات البرمجيات	3	2	2	DS100
IT300	Digital Signal Processing معالجة الإشارات الرقمية	3	2	2	BS101

CS200	2	2	3	Mobile Application Development تطوير تطبيقات المحمول	IT305
IT202	2	2	3	Wireless and Mobile Networks الشبكات اللاسلكية والمتحركة	IT306
IT200	2	2	3	Embedded Systems Design تصميم النظم المدمجة	IT307
CS200	2	2	3	Microcontrollers المتحكمات الصغيرة	IT308
IT300	2	2	3	Image Processing معالجة الصور	IT401
IT304, IT202	2	2	3	Network Security امان الشبكات	IT402
IT203	2	2	3	Computer Vision الرؤية بالحاسب	IT403
IT200	2	2	3	Robotics الإنسان الآلي	IT404

ب-المقررات الاختيارية

(12) ساعات معتمدة يختارها الطالب من بين المقررات الاختيارية التالية

المتطلب السابق	تمارين / عملي	محاضرة	عدد الساعات المعتمدة	اسم المقرر	رقم المقرر
IT203	2	2	3	Computer Animation and 3D Modeling الرسوم المتحركة والنمذجة ثلاثية الأبعاد	IT405
IT202	2	2	3	Information Theory and Data Compression نظرية المعلومات وضغط البيانات	IT406
CS203	2	2	3	Machine Learning تعلم الآلة	CS303
IT203	2	2	3	Virtual and Augmented Reality الواقع الافتراضي والمعزز	IT407
IT202	2	2	3	Network Simulation محاكاة الشبكات	IT408
IT200	2	2	3	Computer Forensics العلوم الجنائية الحاسوبية	IT409
CS201	2	2	3	Systems Programming برمجة النظم	CS301
CS200	2	2	3	Human Computer Interaction التفاعل بين الانسان والالة	CS300
IS201	2	2	3	Multimedia Information Systems نظم معلومات الوسائط المتعددة	IS417

IT202	2	2	3	Cloud Networks الشبكات السحابية	IT410
IT203	2	2	3	Pattern Recognition التعرف على الأنماط	IT411
IT203	2	2	3	Multimedia Mining التنقيب في الوسائط المتعددة	IT412
IT202	2	2	3	Optical Networks الشبكات الضوئية	IT413
CS201	2	2	3	Quantum Computing حوسبة الكم	IT414
IT401	2	2	3	Computational Imaging التصوير الحسابي	IT415
CS200	2	2	3	Game Development تطوير الألعاب	IT416
IT202	2	2	3	Wireless Sensors Networks شبكات الاستشعار اللاسلكية	IT417
---	2	2	3	Selected Topics in Information Technology I موضوعات مختارة في تكنولوجيا المعلومات I	IT425
---	2	2	3	Selected Topics in Information Technology II موضوعات مختارة في تكنولوجيا المعلومات II	IT426

ج–مشروع التخرج (6 ساعات معتمدة)

رقم المقرر	اسم المقرر	عدد الساعات المعتمدة	محاضرة	تمارين / عملي	المتطلب السابق
IT430	Project I المشروع I	3	1	4	---
IT431	Project II المشروع II	3	1	4	IT430

خامساً: دعم القرار.

أ– المقررات الاجبارية

(42) ساعات معتمدة اجبارية مقسمة كما يلي:

رقم المقرر	اسم المقرر	عدد الساعات المعتمدة	محاضرة	تمارين / عملي	المتطلب السابق
DS301	Modeling and Simulation النمذجة والمحاكاة	3	2	2	DS100 BS103
DS300	Software Project Management إدارة مشروعات البرمجيات	3	2	2	DS100
IS303	Introduction to Big Data مقدمة في البيانات الضخمة	3	2	2	IS200

CS200	2	2	3	Introduction to Cloud Computing مقدمة في الحوسبة السحابية	IT303
CS200	2	2	3	Introduction to Cybersecurity مقدمة في الأمن السيبراني	IT304
CS200	2	2	3	Introduction to Internet of Things مقدمة في إنترنت الأشياء	IT302
DS100	2	2	3	Advanced operations Research بحوث العمليات المتقدمة	DS302
DS100	2	2	3	Decision Support Methodologies منهجيات دعم القرار	DS303
DS301	2	2	3	Systems Dynamics Modeling نمذجة النظم الديناميكية	DS305
DS100	2	2	3	Data Analytics تحليل البيانات	DS400
DS100	2	2	3	Stochastic Methods الطرق العشوائية	DS401
CS203	2	2	3	Computational Intelligence الذكاء الحسابي	DS403
DS100	2	2	3	Supply Chain Planning and Logistics تخطيط سلسلة التوريد والخدمات اللوجستية	DS404
DS100	2	2	3	Forecasting Techniques تقنيات التنبؤ	DS405

ب-المقررات الاختيارية

(12) ساعات معتمدة يختارها الطالب من بين المقررات الاختيارية التالية

المتطلب السابق	تمارين / عملي	محاضرة	عدد الساعات المعتمدة	اسم المقرر	رقم المقرر
DS100	2	2	3	Quality Management ادارة الجودة	DS304
DS303	2	2	3	Strategic Management and Business Analysis الإدارة الاستراتيجية وتحليل الأعمال	DS402
	2	2	3	Service Management إدارة الخدمات	DS406
DS100	2	2	3	Operations Management إدارة العمليات	DS407
DS100	2	2	3	Multi-Objective Programing البرمجة متعددة الاهداف	DS408
DS303	2	2	3	Production Planning and Inventory Control تخطيط الإنتاج ومراقبة المخازن	DS409

DS303	2	2	3	Decision and Game Theory نظرية القرارات والألعاب	DS410
DS303	2	2	3	Decision and Risk Management القرار وإدارة المخاطر	DS411
DS403	2	2	3	Optimization Models and Methods نماذج وطرق الأمثلة	DS412
DS100	2	2	3	Scheduling Techniques تقنيات الجدولة	DS413
DS304	2	2	3	Quality Control and Reliability مراقبة الجودة والموثوقية	DS414
DS100	2	2	3	Stochastic Processes and Queuing Models العمليات العشوائية ونماذج الانتظار	DS415
DS400	2	2	3	Data Analytics Programming برمجة تحليل البيانات	DS416
CS203	2	2	3	Fuzzy Logic and Intelligent Systems المنطق الضبابي والأنظمة الذكية	CS416
DS303	2	2	3	Decision Analysis تحليل القرار	DS417
DS301	2	2	3	Network Modelling and Optimization نمذجة وأمثليه الشبكات	DS418
DS300	2	2	3	Advanced Project Management إدارة المشروعات المتقدمة	DS419
IS201	2	2	3	Data Mining and Machine Learning التنقيب في البيانات والتعلم الآلة	IS405
---	2	2	3	Selected Topics in Operations Research and Decision Support I موضوعات مختارة في بحوث العمليات ودعم القرار I	DS425
---	2	2	3	Selected Topics in Operations Research and Decision Support II موضوعات مختارة في بحوث العمليات ودعم القرار II	DS426

ج- مشروع التخرج (6 ساعات معتمدة)

رقم المقرر	اسم المقرر	عدد الساعات المعتمدة	محاضرة	تمارين / عملي	المتطلب السابق
DS430	Project I المشروع I	3	1	4	---
DS431	Project II المشروع II	3	1	4	DS430

المحتوى العلمي للمقررات الدراسية

اولا: المحتوى العلمي للمقررات العامة

HU100: English

The material reflects the stylistic variety that advanced learners must be able to deal with. The course gives practice in specific points of grammar to consolidate and extend learners existing knowledge. The course aims at developing proficiency in speaking, listening, reading, and writing of English. It is generalized as a remedial course for students whose English need considerable repair. The contents include parts of speech, count and uncountable nouns and articles, agreement between subject and verb, adverbs of frequency, tense and the sequence of tenses, active and passive voices, types of sentences, prepositions: time, place, action, directions, questions forms, multi-word verbs, capitalization.

HU101: Report Writing and Presentation Skills

Professionals in the public and private sector increasingly need to document and present complex technical findings, analysis and recommendations for effective decision making. This course is specially designed to focus on the unique needs of technical professionals who write and present to both technical and non-technical readers and decision makers. The course will demonstrate how technical professionals can use their expertise and knowledge to write grammatically accurate and successful technical reports and use persuasive communication for effective data presentation. This course introduces basic rudiments of report writing. The rationale for report writing, the structure of reports, physical appearance and linguistic. The course provides training on the fundamentals of writing and reviewing technical reports that help disseminate critical findings and recommendations effectively to clients in the associated business and government sector. In addition, it will encourage participants to give effective data presentations by helping them to speak with conviction and authority and assist them in selecting notes and visual aids that support their message.

HU102: Social, Ethical, and Professional Issues in Computing

The course examines Social, ethical, and professional issues facing computing professionals; ethical principles; discussion of case studies. The course introduces social and ethical issues that arise in the development and application of computing technology in modern society, alternate points of view and broader perspectives in the analysis of social and ethical concerns arising in the context of computing technology, the immediate and long-term implications to society in the creation and use of computing technology, the potential benefits and risks of computing technology to society, both locally and globally, the impact of computing technology on the economy at large as well as long-term trends, the codes of ethics of one or more professional societies related to computing technologies (e.g., ACM, IEEE، CISSP), the distinction between a profession and a trade, and how this distinction relates to ethics and responsibility, legal issues that computing professionals may encounter as part of their practice. The course introduces basic

human rights philosophy, principles, instruments and institutions, and an overview of current issues and debates in the field with focus on the problems specific to Egypt. Topics may include: definition of human rights, historical development of the concept of human rights, culture relativism versus universally accepted human rights standards, various human rights: personal, political, civil, social, economic, … etc., covering human rights within official international organizations, influence of business and global economic restructuring on human rights, monitoring human rights, human rights violations and Anti-Corruption.

HU104: Organizational Behavior

Perception, learning, motivation and value; individual differences and work performance; understanding yourself; motivating yourself and others, working within groups, achieving success through goal setting, achieving high personal productivity and quality; achieving rewarding and satisfying career; communicating with people; leading and influencing others; building relationships with supervisors, co-worker and customers.

HU105: Communication and Negotiation Skills

The goal is to become knowledgeable of the Integrated and Collaborative Engagement Process and the theory and practice of effective relationship building by developing a critical thinking process that creates an understanding of diverse constructions of reality shared by individuals and groups in any setting. Effective Business Communication, Communicating in Teams & Business Etiquette, Communicating Intercultural, Planning Business Messages, Writing Business Messages, Completing Business Messages, Writing Routine Messages, Writing Bad News Messages Writing Persuasive Messages, Planning Business Reports, Writing Business Reports, Completing Business Reports, Oral Presentations, Writing Resumes and Application Letters, Interviewing for Employment, and Negotiation Skills book

HU106: Strategic Planning

In this strategic planning course, student will gain an understanding of the relationships between strategy, planning and execution, and learn how to develop a strategic mindset, improve your analytical skills, and apply creative planning to current challenges. There’s much confusion and controversy surrounding business strategy. Where is the magic pathway to success for organization? How do we optimize our strategy to use least resources to achieve our objectives? What are the variables and how do we juggle them when so much always seems to be changing? By the end of this course, student should be able to: understanding the definitions and components of strategic planning, identify why some organizations have great difficulty in strategic planning, discuss the role of strategic planning, assess and improve your company strategy, utilize your Improved ability to think strategically while operating and managing daily objectives, new ability to integrate strategic planning into normal business activity.

HU107: Fundamentals of Management

Introduction to management science, principals of organization structures and their categories, inventory models, analysis cost volume profit, objectives and methodologies of resource

management, skills needed to effective management renewable and natural resources. Decision making processes and financial management, accounting management, marketing, and human resource management.

HU108: Fundamentals of Economics and Feasibility Studies

Concepts of economics. The economic problem. Supply and demand. Theory of demand including utility theory, theory of production, theory of cost, theory of firm including pricing theory, economics of education, economic of science and technology, economics of automation including computerization.

HU109: Business Management

This course emphasizes the skills needed for managing a business that involves the selection and supervision of employees including efficient time, personnel, facilities, and financial resources. Students will explore forms of business ownership, typical business organizational structure; product or service promotion in business; effective communications, human relations skills required in dealing with employees, and effective management strategies used in personnel, finance, production, marketing, and information processing.

HU110: Entrepreneurship and Innovation

Entrepreneurship and innovation are increasingly important in all areas of business and government. Entrepreneurial start-ups galvanize the economy by identifying new opportunities and redirecting resources to them. Established firms innovate in order to outmaneuver or respond to their competition. And in the public sector, the need for effective policies to deal with new challenges and for increasing service delivery with declining budgets also places a premium on innovative thinking. The course focuses on the skills necessary for the planning, development and launch of entrepreneurial and innovative ventures. The material covered includes the foundations of entrepreneurship, techniques for creative thinking, and processes for developing, planning and launching a new venture including protecting intellectual property, evaluating markets, developing innovative business models, budgeting, and raising finance. The major piece of assessment is the writing of a comprehensive business plan.

HU111: Digital Marketing

Students learn how to apply digital marketing and analytic tools to create competitive and effective digital marketing programs. Topics include optimizing web and social content, online advertising, lead generation, email marketing, and web analytics.

HU112: Fundamentals of Accounting

This course introduces the students the fundamentals of accounting principles and practice applied to sole or single proprietorship which may be classified as service, merchandising and manufacturing businesses. It involves a study of Nature and Importance of Accounting, the accounts, Journal, and Ledger, Adjusting the accounts, Advisory Examination, Completion of

the Accounting Cycle, Accounting for Merchandising Operations, Accounting Information System, Manufacturing, Cash, Third grading Examination, and Departmental Examination.

HU113: Fundamentals of Grant Writing

This course introduces the skills of grant writing in informatics. Each student will submit a completed grant application as a culminating experience. This course introduces students to grant development and preparation so that they can participate in the process of obtaining public or private funds to support research, education and/or service projects.

BS100: Mathematics I

Graphs and Models, Linear Models and Rates of Change, Functions and Their Graphs, Review of Trigonometric Functions, Inverse Functions, Exponential and Logarithmic Functions, Limits and their properties (finding limits graphically and numerically, evaluating limits analytically, continuity and one-sided limits, infinite limits graphs and limits of trigonometric functions); differentiation (the derivative and the tangent line problem, basic differentiation rules and rates of change, product and quotient rules and higher-order derivatives, the chain rule, implicit differentiation, derivatives of inverse functions, related rates, newton's method); Applications of differentiation ;integration. (antiderivatives and indefinite integration, Area, Riemann sums and definite integrals, the fundamental theorem of calculus, integration by substitution, indeterminate forms and L'hopital's rule, the natural logarithmic function, integration, inverse trigonometric functions, , hyperbolic functions) ; differential equations; (Slope fields and Euler's method, growth and decay, separation of variables, the logistic equation, first-order linear differential equations); Applications of integration; Integration techniques and improper integrals (Basic integration rules, integration by parts, trigonometric integrals, numerical integration, integration by tables and other integration techniques, improper integrals).

BS101: Mathematics II

Systems of linear equations (direct methods for solving linear systems, Gaussian elimination, partial pivoting; counting operations, spanning sets and linear independence, applications, iterative methods for solving linear systems); Matrices (matrix operations, matrix algebra, the inverse of a matrix, the LU factorization, subspaces, basis, dimension, and rank, linear transformations, canonical forms of matrices, applications in biomedical); Eigenvalues and Eigenvectors (determinants, applications of determinants, eigenvalues and eigenvectors of n x n matrices, similarity and diagonalization, iterative methods for computing eigenvalues, applications and the perron-frobenius theorem); Orthogonality (orthogonality in Rn, orthogonal complements and orthogonal projections, the gram-schmidt process and the QR factorization, approximating eigenvalues with the QR algorithm, orthogonal diagonalization of symmetric matrices, applications); Vector spaces(vector spaces and subspaces, linear independence, basis, and dimension, linear transformations, the kernel and range of a linear transformation, the matrix of a linear transformation, applications); Distance and Approximation(inner product spaces. explorations: vectors and matrices with complex entries; geometric inequalities and optimization problems, norms and distance functions. least squares approximation, the singular value decomposition, applications).

BS102: Physics for Computing

This course aims to show the fundamental role of physics in building up computing systems and computer applications. You will be exposed to various selected physics topics (Optics, Electrics، Electronics, and Magnetism), with which, many useful physics-computing systems have been developed and changed our daily life. This course serves you as an introductory general education course to encourage you for interdisciplinary thinking and exploration. This course introduces Electrical sources, electrical circuit elements, Ohm's law, Kirshoffs laws, solution of AC circuits, superposition theorem, substitution theorem, Thevenin's and Norton's theorems, compensation theorem, four-pole networks, electric power, maximum power transfer theorem, diodes, transistors, field effect transistors, operational amplifiers and their basic circuits and applications.

BS103: Probability and Statistics

Introduction to probability, properties of probability, methods of computing probability, probability distribution, sampling and sampling distribution. Review of sampling theory and distributions, point's estimates, confidence interval estimates. Tests of hypotheses and significance for large or small samples, operating characteristic curves, quality control chart, fitting theoretical distributions to sample frequency distributions, goodness of fit. Curve fitting, regression and correlation. Analysis of variance Students are instructed on the use of a statistics computer package at the beginning of them. Parametric classifiers, bays linear classify, linear classifier Design, clustering, parametric clustering, nonparametric clustering selection at representatives.

BS201: Mathematics III

Infinite series (sequences, series and convergence ,Taylor polynomials and approximations, power series, representation of functions by power series, Taylor and McLaurin series; Fourier series) ; conics, parametric equations, and polar coordinates; Functions of several variables ; Fourier transform; Laplace transform; Inverse Laplace transform via partial fraction expansion method; Properties of the Laplace transform; Z transform; Inverse Z transform via partial fraction expansion method; Properties of the Z transform; Codes (code vectors, error-correcting codes, dual codes, linear codes); solutions of nonlinear systems of equations; boundary-value problems for ordinary differential equations; solutions to partial differential equations.

ثانيا: المحتوى العلمي لمقررات قسم علوم الحاسب

CS100: Introduction to Computational Thinking

Computational thinking (CT) is a problem-solving process with the aid of computer; i.e. formulating a problem and expressing its solution in such a way that a computer can effectively carry it out. It includes several characteristics, such as breaking a problem into small and repetitive ordered steps, logically ordering and analyzing data and creating solutions that can be effectively implemented as algorithms running on computer. As such, computational thinking is essential not only to the Computer Science discipline, it can also be used to support problem solving across all disciplines, including math, science, engineering, business, finance and humanities. The aim of this course is hence to take students with no prior experience of thinking in a computational manner to a point where they can derive simple algorithms and code the programs to solve some basic problems in their domain of studies. In addition, the course will include topics to appreciate the internal operations of a processor and raise awareness of the socio-ethical issues arising from the pervasiveness of computing technology. The course also includes learn to design, write, debug, and run programs encoded in the Python language. Develop a working knowledge for how computers operate and how computer programs are executed. Evolve critical thinking and problem-solving skills using an algorithmic approach. Learn about the programmer's role in the software development process. Translate real-world issues into computer-solvable problems.

CS101: Computer Programming I

Introduces the fundamental concepts of procedural programming. Topics include data types, control structures, functions, arrays, files, and the mechanics of running, testing, and debugging. The course also offers an introduction to the historical and social context of computing and an overview of computer science as a discipline. The course also includes Fundamental programming constructs: Syntax and semantics of a higher-level language; variables, types, expressions, and assignment; simple I/O; conditional and iterative control structures; functions and parameter passing; structured decomposition. Algorithms and problem-solving: Problem-solving strategies; the role of algorithms in the problem-solving process; implementation strategies for algorithms; debugging strategies; the concept and properties of algorithms.

CS102: Computer Programming II

Introduces the concepts of object-oriented programming to students with a background in the procedural paradigm. The course begins with a review of control structures and data types with emphasis on structured data types and array processing. It then moves on to introduce the object-oriented programming paradigm, focusing on the definition and use of classes along with the fundamentals of object-oriented design. Other topics include an overview of programming language principles, simple analysis of algorithms, basic searching and sorting techniques, and an introduction to software engineering issues. The course also includes Review of control structures, functions, and primitive data types. Object-oriented programming: Object-oriented design; encapsulation and information hiding; separation of behavior and implementation;

classes, subclasses, and inheritance; polymorphism; class hierarchies. Fundamental computing algorithms: simple searching and sorting algorithms (linear and binary search, selection and insertion sort). Fundamentals of event-driven programming; Introduction to computer graphics: Using a simple graphics API; Overview of programming languages: History of programming languages; brief survey of programming paradigms

CS103: Discrete Structures

Introduces the foundations of discrete mathematics as they apply to computer science, focusing on providing a solid theoretical foundation for further work. Topics include functions, relations, sets, simple proof techniques, Boolean algebra, propositional logic, digital logic, elementary number theory, and the fundamentals of counting. The course also includes Introduction to logic and proofs: Direct proofs; proof by contradiction; mathematical induction. Fundamental structures: Functions (surjections, injections, inverses, composition); relations (reflexivity, symmetry, transitivity, equivalence relations); sets (Venn diagrams, complements, Cartesian products, power sets); pigeonhole principle; cardinality and countability. Boolean algebra: Boolean values; standard operations on Boolean values; de Morgan's laws. Propositional logic: Logical connectives; truth tables; normal forms (conjunctive and disjunctive); validity. Digital logic: Logic gates, flip-flops, counters; circuit minimization. Elementary number theory: Factorability; properties of primes; greatest common divisors and least common multiples; Euclid's algorithm; modular arithmetic; the Chinese Remainder Theorem. The course also includes Predicate logic: Universal and existential quantification; modus ponens and modus tollens; limitations of predicate logic. Recurrence relations: Basic formulae; elementary solution techniques. Graphs and trees: Fundamental definitions; simple algorithms; traversal strategies; proof techniques; spanning trees; applications. Matrices: Basic properties; applications.

CS200: Data Structures

Specification, representation, and manipulation of basic data structures: linked lists, arrays, stacks, queues, trees, strings, symbol tables, Huffman codes, optimal search trees, pattern matching, priority queues, heaps, hash tables. Storage allocation, garbage collection, compaction, reference counts, Sorting, graphs (graph traversal, directed graphs). List and string processing languages. Analysis of algorithms. Performance evaluation involving worst case, average and expected case, and amortized analysis. Students are required to write programs in several languages such as C++, C#, Java, or Pascal.

CS201: Operating Systems

This course will introduce operating system design and implementation. The course will start with a brief historical perspective of the evolution of operating systems over the last fifty years, and then cover the major components of most operating systems. This will include: Computer system structures, Operating system structures, Process and Process management: process synchronization and mutual exclusion; two- process solution and Dekker's algorithm, semaphores (producer- consumer, readers-writer, dining philosophers, etc.), Interprocess communication, Process synchronization, Deadlocks, thread management, CPU scheduling: multiprogramming and time-sharing, scheduling approaches (SJF, FIFO, round robin, etc.),

Memory hierarchy and management: with and without swapping, virtual memory-paging and segmentation, page replacement algorithms, implementation., Virtual memory, Secondary storage management, I/O device management, File system: interface and implementation, FS services, disk space management, directory and data structure, Protection and security, and Case studies: Linux and Windows.

CS202: Analysis and Design of Algorithms

An introduction to the design and analysis of algorithms. The course covers design techniques, such as dynamic programming and greedy methods, as well as fundamentals of analyzing algorithms for correctness and time and space bounds. Topics include advanced sorting and searching methods, graph algorithms and geometric algorithms, notion of an algorithm: big-O, small-O, theta and omega notations. Space and time complexities of an algorithm. Fundamental design paradigms: divide and conquer, branch and bound, backtracking, dynamic programming greedy methods, simulation. Theory of NP-completeness, notion of an intractable problem. Measures of approximation: ratio bound and relative error. Polynomial time approximation scheme. Illustrative examples: graph theory, computational geometry, optimization, numerical analysis and data processing. Other areas vary from year to year, and may include matrix manipulations, string and pattern matching, set algorithms, polynomial computations, and the fast Fourier transform.

CS203: Artificial Intelligence

This is an introductory AI course. Topics will include Artificial and human intelligence, Overview of Artificial Intelligence, Basic Problem-Solving Strategies, Heuristic Search, Problem Reduction and AND/OR Graphs, domains of AI- symbolic processing: semantic nets, modeling model-based reasoning, frames. Knowledge Representation, Representing Knowledge with If-Then Rules. Inference Engines, Inference techniques: implication, forward and backward chaining, inference nets, predicate logic, quantifiers, tautology, resolution, and unification. Rule based systems: inference engine, production systems, problem solving, planning, decomposition, and basic search techniques. AI languages: symbolic and coupled processing prolog: objects and relations, compound goals, backtracking, search mechanism, dynamic databases, lisp, program structure and operations, functions, unification, memory models. Fields of AI: heuristics and game plying, automated reasoning, problem solving, computational linguistics and natural language processing, computer vision, intelligent agents, robotics AI based computer systems: sequential and parallel inference machines, relation between AI and artificial neural nets, fuzzy systems.

CS300: Human Computer Interaction Design

Introduction to Human-Computer Interaction, or how computers communicate with people. Methodology for designing and testing user interfaces, interaction styles (command line, menus, graphical user interfaces, virtual reality), interaction techniques (including use of voice, gesture, and eye movement), design guidelines, and user interface management system software. Comprehensive coverage of computer human interaction(CHI) importance, design, theories, and

future direction; modeling compute interfaces, empirical techniques for task analysis and interface design of interaction, The scope of HCI: Different theories and disciplines that contribute to HCI, HCI Analysis: User analysis, task analysis, environment and domain analysis, Human Cognitive Architecture: Perception, memory, problem solving, Dialogue design: Input, output devices and ergonomics; embedded systems; web usability; interfaces for mobile devices; future systems, CSCW, Influences on Design: Guidelines and standards in HCI; conceptual design, Prototyping in HCI: vertical, horizontal, full, throw-away prototypes, and Empirical evaluation: qualitative and quantitative methods of collecting data from users; the Usability Engineering approach; research topics in evaluation techniques. Students will design a small user interface, program a prototype, and then test the result for usability.

CS301: Systems Programming

Low-level programming; review of addresses, pointers, memory layout, and data representation; text, data, and bss segments; debugging and hex dumps; concurrent execution with threads and processes; address spaces; file names; descriptors and file pointers; inheritance; system calls and library functions; standard I/O and string libraries; simplified socket programming; building tools to help programmers; make and make files; shell scripts and quoting; Unix tools including sed, echo, test, and find; scripting languages such as awk; version control; object and executable files (.o and a.out); symbol tables; pointers to functions; hierarchical directories; and DNS hierarchy; programming embedded systems.

CS302: Formal Languages and Automata

Alphabets and languages. Finite representation of language. Deterministic and non-deterministic finite automata and their applications. Equivalence considerations. Regular expressions. Context-free languages. Context-free grammars. Regular languages, pushdown automata. Properties of context-free languages. Determinism and parsing top-down parsing, and bottom-up parsing. Turing machines: Computing with Turing machines, combining Turing machines, and nondeterministic Turing machines.

CS303: Machine Learning

Machine Learning is concerned with computer programs that automatically improve their performance through experience. Machine Learning methods have been applied to problems such as learning to drive an autonomous vehicle, learning to recognize human speech, and learning strategies for game playing. This course covers the primary approaches to machine learning from a variety of fields, including inductive inference of decision trees, neural network learning, statistical learning methods, genetic algorithms, bayesian methods, explanation-based learning, and reinforcement learning

CS304: Software Testing and Maintenance

Techniques and methods for developing and extending correct, stable, maintainable and efficient software. Testing methodologies and their practical application in software development. Different aspects of testing: Black box testing where testing is done without knowledge of how

the program is written; white box testing where the developer tries to guarantee that every statement, execution path and method is executed during the testing and finally unit testing which is a practical design methodology where test cases are developed as each function or method is written. Software developing aids and methods such as code-inspection. Code and memory profiling as a support for program optimizing.

CS400: High Performance Computing

This course is an introductory course on high-performance computing. High-performance computing refers to a specialized use and programming of (parallel) supercomputers, computer clusters, and everything from software to hardware to speed up computations. The CPU clock speed of desktop and commodity processors has reached a maximum range, due to physical limitations. As a result, more advanced (and often creative) use of software and parallel hardware is required to further speed up processing. In this course you will learn how to write faster code that is highly optimized for modern multi-core processors and clusters, using modern software development tools, performance profilers, specialized algorithms, parallelization strategies, and advanced parallel programming constructs in OpenMP and MPI.

CS401: Compiler Design

The Structure of a Compiler course, Lexical Analyzer, LEX, Design of Lex, Top down Parsing, LL(1) Parsers, Bottom up Parsing, YACC, LR parsers, Syntax Directed Translation, Types and Type Checking, Run-Time Storage Administration and Symbol Table Management, Intermediate Code and Code Generation, Data-Flow Analysis, Code Optimizations, Architecture and recent development on compilers

CS402: Distributed and Concurrent Algorithms

Goals of the course: To present fundamental algorithms and impossibility results from the concurrent programming literature, and to cover techniques for formally specifying and verifying concurrent systems. Both message-passing and shared-memory models of concurrency will be considered. At the end of the course, students will have a general knowledge of the concurrent programming literature and will be able to develop new concurrent algorithms and verify their correctness. Perhaps the most important skill to be developed is the ability to intuitively “see” how or why a concurrent program works (a skill most students probably take for granted when it comes to sequential programs). In other words, this class will teach you how to \think" concurrently.

CS403: Neural networks and deep learning

Over the past few years, neural networks have enjoyed a major resurgence in machine learning, and today yield state-of-the-art results in various fields. This course introduces deep neural network models, and surveys some the applications of these models in areas where they have been particularly successful. The course covers feedforward networks, convolutional networks, recurrent and recursive networks, as well general topics such as input encoding and training

techniques. The course also provides acquaintance with some of the software libraries available for building and training deep neural networks.

CS404: Bioinformatics

Introduces bioinformatics concepts and practice. Topics include biological databases, sequence alignment, gene and protein structure prediction, molecular phylogenetics, genomics and proteomics. Students will gain practical experience with bioinformatics tools and develop basic skills in the collection and presentation of bioinformatics data, as well as the rudiments of programming in a scripting language.

CS405: Fuzzy Logic and Intelligent Systems

Fuzzy Set and Fuzzy Logic: motivation, possibilistic interpretation, basic concepts, set operations, fuzzy relations, and fuzzy inferences. Fuzzy Logic Applications: approximate reasoning, fuzzy arithmetic, linguistic models, decision theory, classification, and fuzzy controllers (development, tuning, compilation, deployment). Computational Intelligence (CI): hybrid systems based on fuzzy, neural and evolutionary computation. Case studies of real world industrial and financial applications.

CS406: Software Design and Architecture

This course is concerned with the principles and concepts of engineering of large software systems and programs. Software architecture is an abstraction of system details that helps in managing the inherent complexity of software systems development. Software architecture provides opportunities for early evaluation of user needs, analysis of requirements and design, and prediction of system properties. Architectural styles, views, notations, and description languages provide systematic frameworks for engineering decisions and design practices. The focus of the course is on advanced topics related to software architecture practices, technologies, and artifacts. Students participate in individual or group projects related to developing architectural representations of software systems.

CS407 Natural Language Processing

Foundations of the natural language processing, language data in corpora, levels of description: phonetics and phonology, morphology, syntax, semantics and pragmatics. Traditional vs. formal grammars: representation of morphological and syntactic structures, meaning representation. context-free grammars and their context-sensitive extensions, DCG (Definite Clause Grammars), CKY algorithm (Cocke-Kasami-Younger), chart-parsing. Problem of ambiguity. Electronic dictionaries: representation of lexical knowledge. Types of the machine-readable dictionaries. Semantic representation of sentence meaning. The Compositionality Principle, composition of meaning. Semantic classification: valence frames, predicates, ontologies, transparent intentional logic (TIL) and its application to semantic analysis of sentences. Pragmatics: semantic and pragmatic nature of noun groups, discourse structure, deictic expressions, verbal and non-verbal contexts. Natural language understanding: semantic representation, inference and knowledge representations.

CS408: Soft Computing

Evolutionary computation (EC), neuro-computation (NC) and fuzzy logic (FL), are considered as three major components of the so-called soft computing. The main idea of soft computation is to make decisions based on rough (incomplete, noisy, uncertain) data. The computing technology which make decisions based on clean, clear and complete data is often called hard computing, although researchers in this field are not hard at all (they are the most intelligent and flexible people in the world). The human brain is a computing machine consisting of two parts. The left part is good at hard computing (logical thinking), and the right part is good at soft computing (heuristic thinking). During the last half century, we developed a lot of computers for assisting the left part of the brain. In this century, we will put more energy to make computers to assist the right part of the brain.

CS409: Introduction to Cryptography

Cryptography provides important tools for ensuring the privacy, authenticity, and integrity of the increasingly sensitive information involved in modern digital systems. Nowadays, core cryptographic tools, including encryption, message authentication codes, digital signature, key agreement protocols, etc., are used behind millions of daily on-line transactions. In this course, we will unveil some of the "magic" of cryptography. Modern Cryptography uses mathematical language to precisely pin down elusive security goals, design primitives and protocols to achieve these goals, and validate the security of designed primitives and protocols using mathematical proofs based on clearly stated hardness assumptions. Therefore, to learn cryptography, it is essential to understand its mathematical underpinning. In this class, we will see the inner working of cryptography for several core cryptographic tools, from encryption, to message authentication codes, to hash functions, to digital signatures, etc.

CS410: Theory of Computation

An introduction to the theoretical foundations of computing, including abstract models of computing machines, the grammars those machines recognize, and the corresponding classes of languages. Topics include: Church's thesis; Grammars, the M-recursive functions, and Turing computability of the M-recursive functions, The incompatibility: The halting problem, Turing innumerability, Turing acceptability, and Turing decidability, unsolvable problems about Turing machines and M-recursive functions, Computational complexity: Time-bounded Turing machines, Rate of growth of functions, NP- Completeness, The complexity hierarchy, The prepositional calculus: Syntax, Truth-assignment, Validity and satisfy, and Equivalence and normal forms compactness.

CS411: Programming Language Design

This course is an introduction to the principles which underlie the definition and implementation of programming languages. Study of modern programming language paradigms (procedural, functional, logic, object oriented). Introduction to the design and implementation of programming languages including syntax, semantics, data types and structures, control structures, and run-time environments.

CS4112: Intelligent Agents

This course gives a broad introduction to the new and rapidly expanding field of agent-based computing. It introduces the key concepts and models of the field, dealing both with the individual agents and with their interactions. Emphasis is placed on automated negotiation, cooperation and on-line auctions, and students are required to program a trading agent in Java which will compete in a class tournament within a simulated trading environment.

CS413: Computer Systems Performance

It introduces the main concepts and techniques needed to plan the capacity of computer systems, predict their future performance under different configurations, and design new applications that meet performance requirements. The course is mainly based on the use of analytic queuing network models of computer systems. These techniques are applied to study the performance of centralized, distributed, parallel, client/server systems, Web server and e-commerce site performance. The course also discusses performance measuring tools for operating systems such as Unix and Windows.

CS425: Selected Topics in Computer Science I

Selected Topics provides an opportunity to study a topic which is not included in the existing curriculum. This course examines one or more selected current issues in the area of Computer Science. Topics chosen for study will be by arrangement with the department.

CS426: Selected Topics in Computer Science II

Selected Topics provides an opportunity to study a topic which is not included in the existing curriculum. This course examines one or more selected current issues in the area of Computer Science. Topics chosen for study will be by arrangement with the department.

CS430/CS431: Project

This course will continue for two semesters. In the first semester, a group of students will select one of the projects proposed by the department and analyze the underlying problem. In the second semester, the design and implementation of the project will be conducted. The student will deliver oral presentations, progress reports, and a final report.

ثالثا: المحتوى العلمي لمقررات قسم نظم المعلومات

IS200: Database Systems

The goal of this course is to introduce the main features of theory, and database application design and development. Logical design and conceptual modeling, physical database design strategies, relational data model and query languages, query optimization, transaction management and distributed databases.

IS201: Systems Analysis and Design

The analysis and design phases of system development life cycle are covered in detail Methodologies for systems analysis, specifications, and design are covered. Both the traditional structured and object-oriented methodologies systems. Emphasis is placed on well-written documentation as well as oral communication typically required during the software development life cycle. Project management tools are employed by students to monitor their progress and the costs associated with their projects. CASE tools are employed for data and information modeling and specification.

IS300: Database Management Systems

This course introduces Transaction management; query processing and optimization; organization of database systems, indexing, multi-dimensional data, similarity-based analysis, performance evaluation, new database applications. This course will cover the core principles and techniques of data and information management. The potential topics covered in class include processing and optimization of declarative queries, transactions, crash recovery, self-tuning database systems, data stream systems, information retrieval and Web data management, and data mining.

GI300: Geographical Information Systems

Provides an understanding of the theory, data models and associated issues (such as uncertainty) that underlie GIScience and the way these are applied to, and effect, spatial analysis and spatial data management. This course discusses GIS concepts and terminology, the role of GIS in spatial data management and digital mapping, the multipurpose cadastre and resource GIS, methods of data collection and input, data modelling and representation, storage and retrieval of spatial data, concepts of database systems, manipulation and analysis features of GIS.

IS301: Business Intelligence

This course covers the key concepts and applications of business intelligence (BI). Business and technology drivers are explained in order to provide students with the proper context in understanding how BI can provide business value and help companies use technology effectively in managing their businesses. An overview that includes the uses and users of business intelligence, as well as the type of applications and tools that may be deployed, help students better understand the business intelligence project lifecycle. Additional topics that complement

the understanding and application of business intelligence such as data warehousing (DW) are introduced. Using practical examples and hands-on exercises with real life applications present an opportunity to effectively illustrate technical concepts and techniques used in BI. By providing an opportunity to gain both business and technical perspective, students are better equipped to appreciate in ways information technologies can be implemented to drive business results.

IS303: Introduction to Big Data

Big Data is the hot new buzzword in IT circles. The proliferation of digital technologies with digital storage and recording media has created massive amounts of diverse data, which can be used for marketing and many other purposes. The concept of Big Data refers to massive and often unstructured data, on which the processing capabilities of traditional data management tools result to be inadequate. Big Data can take up terabytes and petabytes of storage space in diverse formats including text, video, sound, images, and more. The course gives an overview of the Big Data phenomenon, focusing then on extracting value from the Big Data using predictive analytics techniques. Upon successful completion of this course, students should be able to: Understand the Big Data phenomenon; Understand the main Big Data tools (Hadoop & Spark); Understand the potential use in a corporate environment.

IS304: E-Business

This course focuses on business process redesign and change the management in the context of e-business. Topics include impact of e-business on business models, channel relationships and the value chain, integration of emerging technologies with legacy systems, functional and inter-organizational integration, and transaction cost issues. Applications include supply and selling chain management, customer relation management, enterprise resource planning, e-procurement, and knowledge tone applications.

IS400: Big Data Analytics

This course provides a comprehensive and rigorous introduction to big data analytics. It will describe the hardware/software infrastructures that are used today for big data (e.g., Hadoop, Hive) and the implications of these infrastructures for the accurate and efficient analysis of big data. Students will learn the mathematical, statistical, artificial intelligence, and modeling techniques that have been developed for analysis of big data, especially for health care applications. Also, it will describe the visualization techniques which are useful for displaying big data analysis results for meaningful interpretation of the results by humans.

IS401: Information Security

Introduction, identification and authentication, authorization rules. Data classification. Basic data encryption and decryption, different encryption and decryption techniques, different types of ciphers, characteristics of good ciphers, crypt analysis, public-key system, single-key system and data encryption standards, threats, safeguards and security objectives, security with some existing systems, security level. Computer virus protection, privacy and data protection,

designing of secure system, models of security, database, security, reliability and integrity, sensitive data. Multi-level data, security, protection of files, copy protection, personal computer, security computer network and security.

IS402: Distributed and Mobile Database

Levels of distribution transparency. Distributed database design, mapping user's transactions to distributed level. Optimization of accesses strategies. The management of distributed transactions. Distributed concurrence control, recovery in distributed database. Distributed database administration. Also, this course addresses the use of Internet databases to support Web solutions. Topics covered include techniques for the exchange and sorting of information, and the best way to achieve this through an Internet database. The emphasis is on the design of Internet databases that could allow the deployment of an entire product catalog online; dynamically-generated Web pages that allow visitors to share common interests on topics related to a Web site; a catalog linked to sites that may be useful to visitors; and, building a company Intranet that tracks the progress and status of current projects.

IS403: Blockchain Technologies

Discover the technology underpinning blockchain, understand the structure of blockchain, and explore the scope of the blockchain industry by analyzing the scale of investment in the industry, the sociopolitical and economic context, key stakeholders, and the evolution of the industry landscape. Learn how blockchain is fundamentally changing ways of doing business, and the impact this has on industries, consumers and society. Equipped with an understanding of the technology and strategies underpinning this space, you'll learn how to build dynamic capabilities for innovation, and recommend growth paths to help you and your group scale your blockchain business strategy.

IS404: Web and Social Media Analytics

The phenomenal growth of social media has transformed the social, political, and technological landscapes. Social media sparked a revolution by putting knowledge production and communication tools in the hands of the masses. Today on sites such as Twitter, Facebook, and YouTube, large numbers of people publish rich content, annotate it with descriptive metadata, communicate and respond to others. Social media has transformed how we create and consume knowledge, respond to disasters, monitor environment, manage resources, and interact with the world and one another. What's more, by exposing individual and collective behavior, social media delivers large quantities of social data for analysis, offering new research opportunities and new computational challenges. This course will examine topics in social data analysis, including influence and centrality in social media, information diffusion on networks, topic modeling and sentiment analysis, identifying social bots, and predicting behavior. We will see how AI, network analysis, and statistical methods can be used to study these topics. While there are no prerequisites, I expect students to be proficient in programming, algorithms and data structures, and have taken college level or above courses in linear algebra and statistics. AI and machine learning coursework is a plus.

IS405: Data Mining and Machine Learning

Data is a critical type of business capital, and data mining is essential to unleash the value of data for business analytics. Mining data from massive amounts of data accumulated in organizations creates value for individuals, businesses, and society via data-driven decision-making or pattern-based strategy. In this course, students will learn state-of-the-art data mining methods and theories. We will also discuss the applications of data mining methods to solve real-world business problems in a wide range of areas such as marketing, finance, and healthcare. The course has two objectives. First, it seeks to introduce you to modern data mining methods that provide useful insights to a large spectrum of managerial problems. Second, it aims at informing you the kinds of business problems that can be solved using data mining methods as well as how to solve these problems.

IS406: Information Retrieval

Overview of fundamental issues of information retrieval with theoretical foundation. Comprehensive survey of information – retrieval techniques and theory, covering both effectiveness and run – time performance of information – retrieval systems. The focus is on algorithms and heuristics used to find documents relevant to the user request and to find them fast.

IS407: Data Visualization and Dashboards

With the growing amount of data available to businesses, decision-makers must translate strategy into accountability, measure progress against goals, and leverage data for business decision making. Dashboards are used to present and analyzing enterprise performance data, both strategic and operational, and to perform business analysis easily and quickly. This course will teach dashboards and data visualization technologies, using an approach that will include theory as well as a significant hands-on component. Students will learn how to design and build dashboards, as well as create content of different types that can be incorporated into dashboards. This course is about data visualization, the art and science of turning data into readable graphics. We'll explore how to design and create data visualizations based on data available and tasks to be achieved. This process includes data modeling, data processing (such as aggregation and filtering), mapping data attributes to graphical attributes, and strategic visual encoding based on known properties of visual perception as well as the task(s) at hand.

IS408: Software Engineering

This course is designed to provide you opportunity to gain knowledge and skills necessary to analysis, design and implement complex software engineering projects. You should learn to analysis and design complex real-life systems, working as teams. The project-based approach used requires you to review and refine your design iteratively based on regular feedback from staff. You are also made aware of current software engineering standards and processes. You are also taught to consider qualitative aspects including maintainability, extensibility, reusability and robustness in every stage of the software-engineering lifecycle. At the end of the course you should be able to combine top-down and bottom-up approaches to software design and choose

the most appropriate process considering the underlying technology, project duration, the level of risks and the customer expectations. At the conclusion of the course, you should be able to: Examine, identify and use Design Patterns in the developments of software systems; Understand the UML Process.

IS409: Database Administration

This course will cover disk storage, basic-file structure, hashing techniques, indexing structures for files, transaction processing concepts and theory for databases with main schedules for recoverability, schedules for serializability, and transaction support in SQL. Concurrency control techniques will be also covered such as timestamp ordering, multi-version concurrency control techniques, validation concurrency control techniques, granularity of data items and multiple granularity locking. The course will also cover database recovery techniques such as NO-UNDO/REDO recovery, recovery techniques based on immediate update, shadow paging, and ARIES recovery algorithm.

IS410: Managing Digital Firms

This course focuses on the use of both traditional and web-based information technologies to manage the firm .these technologies make possible new business models, new organizational structures ,and new management processes .topics covered in new technology infrastructure and architecture, major functional applications of IT within the firm ,new IT-based business models, enterprise systems, knowledge management ,multinational systems ,managerial decisions about technology, and new organizational forms.

IS411: Data Warehouses

The objective of this course is to understand the fundamentals of data warehousing. Topics include basic data warehouse architecture, data consolidation, warehouse internals (storage and indexing materialized views and aggregate pre-computation), Online Analytical Processing (OLAP) systems, main operations of data mining, system integration issues in decision support tools, survey of existing mining and OLPA products, and success and failure stories of data mining.

IS412: Business Process Management

To meet the demands of today’s competitive marketplace enterprise processes must be lean and customer focused. This course looks at ways in which business processes can be analyzed, redesigned, and improved thus ensuring that they are meeting the needs of customers and the enterprise. A business process is a set of related activities that together realize a business goal in an organizational and technical context. These processes take place in a single organization but may need to interact with processes in other organizations. Business process management (BPM) is concerned with the concepts, methods, and techniques that support the design, improvement, management, configuration, enactment, and analysis of business processes that deliver lean and customer focused business processes. BPM includes process modelling that explicitly represents

processes – once they are defined, processes can be analyzed, improved, and enacted. Software in the form of business process management systems can be used to manage business process.
By taking this course you will be able to understand business process from a management and process analyst perspective, learn skills, analytical frameworks and general principles for managing business processes. The course will incorporate a laboratory component using BPM software.

IS413: Web-based Information Systems

This course covers the management and development of web-based information systems. students will analyze, design and develop web-enabled database applications using several different approaches. Emphasis will be on concepts and architecture of new technologies. topics include: the CGI processing model and its alternatives ,java applets, java servlets, JDBC; application service providers; multitier client-server computing ;object-oriented models; active server pages and other server-based processing alternatives; distributed business objects such as CORBA; text processing applications (PERL, awk, etc.);and platform options (Windows NT vs. Unix).

IS414: Business Analytics Programming

This course is designed to introduce business analytics programming in Python to students. Students will learn programming foundations, application development in Python, and how to integrate Python applications with business operations in this class. This course consists of the following learning objectives: Students will learn Python programming fundamentals. Knowledge such as object-oriented programming in Python will be introduced to students. Students will learn how to use Python to perform business data analysis. Techniques such as time series analysis, geographical data analysis in Python will be introduced to students.

IS415: Enterprise Information Systems

This course focuses on the design, management, and implementation of IT-supported processes. The evolution of information technology and the near ubiquity of the internet give business firms the opportunity to completely redesign their business processes, to develop systems faster, and to implement systems in entirely new ways. topics covered in this course include business process analysis and design ,implementation, change management ,and performance measurement systems relevant technologies include web-based application serve providers, workflow management systems ,and enterprise systems .students learns how to analyze a business problem ,design new business processes ,and manage the implementation process .they also gain an understanding of the technology support structure required for successful implementation of organizational and interorganizational processes.

IS416: Information Systems Auditing

Computer forensics is the application of computer investigation and analysis techniques to the process of discovering and preserving potential legal evidence. Systems auditing is concerned with ensuring that adequate security controls are in place to prevent or at least discover fraud or other misuse of IT resources. Legal evidence might be sought in a wide range of computer

crimes or misuse and students in this course will develop an understanding of forensic and auditing and will develop the skills needed for discovering and preventing theft of trade secrets, theft of or destruction of intellectual property, and fraud. They will learn how to recover deleted, encrypted, or damaged file information and to plan and execute audits of security and other related IT procedures. This course is intended to provide a foundation in computer forensics and auditing and provide hands-on practice in applying forensic and auditing techniques.

IS417: Multimedia Information Systems

Recent advances in digital media technology and rapid growth of social media platforms where multimedia objects such as images, videos and music (audio), and mobile and geospatial data, are increasingly embedded in online social communities. As a result, multimedia has gained enormous potential in improving the traditional educational, professional, business, communication and entertainment processes. To be able to use this potential for transferring these processes into user-friendly multimedia applications, technology is required that can help us access, deliver, browse, search, enrich and share multimedia content. This course covers such topics as organizing multimedia content, physical storage and retrieval of multimedia data, Content-based Search and retrieval, creating and delivering networked and multimedia presentations, securing multimedia content and current research directions in this area. The main objective of the course is to introduce students' different types of multimedia data, different techniques to store, manipulate, and retrieve multimedia data residing across global computer networks.

IS418: Software Requirements Analysis

Students will learn how to capture software requirements and handle difficult situations in gathering data to build systems. Special emphasis is given to working with clients and to learning about the needs of users who interact with a system. The course addresses elicitation, specification, and management of software system requirements. Additionally, the course examines iterative prototyping user interactions for a system.

IS419: Systems Design Patterns

This course extends object-oriented analysis and design by incorporating design patterns to create interactive applications. Through a survey of established design patterns, you will gain a foundation for more complex software applications. Finally, you will identify problematic software designs by referencing a catalog of code smells.

IS420: Knowledge Management

The focus of this course is a blend of theories, approaches and technologies for managerial problem solving and knowledge management. The course reviews common fallacies and pitfalls in decision making and seeks to equip students with the knowledge of managerial techniques and information technologies for effective organizational decision making. Students will be exposed to methods and technologies for leveraging intellectual capital, both at an individual and firm level. Major topics of the course include "decision traps", problems in dynamic decision making,

system thinking, decision support, and technologies that facilitate knowledge sharing, knowledge management and organizational learning.

IS421: Cloud Databases

Extend your core DBA skills to the cloud with Database Cloud Services training. Learn how to migrate your Database to the Cloud and use Database Cloud Services. Learn how to create database applications in the cloud .Learn the key areas of functionality of the Oracle Database as a Service (DBaaS) implementation with an Oracle Database Cloud certification. Discover how to use these key areas to develop, deploy, administer, and tune DbaaS.

IS422: Information Systems Quality Assurance

The course takes its starting point in well-established research around information systems quality and highlights three subareas; Information Quality, Software Quality and Business Value. This course is about the theory, models and practice of software testing and quality assurance. The subject matter focuses on three broad areas: (1) Theory of Software Testing that reviews the relevant techniques and research results, the aim is to provide the student with a solid foundation from which to build real-world testing systems and teams. (2) Testing in practice that looks at the process and practice of testing, including the role of tester in an iterative, incremental development project. (3) Test automation is essential for modern software testing. Several automation methods are discussed and a survey of tools, both commercially available ones and homegrown is performed. The course will mostly be based on research papers and the latest publications in the community of quality assurance.

IS425: Selected Topics in Information Systems I

Selected Topics provides an opportunity to study a topic which is not included in the existing curriculum. This course examines one or more selected current issues in the area of Information Systems. Topics chosen for study will be by arrangement with the department.

IS426: Selected Topics in Information Systems II

Selected Topics provides an opportunity to study a topic which is not included in the existing curriculum. This course examines one or more selected current issues in the area of Information Systems. Topics chosen for study will be by arrangement with the department.

IS430/IS431: Project

This course will continue for two semesters. In the first semester, a group of students will select one of the projects proposed by the department and analyze the underlying problem. In the second semester, the design and implementation of the project will be conducted. The student will deliver oral presentations, progress reports, and a final report.

GI301: Spatial Database

The goal of this course is to introduce the main features of spatial databases, the kernel of Geographic Information Systems (GIS). Topics include spatial concepts and data models, spatial

query languages, spatial storage and indexing, query processing and optimization, spatial networks, introduction to spatial data mining. Exercises and practical work will be concentrated on building and designing geodatabases.

GI302: Principles of Remote Sensing

This course is designed to provide students with the basic knowledge of biophysical, quantitative, and digital remote sensing. Both the theoretical basis and practical aspects of these approaches to remote sensing are addressed. Topics examine include remote sensing applications in natural environment such as meteorology, oceanography, hydrology, and biomass detection.

GI400: Digital Cartography and Visualization

An overview of the development of Cartography, the concepts, processes, techniques and data sources. The role of Cartography in digital mapping and Geographic Information Systems. Rules of graphical communication and the depiction of spatial data. The Cartographic process: need, data sources, evaluation, scale, reference base, projection, design specifications, compilation, production and final output. Graphical elements of design and symbolization. Applications of the representation of spatially referenced data in the areas of sociological, economical, topographical and environmental the traditional and digital approaches to cartographic design, production methods and user/supplier requirements. Evaluation of the cartographic processes for applicability. The functionality of digital mapping programs and the cartographic software of Geographical Information Systems. The cognitive processes of spatial data capture and the present methods of data visualization. Knowledge based map design techniques. Multimedia and virtual reality as visualization techniques.

GI401: Spatial Analysis and Modeling

This course explores methods of analyzing spatial data in the interactive and graphical environment of a GIS. The course draws on related theory in spatial statistics, geo-statistics, geographical analysis and cartographic modeling to provide a set of generic techniques for GIS users. Topics include the analysis of point patterns, networks, overlay analysis, spatial interaction models, and visualization of spatial data (virtual reality, simulation of landscape, animation, multi-media). The course concludes by considering how to extend the spatial analytical capabilities of GIS and points to the evolution of spatial decision support systems. Associated exercises and hands-on allow methods to be applied in a GIS context.

GI402: GIS Programming

This course introduces the development of GIS applications. During this course students will learn to use programming techniques to create applications that perform fundamental spatial analysis and automation tasks, such as geoprocessing, editing, database management, projecting data, and map creation.

GI403: Spatial Decision Support Systems

This course introduces students to key theories, concepts and techniques that have been

developed recently to improve the decision support capabilities of spatial information systems. Topics covered include participatory GIS, group-based spatial decision support systems, and the integration of multi-criteria analysis (MCA) methods with GIS to facilitate decision making in planning.

GI404: Web and Mobile GIS

This course discusses the design and implementation of locally served and cloud-based geospatial web applications. Construction of web maps, mashups and volunteered geographic information interfaces. This course will also discuss design, coding and implementation of mobile GIS applications using the Java and JavaScript object-oriented programming languages.

GI405: Spatial Statistics

This course reviews some popular approaches to statistically analyze data in their spatial context, providing hands-on experience with widespread software. The module starts with a review of basic statistical concepts and their extension by adding the spatial aspect; it then explains concepts and methods of pattern analysis, introduces methods for measuring spatial dependence, and finally provides a compact gateway to geostatistics.

GI406: Open and Distributed GIS Infrastructures

Currently, all over the globe and at all scale levels, Spatial Data Infrastructure projects can be recognized. Their aim is to improve the availability of and access to geospatial data. With the paradigm shift “from systems to services”, Spatial Data Infrastructures, spatial data marketplace and geo business have become keywords in the GIS world. A common understanding of these concepts is given which helps to evaluate the political and economic impact of distributed geo-processing and the OGC process. The technological side to these developments such as WMS as the first Web Service standard of the OGC, and XML and GML are introduced.

GI407: Medical GIS

Explore how spatial data and geographic information systems (GIS) can be used to understand and improve public health. The environment in which we live, and work can have a profound effect on our health – an effect that is explored by the emerging field of geohealth. This course will introduce you to new developments in geohealth, looking at the latest thinking and methods for using spatial data and geographic information systems (GIS) in health settings.

GI408: GIS Network Modeling

Examines the theory of network analysis and its application in Geographic Information Systems. Topics covered include graph theoretic measures of network connectivity and proofs of network properties; optimization problems including shortest path algorithms, flow algorithms, and assignment problems on networks; special solution procedures for the classic transportation problem; procedures for linear referencing and urban travel demand modeling. The implementation of these algorithms and procedures with GIS data structures is explored using industry standard GIS software.

GI409: Spatial Data Mining

Spatial data mining is the branch of data mining that deals with spatial data. This course focuses on algorithm techniques that can be used for spatial data mining tasks such as classification, association rule mining, clustering, and numerical prediction. This includes probabilistic and statistical methods, genetic algorithms and neural networks, visualization techniques, and mathematical programming. We also place such data mining within the larger picture of knowledge discovery in databases and its relationship with data warehousing. We will consider numerous case studies from different application areas such as remote sensing, ecology, weather, natural disasters, public health, transportation, and criminal analysis.

GI410: Applied Remote Sensing

Focuses on the application of remote sensing techniques to solving real world urban and environmental problems in areas such as urban and suburban landscape, lane use and land cover, transportation and communication, vegetation and forestry, biodiversity and ecology, water and water quality control, soils and minerals, geology and geomorphology studies. The current generation, industry standard software is used for labs and applications development.

GI411: Spatial Big Data

This course will introduce basic concepts and techniques related to Spatial Big Data from a computational perspective. Topics to be covered include: Introduction to Spatial Big Data Analytic, Types of Spatial Big Data, Spatial Statistic Foundation, Spatial Colocation Discovery, Spatial Outlier Analysis, Spatial Prediction, Spatial Hotspot, Spatial Summarization, Spatial and Spatiotemporal Change, Spatial Big Data Platform, Spatiotemporal Big Data, and Recent Trends.

GI412: GIS and Cyber Security

This course introduces technical aspects of cyber security in geographic information systems. It describes threats and types of attacks against geographic information systems to enable students to understand and analyze security requirements and define security policies. Security mechanisms and enforcement issues will be introduced.

GI413: Cloud GIS

This course teaches students to use cloud and server GIS resources to solve problems for which geospatial data is an integral element. We will evaluate and implement systems using three cloud service models (infrastructure services, platform services, and software services). The course will teach students to set up cloud services for creating maps, cloud services for managing spatial data, and cloud services for processing spatial data.

GI414: Spatial Data Acquisition Techniques

This course introduces surveying and mapping techniques of use to GIS professionals, including the Global Positioning System (GPS). Topics include: basic traditional survey methods, including horizontal and vertical location techniques; geodesy; data adjustments; datum and

ellipsoids; coordinate systems; and transformations; understand the issues surrounding data quality; learn the difference between terms such as precision, absolute accuracy, relative accuracy, classification accuracy, temporal accuracy, and thematic accuracy.

GI425: Selected Topics in Geoinformatics I

Selected Topics provides an opportunity to study a topic which is not included in the existing curriculum. This course examines one or more selected current issues in the area of Spatial informatics. Topics chosen for study will be by arrangement with the department.

GI426: Selected Topics in Geoinformatics II

Selected Topics provides an opportunity to study a topic which is not included in the existing curriculum. This course examines one or more selected current issues in the area of Spatial informatics. Topics chosen for study will be by arrangement with the department.

GI430/GI431: Project

This course will continue for two semesters. In the first semester, a group of students will select one of the projects proposed by the department and analyze the underlying problem. In the second semester, the design and implementation of the project will be conducted. The student will deliver oral presentations, progress reports, and a final report.

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IT100: Digital Logic Design

This course provides a modern introduction to logic design and the basic building blocks used in digital systems, digital computers. It starts with a discussion of combinational logic: logic gates, minimization techniques, arithmetic circuits, and modern logic devices such as field programmable logic gates. The second part of the course deals with sequential circuits: flip-flops, synthesis of sequential circuits, and case studies, including counters, registers, and random-access memories. State machines will then be discussed and illustrated through case studies of more complex systems using programmable logic devices. Different representations including truth table, logic gate, timing diagram, switch representation, and state diagram will be discussed. The course has an accompanying lab component that integrates hands-on experience with modern computer-aided design software including logic simulation, minimization and an introduction of the use of hardware description language (VHDL).

IT201: Computer Graphics

Computer Graphics is a study of the hardware and software principles of interactive raster graphics. Topics include an introduction to the basic concepts, 2-D and 3-D modeling and transformations, viewing transformations, projections, rendering techniques, graphical software packages and graphics systems. Students will use a standard computer graphics API to reinforce concepts and study fundamental computer graphics algorithms. This course examines one or more selected current issues in the area of image synthesis. Specific topics covered are dependent on the instructor. Potential topics include scientific visualization, computational geometry, photo-realistic image rendering and computer animation.

IT200: Computer Organization and Architecture

An introduction to computer architecture. Includes a survey of computer architecture fundamentals exemplified in commercially available computer systems, including classical CPU and control unit design, register organization, primary memory organization and access, internal and external bus structures, and virtual memory schemes. Alternatives to classical machine architecture, such as the stack machine and the associative processor, are defined and compared. Parallel processors and distributed systems are also presented, along with an analysis of their performance relative to nonparallel machines.

IT203: Multimedia

This course Applies basic knowledge of mathematics and science in multimedia system computing introduce students to the different media types and design issues related to multimedia systems; The course examines types of multimedia information: voice, data video facsimile, graphics, and their characterization; modeling techniques to represent multimedia information; introduce students to the advances in multimedia compression technology; Provide an opportunity for students to apply design, implementation and evaluation concepts and techniques to the development of a small but realistic multimedia system. Define criteria and

specifications appropriate to multimedia compression systems problems, and plan strategies for their solution. Identify the current and underlying technologies that support multimedia compression processing.

IT202: Computer Networks

The principles and practice of computer networking, with emphasis on the Internet. The structure and components of computer networks, packet switching, layered architectures, OSI 7-layer model, TCP/IP, physical layer, error control, window flow control, local area networks (Ethernet, Token Ring; FDDI), network layer, congestion control, quality of service, multicast.

IT301: Web and Network Programming

This course aims to give a broad knowledge of modern networking technologies and network-based applications, computing systems, and software. The course will cover the background and history, basic concepts and components, mechanisms and protocols of computer networks and Internet. The scope will extend to the World Wide Web computing and information exchange framework built on top of Internet and introduce key technologies that enable the client–server web application modes. You are expected to finish the course with necessary knowledge and understanding of the rationale in modern computer networking and network centric system and application design.

IT302: Introduction to Internet of Things (IoT)

The Internet of Things (IoT) is everywhere. It provides advanced data collection, connectivity, and analysis of information collected by computers everywhere—taking the concepts of Machine-to-Machine communication farther than ever before. This course gives a foundation in the Internet of Things, including the components, tools, and analysis by teaching the concepts behind the IoT and a look at real-world solutions.

IT303: Introduction to Cloud Computing

This course provides a hands-on comprehensive study of Cloud concepts and capabilities across the various Cloud service models including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), and Business Process as a Service (BPaaS). IaaS topics start with a detailed study the evolution of infrastructure migration approaches from VMWare/Xen/KVM virtualization, to adaptive virtualization, and Cloud Computing / on-demand resources provisioning. Mainstream Cloud infrastructure services and related vendor solutions are also covered in detail. PaaS topics cover a broad range of Cloud vendor platforms including AWS, Google App Engine, Microsoft Azure, Eucalyptus, OpenStack and others as well as a detailed study of related platform services such as storage services that leverage Google Storage, Amazon S3, Amazon Dynamo, or other services meant to provide Cloud resources management and monitoring capabilities. The SaaS and PaaS topics covered in the course will familiarize students with the use of vendor-maintained applications and processes available on the Cloud on a metered on-demand basis in multi-tenant environments. The course also covers the Cloud security model and associated challenges and delves into the implementation and

support of High-Performance Computing and Big Data support capabilities on the Cloud. Through hands-on assignments and projects, students will learn how to configure and program IaaS services. They will also learn how to develop Cloud-based software applications on top of various Cloud platforms, how to integrate application-level services built on heterogeneous Cloud platforms, and how to leverage SaaS and BPaaS solutions to build comprehensive end-to-end business solutions on the Cloud.

IT300: Digital Signal Processing

This course will cover : Digital processing of signals, sampling, difference equations, discrete-time Fourier transforms, discrete and fast Fourier transforms, digital filter design, LTI systems, Z-transform, Multirate signal processing, Filter Banks, Wavelets and Applications to mp3 and JPEG , Overview of FIR and IIR filter design techniques, DFT, FFT, and role of DCT in MPEG and JPEG, and Spectral Analysis.

IT304: Introduction to Cybersecurity

This is an introductory course designed to familiarize students with the concepts of cybersecurity. The course will prepare students for succeeding courses in cybersecurity and forensics. Course Topics: Introduction to Information Security, The Need for Security, Legal, Ethical, and Professional Issues in Information Security, Risk Management, Planning for Security, Security Technology: Firewalls, VPNs, and Wireless, Security Technology: Intrusion Detection and Prevention Systems and Other Security Tools, Cryptography, Physical Security, Implementing Information Security, Security and Personnel, Information Security Maintenance and eDiscovery.

IT305: Mobile Application Development

There are more mobile devices on the planet than people. Mobile app development helps to unleash the full power of mobile devices and push their usage into every corner of modern society. This course introduces students to important concepts and aspects in mobile application development on Java based Android phones, including UI design, data persistence, multimedia support, sensor management, multithreading, debug and test, and application publishing. Although the course is centered on Android, general principles of mobile app development discussed here can also be applied to other contexts.

IT306: Wireless and Mobile Networks

This course provides a comprehensive treatment of wireless data and telecommunication networks. Topics include recent trends in wireless and mobile networking, wireless coding and modulation, wireless signal propagation, IEEE 802.11a/b/g/n/ac wireless local area networks, 60 GHz millimeter wave gigabit wireless networks, vehicular wireless networks, white spaces, IEEE 802.22 regional area networks, Bluetooth and Bluetooth Smart, wireless personal area networks, wireless protocols for Internet of Things, ZigBee, cellular networks: 1G/2G/3G, LTE, LTE-Advanced, and 5G.

IT307: Embedded Systems Design

Embedded systems are the systems of future with cellular phones, smart-phones, tablets becoming the dominant platforms for computing and communication. This course introduces fundamental knowledge of Embedded systems. The ubiquity of information and the associated need for the computation that accompanies it is driving this revolution only to be accelerated by the new paradigms such as the Internet-of-Things (IoT). These platforms are clearly very different in terms of their processing requirements which are unique: real-time needs, high performance but at low energy, compact-code and data segments, and most importantly ever-changing software stack. Such unique requirements have led to a complete redesign and reinvention of the both hardware and the software stack from ground up, for example, brand new processors such as ARM, DSPs, network processors were invented all the way up to new virtual machines such as Dalvik.

IT308: Microcontrollers

This course provides the main principles of microprocessors and microcontrollers and their peripherals. Various related topics are covered including introduction to computing system; microcontroller architecture; instruction set; assembly language programming; hardware interfaces; memory management.

IT401: Image Processing

This course will provide students with a preliminary understanding of the theory and practice of image processing. Basic concepts and fundamentals of image processing and analysis will be described in the course. The spatial frequency domain (The sampling theorem, template matching and the convolution theorem, spatial filtering). Enhancement and restoration, image segmentation. Image representation: (Spatial differentiation and smoothing, template matching، region analysis, contour following).

IT402: Network Security

Discussion of the need for network security, describe various threats, attack types and hackers. Explain authentication, encryption & encryption standard. Secret-Key, public key algorithm authentication protocols, digital certificate. Virtual private network, (VPN), secure sockets layer (SSL). Firewalls, and firewalls topology, packet filters and proxy servers. Threats and couther measures in centralized and distributed systems; communication security techniques based on encryption; symmetric and asymmetric encryption; encryption modes, including stream and block encryption, and cipher-block chaining; message origin and mutual authentication; third-party and inter-realm authentication; authentication of mobile users; data confidentiality and integrity protocols; formal analysis of authentication protocols and message integrity; access control in distributed systems and networks; firewall design.

IT403: Computer Vision

This course introduces computer vision, including fundamentals of image formation, camera imaging geometry, feature detection and matching, stereo, motion estimation and tracking, image

classification, scene understanding, and deep learning with neural networks. We will develop basic methods for applications that include finding known models in images, depth recovery from stereo, camera calibration, image stabilization, automated alignment, tracking, boundary detection, and recognition.

IT404: Robotics

Introduction to Robotics; Co-ordinate systems(Cartesian, cylindrical ; Polar and Revolute systems); Robot Arms(Axes, ranges , Off-set and In-line Wrist, Roll, Pitch and Yaw); End Effectors; Sensors (Micro-switches, Resistance Transducers, Peizo-electric, infrared , Laser and Vidicon Tubes); Application of sensors (Reed Switches, Ultra Sonic, Bar Code Readers) ; Hydraulic system units (pumps, valves, solenoids, cylinders) ; Electrical system units (stepper motors, encoders and AC motors); programming of Robots ; Safety considerations.

IT405: Computer Animation and 3D Modeling

Kinematics and techniques for character animation. Topics include physical modeling and simulation, motion planning, control and learning algorithms, locomotion, motion trajectory optimization, scripting languages, motion capture and motion editing. Students will implement algorithms and interactive animation tools.

IT406: Information Theory and Data Compression

This course is about how to measure, represent, and communicate information effectively. Why bits have become the universal currency for information exchange. How information theory bears on the design and operation of modern-day systems such as smartphones and the Internet. What are entropy and mutual information, and why are they so fundamental to data representation, communication, and inference. Practical compression and error correction. Relations and applications to probability, statistics, machine learning, biological and artificial neural networks, genomics, quantum information, and blockchains.

IT407: Virtual and Augmented Reality

Design and implementation of software systems necessary to create virtual environments; techniques for achieving real time, dynamic display of photorealistic, synthetic images; hands-on experience with electromagnetically tracked, head mounted displays. Final project requires the design and construction of a virtual environment.

IT408: Network Simulation

The course is intended to provide the participants knowledge in modeling and simulation of telecommunication networks. The course features software commonly used for telecommunication network simulation. In addition to the basic theory necessary for understanding network simulation, the course aims to give practical skills in using these tools to design and implement simulation models for performance analysis of wired as well as wireless networks. After completing the course, the students should be able to: Describe the main quantitative methods for performance evaluation of telecommunication networks; Explain the

advantages and drawbacks of using simulation as a tool for analyzing telecommunication networks; Describe common assumptions, simplifications, and generalizations made in modeling telecommunication systems; Implement, verify and validate simulation models of telecommunication networks; Design, build, and experiment with simulation models, as well as evaluate the results obtained by simulation

IT409: Computer Forensics

Introduces computer security administrators to computer forensics. Includes setup and use of an investigator's laboratory, computer investigations using digital evidence controls, processing crime and incident scenes, performing data acquisition, computer forensic analysis, e-mail investigations, image file recovery, investigative report writing, and expert witness testimony.

IT410: Cloud Networks

In the cloud networking course, we will see what the network needs to do to enable cloud computing. We will explore current practice by talking to leading industry experts, as well as looking into interesting new research that might shape the cloud network's future. This course will allow us to explore in-depth the challenges for cloud networking—how do we build a network infrastructure that provides the agility to deploy virtual networks on a shared infrastructure, that enables both efficient transfer of big data and low latency communication, and that enables applications to be federated across countries and continents? Examining how these objectives are met will set the stage for the rest of the course. This course places an emphasis on both operations and design rationale.

IT4011: Pattern Recognition

Pattern recognition techniques are used to design automated systems that improve their own performance through experience. This course covers the methodologies, technologies, and algorithms of statistical pattern recognition from a variety of perspectives. Topics including Bayesian Decision Theory, Estimation Theory, Linear Discrimination Functions, Nonparametric Techniques, Support Vector Machines, Neural Networks, Decision Trees, and Clustering Algorithms etc. will be presented.

IT412: Multimedia Mining

Multimedia mining deals with the extraction of implicit knowledge, multimedia data relationships, or other patterns not explicitly stored in multimedia files. Multimedia mining is more than just an extension of data mining, as it is an interdisciplinary endeavor that draws upon expertise in computer vision, multimedia processing, multimedia retrieval, data mining, machine learning, database and artificial intelligence.

IT413: Optical Networks

Principles and procedures of optical networking with focus on high speed optical signal transmission between network nodes, light path routing and distribution, multilayer network

design, and advanced photonic techniques and devices for optical signal transmission and switching.

IT414: Quantum Computing

Quantum computing exploits the quantum mechanical nature of matter to simultaneously exist in multiple possible states. Building up on the digital binary logic of bits, quantum computing is built based on interacting two-level quantum systems or 'qubits' that follow the laws of quantum mechanics. Addressability of the quantum system and its fragility to fidelity are the major issues of concern, which if addressed appropriately, will enable this new approach to revolutionize the present form of computing. After developing the basics, this course delves on various implementation aspects of quantum computing and quantum information processing.

IT415: Computational Imaging

Computational imaging systems have a wide range of applications in consumer electronics, scientific imaging, HCI, medical imaging, microscopy, and remote sensing. We discuss light fields, time-of-flight cameras, multispectral imaging, thermal IR, computational microscopy, compressive imaging, computed tomography, computational light transport, compressive displays, phase space, and other topics at the convergence of applied mathematics, optics, and high-performance computing related to imaging. Hands-on assignments.

IT416: Game Development

This course furthers the students understanding of programming through the implementation of advanced programming methods employed in video game production. Various data structures used to represent, organize and manage game world information will be explored and implemented in gaming solutions.

IT417: Wireless Sensors Networks

This course deals with the comprehensive knowledge about wireless sensor networks. It provides an insight into different layers and their design considerations. A thorough knowledge of infrastructure establishment and sensor network platform is provided.

IT425: Selected Topics in Information Technology I

Selected Topics provides an opportunity to study a topic which is not included in the existing curriculum. This course examines one or more selected current issues in the area of Information Technology. Topics chosen for study will be by arrangement with the department.

IT426: Selected Topics in Information Technology II

Selected Topics provides an opportunity to study a topic which is not included in the existing curriculum. This course examines one or more selected current issues in the area of Information Technology. Topics chosen for study will be by arrangement with the department.

IT430/IT431: Project

This course will continue for two semesters. In the first semester, a group of students will select one of the projects proposed by the department and analyze the underlying problem. In the second semester, the design and implementation of the project will be conducted. The student will deliver oral presentations, progress reports, and a final report.

خامسا: المحتوى العلمي لمقررات بحوث العمليات ودعم القرار

DS100: Operations Research

This course is an introduction to the use of quantitative methods in business decision-making. Topics include linear programming, decision making under certainty, forecasting, queuing, and inventory systems.

DS300: Software Project Management

This course introduces the fundamental principles of project management from an information technology (IT) perspective. Critical features of core project management are covered including integration management, scope management, time management, cost management, quality management, human resource management, communication management, risk management, and procurement management. Also covered is information technology management related to project management: user requirements management, infrastructure management, conversion management, software configuration, workflow management, security management, interface management, test management, customer management, and support management. The following areas of change management related to project management will also be covered: realization management, sponsorship management, transformation management, training management, and optimization management. Students will explore and learn hands-on skills with project management software assignments and participate in a health care systems implementation course-long group project intended to apply these newly developed knowledge and skills in a controlled environment.

DS301: Modeling and Simulation

Basic simulation modeling, nature of simulation. system models & simulation, discrete event simulation, simulation of a single-server queuing system, simulation of an inventory system, list processing in simulation, simulation languages, simulation of time sharing systems, simulation output data and stochastic processes, building valid and credible simulation models, principles of valid simulation modeling, verification of simulation computer programs, an approach for developing valid & credible simulation models, statistical procedures for computing real-world observation & simulation output data, some practical considerations: selecting input probability distributions, random number generators, generating random variables, output data analysis for a single system.

DS302: Advanced operations Research

This course is an introduction to nonlinear programming problems, unconstrained optimization search techniques. Kuhn-Tucker theorems, quadratic programming, separable programming, meta heuristics, goal programming, and dynamic programming.

DS303: Decision Support Methodologies

This course provides an overview of current trends in Decision support systems; This mainly includes DSS methodology and covers Rapid DSS application, Management support systems

and other techniques. Understand how management uses computer technologies. Learn basic concepts of decision-making, Understands decision support systems. Recognize different types of decision support systems used in the workplace.

DS304: Quality Management

Total quality management (TQM) is a philosophy, methodology and system of tools aimed to create and maintain mechanism of organization's continuous improvement. It involves all departments and employees into improvement of processes and products. It helps to reduce costs and to meet and exceed needs and expectations of customers and other stakeholders of an organization. TQM encompasses the concepts of business and social excellence that is sustainable approach to organization's competition, efficiency improvement, leadership and partnership. The objectives of this course are to introduce the main principles of business and social excellence, to generate knowledge and skills of students to use models and quality management methodology for the implementation of total quality management in any sphere of business and public sector.

DS305: Systems Dynamics Modeling

The goal of this course is to provide students with an introduction to the field of system dynamics computer simulation modeling. The course begins with the history of system dynamics and the study of why policy makers can benefit from its use. Next, students systematically examine the various types of dynamic behavior that socioeconomic systems exhibit and learn to identify and model the underlying nonlinear stock-flow-feedback loop structures that cause them. The course concludes with an examination of a set of well-known system dynamics models that have been created to address a variety of socioeconomic problems. Emphasis is placed on how the system dynamics modeling process is used to test proposed policy changes and how the implementation of model-based results can improve the behavior of socioeconomic systems.

DS400: Data Analytics

Data Analytics is the science of analyzing data to convert information to useful knowledge. This knowledge could help us understand our world better, and in many contexts enable us to make better decisions. While this is broad and grand objective, the last 20 years has seen steeply decreasing costs to gather, store, and process data, creating an even stronger motivation for the use of empirical approaches to problem solving. This course seeks to present you with a wide range of data analytic techniques and is structured around the broad contours of the different types of data analytics, namely, descriptive, inferential, predictive, and prescriptive analytics.

DS401: Stochastic Methods.

Stochastic processes and other applications of probability theory. Use of spreadsheet and other software tools for analysis, simulation and decision theory. Models for business operations and planning, computer systems, transportation, finance.

DS402: Strategic Management and Business Analysis

This course provides a comprehensive analysis of individual and group behavior in organizations. Its purpose is to provide an understanding of how organizations can be managed more effectively and at the same time enhance the quality of employees work life. Topics include motivation, rewarding behavior, stress, individual and group behavior, conflict, power and politics, leadership, job design, organizational structure, basic concept of strategic management, Strategic management process, Environmental scanning and industry analysis, Corporate governance: role of the board of directors , Strategic management process Strategy formulation: situation analysis and business, Strategy implementation: organizing for action, decision-making, communication and organizational change and development

DS403: Computational Intelligence

This course aims to develop a deeper understanding of optimal decision-making models, algorithms and applications to engineering, decision sciences, and machine learning. To provide an insight for algorithm design and formulation of decision models.

DS404: Supply Chain Planning and Logistics.

Covers concepts in designing, analyzing, improving, measuring and controlling logistics operations in modern supply chains. Students are presented with logistics concepts, techniques, planning tools, and case studies to facilitate learning. Provides an overview of how enterprise business systems operate and are used to manage operations and supply chains in order to make effective business decisions.

DS405: Forecasting Techniques

This course includes techniques of preparing sales and financial forecasts, estimate the relative error in these forecasts, hands-on approach, and transform data and information into a competitive advantage, identify major trends in cash budgeting and cash flow planning, understand forecasting error and the impact of uncertainty participants. Software packages correlated to advanced forecasting techniques are used.

DS406: Service Management

This case course explores the dimensions of successful service firms. It prepares students for enlightened management and suggests creative entrepreneurial opportunities. Outstanding service organizations are managed differently than their "merely good" competitors. Actions are based on totally different assumptions about the way success is achieved. The results show not only in terms of conventional measures of performance but also in the enthusiasm of the employees and quality of customer satisfaction. Beginning with the service encounter, service managers must blend marketing, technology, people, and information to achieve a distinctive competitive advantage. This case will study service management from an integrated viewpoint with a focus on customer satisfaction. The material will integrate operations, marketing, strategy, information technology and organizational issues. Finally, because the service sector is

the fastest-growing sector of the economy, this course is intended to help students discover entrepreneurial opportunities.

DS407: Operations Management

This course offers practical guidance about application of management sciences to the planning and design of production, distribution, and service systems. Case studies of real world industrial and financial applications

DS408: Multi-Objective Programing

This course will focus on methods for multi-objective optimization and their combination with multi-criteria decision-making techniques. First, classical methods for treating multi-objective problems will be presented, and their deficiencies will be clarified. Next, advanced methods, which are based on Pareto-optimality, will be presented. The major part of the course will be based on evolutionary techniques for optimization problems with and without constraints. Leading algorithms will be presented and compared, such as: NSGA-II, SPEA-2, and MO-CMA-ES. Methods to compare algorithms will be detailed including test functions and measures to analyze the obtained approximated Pareto-optimal set and front. The numerical limitations of the presented algorithms will be clarified. Methods to cope with such limitations will be described and how to handle the course of dimensionality of the Pareto-front. Finally, multi-criteria decision-making approaches will be presented, and their combination with multi-objective optimization will be described. A focus will be given on demonstrations from different application areas such as: mechanical design, robotics and control. Students will be allowed to make a programming project in one of these areas or in other areas such as: machine learning, aeronautical design, environmental engineering, industrial engineering, and electrical engineering.

DS409: Production Planning and Inventory Control.

This course is an introduction to Principles of production planning, master scheduling, job sequencing, design and control of deterministic and stochastic inventory systems, material requirement planning

DS409: Statistical Software for decision science Applications.

Hands-on experience with statistical software commonly used in industry. Data preparation, advanced statistical methods for business problems - marketing, finance, operations, etc. Interpretation and communication of results to guide decision making.

DS410: Decision and Game Theory

This course includes basic concepts of decision making under certainty, risk and uncertainty, The use of decision tables, decision trees and sequential decision-making, opportunity loss, one-time decisions and expected value of information, multiple comparison and multiple ranking methods, examining the many facets of game theory, such as bargaining theory, non-cooperative games,

cooperative games, games with incomplete information, several cases studies will be used to illustrate the application of decision theory to real world problems.

DS411: Decision and Risk Management

This course is an introduction to risk management. Loan and credit management; credit scoring. Risk measurements and reserves; banking and insurance capital requirements, the BASEL accord, tail events and catastrophic event insurance. Financial contracts and hedging. Overview of enterprise-wide risk management strategies and techniques: strategies that firms employ to enhance value and minimize exposure; techniques used to identify, measure, reduce, and transfer risk.

DS412: Optimization Models and Methods

This course introduces basic methods of operations research and optimization. The critical path method; the knapsack problem, traveling salesman problem, introduction to set covering models Linear, combinatorial methods. Use of spreadsheet and other software tools. Duality, sensitivity analysis. Models for business operations and planning, computer systems, transportation, finance. Network models, and integer linear programming.

DS413: Scheduling Techniques

This course focuses on developing effective project schedules. Proven techniques are applied to each of the following: work breakdown structure creation, realistic estimate development, functional dependency definition, task constraint management, resource assignment, schedule optimization, baseline creation, and variance tracking. Extensive hands-on exercises using Microsoft project database for effectively process tasks, estimates, dependencies, constraints, deadlines, resources, and assignments. Optimize the schedule to meet deadlines and budget restrictions. Balance resource workloads through the application of advanced resource-driven scheduling techniques, create project state reports, manage baselines and update project actual, crash or fast-track a project schedule.

DS414: Quality Control and Reliability.

This course is an introduction to Principles of statistical quality control including control by variable and by attribute, construction and use of control charts for variables, fraction defectives and number of defects and use of standard plans, reliability and life cycle testing.

DS415: Stochastic Processes and Queuing Models.

This course is an introduction to stochastic dynamic systems, queuing networks, probabilistic state transition models and nondeterministic decision-making models

DS416: Data Analytics Programming

Data-driven analysis has wrought a quiet revolution in business. As disk storage and computing power have become cheaper, companies have started maintaining detailed logs of inventories, sales, and customer activity, among others. Yet, this is only half the job; the real need is for

insights, and this course teaches you the tools for that. We will learn data analysis in Python, a general-purpose language that lies at the intersection of (a) easy enough to learn, (b) fast enough to scale, and (c) endowed with a wide range of powerful libraries that make data cleaning, visualization, and many common data analysis tasks a cinch.

DS417: Decision Analysis

This course offers practical guidance about how to make better decisions and teaches students how to use modeling to do decision analysis. We analyze decisions involving uncertainty, risk, and time delay. In addition to methods of decision analysis, the course will also emphasize sensitivity analysis and communication of recommendations. Prior and posterior distributions; conjugate priors; value of information; applications to decision making in business

DS418: Network Modelling and Optimization

This course provides an overview on network optimization fundamentals and engineering applications with focus on linear, nonlinear, and discrete problems. The interplay between discrete and continuous problem structures will be highlighted. Discrete network optimization problems will be discussed in the detail. In the case of continuous network optimization, duality and iterative cost improvement will be studied and applied in most common linear cost problems, such as minimum cost flow and transshipment problems. Main solution methods, including branch-and-bound, Lagrangian relaxation, Dantzig-Wolf decomposition, heuristics, and local search methods will be studied.

DS419: Advanced Project Management

This course includes project management body of knowledge (PMBOK) and project management systems, pricing and estimating, project risk management, managing multiple projects and enterprise project management, communication skills, effect of concurrent engineering, critical chain project management, dependency structure matrix, object-oriented project management.

DS425: Selected Topics in Operations Research and Decision Support I

Selected Topics provides an opportunity to study a topic which is not included in the existing curriculum. This course examines one or more selected current issues in the area of Operations Research and Decision Support. Topics chosen for study will be by arrangement with the department.

DS426: Selected Topics in Operations Research and Decision Support II

Selected Topics provides an opportunity to study a topic which is not included in the existing curriculum. This course examines one or more selected current issues in the area of Operations Research and Decision Support. Topics chosen for study will be by arrangement with the department.

DS430/DS431: Project

This course will continue for two semesters. In the first semester, a group of students will select one of the projects proposed by the department and analyze the underlying problem. In the second semester, the design and implementation of the project will be conducted. The student will deliver oral presentations, progress reports, and a final report.