

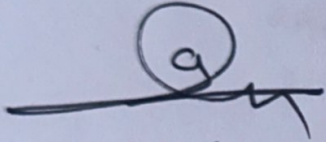
وزارة التعليم العالي والبحث العلمي
جهاز الاشراف والتقويم العلمي دائرة ضمان الجودة
والاعتماد الأكاديمي

استمارة وصف البرنامج الأكاديمي للكليات والمعاهد

الجامعة : الجامعة التقنية الشمالية

الكلية /المعهد: الكلية هندسة تقنيات النفط والغاز

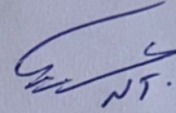
القسم العلمي: هندسة تقنيات الطاقة المتجددة



التوقيع:

اسم المعاون العلمي: أ.م.د. كلاويش نوري طاهر

التاريخ: ٢٠٢٤/١٠/١٠



التوقيع:

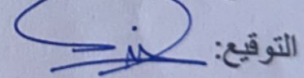
اسم رئيس القسم : أ.م.د. نصير توفيق علوان

التاريخ: ٢٠٢٤/١٠/١٠

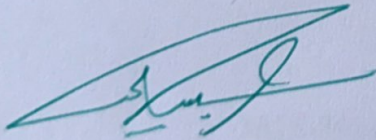
دقق الملف من قبل شعبة ضمان الجودة والاداء الجامعي

اسم مدير شعبة ضمان الجودة والأداء الجامعي: م.م.مها عدنان داود

التاريخ: ٢٠٢٤/١٠/١٠



التوقيع:



مصادقة السيد العميد: أ.م.د. عبيد مجيد علي

التاريخ: ٢٠٢٤/١٠/١٠

1. رؤية البرنامج

التميز في مجال التعليم الهندسي والتعلم والبحث العلمي في كافة المجالات المعرفية لهندسة الطاقة المتجددة وفقاً للمعايير المعتمدة محلياً دولياً وبناء جسور مع المجتمع المحلي ودعم اقتصاده باستخدام مصادر الطاقة البديلة ذات العوائد الاقتصادية العالية.

2. رسالة البرنامج

- أ. قسم هندسة تقنيات الطاقة المتجددة يسعى لتحقيق رسالة الجامعة التقنية الشمالية في بناء مؤسسة تعليمية قادرة على مواكبة واستيعاب التطور المستمر والمتواصل مع العلوم الأساسية وتطبيقاتها المختلفة:
- ب. رفد القطاع الخاص المحلي والعالمي والقطاع الحكومي بأجيال من المهندسين والعاملين ذو معرفة بأحدث تقنيات توليد الطاقة الخضراء وإمكانية تعزيز خبراتهم بالمراكز العلمية، والبحثية، والتعليمية، والصناعية.
- ت. تقديم أفضل الخدمات التعليمية للطلاب في مجال دراسة العلوم الأساسية لمرحلة البكالوريوس لإكسابهم المهارات المطلوبة في التخصص من خلال برامج تعليمية وفقاً للمعايير العالمية.
- ث. المساهمة في التطوير والتحديث المستمر للبرامج التعليمية والبحثية.
- ج. القيام بدور مؤثر في تنمية المجتمع من خلال برامج التدريب والتوعية والاستشارات والتفاعل التبادلي بين القسم والمجتمع.
- ح. العمل على خلق وتنمية العلاقات الأكاديمية بين الجامعات المحلية والإقليمية من خلال التبادل العلمي والثقافي.
- خ. تعميق الولاء الوطني والمحافظة على مبادئ المجتمع والقيم الإنسانية النبيلة وتطوير القيم الإبداعية والأخلاقية.

3. أهداف البرنامج

يسعى القسم إلى تحقيق الأهداف الإستراتيجية التالية:

أولاً: الأهداف العامة:

- أ. مواكبة التطور العالمي في كل المجالات العلمية خاصة في هندسة الطاقة المتجددة.
- ب. رفد المجتمع ومؤسسات الدولة بالخبرات العلمية والفنية في مجال هندسة الطاقة المتجددة وتطوير مؤسساته العلمية والصحية والبيئية.
- ج. رفع مستوى الأداء والجودة إلى مصاف الجامعات العالمية المتقدمة.

ثانياً: الأهداف التعليمية:

- أ. تطوير وتحديث المناهج العلمية بشقيها النظري والعملية.
- ب. تطوير الكفاءات العلمية، والأداء للتدريسيين، والباحثين، والطلبة.
- ت. يهدف القسم إلى اعتماد التقنيات الحديثة في المختبرات العملية.

ثالثاً: أهداف البحث العلمي:

- د. الانخراط في الدراسات العليا والمسائل المهنية الهندسية في سوق العمل على كل المستويات مع التأكيد على التطوير الوظيفي المستمر.
- ذ. إيجاد حلول للمشاكل البيئية المعاصرة.
- ر. فهم دراسة المسببات الرئيسية للجوانب السلبية المنتشرة في بيئتنا ومجتمعنا ودراستها علمياً وإيجاد العلاج الناجح لها.
- ز. استثمار بحوث الطاقة والتنمية المستدامة لتطوير الصناعة في مجالاتها المختلفة كالصناعات الطبية، والكيميائية، والغذائية، وغيرها.
- س. المساهمة في معالجة المشاكل المتعلقة بالطاقة في العراق (المساهمة في المشاريع الريادية والابداعية والتطوير المهني المستمر في المجتمع المحلي).

رابعاً: أهداف خدمة المجتمع:

- أ. دعم الأنشطة المجتمعية من خلال إقامة الندوات والمؤتمرات العلمية والدورات العملية في مختلف مجالات علوم الطاقة والطاقات المتجددة.
- ب. التعاون مع دوائر الدولة المختلفة للنهوض بالواقع الصحي والبيئي والصناعي والزراعي بتقديم الخبرات العلمية ونتائج البحوث لنقلها الى ارض الواقع.
- ج. السعي الى النهوض بالمجتمع من خلال توسيع الآفاق العامة المتعلقة بأهمية هندسة الطاقة المتجددة في حل الكثير من المشاكل الصحية والبيئية والصناعية.

خامساً: أهداف النشاط الطلابي:

- أ. دعم الأنشطة الطلابية والثقافية، والاجتماعية، والرياضية، والفنية.
- ب. التبادل المعرفي والثقافي والعلمي مع الجامعات المحلية والعالمية الأخرى.
- ت. تدريب الطلبة في مؤسساتنا العلمية والصحية والصناعية والبيئية خلال العطلة الصيفية.
- ث. السعي لعقد اتفاقات مع الجامعات والأقسام المتناظرة مع قسمنا داخل وخارج القطر لأرسال المتميزين من الطلبة للتدريب والاطلاع على النشاط العلمي فيها خلال العطلة الصيفية.
- ج. إقامة مؤتمر علمي سنوي لمشاريع البحوث (مشاريع تخرج) وتكريم المتميزين منهم.

4. الاعتماد البرامجي

لا يوجد

5. المؤثرات الخارجية الأخرى

لا يوجد

| 6. هيكلية البرنامج | | | | |
|--------------------|----------------|-------------|--------------|-----------------|
| ملاحظات * | النسبة المئوية | وحدة دراسية | عدد المقررات | هيكل البرنامج |
| مقرر اساسي | 9.583% | 23 | 9 | متطلبات المؤسسة |
| مقرر اساسي | 21.25% | 51 | 8 | متطلبات الكلية |
| مقرر اساسي | 69.166% | 166 | 27 | متطلبات القسم |
| | | | يوجد | التدريب الصيفي |
| | | | | أخرى |

* ممكن ان تتضمن الملاحظات فيما اذا كان المقرر أساسيا او اختياري.

| 7. وصف البرنامج | | | |
|-----------------|----------------------|----------------------|------------------|
| السنة / المستوى | رمز المقرر أو المساق | اسم المقرر أو المساق | الساعات المعتمدة |
| / 2024-2023 | | | نظري |
| | | | |

| Graduation Requirements | | | | | | | | | |
|-------------------------|--------------|--------------------------------|------|--------------|-------|------|-----|------|-------|
| المستوى الأول: | | | | | | | | | |
| No. | Subject code | Subject | ECTS | Weekly hours | | | | | |
| | | | | CL. | Lect. | Lab. | Pr. | Tut. | Semn. |
| 1 | NTU 101 | English Language | 2.00 | 2 | | | | | |
| 2 | RETE 100 | Mechanics Engineering / Static | 7.00 | 3 | | | | 2 | |
| 3 | COGTEK 100 | Mathematics Principles | 7.00 | 3 | | | | 2 | |
| 4 | RETE 102 | Electrical Technology | 6.00 | 2 | | 2 | | 1 | |
| 5 | RETE 103 | Workshop | 6.00 | | | 6 | | | |
| 6 | NTU 100 | Human Rights & Democracy | 2:00 | 2 | | | | | |
| 7 | RETE 104 | Thermodynamics' Principles | 9.00 | 3 | | 2 | | 2 | |
| 8 | NTU 102 | Computer | 3.00 | 1 | | 1 | | | |
| 9 | RETE 101 | Eng. Mechanics/ Dynamics | 8.00 | 3 | | | | 2 | |
| 10 | COGTEK 101 | Engineering Drawing | 8.00 | 1 | | 3 | | | |

| | | | | | | | | | |
|----|---------|-----------------|------|---|--|--|--|--|--|
| | | | | | | | | | |
| 11 | NTU 103 | Arabic Language | 2.00 | 2 | | | | | |

| Graduation Requirements | | | | | | | | | |
|-------------------------|--------------|---|------|--------------|-------|------|-----|------|-------|
| المستوى الثاني | | | | | | | | | |
| No. | Subject code | Subject | ECTS | Weekly hours | | | | | |
| | | | | CL. | Lect. | Lab. | Pr. | Tut. | Semn. |
| 1 | COGTEK 200 | Fluid Mechanics | 7.00 | 3 | | 2 | | 1 | |
| 2 | COGTEK 201 | Mathematics | 7.00 | 3 | | | | 2 | |
| 3 | RETE 200 | Electronics | 7.00 | 3 | | 2 | | 1 | |
| 4 | RETE 201 | Mechanical Drawing | 5.00 | 1 | | 3 | | | |
| 5 | NTU 200 | Baath Crimes | 2.00 | 2 | | | | | |
| 6 | NTU 201 | English Language | 2.00 | 2 | | | | | |
| 7 | RETE 202 | Strength of Materials | 6.00 | 3 | | 2 | | 1 | |
| 8 | RETE 203 | Electronics circuits | 6.00 | 3 | | 2 | | 1 | |
| 9 | RETE 204 | Refrigeration & Air Conditioning Principles | 5.00 | 2 | | 2 | | | |
| 10 | RETE 205 | Electric machines | 5.00 | 2 | | 2 | | 1 | |
| 11 | NTU 202 | Computer | 2.00 | 1 | | 1 | | | |
| 12 | NTU 203 | Arabic Language | | 2 | | | | | |

| Graduation Requirements | | | | | | | | | |
|-------------------------|--------------|--|------|--------------|-------|------|-----|------|-------|
| المستوى الثالث: | | | | | | | | | |
| No. | Subject code | Subject | ECTS | Weekly hours | | | | | |
| | | | | CL. | Lect. | Lab. | Pr. | Tut. | Semn. |
| 1 | RETE 300 | Conduction and radiation heat transfer | 7.00 | 3 | | 2 | | 1 | |
| 2 | COGTEK 300 | Engineering Analysis | 6.00 | 2 | | 1 | | 1 | |
| 3 | RETE 302 | Renewable Energy systems | 6.00 | 2 | | 2 | | | 1 |
| 4 | RETE 303 | Power electronics | 5.00 | 2 | | 2 | | | |
| 5 | RETE 304 | Gas dynamics | 6.00 | 2 | | 2 | | | |

| | | | | | | | | | |
|----|------------|---|------|---|--|---|--|---|---|
| 6 | RETE 305 | Solar Energy Engineering | 6.00 | 2 | | 2 | | 1 | |
| 7 | RETE 306 | Biofuel | 5.00 | 2 | | 2 | | | 1 |
| 8 | RETE 301 | Convection heat transfer, and heat exchanger design | 7.00 | 3 | | 2 | | 1 | |
| 9 | RETE 307 | Combustion and Pollution Engineering | 6.00 | 2 | | 1 | | 1 | |
| 10 | COGTEK 301 | Numerical Analysis | 6.00 | 2 | | 2 | | 1 | |

| Graduation Requirements | | | | | | | | | |
|-------------------------|--------------|---|------|--------------|-------|------|-----|------|-------|
| المستوى الرابع: | | | | | | | | | |
| No. | Subject code | Subject | ECTS | Weekly hours | | | | | |
| | | | | CL. | Lect. | Lab. | Pr. | Tut. | Semn. |
| 1 | RETE 400 | Wind energy | 5.00 | 2 | | 2 | | | 1 |
| 2 | RETE 401 | Solar Photovoltaic Conversion | 5.00 | 2 | | 2 | | | 1 |
| 3 | RETE 402 | Simulation of renewable energy systems | 6.00 | 2 | | 2 | | 1 | |
| 4 | COGTEK 400 | Engineering projects management and its risks | 4.00 | 2 | | | | 1 | 1 |
| 5 | RETE 404 | Power Plants | 5.00 | 2 | | 2 | | | 1 |
| 6 | NTU 400 | Methodology of Scientific Research | 5.00 | 2 | | | | | 1 |
| 7 | RETE 405 | Design of solar renewable systems | 6.00 | 2 | | 2 | | | 1 |
| 8 | RETE 406 | Store and recover Energies | 5.00 | 2 | | 2 | | | |
| 9 | RETE 407 | Control systems | 5.00 | 2 | | 2 | | | |
| 10 | RETE 403 | Computer-based modelling and simulation of renewable energy systems | 8.00 | 2 | | 4 | | | |
| 11 | COGTEK 401 | Graduation Project | 6.00 | 1 | | | 3 | | 1 |

| 8. مخرجات التعلم المتوقعة للبرنامج | |
|------------------------------------|---|
| المعرفة | |
| | <p>أ- الاهداف المعرفية .</p> <p>1- مواكبة التطور العالمي في كل المجالات العلمية خاصة في هندسة الطاقة المتجددة</p> <p>2- أفهام وتعليم الطالب الأسس الهندسية الخاصة بعلم هندسة تقنيات الطاقة المتجددة.</p> <p>3- تمكين الطلبة من الحصول على المعرفة والفهم في العمل على الأنظمة الحديثة للطاقة المتجددة وفي تحليل البرامج المتعلقة بتلك الانظمة .</p> <p>4- تمكين الطلبة من الحصول على المعرفة والفهم على تشخيص الاعطال وصيانتها لاجهزة الطاقة المتجددة المختلفة.</p> <p>5- تمكين الطالب من تحليل وتصميم منظومات الطاقة المتجددة.</p> |
| المهارات | |
| | <p>ب- الاهداف المهاراتية الخاصة بالبرنامج :</p> <p>1 - شرح مواضيع اسس هندسة الطاقة المتجددة من قبل المختصين بالموضوع مع التاكيد على استخدام الرياضيات كأساس للفهم والتعلم .</p> <p>2 - تزودهم بمهارات حل المشاكل التطبيقية المتعلقة بالأنظمة توليد الطاقة .</p> <p>3- تعريف الطالب بأساسيات توليد الطاقة المتجددة.</p> <p>4 - يتم التركيز على مواضيع تصميم وتحليل المنظومات الصناعية وتطويرها والسيطرة عليها باستخدام منظومات تحكم .</p> |
| القيم | |
| | <p>ج- الاهداف الوجدانية والقيمية :</p> <p>1- تمكين الطلبة من التفكير والتحليل للمواضيع المرتبطة بالاطار الهندسي كالدوائر الكهربائية المختلفة ومنظومات نقل الطاقة الكهربائية ومنظومات التحكم القابلة للبرمجة في مجال التطبيق الصناعي للطاقات المتجددة.</p> <p>2- تمكين الطلبة من التفكير والتحليل للمواضيع المرتبطة بالأنظمة الحاسوبية المتعلقة بالاطار الهندسي.</p> <p>3- تمكين الطلبة من التفكير والتحليل في المواضيع المتعلقة بحل المشكلات العملية الخاصة بانظمة الطاقة المتجددة.</p> |

| 9. استراتيجيات التعليم والتعلم | |
|--------------------------------|--|
| | <p>1- شرح النظريات الهندسية المتعلقة بمجال توليد ونقل القدرة الكهربائية.</p> <p>2- تكوين حلقات نقاشية خلال المحاضرات او خارجها لمناقشة مواضيع هندسية علمية التي تتطلب التفكير والتحليل.</p> <p>3- تزويد الطلبة بالأساسيات والمواضيع الاضافية المتعلقة بمخرجات التعليم السابقة للمهارات لحل المشاكل العملية.</p> <p>4- حل مجموعة من الامثلة العملية من قبل الكادر الاكاديمي متخصص في مجال هندسة الطاقة المتجددة</p> <p>5- تكليف الطلاب بحل الواجبات البيئية لمشاكل معقدة تمهيدا لنقله الى مرحلة حل المشاكل العملية.</p> <p>6- يتم مشاركة الطلبة خلال المحاضرة بحل بعض المشاكل العملية.</p> <p>7- يتم متابعة المختبرات العلمية الخاصة بالقسم من قبل الكادر الاكاديمي متخصص في هندسة الطاقة المتجددة.</p> |

10. طرائق التقييم

- 1- توجيه اسئلة مفاجئة للطلبة داخل القاعة الدراسية بمواضيع تم شرحها سابقا تمهيدا لشرح المواضيع المتقدمة.
- 2- امتحانات يومية بأسئلة لها علاقة بالمشاكل العملية .
- 3- درجات مشاركة لأسئلة التنافسية بين الطلاب .
- 4- وضع درجات للمشاركة العلمية التي يكلف بها الطالب.
- 5- وضع درجات للواجبات البيئية والتقارير المكلفة بها الطالب.
- 6- امتحانات فصلية للمنهج الدراسي اضافة الى امتحان نصف السنة والامتحان النهائي.
- 7- المشاركة الفاعلة في قاعة الدرس دليل التزام الطالب وتحمله المسؤولية.
- 8- الالتزام بالموعد المحدد في تقديم الواجبات والتقارير المطلوبة من الطالب.
- 9- تعبر الاختبارات الفصلية والنهائية عن الالتزام والتحصيل المعرفي والمهاري للطلاب.

11. الهيئة التدريسية

أعضاء هيئة التدريس

| اعداد الهيئة التدريسية | | المتطلبات/المهارات الخاصة (ان وجدت) | | التخصص | | الرتبة العلمية |
|------------------------|------|--|--|-------------------------------------|-------------------------------|----------------|
| محاضر | ملاك | | | خاص | عام | |
| | ملاك | | | طاقات حرارية/ طاقات متجددة | الهندسة الميكانيكية | استاذ مساعد |
| | ملاك | | | كيمياء حياتية | علوم | استاذ مساعد |
| | ملاك | | | حراريات | هندسة ميكانيك | مدرس |
| | ملاك | | | الالكترونيك | هندسة كهرباء والكترونيك | مدرس مساعد |
| | ملاك | | | حراريات | هندسة ميكانيك | مدرس مساعد |
| | ملاك | | | جبلوجي هندسية | جبلوجي | مدرس مساعد |
| | ملاك | | | رياضيات | تربية رياضيات | مدرس مساعد |
| | ملاك | | | رياضيات | علوم رياضيات | مدرس مساعد |

| | | | | | | |
|--|------|--|--|-------------|------------------|------------|
| | ملاك | | | حراريات | وقود وطاقة | مدرس مساعد |
| | ملاك | | | فيزياء مواد | فيزياء | مدرس مساعد |
| | ملاك | | | قانون | قانون | مدرس مساعد |
| | ملاك | | | الاداب | اللغة العربية | مدرس مساعد |

| |
|--|
| التطوير المهني |
| توجيه أعضاء هيئة التدريس الجدد |
| من خلال الندوات والحلقات الدراسية وحضور المؤتمرات |
| التطوير المهني لأعضاء هيئة التدريس |
| من خلال المؤتمرات والندوات والحلقات النقاشية وحضور التدريسين مناقشات الدراسات العليا |

| |
|---|
| 12. معيار القبول |
| <ul style="list-style-type: none"> ➤ اعتماد شروط القبول للطلاب وفق لوائح وزارة التعليم العالي والبحث العلمي (القبول المركزي) ➤ اجتياز المقابلة الشخصية للقسم. ➤ ان يكون لائق بالفحص الطبي. ➤ معدل التخرج من مرحلة الاعدادية. ➤ الطاقة الاستيعابية للقسم. |

| |
|---|
| 13. أهم مصادر المعلومات عن البرنامج |
| <ul style="list-style-type: none"> ➤ احتياجات السوق. ➤ التوجهات المحلية للمحافظة. ➤ الدراسات والاستبيانات. |

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|-------------------------------|
| 14. خطة تطوير البرنامج |
| 15. دورات تدريبية داخل القطر |
| 16. دورات تدريبية خارج القطر |

| مخطط مهارات البرنامج | | | | | | | | | | | | | | | |
|------------------------------------|----|----|----|----------|----|----|----|---------|----|----|----|------------------|---------------------------|------------|---------------------|
| مخرجات التعلم المطلوبة من البرنامج | | | | | | | | | | | | اساسي أم اختياري | اسم المقرر | رمز المقرر | السنة / المستوى |
| القيم | | | | المهارات | | | | المعرفة | | | | | | | |
| ج4 | ج3 | ج2 | ج1 | ب4 | ب3 | ب2 | ب1 | أ4 | أ3 | أ2 | أ1 | | | | |
| * | * | * | * | * | * | * | * | * | * | * | * | اساسي | اللغة الانكليزية | NTU 101 | /2024-2023 الأول |
| | | | | * | * | * | * | * | * | * | * | اساسي | الميكانيك الهندسي/ السكني | RETE 100 | |
| | | | | * | * | * | * | * | * | * | * | اساسي | مبادئ الرياضيات | COGTEK 100 | |
| | | | | * | * | * | * | * | * | * | * | اساسي | تكنولوجيا كهرباء | RETE 102 | |
| | | | | * | * | * | * | * | * | * | * | اساسي | المعامل | RETE 103 | |
| | | | | * | * | * | * | * | * | * | * | اساسي | حقوق الانسان والديمقراطية | NTU 100 | |
| | | | | * | * | * | * | * | * | * | * | اساسي | الديناميكا الحرارية | RETE 104 | |
| * | * | * | * | * | * | * | * | * | * | * | * | اساسي | الحاسوب | NTU 102 | |
| | | | | * | * | * | * | * | * | * | * | اساسي | الميكانيك الهندسي/ الحركي | RETE 101 | |
| | | | | * | * | * | * | * | * | * | * | اساسي | الرسم الهندسي | COGTEK 101 | |
| * | * | * | * | * | * | * | * | * | * | * | * | اساسي | اللغة العربية | NTU 103 | |
| | | | | * | * | * | * | * | * | * | * | اساسي | ميكانيك الموائع | COGTEK 200 | /2025-2024 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|-------|-----------------------------------|---------------|--------|
| | | | | * | * | * | * | * | * | * | * | اساسي | رياضيات | COGTEK 201 | الثاني |
| | | | | * | * | * | * | * | * | * | * | اساسي | الالكترونيك | RETE 200 | |
| | | | | * | * | * | * | * | * | * | * | اساسي | رسم ميكانيكي | RETE 201 | |
| * | * | * | * | * | * | * | * | * | * | * | * | اساسي | جرائم حزب البعث | NTU 200 | |
| * | * | * | * | * | * | * | * | * | * | * | * | اساسي | اللغة الانكليزية | NTU 201 | |
| | | | | * | * | * | * | * | * | * | * | اساسي | مقاومة المواد | RETE 202 | |
| | | | | * | * | * | * | * | * | * | * | اساسي | الدوائر الإلكترونية | RETE 203 | |
| | | | | * | * | * | * | * | * | * | * | اساسي | مبادئ التبريد والتكييف | RETE 204 | |
| | | | | * | * | * | * | * | * | * | * | اساسي | مكائن كهربائية | RETE 205 | |
| * | * | * | * | * | * | * | * | * | * | * | * | اساسي | الحاسوب | NTU 202 | |
| * | * | * | * | * | * | * | * | * | * | * | * | اساسي | اللغة العربية | NTU 203 | |
| | | | | * | * | * | * | * | * | * | * | اساسي | انتقال حرارة بالتوصيل والاشعاع | RETE 300 | |
| | | | | * | * | * | * | * | * | * | * | اساسي | تحليلات هندسية | COGTEK 300 | |
| | | | | * | * | * | * | * | * | * | * | اساسي | منظومات الطاقة المتجددة | RETE 302 | |

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|---|---|---|---|---|---|---|---|---|---|---|---|-------|---|---------------|----------------------|
| | | | | * | * | * | * | * | * | * | * | اساسي | الالكترونيات القدرة | RETE 303 | |
| | | | | * | * | * | * | * | * | * | * | اساسي | ديناميك الغازات | RETE 304 | |
| | | | | * | * | * | * | * | * | * | * | اساسي | هندسة الطاقة الشمسية | RETE 305 | |
| | | | | * | * | * | * | * | * | * | * | اساسي | الوقود الحيوي | RETE 306 | |
| | | | | * | * | * | * | * | * | * | * | اساسي | انتقال الحرارة بالحمل الحراري، وتصميم المبادل الحراري | RETE 301 | |
| | | | | * | * | * | * | * | * | * | * | اساسي | هندسة الاحتراق والتلوث | RETE 307 | |
| | | | | * | * | * | * | * | * | * | * | اساسي | تحليلات عددية | COGTEK 301 | |
| | | | | * | * | * | * | * | * | * | * | اساسي | طاقة الرياح | RETE 400 | /2027-2026 الرابع |
| | | | | * | * | * | * | * | * | * | * | اساسي | تحويل الطاقة الكهروضوئية | RETE 401 | |
| | | | | * | * | * | * | * | * | * | * | اساسي | محاكاة انظمة الطاقة المتجددة | RETE 402 | |
| | | | | * | * | * | * | * | * | * | * | اساسي | ادارة المشاريع الهندسية ومخاطرها | COGTEK 400 | |
| | | | | * | * | * | * | * | * | * | * | اساسي | محطات توليد الطاقة | RETE 404 | |
| * | * | * | * | * | * | * | * | * | * | * | * | اساسي | منهج البحث العلمي | NTU 400 | |

| | | | | | | | | | | | | | | |
|--|--|--|--|---|---|---|---|---|---|---|---|-------|---|---------------|
| | | | | * | * | * | * | * | * | * | * | اساسي | تصميم أنظمة الطاقة المتجددة | RETE 405 |
| | | | | * | * | * | * | * | * | * | * | اساسي | خزن الطاقة واستردادها | RETE 406 |
| | | | | * | * | * | * | * | * | * | * | اساسي | أنظمة التحكم | RETE 407 |
| | | | | * | * | * | * | * | * | * | * | اساسي | نمذجة و محاكاة أنظمة الطاقة المتجددة باستخدام الحاسوب | RETE 403 |
| | | | | * | * | * | * | * | * | * | * | اساسي | مشروع التخرج | COGTEK 401 |

يرجى وضع اشارة في المربعات المقابلة لمخرجات التعلم الفردية من البرنامج الخاضعة للتقييم



وصف المقررات الدراسية

المستوى الأول

| Module 1 معلومات المادة الدراسية | | | |
|--|-------------------------|--------------------------------------|---|
| Module Title | English Language | | Module Delivery |
| Module Type | Basic | | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar |
| Module Code | NTU 101 | | |
| ECTS Credits | 2 | | |
| SWL (hr/sem) | 50 | | |
| Module Level | 1 | Semester of Delivery | 1 |
| Administering Department | RETE | College | College of Oil & Gas Techniques Engineering/Kirkuk |
| Module Leader | Noor Saad Abd aljaleel | e-mail | noor.saad23@ntu.edu.iq |
| Module Leader's Acad. Title | Assist. Lecture | Module Leader's Qualification | MSc |
| Module Tutor | | e-mail | |
| Peer Reviewer Name | Name | e-mail | E-mail |
| Scientific Committee Approval Date | 01/06/2023 | Version Number | 1.0 |

| Relation with other Modules العلاقة مع المواد الدراسية الأخرى | | | |
|---|------|-----------------|--|
| Prerequisite module | None | Semester | |
| Co-requisites module | None | Semester | |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|---|---|
| <p>Module Objectives</p> <p>أهداف المادة الدراسية</p> | <ol style="list-style-type: none">1. To develop problem solving skills and understanding of circuit theory through the application of techniques.2. Developing strategies to produce more coherent writing and to make clear appropriate, and relevant notes from academic texts.3. Encouraging them to adopt varies approaches for dealing with new unknown vocabulary by practicing effective use for dictionaries and through making effective vocabulary records.4. Exploring and evaluating research technologies and resource and crediting source information.5. Promoting learner independence by encourage students to return to earlier study skills to refresh their memories or see how new skills build on and develop those previously presented. |
| <p>Module Learning Outcomes</p> <p>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none">1. Students will identify topics and formulate questions.2. identify appropriate methods and sources for research3. engage ethically with sources.4. Oral Communication.5. Identify literary techniques and creative uses of language in literary texts.6. Adapt their texts to particular audiences and purposes7. Apply relevant theoretical concepts to literary or other texts and practices8. Describe their own writing practices and how they have evolved9. Plan, structure and give a presentation in English using a stock of typical phrases and visuals effectively10. Use appropriate strategies for asking and responding to questions, as well as summarizing speaker's ideas during the Q&A sessions11. Use appropriate language for managing and participating in a round-table discussion12. . Prepare for and take part in a panel discussion as a panelist |
| <p>Indicative Contents</p> | <p>Indicative content includes the following.</p> <p>It is often seen as a relatively formal and complex English language that conveys</p> |

ideas in an accurate and objective manner. It is generally known to include the basic skills of literary analysis, adherence to repositories, synthesis of associated scholars, and the ability to critically evaluate. Basic academic vocabulary, phrases, and grammatical complexity are often used in academic dialogue and texts. Specifically, academic English refers to words and practices that are not necessarily common or frequently encountered in informal conversations and circumstances.

- 1- **Student life Reading** :who to read ways of reading ,methods reading ,**punctuation** :capital letters ,full stop , and question mark , **linking idea**: and and and but joints sentence , **Rules** : present simple, **checking your writing** , error in spelling, capital letters , punctuation and grammar .
- 2- **Daily routine , reading**: working and stress, **predicting content** : using picture in a text , **Writing** : routine and procedure , **Hand writing** : making hand written work clear and easy to read , **paragraph**: block and intended styles **linking idea**: sequencing word ,first, after ,then ,finally
- 3- **People and the environment , Reading** : weather, **Scanning** :using headings , **meaning from context** : guessing the meaning from the new word, **Writing** :describing our lives, **punctuation** : apostrophes , **rules** :talking about frequency ,
- 4- **Architecture reading** : famous building , **making notes** :notes from study, intensive reading labelling diagram , **Research** : finding information ,asking your self question , **linking idea** :expressing reason ,because, express result ,so, **word and phrases** : language to describe building
- 5- **Education , reading** :universities, **predicting content** : using the title and the first few sentences , **linking ideas** : expressing contrast – however , **writing** : formal letters and emails , greetings and endings: dear , yours, word and phrases : languages for letters and emails
- 6- **Technology ,reading** : invention , **getting information from website** :skimming and scanning to find useful information , **using visual in web sites** : getting extra information from diagram and pictures, **Writing definition** : using which or that to describe things , **giving examples**: supporting definition with example .
- 7- **Food drink and culture** , reading : food from another countries , **topic sentence** :using topic sentence to help understanding , **writer opinion** :identifying writer opinion, punctuation: commas , **linking ideas** , in addition and and ,**using pronouns** : avoiding repetition .
- 8- **Cites of the world ,reading**: city life, looking at data : table ,chart,& graph , **getting facts from text** : using heading to help your information , **rules** : comparatives and superlatives, **linking ideas** : using relative pronouns which and where .
- 9- **Brain power ,reading** : a healthy brain, **in other word** :using pronouns and synonyms to avoid repetition, **making notes** : organizing notes ,**common mistake** :typical grammar rules ,summaries :summarizing the main point of a text

10- Staying alive, reading: dangerous disease of our time , using what you know : using your own knowledge to help you understand a text ,using a reference to understand a text :pronouns ,adjective ,adverb

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies

Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

| | | | |
|--|-----------|---|------------------|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 33 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا | (33/15) =2.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 17 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا | (18/15)= 1.13 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 50 | | |

Module Evaluation

تقييم المادة الدراسية

| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
|------------------|---------|-------------|----------------|--------------|---------------------------|
| Formative | Quizzes | 3 | 15% (15) | 5, 8, and 10 | LO #3 and #6, #13 |

| | | | | | |
|-----------------------------|---------------------|------|------------------|----------------------|-------------------------|
| assessment | Assignments | 3 | 15% (15) | 4,6, 8,10, and 12 | LO #5,7, 9, 11, and #13 |
| | Projects | | | | |
| | Seminar | 1 | 10% (10) | 13 | LO #8 |
| Summative assessment | Midterm Exam | 1hr | 10% (10) | 7 | LO #9 |
| | Final Exam | 3 hr | 50% (50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

| Delivery Plan (Weekly Syllabus) | |
|--|--|
| المنهاج الأسبوعي النظري | |
| | Material Covered |
| Week 1 | Introduction to the academic English |
| Week 2 | Student life Reading Skills , way of reading. |
| Week 3 | Student life Writing skills punctuation, linking idea. Checking your writing, Writing about people. vocabulary development. , part of speech, A dictionary you're writing about people |
| Week 4 | Daily Routine Reading Skills predicting content , skimming |
| Week 5 | Daily Routine Writing skills hand writing, paragraph .linking idea .writing about routine & procedure Vocabulary development , colocation jobs ending - in or er ist |
| Week 6 | People & the environment |

| | |
|----------------|---|
| | Reading skills scanning using headings meaning from context |
| Week 7 | <p>People & the environment</p> <p>Writing skills punctuation talking about frequency writing about study habits</p> <p>Research sources</p> |
| Week 8 | <p>Architecture</p> <p>Reading skills making notes</p> <p>Research focusing your search</p> |
| Week 9 | <p>Architecture</p> <p>Writing skills linking idea word & phrases writing about building</p> <p>Vocabulary development Dictionary entry countable and uncountable nouns</p> |
| Week 10 | <p>Educations</p> <p>Reading skills predicting content linking idea</p> <p>Writing skills greeting and ending in formal letters word and phrases writing a letter or email</p> <p>Vocabulary developments plurals</p> |
| Week 11 | <p>Technology</p> <p>Reading skills getting information from web site using visual in websites</p> <p>Writing skills writing definition giving example writing a description for a device</p> <p>Vocabulary development Homophones</p> <p>Research websites</p> |
| Week 12 | <p>Food drink and culture</p> <p>Reading skills topic sentence writing opinion</p> <p>Writing skills punctuation linking ideas using pronouns writing about food and drink</p> <p>Vocabulary development prefixes</p> |

| | |
|----------------|--|
| Week 13 | <p>Cites of the word</p> <p>Reading skills looking at data getting facts from text</p> <p>Writing skills comparatives and superlatives linking idea writing about cites</p> <p>Research finding facts and figure</p> <p>Vocabulary development word attack skills</p> |
| Week 14 | <p>Brain power</p> <p>Reading skills in other words making notes</p> <p>Writing skills common mistake summaries writing a summary</p> <p>Research books</p> |
| Week 15 | <p>Staying alive</p> <p>Reading skills using what you know using reference to understand text focusing on statics</p> <p>Writing skills linking ideas word and phrases writing about statics</p> <p>Vocabulary development word or figures learning a words synonyms and anatomies</p> |
| Week 16 | Preparatory week before the final Exam |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|--------------------------|---|---------------------------|
| Required Texts | <p>[1] R. Harrison, <i>academic Skills Level 1 students books</i>. UK: Oxford, 2011.</p> <p>[2] John and liz Soar. (New Headway Beginner) 4th edition. Oxford: Oxford University Press.</p> | Yes |
| Recommended Texts | | |

| | |
|----------|--|
| Websites | |
|----------|--|

| Module 2 معلومات المادة الدراسية | | | |
|--|--------------------------------------|-------------------------------|--|
| Module Title | Mechanics Engineering /static | | Module Delivery |
| Module Type | Core | | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar |
| Module Code | RETE 100 | | |
| ECTS Credits | 7 | | |
| SWL (hr/sem) | 175 | | |
| Module Level | 1 | Semester of Delivery | 1 |
| Administering Department | RETE | College | College of Oil & Gas Techniques Engineering/Kirkuk |
| Module Leader | | e-mail | |
| Module Leader's Acad. Title | | Module Leader's Qualification | |
| Module Tutor | | e-mail | |
| Peer Reviewer Name | Name | e-mail | E-mail |
| Scientific Committee Approval Date | 01/06/2023 | Version Number | 1.0 |

| Relation with other Modules العلاقة مع المواد الدراسية الأخرى | | | |
|---|------|--|----------|
| Prerequisite module | None | | Semester |
| Co-requisites module | None | | Semester |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|--|---|
| Module Aims أهداف المادة الدراسية | <ol style="list-style-type: none">1. To develop problem solving skills and understanding of mechanic's theory through the application of techniques.2. To understand Force, Moment and Couple from a given machine.3. Covers the fundamentals of mechanics and mechanical machine components.4. To understand friction and equilibrium problems.5. To calculate centroids and moments of inertia. |
| Module Learning Outcomes مخرجات التعلم للمادة الدراسية | <ol style="list-style-type: none">1. Explain the principles of static equilibrium.2. Recognize how mechanics work in mechanical machines.3. Describe force, moment, and couple.4. Solve problems related to the forces in truss members using the method of joints and the method of sections.5. Identify types of forces.6. Define types of friction.7. Use Free Body Diagrams to solve static problems involving components and pulley systems.8. Explain the concept of equilibrium used in problem-solving.9. Solve problems related to work and equilibrium. |
| Indicative Contents المحتويات الإرشادية | <p>Indicative content includes the following.</p> <ul style="list-style-type: none">• Mechanics: is the physical science that deals with the effects of forces on objects.• Branches of Mechanics: Statics, Dynamics, Strength of Materials.• Statics: is the study of rigid bodies that are in equilibrium.• Two kinds of quantities are used in engineering mechanics: A scalar quantity has only magnitude (mass, time, temperature, etc.). A vector quantity has both magnitude and direction (force, velocity, etc.).• Rigid Body: a body is considered rigid when the changes in distance between any two of its points are negligible under any condition.• External Force: When a force is applied to a body, it is called an external force.• Internal Force: the resistance to deformation or change of shape exerted by the material of a body is called an internal force.• Collinear Forces: forces whose lines of action pass through a common point are called concurrent forces. |

| | |
|--|--|
| | <ul style="list-style-type: none"> • Concurrent Forces: forces whose lines of action pass through a common point are called concurrent forces. • Resultant: a single force that can replace two or more forces and produce the same effect on the body as all the forces combined. The resultant of these two forces can be determined analytically or graphically. • When a body moves or tends to move over another body, a force opposing the motion develops at the contact surfaces. This force, which opposes the movement or the tendency of movement, is called Frictional Force or Friction. |
|--|--|

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

| | |
|-------------------|--|
| Strategies | <ul style="list-style-type: none"> • Clearly define the learning objectives for the unit. Students should understand what they are expected to learn and achieve by the end of the unit. • Promote active learning by engaging students in hands-on activities, problem-solving exercises, and group discussions. This helps students actively participate in the learning process and enhances their understanding of mathematical concepts. • Support Learning: Build the unit in a way that builds on previously learned concepts. Start with foundational topics and gradually progress to more complex ideas. Provide clear explanations and examples to support students' understanding at each stage. • Link mathematical concepts to real-life applications to demonstrate their relevance and practicality. Show students how mathematics is used in various fields and professions, which will enhance their appreciation of the subject. • Utilize technology tools and resources to enhance the teaching and learning experience. Interactive software, online simulations, graphing calculators, and educational apps can help students visualize and explore mathematical concepts. |
|-------------------|--|

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا

| | | | |
|-------------------------------|----|-----------------------------|-----|
| Structured SWL (h/sem) | 78 | Structured SWL (h/w) | 5.3 |
|-------------------------------|----|-----------------------------|-----|

| | | | |
|--|-----|---|-----|
| الحمل الدراسي المنتظم للطالب خلال الفصل | | الحمل الدراسي المنتظم للطالب أسبوعيا | |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 97 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا | 6.4 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 175 | | |

Module Evaluation

تقييم المادة الدراسية

| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
|-----------------------------|---------------------|-------------|------------------|----------------|---------------------------|
| Formative assessment | Quizzes | 5 | 20% (20) | 2, 4, 7, 9, 11 | LO # 3, 5,7,9,11 and 13 |
| | Assignments | 5 | 10% (10) | 5, 7,9,11,13 | LO # 4, 5,8,10, and 12 |
| | Projects | 2 | 10% (10) | 6,11 | LO # 5, and 10 |
| Summative assessment | Midterm Exam | 2hr | 10% (10) | 11 | LO # 1-8 |
| | Final Exam | 3hr | 50% (50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

Delivery Plan (Weekly Syllabus)

المنهاج الأسبوعي النظري

| | Material Covered |
|-----------------|---|
| Week 1 | Core concepts: Concepts of weight, force, moments, Units, Centre of gravity, Vector Algebra |
| Week 2 | Vector quantities and scalar quantities .2D resolve force |
| Week 3-4 | Force Systems: Component forces and Resultant forces. |

| | |
|------------------|--|
| Week 5 | Resultant Forces examples and Dot product |
| Week 5 | Moment |
| Week 6 | Couple |
| Week 7-8 | Equilibrium: System Isolation, Free Body Diagram, 2-D and 3-D equilibrium equations |
| Week 9-10 | Friction |
| Week 11 | Exam |
| Week 12 | Centers of Mass and Centroids: Centre of Mass, Centroids of Lines, Areas and Volumes |
| Week 13 | Area Centroid under curve |
| Week 14 | Wight Centroid |
| Week 15 | Preparatory week before the final Exam |
| Week 16 | The week of final Exam |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|--------------------------|---|---------------------------|
| Required Texts | ENGENIRING MECHANICS STATICS, J.L. MERIAM, L. G. KRAIGE, J. N. BOLTON, SI Version | Yes |
| Recommended Texts | ENGENIRING MECHANICS STATICS, R. C. Hibbeler, Plarson | yes |
| Websites | | |

Module 3

معلومات المادة الدراسية

| | | |
|---------------------|-------------------------------|------------------------|
| Module Title | Mathematics Principles | Module Delivery |
|---------------------|-------------------------------|------------------------|

| | | | | |
|---|---------------------|--------------------------------------|--|--|
| Module Type | Core | | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar | |
| Module Code | COGTEK 100 | | | |
| ECTS Credits | 7 | | | |
| SWL (hr./sem.) | 175 | | | |
| Module Level | 1 | Semester of Delivery | 1 | |
| Administering Department | RETE | College | College of Oil & Gas Techniques Engineering/Kirkuk | |
| Module Leader | Ali Jasim Mohammed | e-mail | ali.jasim@ntu.edu.iq | |
| Module Leader's Acad. Title | Assist. Lecturer | Module Leader's Qualification | MSc | |
| Module Tutor | Name (if available) | e-mail | E-mail | |
| Peer Reviewer Name | Name | e-mail | E-mail | |
| Scientific Committee Approval Date | 01/06/2023 | Version Number | 1.0 | |

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

| | | | |
|-----------------------------|------|-----------------|--|
| Prerequisite module | None | Semester | |
| Co-requisites module | None | Semester | |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|---|---|
| Module Aims أهداف المادة الدراسية | <ol style="list-style-type: none"> To provide students with a foundation in basic mathematical concepts, this foundation is essential for further studies in advanced mathematics and its applications. To develop a foundation in mathematical concepts, principles, and problem-solving techniques. |
|---|---|

| | |
|---|---|
| | <ol style="list-style-type: none"> 3. To enhance logical reasoning, critical thinking, and analytical skills. 4. To promote mathematical literacy and numeracy among students. 5. To develop students' ability to analyze problems and apply mathematical principles to solve complex problems in various contexts. 6. Mathematics is essential for developing numerical literacy, which involves understanding and working with numbers, data, measurements, and calculations. |
| <p>Module Learning Outcomes</p> <p>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> 1. Determinants: <ul style="list-style-type: none"> • Understand the concept of determinants and their properties. • Calculate determinants of matrices of various sizes. Apply determinants in solving systems of linear equations. • Use determinants to find the inverse of a matrix. 2. Trigonometric Functions: <ul style="list-style-type: none"> • Understand and apply the definitions of trigonometric functions such as sine, cosine, tangent, cosecant, secant, and cotangent. • Solve trigonometric equations. Apply trigonometric identities and formulas to simplify expressions and solve problems involving angles and triangles. 3. Vectors: <ul style="list-style-type: none"> • Define and understand vectors in two and three dimensions. • Perform vector operations such as addition, subtraction, scalar multiplication, and dot product. Calculate vector magnitudes and directions. Solve geometric and algebraic problems involving vectors. • Apply vector concepts to physical and engineering problems, including forces, velocity, and displacement. 4. Limits: <ul style="list-style-type: none"> • Understand the concept of a limit. Evaluate limits algebraically and graphically. Apply limit properties and theorems to find limits of functions. • Determine the continuity of a function at a point. Solve problems involving infinite limits and limits at infinity. 5. Derivatives: <ul style="list-style-type: none"> • Define the derivative as the instantaneous rate of change of a function. • Calculate derivatives using various differentiation rules, including the power rule, product rule, quotient rule, and chain rule. • Apply derivatives to analyze functions, Understand the relationship between the graph of a function and its derivative. • Solve related rates problems using derivatives. 6. Integration: <ul style="list-style-type: none"> • Understand the concept of integration. Calculate definite and indefinite integrals using various integration techniques, such as substitution, integration by parts, and trigonometric substitution. |

| | |
|--|---|
| | <ul style="list-style-type: none"> • Apply integration to find areas between curves, volumes of solids of revolution, and other applications in physics and engineering. • Use integration to solve differential equations and represent inverse derivatives. |
| <p>Indicative Contents</p> <p>المحتويات الإرشادية</p> | <p>Indicative content includes the following.</p> <ul style="list-style-type: none"> • Determinants and their properties: This topic involves understanding determinants, their properties, and their applications, including solving linear equations using Cramer's method. • Trigonometric functions: This includes studying the properties and graphs of trigonometric functions, trigonometric relationships and identities, and their applications in solving equations and various other contexts. • Vectors: This topic focuses on vector arithmetic operations in two and three-dimensional spaces, vector projections, orthogonal components, and their applications in finding areas of shapes. • Limits: Understanding the concept of limits of functions, including algebraic and trigonometric functions, as well as limits at infinity. Applications of limits are also explored. • Derivatives: Studying derivatives of algebraic and trigonometric functions, implicit functions, and inverse functions. The chain rule and applications of derivatives, particularly in mechanical engineering, are covered. • Hyperbolic functions: This involves derivatives of hyperbolic functions and inverse hyperbolic functions, drawing graphs, and their applications in physical and mechanical contexts. • Integration: Integration theory, definite and indefinite integration, integration of various functions including trigonometric, logarithmic, exponential, and hyperbolic functions. Methods of integration, such as integration by parts, partial fractions, and substitution, are also explored. Applications of integration in physics, engineering, and finding areas under curves and volumes of revolution are covered. • Differential equations: Simplifying differential equations is discussed, along with numerical integration methods like the Trapezoidal Rule and Simpson's Rule, and their applications. |

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies

- Clearly define the learning objectives for the unit. Students should understand what they are expected to learn and achieve by the end of the unit.
- Active learning by engaging students in hands-on activities, problem-solving exercises, and group discussions. This helps students to actively participate in the learning process and enhances their understanding of mathematical concepts.
- Supported Learning: Build the unit in a way that builds on previously learned concepts. Start with foundational topics and gradually progress to more complex ideas. Provide clear explanations and examples to support students' understanding at each stage.
- Link mathematical concepts to real-life applications to prove their relevance and practicality. Show students how mathematics is used in various fields and professions, which will enhance their appreciation of the subject.
- Use technology tools and resources to enhance the teaching and learning experience. Interactive software, online simulations, graphing calculators, and educational apps can help students visualize and explore mathematical concepts.

Student Workload (SWL)

الحمل الدراسي للطلاب محسوب لـ ١٥ أسبوعا

| | | | |
|---|-----|---|------|
| Structured SWL (hr./sem.) الحمل الدراسي المنتظم للطلاب خلال الفصل | 78 | Structured SWL (hr./w) الحمل الدراسي المنتظم للطلاب أسبوعيا | 5.2 |
| Unstructured SWL (hr./sem.) الحمل الدراسي غير المنتظم للطلاب خلال الفصل | 97 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعيا | 6.46 |
| Total SWL (hr./sem.) الحمل الدراسي الكلي للطلاب خلال الفصل | 175 | | |

Module Evaluation

تقييم المادة الدراسية

| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
|----------------------|-----------------|-------------|------------------|--------------------|---------------------------|
| Formative assessment | Quizzes | 5 | 20% (20) | 3, 5, 7, 10 and 13 | LO #1, #3, #8, #12, #14 |
| | Assignments | 5 | 15% (15) | 3, 4, 7, 12 and 14 | LO #2, #4, #6, #8, #10 |
| | Projects / Lab. | | | | |
| | Report | 1 | 5%(5) | 10 | LO 7# |
| Summative assessment | Midterm Exam | 2 hr. | 10% (10) | 7 | LO # 1 - 2 |
| | Final Exam | 3 hr. | 50% (50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

Delivery Plan (Weekly Syllabus)

المنهاج الأسبوعي النظري

| | Material Covered |
|--------|---|
| Week 1 | Determinants and their properties - Determinants of n degree - Solving Linear Equations by Cramer's Method - Applications to Determinants. |
| Week 2 | Trigonometric functions - Graph of Trigonometric Functions- Trig. relationships and identities - Trigonometric applications and equations - various applications on trigonometric functions. |
| Week 3 | Vectors - vector arithmetic operations in two and three-dimensional spaces - Vector Projections & Orthogonal Components - orthogonal vectors and unit vectors - Calculate vector scales, scalar and vector projections – Application of vectors to find area of shapes. |
| Week 4 | limits - Limit of a Function -The limits of algebraic and trigonometric functions and the |

| | |
|----------------|---|
| | limits of functions At Infinity (∞) - Applications on limits The Limit |
| Week 5 | derivatives- Composite Functions - Derivatives of algebraic and trigonometric functions - Derivatives of Implicit Functions - chain rule - Applications of Derivatives (Mechanical Engineering) |
| Week 6 | Derivative of inverse functions - Derivative of Inverse Trigonometric Functions - Various applications. Derivatives of Logarithmic and Exponential Functions. |
| Week 7 | Hyperbolic functions - Derivatives of Hyperbolic Functions - The derivative of Inverse Hyperbolic Functions - Drawing and Graphs of Hyperbolic Functions and their Inverses relations - Physical and Mechanical applications. |
| Week 8 | Integration - Integration Theory - Definite and Indefinite Integration - Integration of Trigonometric and Inverse Functions. |
| Week 9 | Integration of Logarithmic and Exponential Functions - Integration of Hyperbolic and Inverse Functions - Improper Integral and LHopitals Rule. |
| Week 10 | Methods of integration: Integration by parts - Integration by Partial Fractions - |
| Week 11 | Integration by substituting the trigonometric function - Integration by completing the square ... etc. - |
| Week 12 | Physical and engineering Applications of Integration - The area is under a curve and between two curves. |
| Week 13 | Volume of Revolution - Arc Length of a Curve (Integration Application) |
| Week 14 | simplify differential equations |
| Week 15 | Numerical Integration - Trapezoidal Rule & Simpson's Rule - Numerical Integration Method - Applications. |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the |
|--|------|------------------|
|--|------|------------------|

| | | Library? |
|--------------------------|---|----------|
| Required Texts | Thomas' Calculus" by George B. Thomas Jr., Maurice D. Weir, and Joel Hass | Yes |
| Recommended Texts | Advanced Engineering Mathematics" by Erwin Kreyszig | No |
| | "Calculus" by Michael Spivak | No |
| Websites | https://www.khanacademy.org | |

| Module 4 معلومات المادة الدراسية | | | |
|--|------------------------------|--------------------------------------|---|
| Module Title | Electrical technology | | Module Delivery |
| Module Type | Core | | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar |
| Module Code | RETE 102 | | |
| ECTS Credits | 6 | | |
| SWL (hr/sem) | 150 | | |
| Module Level | 1 | Semester of Delivery | |
| Administering Department | RETE | College | College of Oil & Gas Techniques Engineering/Kirkuk |
| Module Leader | Naseer Tawfeeq Alwan | e-mail | naseer.t.alwan@ntu.edu.iq |
| Module Leader's Acad. Title | Lecturer | Module Leader's Qualification | PhD |
| Module Tutor | Naseer Tawfeeq Alwan | e-mail | naseer.t.alwan@ntu.edu.iq |
| Peer Reviewer Name | Name | e-mail | E-mail |
| Scientific Committee Approval Date | 01/06/2023 | Version Number | 1.0 |

| Relation with other Modules العلاقة مع المواد الدراسية الأخرى |
|---|
| |

| | | | |
|-----------------------------|------|-----------------|--|
| Prerequisite module | None | Semester | |
| Co-requisites module | None | Semester | |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|--|--|
| Module Aims أهداف المادة الدراسية | <ol style="list-style-type: none"> 1- Connect electrical circuits and compare theoretical results with practical 2- Introduce the student to understand electrical theories and prove them in practice |
| Module Learning Outcomes مخرجات التعلم للمادة الدراسية | <ol style="list-style-type: none"> 1. To familiarize the student with the importance of the most important electrical principles 2. Learning Outcomes, Teaching, Learning and Assessment Methods 3. To distinguish the electrical components and parts and their working principle. |
| Indicative Contents المحتويات الإرشادية | <p>Indicative content includes the following.</p> <p><u>Part A - Principles of circuits</u></p> <p>To develop the student's mental ability to connect simple and complex circuits.</p> <p>The student learns how to develop a strategy to change a complex circuit to a simple circuit with the same results.</p> <p><u>Part B – Principles to connect circuits.</u></p> <p>The student learns to connect circuits according to the circuit diagram.</p> |

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

| | |
|-------------------|--|
| Strategies | <p>Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.</p> |
|-------------------|--|

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا

| | | | |
|--|-----|---|-----|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 78 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا | 5.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 72 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا | 4.8 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 150 | | |

Module Evaluation

تقييم المادة الدراسية

| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
|-----------------------------|------------------------|-------------|------------------|---------------|-------------------------------------|
| Formative assessment | Quizzes | 2 | 10% (10) | 5, 10 | LO #7 and #11 |
| | Assignments | 4 | 10% (10) | 2,4,7, and 12 | LO #3, #5, #9 and #12 |
| | Projects / Lab. | 2 | 10% (10) | Continuous | LO #3 and #6 |
| | Report | 10 | 10% (10) | Continuous | LO#3,#5,#6,#7,#8##9 ,#10,#11,#13 |
| Summative assessment | Midterm Exam | 2 hr | 10% (10) | 7 | LO #1 - #2 |
| | Final Exam | 3 hr | 50% (50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

Delivery Plan (Weekly Syllabus)

المنهاج الأسبوعي النظري

| | |
|--|-------------------------|
| | Material Covered |
|--|-------------------------|

| | |
|----------------|---|
| Week 1 | How to use measuring devices for the purpose of measuring (R, I, V) |
| Week 2 | Ohm's law Connecting resistors to mixed parallel |
| Week 3 | Kirchhoff's law for voltage and current |
| Week 4 | Applications of Kirchhoff's law |
| Week 5 | Thevenin Theory |
| Week 6 | Norton Theory |
| Week 7 | Tractorism Theory |
| Week 8 | Nodal theory |
| Week 9 | Series circuits consisting of a coil |
| Week 10 | Parallel circuits consisting of a coil |
| Week 11 | Series circuits consisting of a capacitor |
| Week 12 | Parallel circuits consisting of a capacitor |
| Week 13 | Resonant circuit |
| Week 14 | Applications of series circuits |
| Week 15 | Applications of parallel circuits |
| Week 16 | Preparatory week before the final Exam |

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الأسبوعي للمختبر

| | Material Covered |
|---------------|---|
| Week 1 | Connecting avow-meter with resistance |
| Week 2 | Connecting resistance with power supply |
| Week 3 | Applications |

| | |
|----------------|---|
| Week 4 | Connecting two circuits and measuring the voltage for each resistance |
| Week 5 | Applications |
| Week 6 | Connecting two circuits and measuring the current at each resistance |
| Week 7 | Applications |
| Week 8 | Resonance Theory for electrical circuits |
| Week 9 | Resonance circuits and their applications |
| Week 10 | Make a simple equivalent circuit equivalent to the original circuit |
| Week 11 | Applications |
| Week 12 | Making half and full rectifier wave circuits |
| Week 13 | Applications |
| Week14 | Find a load that draws a voltage equal to the source voltage |
| Week 15 | Applications |
| Week16 | Preparatory week before the final Exam |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|--------------------------|--|---------------------------|
| Required Texts | “Basic Electrical Engineering”, THERAJA. | Yes |
| Recommended Texts | “Electrical and Electronic Principles and Technology”, John Bird | Yes |
| Websites | Basic Electrical Circuits website tutorials | |

Module 5

معلومات المادة الدراسية

| | | | | |
|---|----------------------|--------------------------------------|---|--|
| Module Title | Workshop | | Module Delivery | |
| Module Type | Core | | <input type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar | |
| Module Code | RETE 103 | | | |
| ECTS Credits | 6 | | | |
| SWL (hr/sem) | 150 | | | |
| Module Level | 1 | Semester of Delivery | 1 | |
| Administration Department | RETE | College | College of Oil & Gas Techniques Engineering/Kirkuk | |
| Module Leader | Naseer Tawfeeq Alwan | e-mail | naseer.t.alwan@ntu.edu.iq | |
| Module Leader's Acad. Title | Lecturer | Module Leader's Qualification | PhD | |
| Module Tutor | Name (if available) | e-mail | | |
| Peer Reviewer Name | | e-mail | | |
| Scientific Committee Approval Date | 01/06/2023 | Version Number | | |

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

| | | | |
|-----------------------------|------|-----------------|--|
| Prerequisite module | None | Semester | |
| Co-requisites module | None | Semester | |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|--------------------|---|
| Module Aims | 1. The student is able to acquire manual skills by carrying out the operation and manufacturing processes using various hand tools and measuring tools. |
|--------------------|---|

| | |
|---|--|
| <p>أهداف المادة الدراسية</p> | <p>2. Introducing the student to gaining the manual skill by implementing the operations and connection of the manual tools and measuring tools for the household refrigeration and air conditioning equipment.</p> <p>3. The laboratory material consists of laboratory workshops and refrigeration workshop.</p> |
| <p>Module Learning Outcomes</p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>4. To familiarize the student with the importance of workshops.</p> <p>5. To teach the student how to acquire the manual skill by carrying out the operation and manufacturing processes using various hand tools and measuring tools.</p> <p>6. To distinguish the manual tools and measuring tools for the household refrigeration and air conditioning equipment.</p> |
| <p>Indicative Contents</p> <p>المحتويات الإرشادية</p> | <p>Indicative content includes the following.</p> <p><u>Part A - Tools</u></p> <p>Include recognition of different tools. Employed for surface preparation and methods of application correctly, Devices of measuring dimensions, Calipers, types and uses, drill types and dimensions</p> <p><u>Part B - Measuring tools</u></p> <p>T Steel miler, Veneer, Micrometer, Height & height gauge hand tools, Saws, Hammers, Files, Scriber , Chisels , Taps and dies , Surface plate , Bench working.</p> <p><u>Part C - Welding Workshop</u></p> <p>Include recognition of tools and materials employed – Gas cylinder of oxy – Acetylene welding of surface – Electrical are welding exercise – Welding spot.</p> <p><u>Part D - Lathing Workshop</u></p> <p>lathe machine – Parts – Operation - Practice on longitudinal lathing – Making center – Puncturing – Making external teeth – Practice - Employing measuring tools – internal & external lath machining.</p> |

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

| | |
|--------------------------|--|
| <p>Strategies</p> | |
|--------------------------|--|

| | |
|--|--|
| | <p>Teaching Method 1 – Asynchronous on-line course materials</p> <p>Description: Podcasts, videos and articles in workshop</p> <p>Attendance Recorded: yes</p> <p>Unscheduled Directed Student Hours (time spent away from the timetabled sessions but directed by the teaching staff).</p> <p>Teaching Method 2 - Practical</p> <p>Description: Practical homework assignments</p> <p>Attendance Recorded: Yes</p> <p>Unscheduled Directed Student Hours (time spent away from the timetabled sessions but directed by the teaching staff).</p> |
|--|--|

| Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا | | | |
|--|-----|---|---|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 90 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا | 6 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 60 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا | 4 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 150 | | |

| Module Evaluation تقييم المادة الدراسية | | | | | |
|---|----------------|-------------|----------------|----------|---------------------------|
| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
| Formative | Quizzes | No | No | No | No |

| | | | | | |
|-----------------------------|------------------------|----|------------------|------------|-----|
| assessment | Assignments | 4 | 10% (10) | Continuous | All |
| | Projects / Lab. | 10 | 40% (40) | Continuous | All |
| | Report | 10 | 50% (50) | Continuous | All |
| Summative assessment | Midterm Exam | No | No | No | No |
| | Final Exam | No | No | No | No |
| Total assessment | | | 100% (100 Marks) | | |

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الأسبوعي للمختبر

| | Material Covered |
|-------|--|
| 1 | <p>Tools</p> <p>Include recognition of different tools. Employed for surface preparation and methods of application correctly, Devices of measuring dimensions, Calipers , types and uses , drill types and dimensions</p> |
| 2-3 | <p>Measuring tools</p> <p>Steel miler , Veneer , Micrometer , Height & height gauge hand tools , Saws , Hammers , Files , Scriber , Chisels , Taps and dies , Surface plate , Bench working.</p> |
| 4-6 | <p>Welding Workshop</p> <p>Include recognition of tools and materials employed – Gas cylinder of oxy – Acetylene welding of surface – Electrical are welding exercise – Welding spot.</p> |
| 7-9 | <p>Lathing Workshop</p> <p>lathe machine – Parts – Operation - Practice on longitudinal lathing – Making center – Puncturing – Making external teeth – Practice - Employing measuring tools – internal & external lath machining.</p> |
| 10-11 | <p>Alloying Workshop</p> <p>Contents of alloying workshops – Alloying sands and characteristics – Additives for improvement – Metals melts – Method of casting – Sand mould shaping – Heat treatment.</p> |
| 12-13 | <p>Carpentry Workshop</p> <p>tools, machinery in the carpentry workshop, Fundamental principles – types of wood – application samples preparation</p> |

| | |
|-------|--|
| 14-15 | CarsWorkshop Modes of car motor operation - Fuel feed pump - Electrical spark transfer device - Pistons in cylinder as motion transfer device to the front, back wheels. |
| 16 | Preparatory week before the final Exam |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|-----------------------|----------|---------------------------|
| Required Texts | Workshop | Yes |

Module 6

معلومات المادة الدراسية

| Module Title | HUMAN RIGHTS AND DEMOCRACY | | Module Delivery | |
|-----------------------------|----------------------------|-------------------------------|---|------------------|
| Module Type | BASIC | | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar | |
| Module Code | NTU100 | | | |
| ECTS Credits | 2 | | | |
| SWL (hr/sem) | 50 | | | |
| Module Level | 1 | Semester of Delivery | | |
| Administering Department | RETE | College | Type College Code | |
| Module Leader | Dr. Osama | | e-mail | Osama@ntu.edu.iq |
| Module Leader's Acad. Title | Lecturer | Module Leader's Qualification | Ph.D. | |
| Module Tutor | None | | e-mail | None |
| Peer Reviewer Name | | e-mail | | |
| Review Committee Approval | 01/06/2023 | Version Number | 1.0 | |

| Relation with Other Modules العلاقة مع المواد الدراسية الأخرى | | | |
|---|---|-----------------|--|
| Prerequisite module | None | Semester | |
| Co-requisites module | None | Semester | |
| Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية | | | |
| Module Aims أهداف المادة الدراسية | <ol style="list-style-type: none"> 1. Increase the student's knowledge of the theoretical and historical development of human rights and democracy. 2. Develop the student's analytical and critical skills regarding the current and future aspects of human rights and democracy. 3. Train the student on the importance of active participation in public life as a means to promote respect for human rights and engage in political and cultural activities. 4. Empower students to understand the significance of education and its role in promoting a culture of human rights and democracy, contributing to the building of a civilized society based on good governance, faith in human rights, education about them, and active participation in governance through free and fair elections. | | |
| Module Learning Outcomes مخرجات التعلم للمادة الدراسية | <ol style="list-style-type: none"> 1. Understand the historical development of human rights in ancient civilizations and their relevance to contemporary societies. 2. Analyze the positions of divine laws and religious texts on human rights and evaluate their impact on different societies. 3. Critically examine international constitutions and treaties related to human rights and assess their effectiveness in promoting and protecting human rights. 4. Evaluate the role and significance of the United Nations Charter in establishing a framework for the protection of human rights at the international level. 5. Assess the functions and contributions of international organizations in promoting and safeguarding human rights globally. 6. Explore the role of non-governmental organizations (NGOs) in advocating for and protecting human rights in different contexts. 7. Identify and explain the key safeguards and mechanisms in place to ensure the protection of human rights at the national and | | |

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| | <p>international levels.</p> <ol style="list-style-type: none"> 8. Understand the concept of international humanitarian law and its historical evolution, and its significance in times of armed conflict. 9. Analyze the concept, origin, and evolution of democracy, and understand its principles and values. 10. Examine the relationship between Islam and democracy and evaluate different perspectives on the compatibility of these concepts. 11. Identify and describe the characteristics and features of a democratic system. 12. Differentiate between various forms and types of democracy and assess their strengths and weaknesses. 13. Analyze the political components of democracy, including the role of political parties and their influence on the democratic process. 14. Understand the relationship between democracy, education, and the role of education in promoting democratic values and citizenship. 15. Evaluate the role of media in a democratic system, including its influence on public opinion and the functioning of democratic institutions. |
| <p>Indicative Contents المحتويات الإرشادية</p> | <ol style="list-style-type: none"> 1. Human Rights in Ancient Civilizations: <ul style="list-style-type: none"> ○ Overview of human rights in ancient Greek civilization ○ Exploration of human rights in ancient Roman civilization 2. Divine Laws and Human Rights: <ul style="list-style-type: none"> ○ Examination of the positions of divine laws and religious texts on human rights ○ Analysis of the impact of divine laws on human rights in different societies 3. Human Rights in International Constitutions: <ul style="list-style-type: none"> ○ Study of human rights provisions in international constitutions and charters ○ Comparison of the approaches taken by different countries in guaranteeing human rights in their constitutions 4. The United Nations Charter and Human Rights: <ul style="list-style-type: none"> ○ Overview of the United Nations Charter and its significance in promoting and protecting human rights ○ Analysis of specific articles and provisions related to human rights in the UN Charter 5. Human Rights in International Organizations: <ul style="list-style-type: none"> ○ Examination of the role and functions of international |

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| | <p>organizations in promoting and safeguarding human rights</p> <ul style="list-style-type: none"> ○ Case studies on the work of specific international organizations in advancing human rights agendas <p>6. Human Rights in Non-Governmental Organizations:</p> <ul style="list-style-type: none"> ○ Exploration of the role and contributions of non-governmental organizations (NGOs) in the field of human rights ○ Analysis of the challenges and opportunities faced by NGOs in advocating for human rights <p>7. Safeguards for Human Rights:</p> <ul style="list-style-type: none"> ○ Study of legal and institutional safeguards for the protection of human rights at national and international levels ○ Examination of mechanisms such as national human rights institutions, ombudsman offices, and international human rights tribunals <p>8. International Humanitarian Law:</p> <ul style="list-style-type: none"> ○ Introduction to the concept of international humanitarian law and its historical development ○ Analysis of the legal framework governing the conduct of armed conflicts and the protection of civilians <p>9. The Concept and Evolution of Democracy:</p> <ul style="list-style-type: none"> ○ Understanding the concept, origin, and historical evolution of democracy ○ Exploration of different theoretical perspectives on democracy and its core principles <p>10. Islam and Democracy:</p> <ul style="list-style-type: none"> ○ Examination of the relationship between Islam and democracy ○ Analysis of different interpretations and debates surrounding the compatibility of Islamic principles and democratic values <p>11. Characteristics of Democracy:</p> <ul style="list-style-type: none"> ○ Identification and explanation of the key characteristics and features of a democratic system ○ Analysis of the importance of democratic principles such as popular sovereignty, rule of law, and political participation <p>12. Forms and Types of Democracy:</p> <ul style="list-style-type: none"> ○ Exploration of different forms and types of democracy, including direct democracy, representative democracy, and hybrid systems ○ Assessment of the strengths and weaknesses of each form of democracy <p>13. Political Components of Democracy:</p> <ul style="list-style-type: none"> ○ Study of the role of political parties and electoral systems in a democratic system ○ Analysis of the influence of interest groups, civil society organizations, and media on democratic processes <p>14. Democracy, Education, and Citizenship:</p> <ul style="list-style-type: none"> ○ Examination of the relationship between democracy, education, and the role of education in promoting democratic values and active citizenship ○ Analysis of the importance of civic education and the |
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| | <p>development of critical thinking skills in a democratic society</p> <p>15. Media and Democracy:</p> <ul style="list-style-type: none"> ○ Evaluation of the role of media in a democratic system, including the freedom of the press, media ethics, and media's role in shaping public opinion ○ Analysis of the challenges and opportunities posed by digital media in the context of democratic societies |
|--|---|

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

| | |
|-------------------|--|
| Strategies | <ol style="list-style-type: none"> 1. Lectures: Traditional lectures delivered by the instructor can provide an overview of key concepts, theories, and historical developments in the field. Lectures can help students build foundational knowledge and understand the broader context of the subject matter. 2. Discussions and Debates: Facilitating class discussions and debates allows students to actively engage with the course material, share their perspectives, and critically analyze different viewpoints. This can promote critical thinking, enhance communication skills, and encourage students to explore the complexities of human rights and democracy. 3. Case Studies: Using real-life case studies and examples can help students apply theoretical knowledge to practical situations. Analyzing specific cases can deepen understanding, highlight challenges, and stimulate discussions on the implementation of human rights and democratic principles in different contexts. 4. Group Projects and Presentations: Assigning group projects or presentations on specific topics within the course can encourage collaboration, research skills, and in-depth understanding. Working in groups allows students to explore different aspects of the subject matter and present their findings to the class. 5. Guest Speakers: Inviting guest speakers who are experts in the field of human rights, democracy, or international law can provide students with practical insights, real-world experiences, and diverse perspectives. Guest speakers can also share their expertise on specific topics or case studies related to the course. 6. Interactive Workshops and Simulations: Conducting interactive workshops or simulations can provide students with hands-on experiences related to human rights and democracy. This can include activities such as role-playing exercises, mock trials, or model United Nations sessions, allowing students to understand the practical application of concepts and engage in problem-solving. 7. Multimedia Resources: Incorporating multimedia resources such as videos, documentaries, and online platforms can enhance students' understanding and engagement with the course material. Multimedia resources can provide visual and audio representations of complex |
|-------------------|--|

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| | <p>topics, showcase real-world examples, and stimulate discussions.</p> <p>8. Independent Research and Critical Analysis: Assigning research projects or essays that require independent research and critical analysis can foster self-directed learning, research skills, and the ability to critically evaluate sources of information. This can deepen students' understanding of specific topics and encourage them to develop their own arguments and perspectives.</p> <p>9. Assessments and Feedback: Providing regular assessments, such as quizzes, exams, or essays, can help students gauge their understanding of the material and receive feedback on their progress. Constructive feedback can guide students in improving their knowledge and skills throughout the course.</p> |
|--|---|

| Student Workload (SWL) الحمل الدراسي للطالب | | | |
|--|----|--|--------------|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 33 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً | (32/15)=2.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 17 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً | (18/15)=1.13 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 50 | | |

| Module Evaluation تقييم المادة الدراسية | | | | | |
|---|------------------------|-------------|------------------|----------|---------------------------|
| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
| Formative assessment | Quizzes | 2 | 20% (20) | 5 and 10 | LO #2, and #6 |
| | Assignments | 2 | 10% (10) | 6 and 12 | LO#3 and #8 |
| | Projects / Lab. | 0 | 0 | | |
| | Report | 1 | 10% (10) | 14 | LO #5 |
| Summative assessment | Midterm Exam | 1 hr | 10% (10) | 7 | LO #1 - #3 |
| | Final Exam | 3hr | 50% (50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

| Delivery Plan (Weekly Syllabus) المنهاج الأسبوعي النظري | |
|---|---|
| Material Covered | |
| Week 1 | Human rights in ancient civilizations (Greek and Roman civilizations) |

| | |
|----------------|---|
| Week 2 | The position of divine laws on human rights. |
| Week 3 | Human rights in international constitutions. |
| Week 4 | The United Nations Charter and its stance on human rights. |
| Week 5 | Human rights in international organizations. |
| Week 6 | Human rights in non-governmental organizations. |
| Week 7 | Safeguards for human rights. |
| Week 8 | The concept of international humanitarian law and its historical development. |
| Week 9 | The concept, origin, and evolution of democracy. |
| Week 10 | The relationship between Islam and democracy. |
| Week 11 | Characteristics of democracy. |
| Week 12 | Forms and types of democracy. |
| Week 13 | Political components of democracy. |
| Week 14 | Democracy and education. |
| Week 15 | Preparatory week before the final Exam |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|--------------------------|---|---------------------------|
| Required Texts | الدكتور عابد الجابري محمد حقوق الإنسان والديمقراطية 2006 | Yes |
| Recommended Texts | حقوق الإنسان والديمقراطية اعداد أ.م.د. غسان كريم مجذاب و أ.م. امجد زين العابدين طعمة للعام 2018 | No |
| Websites | "طرق وتعليم وثقافة حقوق الانسان"، منشور على شبكة المعلومات الدولية (الانترنت) على الموقع الإلكتروني http://ghrorg-learning.blogspot.com | |

Module 7

معلومات المادة الدراسية

| | | |
|--------------|----------------|---|
| Module Title | Thermodynamics | |
| Module Type | Core | <input checked="" type="checkbox"/> Theory |
| Module Code | RETE 104 | <input type="checkbox"/> Lecture |
| ECTS Credits | 9 | <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial |

| | | | |
|------------------------------------|----------------------|-------------------------------|--|
| SWL (hr/sem) | 225 | | <input type="checkbox"/> Practical <input type="checkbox"/> Seminar |
| Module Level | 1 | Semester of Delivery | 2 |
| Administration Department | RETE | College | College of Oil & Gas Techniques Engineering/Kirkuk |
| Module Leader | Naseer Tawfeeq Alwan | e-mail | naseer.t.alwan@ntu.edu.iq |
| Module Leader's Acad. Title | Lecturer | Module Leader's Qualification | PhD |
| Module Tutor | Name (if available) | e-mail | |
| Peer Reviewer Name | | e-mail | |
| Scientific Committee Approval Date | 14/09/2023 | Version Number | 1 |

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

| | | | |
|----------------------|------|----------|----|
| Prerequisite module | None | Semester | -- |
| Co-requisites module | None | Semester | -- |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|---|--|
| <p>Module Aims أهداف المادة الدراسية</p> | <ol style="list-style-type: none"> 1. Understanding energy and its transformation: Thermodynamics deals with the study of energy and its conversion from one form to another. By studying thermodynamics, engineers gain a fundamental understanding of how energy behaves and can be manipulated. 2. Analyzing and optimizing energy systems: Engineers use thermodynamics to analyze and optimize the performance of energy systems, such as power plants, engines, refrigeration systems, and HVAC systems. They can determine the efficiency, energy transfer rates, and overall performance of these systems, leading to improvements in design and operation. 3. Designing and improving energy-related devices: Thermodynamics provides engineers with the knowledge necessary to design and improve energy-related devices, including combustion engines, turbines, heat exchangers, and renewable energy systems. By understanding the principles of thermodynamics, engineers can enhance the efficiency, reliability, and sustainability of these devices. |
|---|--|

Module Learning Outcomes

مخرجات التعلم للمادة الدراسية

(LO1) describe basic concepts of Thermodynamics

- restate definition of system, surrounding, closed and open system, extensive and intensive properties.
- calculate absolute and gage pressure, and absolute temperature.
- calculate changes in kinetic, potential, enthalpy and internal energy.

(LO2) arrange the ideal and real gas equations of state.

(LO3) formulate the first law of thermodynamics for a closed systems and arrange the change in energy in the closed systems via heat and work transfer.

(LO4) apply first law of thermodynamics for closed systems and construct conservation of mass and energy equations.

(LO5) formulate the first law of thermodynamics for a closed systems and arrange the change in energy in the closed systems via heat and work transfer.

(LO6) apply the first law of thermodynamics to the open systems.

- describe steady-flow open system.
- apply the first law of thermodynamics to the nozzles, diffusers, turbines, compressors, throttling valves, mixing chambers, heat exchangers, pipe and duct flow.

(LO7) judge the properties of pure substances

- judge the state of the pure substances such as compressed liquid, saturated liquid-vapor mixture and superheated vapor using property diagrams and tables.

(LO7) assess thermodynamic applications using second law of thermodynamics.

- calculate thermal efficiency and coefficient of performance for heat engine, refrigerators and heat pumps.
- restate perpetual-motion machines, reversible and irreversible processes.

(LO8) On successful completion of the module, students should be able to show experience and enhancement of discipline-specific practical skills in carrying out Level 1 practical exercises in Thermodynamics following instruction, using test and measurement equipment and techniques, collecting and recording data, estimating accuracy, assessing errors, and using safe systems of work.

(LO9) Problem solving skills

(LO10) Numeracy

(LO11) Communication skills

(LO12) IT skills

Indicative Contents

الإرشادية المحتويات

Indicative content includes the following.

- Conservation of Energy: The total energy of an isolated system remains constant over time. The energy may change its form or be transferred between different components of the system, but the total energy within the system remains constant.
- The ideal gas is a theoretical model that simplifies the behavior of gases under certain conditions. While real gases deviate from ideal behavior at high pressures and low temperatures, the ideal gas concept provides a useful framework for understanding gas properties
- Ideal Gas Law: The ideal gas law is an equation that relates the pressure (P), volume (V), temperature (T), and number of moles (n) of an ideal gas. It can be expressed as $PV = nRT$, where R is the ideal gas constant. This equation shows that, at a constant temperature, the product of pressure and volume is proportional to the number of moles of gas.
- Boyle's Law: Boyle's law describes the relationship between the pressure and volume of an ideal gas at constant temperature. It states that the pressure of an ideal gas is inversely proportional to its volume: $P_1V_1 = P_2V_2$.
- Charles's Law: Charles's law relates the volume and temperature of an ideal gas at constant pressure. It states that the volume of an ideal gas is directly proportional to its absolute temperature: $V_1/T_1 = V_2/T_2$.
- Avogadro's Law: Avogadro's law states that equal volumes of different gases, at the same temperature and pressure, contain an equal number of molecules. It implies that the volume of an ideal gas is directly proportional to the number of moles of the gas: $V_1/n_1 = V_2/n_2$.
- Energy Conservation Equation: The first law can be mathematically expressed using the energy conservation equation. It states that the change in internal energy of a system is equal to the heat added to the system minus the work done by the system: $\Delta U = Q - W$, where ΔU represents the change in internal energy, Q represents the heat added to the system, and W represents the work done by the system.
- The second law of thermodynamics is a fundamental principle in thermodynamics that governs the direction and limitations of energy transfer and conversion.
- The second law sets an upper limit on the efficiency of heat engines, which are devices that convert heat energy into mechanical work. The Carnot efficiency represents the maximum efficiency that can be achieved by an ideal heat engine operating between two temperature extremes. It depends only on the temperatures of the heat source and heat sink and is given by $(T_1 - T_2) / T_1$, where T_1 is the temperature of the heat source and T_2 is the temperature of the heat sink.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies

Teaching Method 1 – Lectures
Description:

| | |
|--|--|
| | <p>Attendance Recorded: Yes</p> <p>Teaching Method 2 – Asynchronous on-line course materials Description: Podcasts, videos and articles in thermodynamics Attendance Recorded: No</p> <p>Unscheduled Directed Student Hours (time spent away from the timetabled sessions but directed by the teaching staff).</p> <p>Teaching Method 3 - Tutorials Description: Attendance Recorded: Yes</p> <p>Teaching Method 4 - Practical Description: Practical homework assignments Attendance Recorded: No Unscheduled Directed Student Hours (time spent away from the timetabled sessions but directed by the teaching staff).</p> |
|--|--|

| Student Workload (SWL) الحمل الدراسي للطالب | | | |
|---|-----|---|-----|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 108 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً | 7.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 117 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً | 7.8 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 225 | | |

| Module Evaluation تقييم المادة الدراسية | | | | | |
|--|------------------------|-------------|------------------|-------------------|----------------------------|
| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
| Formative assessment | Quizzes | 5 | 10% (10) | 3,5,7,9,11 and 15 | LO #2, #3,#5,#7,#9 and #11 |
| | Assignments | 5 | 10% (10) | 2,6,8 and 12 | LO #1, #4, #6and #10 |
| | Projects / Lab. Report | 4 | 20% (10) | Continuous | All |
| | | | | | |
| Summative assessment | Midterm Exam | 2 hr | 10%(10) | 7 | LO #1 - #5 |
| | Final Exam | 3 hr | 50%(50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

| | |
|---------|---|
| Week 1 | Definition of energy – kinetic & potential energies –work – power flow & internal energy – enthalpy- energy diagram |
| Week2 | Definition of state – property, process – property diagrams -1st law of thermo dynamic, (P- V) diagram. |
| Week3 | Ideal gases – ideal gasses laws (boyle , Charles , Gaylosic), gas constant – Avogadro law specific heat at constant volume &pressure |
| Week4 | Energy analysis of closed system , particular closed system processes – constant volume , constant pressure and constant temperature process. |
| Week5 | Particular closed system processes – adiabatic and polytrophic processes |
| Week6 | Mass and energy analysis of control systems |
| Week7 | Properties of pure substances and Phase change process of pure substances |
| Week8 | Steam formation process, Dryness fraction ,Liquid line ,Steam line and Wet steam |
| Week9 | Calculation of steam ,steam table |
| Week 10 | Steam process with drawing each processes on (P-V)diagram |
| Week 11 | Second law of thermodynamic Statement of (Kelvin, Planck & Clausius statement) |
| Week 12 | Heat engine , Refrigerator and Heat pump |
| Week 13 | Carnot and reverse Carnot cycle |
| Week 14 | Entropy , Entropy change of ideal gases and isentropic process |
| Week 15 | Entropy change of pure substances and Isentropic efficiencies of steady-flow devices |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|-------------------|--|---------------------------|
| Required Texts | Applied Thermodynamics for engineering technology By T.D. EASTOP | Yes |
| Recommended Texts | Thermodynamics An engineering approach By Yunus A. Cengel | Yes |
| | Fundamentals of engineering thermodynamics By Michael J. Moran | No |

Module 8

معلومات المادة الدراسية

| | | | | |
|---|-----------------|--------------------------------------|--|---|
| Module Title | Computer | | Module Delivery | |
| Module Type | Basic | | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar | |
| Module Code | NTU 102 | | | |
| ECTS Credits | 3 | | | |
| SWL (hr/sem) | 75 | | | |
| Module Level | 1 | Semester of Delivery | | 2 |
| Administering Department | RETE | College | College of Oil & Gas Techniques Engineering/Kirkuk | |
| Module Leader | | e-mail | E-mail | |
| Module Leader's Acad. Title | | Module Leader's Qualification | | |
| Module Tutor | | e-mail | | |
| Peer Reviewer Name | Name | e-mail | E-mail | |
| Scientific Committee Approval Date | 01/06/2023 | Version Number | 1.0 | |

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

| | | | |
|-----------------------------|------|-----------------|--|
| Prerequisite module | None | Semester | |
| Co-requisites module | None | Semester | |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|---|---|
| Module Aims أهداف المادة الدراسية | <ol style="list-style-type: none"> To develop problem solving skills and understanding of computer skills through the application of techniques. |
|---|---|

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|---|--|
| | <p>2. Acquire the ideas of how computer works by understanding the basic functions of input, output and storage devices</p> <p>3. This program is meant for those students who have low-level literacy in computer use and only partial understanding of the functions of a computer. And so the students are introduced to this program to improve computer literacy</p> |
| <p>Module Learning Outcomes</p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>Students completing this module will be able to:</p> <ul style="list-style-type: none"> - Understand basic computer terminology; - Identify components of a computer and peripheral devices; - Perform the basic computer functions by using a desktop or a laptop; - Develop an understanding of word processing capabilities of a computer; - Understand the concept and usage of the Internet and e-mails; - Use the acquired skills to pursue employment opportunities; - Enhance their computer literacy. |
| <p>Indicative Contents</p> <p>المحتويات الإرشادية</p> | <p>Indicative content includes the following.</p> <ul style="list-style-type: none"> • MS Office Word, Excel, Outlook, Powerpoint, Access • Google Drive Docs, Drive, Forms, Gmail, Sheets • Spreadsheets Excel, Google Drive, Open Office, pivot tables, vertical lookups, macros • Email Outlook, Gmail, mail merge, filters, folders • Presentations PowerPoint, Google slides, Tableau, Keynote • Operating systems MacOS, Microsoft Windows, |

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

| | |
|-------------------|---|
| Strategies | Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. |
|-------------------|---|

| Student Workload (SWL) | | | |
|--|----|---|-----|
| الحمل الدراسي للطلاب محسوب لـ ١٥ أسبوعا | | | |
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل | 33 | Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعيا | 2.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل | 42 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعيا | 2.8 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل | 75 | | |

| Module Evaluation | | | | | |
|---|-----------------------|-------------|----------------|------------------|---------------------------|
| تقييم المادة الدراسية | | | | | |
| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
| Formative assessment 40% | Quizzes | 5 | 10%(10) | 3,6, 8,12 and 14 | LO #1, #2,#4,#5 and #6 |
| | Assignments | 4 | 10%(10) | 2,5,10 and 13 | LO #2, #4,#5 and #7 |
| | projects/ Lab. | 4 | 20%(20) | Continuous | All |
| | Report | | | | |
| Summative | Midterm Exam | 2hr | 10%(10) | 7 | LO #1 - #3 |

| | | | | | |
|-------------------------|-------------------|-----|------------------|----|-----|
| assessment | Final Exam | 3hr | 5% (50) | 16 | All |
| 60% | | | | | |
| Total assessment | | | 100% (100 Marks) | | |

Delivery Plan (Weekly Syllabus)

المنهاج الأسبوعي النظري

| | Material Covered |
|----------------|--|
| Week 1 | Introduction - What is Computer, |
| Week 2 | Basic Applications of Computer |
| Week 3 | Components of Computer System, |
| Week 4 | Central Processing Unit (CPU), |
| Week 5 | Concepts of Hardware and Software |
| Week 6 | Introduction to Internet, WWW and web browsers |
| Week 7 | Operating Computer using GUI Based Operating System |
| Week 8 | Basics of Popular Operating Systems; The User Interface |
| Week 9 | Using right Button of the Mouse and Moving Icons on the screen, Use of Common Icons, Status Bar, Using Menu and Menu-selection, Running an Application |
| Week 10 | Viewing of File, Folders and Directories, Creating and Renaming of files and folders, |
| Week 11 | Opening and closing of different Windows; Using help; Creating Short cuts, |
| Week 12 | Basics of O.S Setup |
| Week 13 | Common utilities |
| Week 14 | Understanding Word Processing: |

| | |
|----------------|---------------------------|
| Week 15 | Using Spread Sheet |
| Week 16 | Making small presentation |

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الأسبوعي للمختبر

| | Material Covered |
|---------------|---|
| Week 1 | Knowing computer |
| Week 2 | Operating Computer using GUI Based Operating System |
| Week 3 | Understanding Word Processing |
| Week 4 | Using Spread Sheet |
| Week 5 | Introduction to Internet, WWW and web browsers |
| Week 6 | Making small presentation |
| Week 7 | Basics of O.S Setup |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|--------------------------|---|---------------------------|
| Required Texts | | |
| Recommended Texts | Beginning Programming All-in-One For Dummies Author: Wallace Wang | No |
| Websites | https://www.w3schools.in/computer-fundamentals/output-devices | |

Module 9

معلومات المادة الدراسية

| | | | | |
|---|---|--------------------------------------|--|--|
| Module Title | Mechanics Engineering /Dynamic's | | Module Delivery | |
| Module Type | Core | | <input checked="" type="checkbox"/> Theory | |
| Module Code | RETE 101 | | <input type="checkbox"/> Lecture | |
| ECTS Credits | 8 | | <input type="checkbox"/> Lab | |
| SWL (hr/sem) | 200 | | <input checked="" type="checkbox"/> Tutorial | |
| | | | <input type="checkbox"/> Practical | |
| | | | <input type="checkbox"/> Seminar | |
| Module Level | 1 | Semester of Delivery | 2 | |
| Administering Department | RETE | College | College of Oil & Gas Techniques Engineering/Kirkuk | |
| Module Leader | | e-mail | | |
| Module Leader's Acad. Title | Lecturer | Module Leader's Qualification | PhD | |
| Module Tutor | | e-mail | | |
| Peer Reviewer Name | Name | e-mail | E-mail | |
| Scientific Committee Approval Date | 01/06/2023 | Version Number | 1.0 | |

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

| | | | |
|-----------------------------|------|-----------------|--|
| Prerequisite module | None | Semester | |
| Co-requisites module | None | Semester | |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|--------------------|--|
| Module Aims | This module is designed to impart essential mechanical science knowledge applicable to all engineering disciplines. It also serves as a foundational steppingstone for advanced studies in mechanical engineering, with a particular emphasis on dynamics. |
|--------------------|--|

| | |
|---|--|
| <p>أهداف المادة الدراسية</p> | <p>The course equips students with the fundamental knowledge and understanding of mechanical and physics principles and methodologies necessary to support their education in various mechanical and related engineering fields. Topics covered in the course encompass a wide range of dynamics mechanics subjects, including various types of motion (linear, circular, and projectile), as well as concepts related to force, momentum, impulse, rotational motion, work, power, torque, angular momentum, and energy. Throughout the course, students will learn and apply various analytical and numerical methods for addressing typical mechanical structures and problems.</p> |
| <p>Module Learning Outcomes</p> <p>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> 1. Grasp and employ fundamental terminology for describing the motion of particles, vector functions, and the fundamental principles of Newtonian mechanics. 2. Resolve mechanical problems in one dimension involving forces such as gravity, friction, and air resistance. 3. Comprehend the concept of terminal velocity and utilize it to solve one-dimensional mechanics problems. 4. Apply Newton's second law in vector form to address problems in multiple dimensions. 5. Resolve problems concerning the motion of a projectile in the absence of air resistance. 6. Explore how displacement, velocity, and acceleration vary with time in linear motion. 7. Examine how displacement, velocity, and acceleration change with time in curvilinear motion. 8. Provide a concise summary of key dynamics components. 9. Elaborate on the concepts of work and energy. 10. Identify power and efficiency considerations for mechanical components and their practical applications. |
| <p>Indicative Contents</p> <p>المحتويات الإرشادية</p> | <p>Indicative content includes the following:</p> <ul style="list-style-type: none"> • Its objective is to familiarize students with the analysis of moving mechanical bodies by imparting an understanding of the theories and laws governing mechanical systems. • Introducing students to this curriculum complements the field of engineering mechanics. • It serves as an introductory foundation for materials engineering, equipping students with essential knowledge required to achieve optimal design for engineering structures and materials capable of withstanding various loads and environmental conditions. |

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

| | |
|--------------------------|--|
| <p>Strategies</p> | <p>Teaching and learning strategies for a Dynamics module in engineering are designed to help students grasp complex concepts related to motion, forces, and mechanical systems effectively. Here are the common strategies used in this module:</p> |
|--------------------------|--|

| | |
|--|---|
| | <ul style="list-style-type: none"> • Lectures: Traditional lectures provide an overview of key concepts and theories in dynamics. Instructors use visual aids, examples, and real-world applications to explain complex topics. • Tutorials and Workshops: Small group tutorials or workshops allow students to work on problem-solving exercises and engage in discussions. Tutors can provide guidance and clarification on challenging concepts. • Computer Simulations: Simulation software and tools help students visualize and analyze dynamic systems. They can explore how different variables impact the behavior of mechanical systems. • Case Studies: Analyzing real-world case studies involving dynamic systems and structures helps students see the practical applications of the concepts they learn in class. • Group Projects: Collaborative projects encourage teamwork and problem-solving. Students may work together to design, analyze, and present solutions for complex engineering problems. • Homework Assignments: Regular assignments challenge students to practice problem-solving and reinforce their understanding of course materials. Instructors can provide feedback and discuss solutions in class. • Peer Teaching and Learning: Encouraging students to explain concepts to their peers can deepen their understanding and enhance communication skills. • Self-Study and Reading: Students are encouraged to read textbooks, research papers, and additional materials to supplement their understanding of course topics. • Assessment: Regular quizzes, tests, and examinations assess students' understanding and mastery of course content. These assessments help identify areas where additional support may be needed. • Online Resources: Course materials, lecture notes, and additional resources are often made available online, allowing students to review and reinforce their learning independently. • Problem-Solving Sessions: Dedicated problem-solving sessions focus on tackling challenging exercises and developing problem-solving skills. |
|--|---|

| Student Workload (SWL) | | | |
|---|----|-----------------------------|-----|
| الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا | | | |
| Structured SWL (h/sem) | 78 | Structured SWL (h/w) | 5.2 |

| | | | |
|--|-----|---|------|
| الحمل الدراسي المنتظم للطالب خلال الفصل | | الحمل الدراسي المنتظم للطالب أسبوعيا | |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 122 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا | 8.13 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 200 | | |

| Module Evaluation تقييم المادة الدراسية | | | | | |
|---|---------------------|-------------|------------------|----------------|---------------------------|
| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
| Formative assessment | Quizzes | 5 | 20% (20) | 2, 4, 8,12 | LO #1, 2, 10 and 11 |
| | Assignments | 2 | 20% (20) | 3, 5, 7, 9, 13 | LO # 3, 4, 6 and 7 |
| Summative assessment | Midterm Exam | 2hr | 10% (10) | 10 | LO # 1-9 |
| | Final Exam | 3hr | 50% (50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

| Delivery Plan (Weekly Syllabus) المنهاج الأسبوعي النظري | |
|---|--|
| | Material Covered |
| Week 1-2 | Introduction of Dynamic Rectilinear Motion Plane curvilinear motion Rectangular Coordinates Normal and tangential coordinates Polar coordinates. |
| Week 3 | Space curvilinear motion Space motion Relative motion Constrained motion |
| Week 4 | Generalized Newton's Second |

| | |
|-----------------|---|
| Week 5-7 | Force, Mass, Acceleration Newton's second law Equation of motion and solution problem |
| Week 8-9 | Work and kinetic energy Potential energy |
| Week 10 | Mid-term exam |
| Week 11 | Linear Impulse and Linear momentum |
| Week 12 | Work-Energy Impulse- Momentum |
| Week 13 | Conservation of Energy and Momentum |
| Week 14 | Rotation Absolute motion Relative velocity |
| Week 15 | Preparatory week before the final Exam |
| Week 16 | The final Exam week |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|--------------------------|---|---------------------------|
| Required Texts | 1. Engineering Mechanics Dynamics, J.L. Meriam, L.G. Kraige, Sixth Edition | Yes |
| Recommended Texts | . 2. Engineering Mechanics Dynamic, R. C. Hibbeler, Twelfth Edition | yes |
| Websites | https://www.noor-book.com/en/ebook-Engineering-Mechanics-Dynamics-14th-pdf | |

Module 10

معلومات المادة الدراسية

| | | | | |
|---|----------------------------|--------------------------------------|--|--|
| Module Title | Engineering Drawing | | Module Delivery | |
| Module Type | Core | | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar | |
| Module Code | COGTEK 101 | | | |
| ECTS Credits | 8 | | | |
| SWL (hr/sem) | 200 | | | |
| Module Level | 1 | Semester of Delivery | 2 | |
| Administration Department | RETE | College | College of Oil & Gas Techniques Engineering/Kirkuk | |
| Module Leader | Naseer Tawfeeq Alwan | e-mail | naseer.t.alwan@ntu.edu.iq | |
| Module Leader's Acad. Title | Lecturer | Module Leader's Qualification | PhD | |
| Module Tutor | Name (if available) | e-mail | | |
| Peer Reviewer Name | | e-mail | | |
| Scientific Committee Approval Date | 01/06/2023 | Version Number | 1.0 | |

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

| | | | |
|-----------------------------|------|-----------------|--|
| Prerequisite module | None | Semester | |
| Co-requisites module | None | Semester | |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|--------------------|---|
| Module Aims | 4. Introducing the student to the importance of engineering drawing and its |
|--------------------|---|

| | |
|--|--|
| أهداف المادة الدراسية | <p>relationship to other engineering subjects.</p> <p>5. Develop the student's mental abilities in drawing simple and complex shapes.</p> <p>6. Expanding the horizons of the student's imagination of geometric shapes and identifying their components, parts, mechanics, and their working principle</p> |
| Module Learning Outcomes مخرجات التعلم للمادة الدراسية | <p>7. To familiarize the student with the importance of engineering drawing</p> <p>8. To teach the student how to imagine geometric shapes.</p> <p>9. To distinguish the mechanical components and parts and their working principle.</p> |
| Indicative Contents المحتويات الإرشادية | <p>Indicative content includes the following.</p> <p><u>Part A - Principles of drawing</u></p> <p>To develop the student's mental ability to draw simple and complex shapes.</p> <p>The student learns how to develop a strategy and sequence for drawing and assembling and deconstructing geometric shapes.</p> <p><u>Part B - Orthographic Projections</u></p> <p>The student learns to draw geometrical projections and set geometric dimensions.</p> <p><u>Part C - Cutting theory.</u></p> <p>To develop the student's mental ability to draw simple and complex shapes Cutting theory- Shapes and lines of cuts by type of material.</p> <p><u>Part D - Drawing stereoscopic shapes using 3D graphics Instructions.</u></p> <p>Prepare to use instructions in drawing three-dimensional geometric shapes and modifications of three-dimensional graphics.</p> |

| | |
|--|--|
| Learning and Teaching Strategies استراتيجيات التعلم والتعليم | |
| Strategies | <p>Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some</p> |

sampling activities that are interesting to the students.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا

| | | | |
|--|-----|---|------|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 63 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا | 4.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 137 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا | 9.13 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 200 | | |

Module Evaluation

تقييم المادة الدراسية

| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
|-----------------------------|------------------------|-------------|------------------|--------------------|-----------------------------|
| Formative assessment | Quizzes | 5 | 10% (10) | 2, 5, 7, 9, and 13 | LO #1, #5, #6, #11, and #13 |
| | Assignments | 5 | 10% (10) | 3, 5, 8, 10 and 14 | LO # 3, 4, 6, 7, and 10 |
| | Projects / Lab. | 10 | 20% (20) | Continuous | All |
| | Report | | | | |
| Summative assessment | Midterm Exam | 2 hr | 10% (10) | 7 | LO #1 - #4 |
| | Final Exam | 3 hr | 50% (50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

Delivery Plan (Weekly Syllabus)

المنهاج الأسبوعي النظري

| | Material Covered |
|---------|--|
| Week 1 | Principles of drawing |
| Week 2 | Title Block |
| Week 3 | drawing geometric shapes, the basic |
| Week 4 | Graphic Adjustments - Computer Graphics Aids |
| Week 5 | Geometric line- Types of engineering drawing lines- Geometric operations- Dimensional placement. |
| Week 6 | Orthographic Projections |
| Week 7 | Mid-term Exam |
| Week 8 | Principle of First Angle Projection |
| Week 9 | Principle of Third Angle Projection |
| Week 10 | The conclusion of a third projection from Two known locations. |
| Week 11 | Cutting theory- Shapes and lines of cuts by type of material. |
| Week 12 | Drawing of projections cut from a specific site |
| Week 13 | Drawing of partially cut elevations. Drawing of semi-cut elevations. |
| Week 14 | 3D Coordinates Drawing Using AutoCAD |
| Week 15 | 3D Solid Primitive Drawing Using AutoCAD |
| Week 16 | Preparatory week before the final Exam |

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الأسبوعي للمختبر

| | Material Covered |
|----------------|--|
| Week 1 | Lab 1: Introduction to Principles of drawing Using AutoCAD |
| Week 2 | Lab 2: drawing Title Block Using AutoCAD |
| Week 3 | Lab 3: Drawing Commands with Exercise |
| Week 4 | Lab 4: Drawing Aids Commands with Exercise |
| Week 5 | Lab 5: Introduction to Edit Commands with Exercise |
| Week 6 | Lab 6: Dimensions , Layers, Line types, Colors with Exercise |
| Week 7 | Lab7: Orthographic Projections Using AutoCAD with Exercise |
| Week 8 | Lab 8: First angle projection Using AutoCAD with Exercise |
| Week 9 | Lab 9: Third angle projection Using AutoCAD with Exercise |
| Week 10 | Lab 10: Construct the view, from the two given views Using AutoCAD with Exercise |
| Week 11 | Lab11: Principles of sectioning Using AutoCAD with Exercise |
| Week 12 | Lab 12: Full Section Drawing Using AutoCAD with Exercise |
| Week 13 | Lab 13: Half Section Drawing Using AutoCAD with Exercise |
| Week14 | Lab 14: 3D Coordinates Drawing Using AutoCAD with Exercise |
| Week 15 | Lab 15: 3D Solid Primitive Drawing Using AutoCAD with Exercise |
| Week16 | Preparatory week before the final Exam |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|--------------------------|---|----------------------------------|
| Required Texts | Engineering Drawing Using AutoCAD | Yes |
| Recommended Texts | Ashleigh Fuller, Antonio Ramirez, Douglas Smith - Technical Drawing with AutoCAD 2017-SDC Publications | No |

| | | |
|-----------------|--|--|
| | (2017) | |
| Websites | Basic Mechanical Drawing website tutorials | |

| Module 11 معلومات المادة الدراسية | | | |
|---|---------------------|--------------------------------------|---|
| Module Title | ARABIC LANGUAGE | | Module Delivery |
| Module Type | SUPPORT | | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar |
| Module Code | NTU 103 | | |
| ECTS Credits | 2 | | |
| SWL (hr/sem) | 50 | | |
| Module Level | 1 | Semester of Delivery | |
| Administering Department | RETE | College | College of Oil & Gas Techniques Engineering/Kirkuk |
| Module Leader | Dr. Jamal Fateh Ali | e-mail | jamal1978@ntu.edu.iq |
| Module Leader's Acad. Title | Lecturer | Module Leader's Qualification | Ph.D. |
| Module Tutor | None | e-mail | None |
| Peer Reviewer Name | | e-mail | |
| Review Committee Approval | 01/06/2023 | Version Number | 1.0 |

| Relation with Other Modules العلاقة مع المواد الدراسية الأخرى | | | |
|---|---|-----------------|--|
| Prerequisite module | None | Semester | |
| Co-requisites module | None | Semester | |
| Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية | | | |
| Module Aims أهداف المادة الدراسية | <p>1. تعزيز التواصل الفعال: يهدف تعلم اللغة العربية إلى تمكين الطلاب من التواصل بشكل فعال في البيئة العربية، سواء كان ذلك في الحياة اليومية أو في السياق الأكاديمي والعملية.</p> <p>2. فهم الثقافة العربية: يعتبر تعلم اللغة العربية مفتاحًا لفهم الثقافة العربية وقيمها، ويساعد الطلاب على التعرف على التراث العربي الغني وفهم تعدد الثقافات في العالم العربي.</p> | | |

| | |
|---|--|
| | <p>3. تعزيز القدرات البحثية والأكاديمية: تعلم اللغة العربية يساهم في تطوير مهارات البحث والكتابة الأكاديمية للطلاب، مما يمكنهم من المشاركة بفاعلية في النقاشات الأكاديمية وإنتاج المعرفة.</p> <p>4. توفير فرص وظيفية: يعتبر إتقان اللغة العربية مهارة قيمة في سوق العمل، حيث يمكن للطلاب العربية العمل في مجالات متعددة مثل الترجمة، الإعلام، العلاقات العامة، والتعليم.</p> <p>1.Enhancing effective communication: Teaching Arabic aims to enable students to communicate effectively in the Arab environment, both in daily life and in academic and professional contexts.</p> <p>2. Understanding Arab culture: Learning Arabic is a key to understanding Arab culture and its values, helping students to explore the rich Arab heritage and comprehend the cultural diversity within the Arab world.</p> <p>3. Enhancing research and academic skills: Learning Arabic contributes to developing research and academic writing skills for students, enabling them to actively participate in academic discussions and contribute to knowledge production.</p> <p>4.Providing job opportunities: Proficiency in Arabic is a valuable skill in the job market, allowing students to</p> |
| <p>Module Learning Outcomes</p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>1. القدرة على التواصل الفعال: يكتسب الطلاب مهارات الاستماع والتحدث والقراءة والكتابة في اللغة العربية، مما يمكنهم من التواصل بطلاقة وفهم المحتوى بشكل صحيح.</p> <p>2. القدرة على فهم النصوص والثقافة: يتعلم الطلاب قراءة وفهم النصوص الأدبية والثقافية باللغة العربية، مما يساهم في تطوير فهمهم للتراث العربي والتحليل النقدي للأعمال الأدبية.</p> <p>3. القدرة على البحث والكتابة الأكاديمية: يتعلم الطلاب كيفية إجراء البحوث والكتابة الأكاديمية باللغة العربية، ويتمكنون من تقديم أوراق بحثية وتقارير أكاديمية بشكل متميز.</p> <p>4. التفاعل الثقافي والاجتماعي: يتمكن الطلاب من المشاركة في المجتمع العربي بشكل أعمق وفهم التقاليد والقيم والعادات المحلية، مما يعزز التفاهم الثقافي والتعايش السلمي.</p> <p>1. Effective communication skills: Students acquire listening, speaking, reading, and writing skills in Arabic, enabling them to communicate fluently and understand content accurately.</p> <p>2. Understanding texts and culture: Students learn to read and comprehend literary and cultural texts in Arabic, enhancing their understanding of Arab heritage and developing critical analysis of literary works.</p> <p>3. Research and academic writing abilities: Students learn how to conduct research and engage in academic writing in Arabic, enabling them to present research papers and academic reports effectively.</p> <p>4. Cultural and social interaction: Students are able to actively participate in the Arab community, gaining a deeper understanding of local traditions, values, and customs, fostering cultural understanding and peaceful coexistence.</p> |
| <p>Indicative Contents</p> <p>المحتويات الإرشادية</p> | <p>1. مقدمة في المحتويات الإشارية: تعريف المحتويات الإشارية وأهميتها، ودورها في مجالات وتخصصات متنوعة.</p> <p>2. أنواع وصيغ المحتويات الإشارية: استكشاف مختلف أنواع وصيغ المحتويات الإشارية، مثل</p> |

| | |
|--|---|
| | <p>الجدول والرسوم البيانية والنقاط البارزة والملخصات.</p> <p>3. إنشاء المحتويات الإشارية: تقنيات واستراتيجيات إنشاء المحتويات الإشارية الفعالة، بما في ذلك اختيار المعلومات الرئيسية، وتبسيط المفاهيم المعقدة، وتنظيم المحتوى لسهولة الفهم.</p> <p>4. التمثيل البصري للمحتويات الإشارية: استخدام الوسائط البصرية، مثل الرسوم البيانية والمخططات والرسومات، لتقديم المحتويات الإشارية بشكل جذاب ومفيد بصرياً.</p> <p>5. أمثلة ودراسات الحالة: تحليل أمثلة ودراسات حالة حقيقية لفهم كيفية استخدام المحتويات الإشارية في سياقات مختلفة، مثل التقارير البحثية ومواد التسويق والموارد التعليمية.</p> <ol style="list-style-type: none"> 1. Introduction to Indicative Contents: Defining indicative contents and understanding their significance in various fields and disciplines. 2. Types and Formats of Indicative Contents: Exploring different types and formats of indicative contents, such as tables, charts, bullet points, and summaries. 3. Creating Indicative Contents: Techniques and strategies for effectively creating indicative contents, including selecting key information, simplifying complex concepts, and organizing content for easy comprehension. 4. Visual Representation of Indicative Contents: Utilizing visual aids, such as infographics, diagrams, and illustrations, to present indicative contents in an engaging and informative manner. 5. Examples and Case Studies: Analyzing real-life examples and case studies to understand how indicative contents are used in various contexts, such as research reports, marketing materials, and educational resources. |
|--|---|

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

| | |
|-------------------|---|
| Strategies | <ol style="list-style-type: none"> 1. Interactive Language Activities: Engaging students in interactive activities such as role-plays, group discussions, and language games to practice and reinforce language skills. 2. Communicative Approach: Emphasizing real-life communication and providing opportunities for students to actively engage in speaking, listening, reading, and writing tasks to develop their language proficiency. 3. Authentic Materials: Incorporating authentic materials such as newspaper articles, songs, videos, and literature to expose students to real-world language usage and cultural contexts |
|-------------------|---|

Student Workload (SWL)

الحمل الدراسي للطالب

| | | | |
|--|----|--|---------------|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 33 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً | (32/15)= 2.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 17 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً | (18/15)= 1.13 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 50 | | |

Module Evaluation

تقييم المادة الدراسية

| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
|----------------------|-----------------|-------------|------------------|---------------|---------------------------|
| Formative assessment | Quizzes | 4 | 30% (30) | 3,6,10 and 14 | LO #1, #2 , #3, and #4 |
| | Assignments | 2 | 10% (10) | 4 and 12 | LO #1and #4 |
| | Projects / Lab. | | 0% (0) | 0 | 0 |
| | Report | | 0% (0) | 0 | 0 |
| Summative assessment | Midterm Exam | 1hr | 10% (10) | 7 | LO #1 - #2 |
| | Final Exam | 2hr | 50% (50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

| | Material Covered |
|---------|--|
| Week 1 | Introduction to Language Errors: |
| Week 2 | Taa Marbuta and Taa Marbuta (Bound and Open Taa): Understanding the rules and usage of the Taa Marbuta and Open Taa in Arabic language. |
| Week 3 | Hamzat Al-Wasl and Al-Qat' (Hamza of Connection and Hamza of Disconnection): Differentiating between Hamzat Al-Wasl and Al-Qat' and their respective roles in pronunciation. |
| Week 4 | Alif Al-Maddooda and Alif Al-Muqassara Writing Rules: Exploring the rules for writing Alif Al-Maddooda (elongated Alif) and Alif Al-Muqassara (shortened Alif). |
| Week 5 | Solar and Lunar Letters: Identifying the distinction between solar and lunar letters in Arabic pronunciation. |
| Week 6 | Adad (Numbers): Learning about the numerical system in Arabic and its usage. |
| Week 7 | Verbs: Understanding verb conjugation and the different verb forms in Arabic. |
| Week 8 | Parts of Speech: Exploring the different parts of speech, including nouns, verbs, adjectives, adverbs, etc. |
| Week 9 | Meanings of Prepositions: Examining the meanings and usage of prepositions in Arabic. |
| Week 10 | Common Language Errors: Analyzing common language errors and their applications in practical contexts. |
| Week 11 | Noon and Tanween: Understanding the usage and pronunciation of Noon and Tanween in Arabic. |
| Week 12 | Taa Marbuta and Taa Marbuta (Bound and Open Taa): Understanding the rules and usage of the Taa Marbuta and Open Taa in Arabic language. |
| Week 13 | Hamzat Al-Wasl and Al-Qat' (Hamza of Connection and Hamza of Disconnection): Differentiating between Hamzat Al-Wasl and Al-Qat' and their respective roles in pronunciation. |

| | |
|----------------|---|
| Week 14 | Alif Al-Maddooda and Alif Al-Muqassara Writing Rules: Exploring the rules for writing Alif Al-Maddooda (elongated Alif) and Alif Al-Muqassara (shortened Alif). |
| Week 15 | Solar and Lunar Letters: Identifying the distinction between solar and lunar letters in Arabic pronunciation. |
| Week 16 | Preparatory week before the final Exam |

| Learning and Teaching Resources مصادر التعلم والتدريس | | |
|---|--|---------------------------|
| | Text | Available in the Library? |
| Required Texts | <p>1. الكافية "للكندي": يعتبر من أهم الكتب في علم النحو، حيث يشرح القواعد والتراكيب النحوية بأسلوب مبسط وشامل.</p> <p>2. الصرف "لابن مالك": كتاب مشهور يتناول قواعد تصريف الأفعال والأسماء في اللغة العربية، ويعد من أعمال النحو الكلاسيكية.</p> <p>3. المفصل في علم العربية "لابن جني": كتاب شامل يغطي مجموعة واسعة من موضوعات النحو والصرف والبلاغة والأدب.</p> | Yes |
| Recommended Texts | <p>1. الألفية "لابن مالك": كتاب مشهور في علم النحو والصرف، يعتبر من أهم المراجع الكلاسيكية في دراسة اللغة العربية.</p> <p>2. المستطرف في كل فن مستظرف "لابن الأنباري": كتاب يشمل العديد من الألفاظ والتعابير العربية المستخدمة في الأدب والشعر.</p> <p>3. البيان والتبيين "لابن حجر العسقلاني": كتاب يتناول موضوعات النحو والصرف والبلاغة، ويعتبر مرجعًا قيمًا في دراسة اللغة العربية.</p> | No |
| Websites | | |

المستوى الثاني

| Module 12 معلومات المادة الدراسية | | |
|---|-------------------|---|
| Module Title | Fluid Mechanics | Module Delivery |
| Module Type | Core | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar |
| Module Code | COGTEK 200 | |
| ECTS Credits | 8 | |
| SWL (hr/sem) | 200 | |

| | | | |
|------------------------------------|--------------------|-------------------------------|---|
| Module Level | 2 | Semester of Delivery | 3 |
| Administration Department | RETE | College | College of Oil and Gas Techniques Engineering - Kirkuk, Northern Technical University, Iraq |
| Module Leader | Obed Majeed Ali | e-mail | obedmajeed@ntu.edu.iq |
| Module Leader's Acad. Title | Assistant lecturer | Module Leader's Qualification | M.Sc. |
| Module Tutor | | e-mail | |
| Peer Reviewer Name | | e-mail | |
| Scientific Committee Approval Date | | Version Number | |

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

| | | | |
|----------------------|------|----------|--|
| Prerequisite module | None | Semester | |
| Co-requisites module | None | Semester | |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|---|--|
| <p>Module Aims أهداف المادة الدراسية</p> | <p>This module will give students a thorough introduction to the fundamental principles of fluid mechanics and deal with engineering applications of inviscid and viscous flow.</p> <p>On completion of this module, students should be able to:</p> <ol style="list-style-type: none"> 1. Understand the fundamental principles of fluid statics and fluid flow, with consideration of both ideal (inviscid) and real (viscous) flow. 2. Compute basic parameters for hydrostatic fluid problems, including forces on submerged bodies. 3. Analyse ideal fluid flow in one- and two-dimensions using the continuum concepts of conservation of mass, momentum and energy. 4. Knowledge and understanding of viscous flow with application to boundary layers, pipe flow, flow around bodies, lubrication and other application areas. |
|---|--|

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|---|--|
| | <p>5. Identify appropriate methodologies for modelling flows using non-dimensional parameters.</p> <p>6. Describe the operation of turbomachinery for incompressible flow, including the dynamics of centrifugal pumps.</p> <p>7. Recognise and simply describe the complex nature of turbulent flow.</p> |
| <p>Module Learning Outcomes</p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>1. Understand how to convert the unit system from British to SI. unit or vice versa.</p> <p>2. Training the students how to solve the problems associated with fluid mechanics.</p> <p>3. Measure the fluid flow of liquids by different types of flow meters. 4. Analyze the magnitude of the horizontal and vertical components of the force of the water on the gate.</p> <p>5. Determine the reading on the pressure gauge by the different types of manometers.</p> <p>6. Draw simple hydraulic and energy gradient lines.</p> <p>7. Solve the formulas of open channel flow.</p> <p>Skills outcomes</p> <ul style="list-style-type: none"> - Analysis - synthesis - interpretation, - report writing - laboratory - computational. |
| <p>Indicative Contents</p> <p>الإرشادية المحتويات</p> | <p>Indicative content includes the following. Part A- Introduction: Basic concepts of fluid mechanics. Fundamental terms. Physical values. Fluids and their properties. Forces inside fluid. Measurement of pressure. Relative statistics of fluid – constant acceleration, rotation. Forces of hydrostatic pressure. Buoyancy. Streamlines. Stream surface. Stream tube. Mass/volume flow. Control volume. Fluid Dynamics: Continuity equation. Basic laws of fluid dynamics – conservation of mass, conservation of linear momentum, conservation of energy. Ideal fluid flow. Application of Bernoulli’s equation. Real fluid flow. Viscosity. Determination of losses. Reynolds experiment. Laminar and turbulent flow. Boundary layer. Velocity profile. Losses in pipes. Frictional losses. Moody’s diagram. Local losses. Pumps, types. Turbines and the working principle of the turbine.</p> <p>Part B- • Analyze characteristics of a particular flow. • Formulate the governing equations and boundary conditions. • Solve these equations analytically in simple cases. Revision problem classes and quiz [6 hrs]</p> |

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

| | |
|--------------------------|---|
| <p>Strategies</p> | <p>Type something like: The main strategy that will be adopted in delivering this module is to encourage students’ participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of</p> |
|--------------------------|---|

| | |
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| | simple experiments involving some sampling activities that are interesting to the students |
|--|--|

| Student Workload (SWL) الحمل الدراسي للطلاب | | | |
|---|-----|--|------|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل | 93 | Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعيا | 6.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل | 107 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعيا | 7.13 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل | 200 | | |

| Module Evaluation تقييم المادة الدراسية | | | | | |
|--|---------------|-------------|----------------|-----------------|----------------------------|
| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
| Formative assessment | Quizzes | 5 | 10% (10) | 3,5,7,9, and 11 | LO #4,6,8,10 and #12 |
| | Assignments | 5 | 10% (10) | 2, 6,9, 11,13 | LO #3, #5, #8, #10 and #13 |
| | Lab Report | 10 | 20% (20) | All | 2,4,6,7,8,9,10,11,12,13 |
| Summative assessment | Mid Term exam | 2 hr | 10% (10) | 7 | LO # 1-7 |
| | Final Exam | 3 hr | 50% (50) | 16 | All |
| 100% (100 Marks) | | | | | |

| Delivery Plan (Weekly Syllabus) المنهاج الأسبوعي النظري | |
|--|--------------------------------|
| Week 1 | Introduction - Units system |
| Week 2 | Physical properties of fluids. |
| Week 3 | Physical properties of fluids |
| Week 4 | Fluid pressure at static. |
| Week 5 | Fluid pressure instruments |

| | |
|---------|---|
| Week 6 | Hydrostatic force on a plane surface. |
| Weeks 7 | Mid-Term Exam |
| Weeks 8 | Hydrostatic force on an inclined surface |
| Week 9 | Hydrostatic force on a curved surface. |
| Week 10 | Fluid dynamics / classifications of fluids. |
| Week 11 | Conservation of mass |
| Week 12 | Conservation of momentum and its application. |
| Week 13 | Conservation of energy- Bernoulli equation. |
| Week 14 | Viscous flow in pipes. |
| Week 15 | Preparing for the final Exam |

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

| | Material Covered |
|---------------|--|
| Week 1 | Lab 1: Density and Specific Gravity |
| Week 2 | Lab 2: DETERMINATION OF LIQUID VISCOSITY USING STOCK'S METHOD. |
| Week 3 | Lab 3: Determination of Centre of Pressure and Hydro-static Force on Plane surface (Part One). |
| Week 4 | Lab 4: Determination of Centre of Pressure and Hydro-static Force on Plane surface (Part Two). |
| Week 5 | Lab 5: Reynolds Number Investigation. |
| Week 6 | Lab 6: Estimation of the Volume Flow Rate Using Orifice Meter Apparatus. |
| Week 7 | Lab 7: IMPACT OF WATER JET ON VANES. |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|-------------------|--|---------------------------|
| Required Texts | FLUID MECHANICS | Yes |
| Recommended Texts | 1- A TEXTBOOK OF FLUID MECHANICS AND HYDRAULIC MACHINES BY RAJPUT. 2- Fluid Mechanics by Yunus A. Cengel, John M. Cimbala. 3- Fluid_mechanics_frank_m._white_4th_ed. | No |

Module 13

معلومات المادة الدراسية

| | | | |
|------------------------------------|--------------------|-------------------------------|--|
| Module Title | Mathematics | | Module Delivery |
| Module Type | Core | | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar |
| Module Code | COGTEK 201 | | |
| ECTS Credits | 7 | | |
| SWL (hr/sem) | 175 | | |
| Module Level | 2 | Semester of Delivery | |
| Administration Department | RETE | College | College of Oil and Gas Techniques Engineering - Kirkuk, Northern Technical University, Iraq |
| Module Leader | | e-mail | |
| Module Leader's Acad. Title | Assistant lecturer | Module Leader's Qualification | |
| Module Tutor | | e-mail | |
| Peer Reviewer Name | | e-mail | |
| Scientific Committee Approval Date | | Version Number | |

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

| | | | |
|----------------------|------|----------|--|
| Prerequisite module | None | Semester | |
| Co-requisites module | None | Semester | |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|--|--|
| Module Aims أهداف المادة الدراسية | <ul style="list-style-type: none">• To equip students with the knowledge and understanding of mathematical concepts, notation and techniques relevant to mechanical engineering.• To develop skills and confidence in mathematical modelling and problem solving.• To support students in understanding mathematical aspects of other modules. |
| Module Learning Outcomes مخرجات التعلم للمادة الدراسية | <p>On successful completion of this module, students should be able to:</p> <ol style="list-style-type: none">1. Use vectors to represent three-dimensional space, including points, lines and planes and find intersections among these.2. Differentiate and integrate vectors in the context of dynamics problems and understand scalar and vector products and their use in mechanics and dynamics.3. Integrate and differentiate functions using a range of techniques and relate derivatives and integrals to engineering applications such as rates of change, maxima and minima, areas, volumes, averages, flow rates, work, centres of mass, etc.4. Sketch (freehand) basic and composite functions, recognising limiting behaviours and discontinuities.5. Create mathematical models of engineering systems described by first order ordinary differential equations, and solve the equations analytically and via Euler's method.6. Differentiate and integrate functions of more than one variable.7. Understand the formation of matrices, their associated algebra, their use in the solution of simultaneous equations and in graphical |

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| | <p>transformations, and the concepts of eigenvalues and eigenvectors.</p> <p>8. Understand, manipulate and plot complex numbers and functions in various forms, find complex solutions of equations, and appreciate the links between exponential, trigonometric and hyperbolic functions.</p> <p>9. Present data effectively using a variety of techniques.</p> <p>10. Calculate important statistical measures of central tendency and dispersion.</p> <p>11. Understand the concept of correlation and regression, calculate the regression coefficient and determine regression lines via the least squares technique.</p> <p>12. Understand the basic concepts of probability, including conditional probability and independence.</p> <p>Skills outcomes</p> <ul style="list-style-type: none"> • Mathematical modelling and problem solving skills • Ability to apply mathematics to represent, analyse and design engineering systems. |
| <p>Indicative Contents الإرشادية المحتويات</p> | <p>Definitions and use of vectors in 3D space; vector algebra; the scalar and vector products and their uses.</p> <p>Functions and graphs; limits of functions.</p> <p>Techniques for differentiation: product rule; quotient rule; chain rule; implicit differentiation; logarithmic differentiation; differentiating parametric equations; differentiating vectors in Cartesian and polar coordinate systems.</p> <p>Techniques for integration: substitution; integration by parts; partial fractions; integration of vectors; numerical integration.</p> <p>Engineering applications of integration and differentiation.</p> <p>Functions of more than one variable: partial differentiation; multiple integrals.</p> <p>First order differential equations; mathematical modelling and problem solving.</p> <p>Vector equations of lines and planes.</p> <p>Matrix algebra; transformation matrices; eigenvalues and eigenvectors.</p> <p>Complex numbers; hyperbolic functions.</p> <p>Statistics, regression and elementary probability.</p> |

| <p>Learning and Teaching Strategies استراتيجيات التعلم والتعليم</p> | |
|--|--|
| <p>Strategies</p> | <p>Implementing active learning in a class room requires preparation and some changes to the lecture. However, the lecture content is not changed or replaced with new material. The same lecture content is</p> |

delivered to the students in a better way and the lecture time is used more effectively. The following are some of the techniques of active learning and cooperative learning I personally use in my engineering classes to enhance student's understanding and retention of the material:

- **One Minute Paper:** Students are asked to write a one minute note (about the previous lecture, the homework or the material in general) to the instructor on a piece of paper. This provides a fast way for the teacher to have a quick feedback on students understanding of what was covered previously.
- **Muddiest Point:** When there is a long lecture with multiple topics covered, the students are given the chance to discuss the material covered in the lecture and list the most difficult parts of the lecture.
- **Clarification Pause:** During the lecture, the students are given the time to go over the material written on the board, think about it and ask if they have any questions. Then, the lecturer answers the different questions raised before resuming the next part of the lecture.
- **Questions and answers:** Usually during the lecture, questions are raised about the new material presented and questions are solved on the board. A sample of the questions asked include "Why do you think this topic is important?" or "what is the relation between what we were talking about and this technique?" or "which technique is best?"
- **Critical Thinking, Group Discussion:** Students are given a handout with multiple problems and they are asked to apply what they learned in the lecture to solve the problems in groups. They are asked to discuss it together and come up with a single solution that all members agree on.
- **Critical Thinking, Think-pair-share:** Students are asked to work individually on a problem for a short time; then students pair up to compare their answers. Then they have to explain their answer and share it with the rest of the class.
- **Peer Teaching:** If one member of the team solves the problem correctly, He will explain it to the rest of the group and discuss with them why his/her answer is correct and their answer is not. This allows the students to find out what went wrong and the mistake they made in solving the problem. This technique will help the student to avoid these mistakes when doing the homework or the exams.

- **Active Review Sessions:** For each exam, students are given a practice test with a set of problems a week in advance. They are encouraged to work on the practice test individually first and then in groups to discuss the answers. During the review

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| | session, the students are asked questions about the problems in the practice test and they are given the choice to decide which problems they want the professor to concentrate on. |
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| Student Workload (SWL) الحمل الدراسي للطالب | | | |
|---|-----|---|------|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 78 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً | 5.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 97 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً | 6.46 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 150 | | |

| Module Evaluation تقييم المادة الدراسية | | | | | |
|---|---------------|-------------|----------------|------------------|--------------------------------|
| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
| Formative assessment | Quizzes | 5 | 15% (15) | 5,7, 9,10 and 12 | LO #1, #3, #5, #6, and #7 |
| | Assignments | 10 | 20% (20) | Continuous | LO#3,4,5,6,7,8,9,10,11, and 12 |
| | Seminar | 1 | 5% (5) | 7 | LO #6 |
| Summative assessment | Mid Term exam | 2 hr | 10% (10) | 8 | LO # 1-4 |
| | Final Exam | 3 hr | 50% (50) | 16 | All |
| 100% (100 Marks) | | | | | |

| Delivery Plan (Weekly Syllabus) المنهاج الأسبوعي النظري | |
|---|--|
| Week 1 | Review in differential and integration |
| Week 2 | Vectors: general introduction to vectors in space – equation of straight line and an equation for a plane in space – plane, tangent and perpendicular line – vector function |
| Week 3 | Complex numbers – polar form – Euler equation – exponential and roots of complex numbers – composite functions |
| Week 4 | Two and more variable equations – partial derivative |

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| Week 5 | Chain rule for partial derivative – gradient and directional derivative – maximum and minimum values for two variable functions |
| Week 6 | Double integral, areas and volumes – physical applications |
| Weeks 7 | Triple integral |
| Weeks 8 | Mid-Term Exam |
| Week 9 | Polar coordinates – cylindrical and spherical coordinates – curve drawing in polar coordinates |
| Week 10 | Green's theorem - divergence theorem |
| Week 11 | The linear integration |
| Week 12 | The Series: sequences of numbers – limits – infinite series – limit by definition - alternating series test - power series - converges interval |
| Week 13 | Taylor/Maclaurin series for a function – general applications |
| Week 14 | Matrices: introduction and Basic Operations |
| Week 15 | Preparing for the final Exam |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|-------------------|---|---------------------------|
| Required Texts | " Calculus " , Ford , S.R. and Ford , J.R. , (1963) McGrawHill | Yes |
| Recommended Texts | "Advanced Engineering Mathematics", Erwin Kreyszig et al., (2006) George B. Thomas, Jr., "Thomas 'Calculus | No |
| | | |

Module 14

معلومات المادة الدراسية

| Module Title | ELECTRONICS | Module Delivery |
|--------------|-------------|---|
| Module Type | CORE | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial |
| Module Code | RETE 200 | |
| ECTS Credits | 7 | |

| | | | | |
|------------------------------------|------------------------------|--------------------------------------|--|--|
| SWL (hr/sem) | 175 | | <input type="checkbox"/> Practical <input type="checkbox"/> Seminar | |
| Module Level | 2 | Semester of Delivery | 3 | |
| Administering Department | Electronics and Control Eng. | College | Technical Engineering College -Kirkuk | |
| Module Leader | | e-mail | | |
| Module Leader's Acad. Title | Asst. lecture | Module Leader's Qualification | M.Sc. | |
| Module Tutor | None | e-mail | None | |
| Peer Reviewer Name | Asst. Lect. | e-mail | @ntu.edu.iq | |
| Review Committee Approval | 01/06/2023 | Version Number | 1.0 | |

| Relation with Other Modules العلاقة مع المواد الدراسية الأخرى | | | |
|---|---|-----------------|--|
| Prerequisite module | None | Semester | |
| Co-requisites module | None | Semester | |
| Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية | | | |
| Module Aims أهداف المادة الدراسية | <ol style="list-style-type: none"> 1. Providing a clear explanation about the operation of basic semiconductor devices available today. 2. To show how each device and its characteristics is used in appropriate circuit 3. Understanding the fundamentals of circuit analysis and analogue electronics and it is a basic introduction to electronic theory for a set of electronics-based programmers. 4. Understanding the basic concepts that are used and built upon in future years. 5. Recognize the fundamentals of basic electric components and circuits and analyses simple electric circuits. 6. Explain basic input and output electronics for the electric circuits. 7. Introduces resources to support learning and their use to develop a resilient approach to learning. 8. Introducing students to the language and methodologies that engineers use to solve problems. 9. Teaching the ability to analyze any DC circuit, and simple electronic circuits containing diodes and transistors. | | |
| Module Learning Outcomes | 16. Students will be able to understand the operation of simple power supply circuits and specify components for a given performance and be | | |

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|---|---|
| <p>مخرجات التعلم للمادة الدراسية</p> | <p>able to discuss and explain them.</p> <p>17. Students will be able to understand the electrical characteristics of diodes and analyses simple analogue circuits containing these elements and be able to discuss and explain them.</p> <p>18. Students will be able to analysis the diode characteristics and equations, ideal vs real. Signal conditioning, clamping and clipping, Zener diodes and power supplies.</p> <p>19. Students will be able to demonstrate broad knowledge of electronic components: their construction, function and application in an electronic circuit, and have the ability to build a working electronic circuit using these components, from a given design.</p> <p>20. Students will be able to demonstrate the ability to design, build and test a printed circuit board based on knowledge of component function and competent use of CAD software and established design rules.</p> <p>21. Students will be able to demonstrate the ability to accurately present the outcomes of an experiment using a laboratory logbook</p> |
| <p>Indicative Contents المحتويات الإرشادية</p> | <p>Indicative content includes the following.</p> <ol style="list-style-type: none"> 1. Introduction to Semiconductors <ul style="list-style-type: none"> ○ The Atom ○ Materials Used in Electronic Devices ○ Current in Semiconductors ○ N-Type and P-Type Semiconductors ○ The PN Junction 2. Diodes and Applications <ul style="list-style-type: none"> ○ Diode Operation ○ Voltage-Current (V-I) Characteristic of a Diode ○ Diode Approximations ○ Half-Wave Rectifiers ○ Full-Wave Rectifiers ○ Power Supply Filters and Regulators ○ Diode Limiters and Clampers ○ Voltage Multipliers ○ The Diode Datasheet 3. Special-Purpose Diodes <ul style="list-style-type: none"> ○ The Zener Diode ○ Zener Diode Applications ○ Device Application 4. Bipolar Junction Transistors <ul style="list-style-type: none"> ○ Bipolar Junction Transistor (BJT) Structure ○ Basic BJT Operation ○ BJT Characteristics and Parameters. |

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

| | |
|------------|---|
| Strategies | <p>The learning and teaching strategy is designed to achieve the following aims:</p> <ol style="list-style-type: none"> 1. communicate knowledge and information on basic electronic circuits 2. engage students in the analysis and understanding of basic electronic circuits through a combination of theory lectures, tutorials problem sheets. 3. communicate knowledge on ethical behavior in work environment through lectures. 4. communicate information on opportunities in electronic engineering paths through lectures. |
|------------|---|

Student Workload (SWL)

الحمل الدراسي للطالب

| | | | |
|--|-----|--|------|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 93 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً | 6.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 82 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً | 5.46 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 175 | | |

Module Evaluation

تقييم المادة الدراسية

| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
|-------------------------|---------------|-------------|------------------|--------------|---------------------------|
| Formative assessment | Quizzes | 5 | 10% (10) | 4,8,9,11,13 | LO #3, 6,8, 10 and 11 |
| | Assignments | 5 | 10% (10) | 2, 4,6,10,12 | LO # 3, 7, 9,12 and 14 |
| | Report / Lab. | 10 | 10% (10) | Continuous | 2,4,6,7,8,9,10,11,12,13 |
| | Projects | 1 | 10% (10) | 13 | LO # 5, 8 and 10 |
| Summative assessment | Midterm Exam | 2hr | 10% (10) | 7 | LO # 1-7 |
| | Final Exam | 3hr | 50% (50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

| | Material Covered |
|---------|--|
| Week 1 | Introduction to Atom, Material Used in Electronics, Current in Semiconductors. |
| Week 2 | N- Type and P- Type Semiconductors, The PN Junction. |
| Week 3 | Diode Operation, Voltage- Current (V-I) Characteristics. |
| Week 4 | Diode Models, Half-Wave Rectifiers. |
| Week 5 | Full-Wave Rectifiers, Power Supply Filters and Regulators. |
| Week 6 | Diode Limiters and Clampers, Voltage Multipliers. |
| Week 7 | The Zener Diode, Zener Diode Applications. |
| Week 8 | Mid-term Exam |
| Week 9 | Bipolar Junction Transistor (BJT) Structure. |
| Week 10 | Basic BJT Operation |
| Week 11 | BJT Characteristics and Parameters |
| Week 12 | Transistor Bias Circuits and the DC Operating Point |
| Week 13 | Voltage-Divider Bias |
| Week 14 | Other Bias Methods |
| Week 15 | Preparatory Week |
| Week 16 | Final Exam |

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

| | Material Covered |
|----------|---|
| Week 1-2 | Lab 1: The Diode Characteristic <ul style="list-style-type: none">Part 1: Characteristic of PN Junction Diode Curve (Forward Bias)Part 2: Characteristic of PN Junction Diode Curve (Reverse Bias) |
| Week 3-5 | Lab 2: Diode Applications <ul style="list-style-type: none">Part 1: Diode Rectifiers<ul style="list-style-type: none">Half-wave rectifier.Center-tapped full-wave rectifier. |

| | |
|-------------------|--|
| | <ul style="list-style-type: none"> • Full-wave rectifier circuit. <p>Part 2: Diode Rectifiers with Filter.</p> <ul style="list-style-type: none"> • Half-wave rectifier with Filter • Full-wave rectifier circuit with Filter. |
| Week 6 | Lab 3: Diode Clipping Circuits |
| Week 7 | Lab 4: Diode Clamping Circuits |
| Week 8 | Lab 5: Voltage Doubler Circuit. |
| Week 9-12 | <p>Lab 6: Special-Purpose Diodes</p> <p>Part 1: Static Characteristic of Zener Diode.</p> <p>Part 2: The Zener Diode and Regulator</p> <ul style="list-style-type: none"> • Out-Put Voltage Regulation by Zener Diode using V_{in} Varying. • Out-Put Voltage Regulation by Zener Diode using R_L Varying. <p>Part 3: Diode Clipping Circuits using Zener Diode.</p> |
| Week 13-14 | <p>Lab 7: Transistor Static Characteristic</p> <ul style="list-style-type: none"> • Common-Base Transistor Connection • Common-Emitter Transistor Connection |

| Learning and Teaching Resources | | |
|--|---|---------------------------|
| مصادر التعلم والتدريس | | |
| | Text | Available in the Library? |
| Required Texts | Electronic Devices' Conventional Current Version, by Thomas L. Floyd, Tenth Edition. | Yes |
| Recommended Texts | Electronic Devices and Circuit Theory' by Robert Boylestad Louis Nashelsk, Ninth Edition. | No |
| Websites | | |

Module 15

معلومات المادة الدراسية

| | | | |
|------------------------------------|--------------------|-------------------------------|--|
| Module Title | Mechanical Drawing | | Module Delivery |
| Module Type | Core | | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar |
| Module Code | RETE 201 | | |
| ECTS Credits | 6 | | |
| SWL (hr/sem) | 150 | | |
| Module Level | 2 | Semester of Delivery | |
| Administration Department | RETE | College | College of Oil and Gas Techniques Engineering – Kirkuk (COGTEK) |
| Module Leader | | e-mail | |
| Module Leader's Acad. Title | | Module Leader's Qualification | |
| Module Tutor | | e-mail | |
| Peer Reviewer Name | | e-mail | |
| Scientific Committee Approval Date | | Version Number | |

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

| | | | |
|----------------------|---------------------|----------|---|
| Prerequisite module | Engineering Drawing | Semester | 2 |
| Co-requisites module | None | Semester | |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|---|---|
| Module Aims أهداف المادة الدراسية | 1. to train students: to read the technical drawings through the application of techniques. 2. Learn students to read symbols, technical terms, standard specifications. |
|---|---|

| | |
|---|---|
| | <p>3. To understand the basic principle for descriptive geometry.</p> <p>4. This course deals with the basic concept of the computer in mechanical drawing.</p> <p>5. To be able to communicate with manufacturers of mechanical systems.</p> <p>6. To understand standard specifications, draw simple and complex assembly drawings.</p> <p>7. To be able to communicate with other mechanical engineering professionals regardless of their spoken language.</p> |
| <p>Module Learning Outcomes</p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.</p> <ol style="list-style-type: none"> 1. Capability to use AutoCAD for 2-D representations. 2. To make the students understand all about the screw threads and their definitions also to teach the students all common types for screw threads and the common types for bolts and nuts with overview in details. 3. To make the students understand all about the Keys, types of keys, spline shaft and hub concept, and the basic definitions for Keys also the correct manner for Keys drawing. 4. Enables the students to learn the techniques and standard practices of technical graphics. 5. To make the students understand all about the riveting and types of rivets. 6. Read a working or assembly drawing (blueprint) 7. Represent mechanical components in multi view orthographic representation 8. understanding all about the welding, types of weld joints and the basic definitions for welding also the correct manner for all types of welding symbol drawing. 9. To help students understand all about the Gears classification, draw spur gear, definitions, formulas and calculations. |
| <p>Indicative Contents</p> <p>الإرشادية المحتويات</p> | <p>Indicative content includes the following.</p> <p>Part A - Introduction to (CAD), components of computer aided drawing (CAD), Exercises. [4 hrs]</p> <p>Screw threads, forms of screw thread, international metric threads (ISO screw), Common types of fasteners. [8hrs]</p> <p>Method of drawing (Hexagonal & Square headed bolts and nuts) Screw threads, Nuts, Forms and types of screw threads and types of nuts, ISO. Also method of drawing (Hexagonal & Square headed bolts and nuts), with an exercise for these objects. [8 hrs]</p> <p>general introduction for Keys, types of keys, spline shaft and hub Drawing, and the basic definitions for Keys also the correct manner for Keys drawing. The common types for Keys also an explanation in detail. Also the pin and cotter joint [12hrs]</p> <p>Revision and quiz [8hrs]</p> <p>Part B –</p> |

| | |
|--|--|
| | <p>Fundamentals of rivets and riveted joints, types of riveted joints, Conventional rivet symbol, and the basic definitions for riveting also the correct manner for all types of rivets drawing, also an explanation in details for all types. [10 hrs]</p> <p>general introduction for Welding, type of welding, welding symbols standard. [4 hrs]</p> <p>general introduction for Pulleys, types of pulleys. location and dimension of Pulleys, and the basic definitions for Pulleys also the correct manner for all types of Pulleys drawing, also an explanation in details for all types. [10 hrs]</p> <p>Gears classification of gears, Assembly and details of common mechanical unit [15 hrs]</p> <p>Pipes and pipe joints, piping fittings, pipe symbols standard. [10 hrs]</p> |
|--|--|

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

| | |
|-------------------|--|
| Strategies | <p>The student work will be assessed according to the module tasks. The excises in the drawing hall will be marked weekly. And the homework will be assessed next lecture. During both assessments the student will give the oral and written feedback in order to improve their skills. The final exam will be done at the end of the semester. Note: the late work will not be marked.</p> |
|-------------------|--|

Student Workload (SWL)

الحمل الدراسي للطالب

| | | | |
|---|-----|--|-----|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 63 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا | 4.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 87 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا | 5.8 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 150 | | |

Module Evaluation

تقييم المادة الدراسية

| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
|----------------------|-------------|-------------|----------------|--------------------|----------------------------|
| Formative assessment | Quizzes | 5 | 10% (10) | 3,6,8,10,11 and 12 | LO #4, #7, #9, #11 and #13 |
| | Assignments | 5 | 10% (10) | 2, 5,9, 11 and 14 | LO #3, #5, #7 #8 and #9 |

| | | | | | |
|----------------------|---------------|------|----------|------------|------------------------------|
| | Lab Report | 10 | 20% (20) | Continuous | LO #2,3,4,5,6,7,8,9,10,11,12 |
| Summative assessment | Mid Term exam | 2 hr | 10% (10) | 7 | LO # 1-7 |
| | Final Exam | 3 hr | 50% (50) | 16 | All |
| 100% (100 Marks) | | | | | |

Delivery Plan (Weekly Syllabus)

المنهاج الأسبوعي النظري

| | |
|---------|---|
| Week 1 | Introduction to (CAD), components of computer aided drawing (CAD), Exercises |
| Week 2 | Screw threads, forms of screw thread, international metric threads (ISO screw), Common types of fasteners |
| Week 3 | Method of drawing (Hexagonal & Square headed bolts and nuts) |
| Week 4 | Keys, types of keys. |
| Week 5 | Pins and Cotters. |
| Week 6 | Rivets and riveted joints |
| Weeks 7 | Mid-Term Exam |
| Weeks 8 | Types of riveted joints, Conventional rivet symbol, working drawing. |
| Week 9 | Welding, type of weld joints, welding symbols standard, location and dimension of weld. |
| Week 10 | Pulleys, types of pulleys. |
| Week 11 | Gears classification of gears, spur gear, definitions, formulas and calculations. |
| Week 12 | Assembly and details of common mechanical units. Screw Jack (Assembly and details). |
| Week 13 | Power screw (Assemble and details) |
| Week 14 | Coupling, Types of coupling, Bearings, types of bearings. |
| Week 15 | Preparatory week before the final Exam |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|----------------|---|---------------------------|
| Required Texts | k. I. Narayana p. kannaiyah k. venketa reddy mechanical | Yes |

| | | |
|-------------------|--|----|
| | engineering. | |
| Recommended Texts | Up.and.Running.with.AutoCAD.2012.2D.and.3D. Drawing.a nd.Modeling | No |
| | | |

| Module 16 معلومات المادة الدراسية | | | |
|---|-----------------------|--------------------------------------|---|
| Module Title | BAATH CRIMES | | Module Delivery |
| Module Type | BASIC | | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar |
| Module Code | NTU 200 | | |
| ECTS Credits | 2 | | |
| SWL (hr/sem) | 50 | | |
| Module Level | 2 | Semester of Delivery | |
| Administering Department | RETE | College | College of Oil and Gas Techniques Engineering - Kirkuk, Northern Technical University, Iraq |
| Module Leader | Dr. Osama Ali Ibrahim | e-mail | Osama@ntu.edu.iq |
| Module Leader's Acad. Title | Lecturer | Module Leader's Qualification | Ph.D. |
| Module Tutor | None | e-mail | |
| Peer Reviewer Name | | e-mail | |
| Review Committee Approval | 01/06/2023 | Version Number | 1.0 |

| Relation With Other Modules العلاقة مع المواد الدراسية الأخرى | | | |
|---|--|-----------------|--|
| Prerequisite module | None | Semester | |
| Co-requisites module | None | Semester | |
| Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية | | | |
| Module Aims أهداف المادة الدراسية | أهداف هذه المادة الدراسية تشمل: 1. فهم التاريخ: دراسة جرائم نظام حزب البعث البائد قد تكون جزءاً من فهم أحداث التاريخ الحديث للمنطقة والبلدان المتأثرة به. | | |

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| | <p>2. تحليل الأحداث: فحص الأحداث والتطورات التي وقعت خلال فترة حكم حزب البعث، مع التركيز على الأحداث التي تمثل انتهاكات لحقوق الإنسان وجرائم.</p> <p>3. العدالة وحقوق الإنسان: فهم مفاهيم حقوق الإنسان والعدالة، وكيف يمكن تحقيق العدالة في ضوء الجرائم التي ارتكبتها نظام حزب البعث.</p> <p>4. الدراسات القانونية: التركيز على الجوانب القانونية لتلك الجرائم، وكيفية معالجتها من خلال النظام القانوني الوطني أو القانون الدولي.</p> <p>5. الوقاية والتعليم: البحث عن السبل التي يمكن من خلالها تجنب تكرار مثل هذه الجرائم في المستقبل، وتعزيز التوعية حول أهمية حقوق الإنسان.</p> |
| <p>Module Learning Outcomes</p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>1. فهم التاريخ والسياق: قدرة الطلاب على فهم وتحليل السياق التاريخي لحكم حزب البعث وكيف وقعت الجرائم خلال هذه الفترة.</p> <p>2. التحليل النقدي: القدرة على تحليل الأحداث والمواقف بشكل نقدي، وتقييم تأثيرها على المجتمع وحقوق الإنسان.</p> <p>3. المعرفة القانونية: فهم القوانين واللوائح التي تتعلق بالجرائم المرتبطة بنظام حزب البعث، وكيفية تطبيقها لتحقيق العدالة.</p> <p>4. التفكير النقدي: تنمية مهارات التفكير النقدي والتحليل العميق للأحداث والظواهر المتعلقة بالموضوع.</p> <p>5. التوعية بحقوق الإنسان: نشر الوعي حول حقوق الإنسان والتأكيد على أهميتها في منع تكرار مثل هذه الجرائم في المستقبل.</p> <p>6. التعامل مع مصادر المعلومات: تنمية مهارات البحث والتحليل في استخدام مصادر موثوقة لفهم التاريخ وتقييم الأحداث.</p> <p>7. الكتابة والتواصل: تحسين مهارات الكتابة والتعبير حول المواضيع ذات الصلة بجرائم نظام حزب البعث البائد.</p> <p>8. القدرة على التفاعل مع المحتوى الحساس: تطوير القدرة على التفاعل مع المواضيع الحساسة بشكل مناسب واحترافي.</p> <p>هذه المخرجات يمكن أن تساهم في تأهيل الطلاب لفهم أعمق للموضوع وتطبيق المعرفة المكتسبة في سياقات مختلفة، سواء في المجال الأكاديمي أو في المجتمع بشكل عام.</p> |
| <p>Indicative Contents</p> <p>المحتويات الإرشادية</p> | <p>1. جرائم نظام البعث وفق قانون المحكمة الجنائية العراقية العليا عام 2005: تتناول هذا الفصل مفهوم الجرائم وأقسامها وتعريف الجريمة لغة واصطلاحاً وايضا دراسة مفصلة عن اقسام الجرائم الموجودة وبعدها يتم التطرق الى جرائم نظام البعث وفق توثيق قانون المحكمة الجنائية العراقية العليا عام 2005م واخيرا يتم التعرف على انواع الجرائم الدولية والقرارات الصادرة من المحكمة الجنائية العليا بحق مرتكبي الجرائم.</p> <p>2. الجرائم النفسية والاجتماعية وأثارها، وأبرز انتهاكات النظام البعثي في العراق: يتعلق ذلك بدراسة تأثير الجرائم النفسية والاجتماعية التي ارتكبتها نظام حزب البعث على الفرد والمجتمع. وتتناول الأثار النفسية للانتهاكات والتعامل معها من منظور اجتماعي. وايضا الجرائم الاجتماعية وعسكرة المجتمع. ويترق هذا الفصل الى موقف النظام البعثي من الدين. ويشرح</p> |

| | |
|--|--|
| | <p>بشكل مفصل انتهاكات القوانين العراقية وصور واماكن السجون الاحتجاز لنظام البعث</p> <p>3. الجرائم البيئية لنظام البعث في العراق: تشمل هذه المحتويات دراسة للتأثير البيئي لجرائم نظام حزب البعث، مثل التلوث البيئي والتدمير البيئي الناتج عن أفعال النظام من تلوث حربي وإشعاعي وانفجار الألغام. إضافة الى تدمير المدن والقرى وتجفيف الأهوار وتجريف بساتين النخيل والأشجار والمزروعات.</p> <p>4. جرائم المقابر الجماعية: يتناول هذا الجزء الجوانب القانونية والأخلاقية المتعلقة بجرائم المقابر الجماعية، وأحداث مقابر الإبادة الجماعية المرتكبة من النظام البعثي في العراق والتصنيف الزمني لمقابر الإبادة الجماعية في العراق للمدة 1963م-2003م.</p> <p>هذه المحتويات تشير إلى تنوع وشمولية الموضوع، حيث يتم التطرق إلى الجوانب القانونية والاجتماعية والبيئية لجرائم نظام حزب البعث. وتشمل المادة الدراسية هذه أيضًا البحث عن حالات دراسية محددة وتحليلها لفهم عميق للسياق والتأثيرات.</p> |
|--|--|

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

| | |
|-------------------|--|
| Strategies | <p>التعلم النشط والمشاركة الفعالة:</p> <ul style="list-style-type: none"> تشجيع الطلاب على المشاركة الفعالة في الدروس من خلال طرح أسئلة ومناقشات جماعية. تنظيم أنشطة تعليمية تشجع على التفكير والنقاش وحل المشكلات. <p>التعلم من خلال التكنولوجيا:</p> <ul style="list-style-type: none"> استخدام منصات التعلم الإلكتروني والتطبيقات التعليمية لتقديم المحتوى وتعزيز التفاعل والممارسة. توفير مصادر عبر الإنترنت ومواد تعليمية متعددة الوسائط لتوجيه الطلاب في التعلم الذاتي. <p>التقييم المستمر والتغذية الراجعة:</p> <ul style="list-style-type: none"> توفير تقييم دوري لأداء الطلاب من خلال اختبارات وواجبات. تقديم تغذية راجعة فورية وإشراف لمساعدة الطلاب على تحسين مهاراتهم والتعلم تاريخ البلد ومعاونة الشعب العراقي خلال فترة حكم النظام البائد. |
|-------------------|--|

Student Workload (SWL)

الحمل الدراسي للطلاب

| | | | |
|--|----|--|------|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل | 33 | Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً | 2.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل | 17 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً | 1.13 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل | 50 | | |

Module Evaluation

تقييم المادة الدراسية

| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
|------------------|----------------|-------------|----------------|------------|---------------------------|
| Formative | Quizzes | 5 | 20% (20) | 2,4,6,8,10 | LO #3, 6, 7,9, and 11 |

| | | | | | |
|----------------------|--------------|------|------------------|------------|--------------------------|
| assessment | Assignments | 5 | 10% (10) | 3,5,7,9,12 | LO # 2, 8, 10,12, and 13 |
| | Report | 2 | 10% (10) | 6,10 | LO # 4, 9 |
| Summative assessment | Midterm Exam | 1 hr | 10% (10) | 7 | LO # 1-6 |
| | Final Exam | 3 hr | 50% (50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

| Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري | |
|---|---|
| | Material Covered |
| Week 1-2 | <ul style="list-style-type: none"> • جرائم نظام البعث وفق قانون المحكمة الجنائية العراقية العليا عام ٢٠٠٥ م • مفهوم الجرائم وأقسامها • جرائم نظام البعث وفق توثيق قانون المحكمة الجنائية العراقية العليا عام ٢٠٠٥ م |
| Week 3-4 | <ul style="list-style-type: none"> • الجرائم النفسية والاجتماعية وأثارها، وأبرز انتهاكات النظام البعثي في العراق • الجرائم النفسية • اليات الجرائم النفسية • الجرائم الاجتماعية |
| Week 5-6 | <ul style="list-style-type: none"> • الجرائم النفسية والاجتماعية وأثارها، وأبرز انتهاكات النظام البعثي في العراق • موقف النظام البعثي من الدين • انتهاكات القوانين العراقية • انتهاكات حقوق الانسان • بعض قرارات الانتهاكات السياسية |
| Week 7 | Mid-term exam |
| Week 8-9 | <ul style="list-style-type: none"> • الجرائم البيئية لنظام البعث في العراق • التلوث الحربي والاشعاعي وانفجار الالغام • تدمير المدن والقرى (سياسة الارض المحروقة) |
| Week 10-12 | <ul style="list-style-type: none"> • الجرائم البيئية لنظام البعث في العراق • تحفيف الاهوار • تجريف بساتين النخيل والاشجار والمزروعات |
| Week 13-14 | <ul style="list-style-type: none"> • جرائم المقابر الجماعية • أحداث مقابر الابداء الجماعية المرتكبة من النظام البعثي في العراق • التصنيف الزمني لمقابر الابداء الجماعية في العراق للمدة 1963م – 2003م |
| Week 15 | Preparatory Week |
| Week 16 | Final Exam |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|--------------------------|--|---------------------------|
| Required Texts | <ul style="list-style-type: none"> • القرآن الكريم • إحسان هندي، قوانين الاحتلال الحربي، حقوق السكان المدنيين في المناطق المحتلة وحمايتهم، الإدارة السياسية، دمشق، ١٩٧٢ • أرشيف مؤسسة السجناء السياسيين. • أرشيف مؤسسة الشهداء • أرشيف المركز العراقي لتوثيق جرائم التطرف في العتبة العباسية المقدسة. | No |
| Recommended Texts | <ul style="list-style-type: none"> • ايمن عبد العزيز سلامة ، ال مسؤولية الدولية عن ارتكاب جريمة الابادة الجماعية ، ط ١ ، دار العلوم للنشر والتوزيع ، القاهرة ، ٢٠٠٦ | No |
| Websites | | |

Module 17

معلومات المادة الدراسية

| Module Title | English Language | | Module Delivery | |
|------------------------------------|--------------------|-------------------------------|--|--|
| Module Type | Basic | | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input checked="" type="checkbox"/> Seminar | |
| Module Code | NTU 201 | | | |
| ECTS Credits | 2 | | | |
| SWL (hr/sem) | 50 | | | |
| Module Level | 2 | Semester of Delivery | | |
| Administering Department | RETE | College | College of Oil and Gas Techniques Engineering – Kirkuk (COGTEK) | |
| Module Leader | | | e-mail | |
| Module Leader's Acad. Title | Assistant lecturer | Module Leader's Qualification | Master | |
| Module Tutor | | | e-mail | |
| Peer Reviewer Name | Name | e-mail | E-mail | |
| Scientific Committee Approval Date | 01/06/2023 | Version Number | 1.0 | |

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

| | | | |
|-----------------------------|------------------|-----------------|---|
| Prerequisite module | English Language | Semester | 1 |
| Co-requisites module | None | Semester | |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|--|--|
| Module Aims أهداف المادة الدراسية | The aim of this English Language Lecture is to provide students with a comprehensive understanding of the English language, including its structure, usage, and various linguistic aspects. The lecture aims to enhance students' language skills and improve their overall proficiency in English. |
| Module Learning Outcomes مخرجات التعلم للمادة الدراسية | <ol style="list-style-type: none">1. Demonstrate a solid understanding of the fundamental aspects of English grammar, vocabulary, and syntax.2. Apply effective reading strategies to comprehend and analyze a variety of written texts.3. Produce coherent and well-structured written pieces using appropriate grammar, vocabulary, and style.4. Listen actively and comprehend spoken English in various contexts, including formal and informal situations.5. Engage in meaningful conversations and deliver clear and organized oral presentations in English.6. Critically evaluate and analyze linguistic elements in literature, media, and other forms of communication.7. Recognize and appreciate the historical and cultural contexts that have shaped the English language. |
| Indicative Contents المحتويات الإرشادية | Indicative content includes the following. <ol style="list-style-type: none">1. Introduction to the English language and its global significance.2. Overview of English grammar, including parts of speech, sentence structure, |

| | |
|--|--|
| | <p>and verb tenses.</p> <ol style="list-style-type: none"> 3. Building vocabulary and word choice for effective communication. 4. Reading comprehension strategies and analysis of different types of texts. 5. Developing writing skills, including organization, coherence, and proper grammar usage. 6. Listening comprehension and effective note-taking techniques. 7. Speaking skills development, including conversation, pronunciation, and presentation skills. 8. Literary analysis and interpretation of English language texts. 9. Historical and cultural influences on the English language. 10. Contemporary issues and challenges in the English language. |
|--|--|

| Learning and Teaching Strategies استراتيجيات التعلم والتعليم | |
|--|---|
| Strategies | <ol style="list-style-type: none"> 1. Lecture delivery: The instructor will present concepts, explanations, and examples through interactive lectures, incorporating visual aids, multimedia resources, and real-life examples. 2. Group activities: Students will engage in group discussions, peer-to-peer interactions, and collaborative learning tasks to reinforce their understanding of concepts and develop their communication skills. 3. Practical exercises: Students will participate in individual and group exercises, such as grammar quizzes, writing assignments, and pronunciation drills, to apply their knowledge and receive feedback. 4. Multimedia resources: The lecture may incorporate audiovisual materials, online resources, and language learning software to provide a dynamic and interactive learning experience. 5. Assessments: Regular assessments, including quizzes, exams, and assignments, will be conducted to gauge students' progress and provide constructive feedback for improvement. 6. Self-directed learning: Students will be encouraged to engage in independent learning outside of the lecture through recommended readings, online resources, and language practice exercises. |

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

| | | | |
|--|----|---|------|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 33 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا | 2.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 17 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا | 1.13 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 50 | | |

Module Evaluation

تقييم المادة الدراسية

| As | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
|-----------------------------|------------------------|-------------|------------------|----------|---------------------------|
| Formative assessment | Quizzes | 0 | 0 | 5, 12 | LO #1, 3 and 7 |
| | Assignments | 0 | 30% (30) | 4, 13 | LO # 2, 4 and 6 |
| | Projects / Lab. | 0 | 0% | | |
| | Report | 1 | 20% (10) | 13 | All |
| Summative assessment | Midterm Exam | 2 hr. | 20% (30) | 7 | LO # 1-6 |
| | Final Exam | 2 hr. | 30% (30) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

| | Material Covered |
|----------------|---|
| Week 1 | <ul style="list-style-type: none"> • Review of basic grammar: Verb tenses (present, past, future) • Words in English (Book 4) |
| Week 2 | <ul style="list-style-type: none"> • Present perfect tense • Words in English (Book 4) |
| Week 3 | <ul style="list-style-type: none"> • Modal verbs: Can, could, may, might, must, should • Words in English (Book 4) |
| Week 4 | <ul style="list-style-type: none"> • writing letters and emails. • Words in English (Book 4) |
| Week 5 | <ul style="list-style-type: none"> • Conditional sentences (Type 1) • Words in English (Book 4) |
| Week 6 | <ul style="list-style-type: none"> • Reported speech (statements and questions) • Words in English (Book 4) |
| Week 7 | <ul style="list-style-type: none"> • Mid-term Evaluation |
| Week 8 | <ul style="list-style-type: none"> • Comparative and superlative adjectives and adverbs • Words in English (Book 4) |
| Week 9 | <ul style="list-style-type: none"> • Passive voice • Words in English (Book 4) |
| Week 10 | <ul style="list-style-type: none"> • Phrasal verbs • Words in English (Book 4) |
| Week 11 | <ul style="list-style-type: none"> • Future forms: Going to, will, and present continuous. • Words in English (Book 4) |
| Week 12 | <ul style="list-style-type: none"> • Prepositions: Time, place, and movement • Words in English (Book 4) |
| Week 13 | <ul style="list-style-type: none"> • Reported speech (commands and requests) • Words in English (Book 4) |
| Week 14 | <ul style="list-style-type: none"> • Relative clauses • Words in English (Book 4) |

| | |
|----------------|--|
| Week 15 | <ul style="list-style-type: none"> Review and reinforcement of previous topics before final term evaluation |
|----------------|--|

| Learning and Teaching Resources مصادر التعلم والتدريس | | |
|---|--|---------------------------|
| | Text | Available in the Library? |
| Required Texts | English Grammar in Use by Raymond Murphy 5 th edition | No |
| Recommended Texts | 4000 Essential English words 2 nd edition | No |
| Websites | http://www.duolingo.com/ http://www.bbc.co.uk/learningenglish | |

| Module 18 معلومات المادة الدراسية | | | |
|---|-----------------------|-------------------------------|---|
| Module Title | Strength of Materials | | |
| Module Type | Core | | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar |
| Module Code | RETE 202 | | |
| ECTS Credits | 6 | | |
| SWL (hr/sem) | 150 | | |
| Module Level | 2 | Semester of Delivery | |
| Administration Department | RETE | College | College of Oil and Gas Techniques Engineering - Kirkuk, Northern Technical University, Iraq |
| Module Leader | | | e-mail |
| Module Leader's Acad. Title | Assistant lecturer | Module Leader's Qualification | MSc |
| Module Tutor | | | e-mail |
| Peer Reviewer Name | | | e-mail |

| | | | |
|------------------------------------|--|----------------|--|
| Scientific Committee Approval Date | | Version Number | |
|------------------------------------|--|----------------|--|

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

| | | | |
|----------------------|------|----------|--|
| Prerequisite module | None | Semester | |
| Co-requisites module | None | Semester | |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|--|--|
| Module Aims أهداف المادة الدراسية | <ul style="list-style-type: none"> To know different types of the stresses which may subjected to the mechanical elements and their expected effects such as strain. To study the shear forces and bending moment diagrams with essential stresses |
| Module Learning Outcomes مخرجات التعلم للمادة الدراسية | <ul style="list-style-type: none"> Students who successfully complete this course will have demonstrated an ability to: <ul style="list-style-type: none"> ✓ Understand the concepts of stress and strain at a point as well as the stress-strain relationships for homogenous, isotropic materials. ✓ Calculate the stresses and strains in axially-loaded members, circular torsion members, and members subject to flexural loadings. ✓ Calculate the stresses and strains associated with thin-wall spherical and cylindrical pressure vessels. ✓ Determine the stresses and strains in members subjected to combined loading and apply the theories of failure for static loading. ✓ Determine and illustrate principal stresses, maximum shearing stress, and the stresses acting on a structural member. ✓ Determine the deflections and rotations produced by the three fundamental types of loads: axial, torsional, and flexural. ✓ Analyze slender, long columns subjected to axial loads. ✓ Design simple bars, beams, and circular shafts for allowable stresses and loads. |
| Indicative Contents الإرشادية المحتويات | <ol style="list-style-type: none"> Introduction to Strength of Materials A. Definition and Importance of Strength of Materials B. Historical Background C. Applications of Strength of Materials Stress and Strain A. Basic Definitions B. Types of Stresses C. Types of Strains D. Hooke's Law |

| | |
|--|--|
| | <p>3. Axial Loading A. Normal Stress and Strain B. Deformation of Axially Loaded Members C. Stress-Strain Diagrams D. Elastic and Plastic Deformation E. Factor of Safety</p> <p>4. Torsion A. Torque and Torsional Shear Stress B. Polar Moment of Inertia C. Torsional Deformation D. Power Transmission in Shafts</p> <p>5. Bending</p> |
|--|--|

| Learning and Teaching Strategies استراتيجيات التعلم والتعليم | |
|---|---|
| Strategies | <p>Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students</p> <p>Unscheduled Directed Student Hours (time spent away from the timetabled sessions but directed by the teaching staff).</p> |

| Student Workload (SWL) الحمل الدراسي للطالب | | | |
|---|-----|---|-----|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 93 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً | 6.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 57 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً | 3.8 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 150 | | |

| Module Evaluation تقييم المادة الدراسية | | | | | |
|--|---------------|-------------|----------------|------------|---------------------------|
| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
| Formative assessment | Quizzes | 2 | 10% (10) | 5, 7 | LO #1, and #3 |
| | Assignments | 3 | 10% (10) | 3,4,14 | LO #2, #4 and #8 |
| | Lab Report | 20 | 20% (20) | Continuous | All |
| Summative assessment | Mid Term exam | 2 hr | 10% (10) | 7 | LO # 1-4 |
| | Final Exam | 3 hr | 50% (50) | 16 | All |
| 100% (100 Marks) | | | | | |

Delivery Plan (Weekly Syllabus)

المنهاج الأسبوعي النظري

| | |
|---------|--|
| Week 1 | simple stress |
| Week 2 | Shearing stress, Bearing stress |
| Week 3 | Thin wall cylinders |
| Week 4 | Simple strain, stress-strain diagram, Hook's law |
| Week 5 | Thermal stress |
| Week 6 | Welded connection |
| Weeks 7 | Riveted joints |
| Weeks 8 | Torsion |
| Week 9 | Spring |
| Week 10 | Shear and moment in Beam |
| Week 11 | Beam deflection |
| Week 12 | Mid-Term Exam |
| Week 13 | Combined stresses |
| Week 14 | Stress at a point /Mohr circle |
| Week 15 | Preparing for the final Exam |

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

| | Material Covered |
|---------------|--|
| Week 1 | Lab 1: Introduction to Strength of materials |
| Week 2 | Lab 2: Brinell Hardness Test |

| | |
|----------------|--|
| Week 3 | Lab 3: Rockwell Hardness Test |
| Week 4 | Lab 4: Vickers Hardness Test |
| Week 5 | Lab 5: Tensile Test |
| Week 6 | Lab 6: Compression Test |
| Week 7 | Lab 7: Torsion Test |
| Week 8 | Lab 8: Creep Test |
| Week 9 | Lab 9: Spring Stiffness |
| Week 10 | Lab 10: Deflection in Cantilever Beam Test |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|-------------------|--|---------------------------|
| Required Texts | Strength of Materials, Ferdinand L. Singer and Andrew Pytel. | Yes |
| Recommended Texts | Schaum's Outline of Strength of Materials | No |
| | | |

Module 19

معلومات المادة الدراسية

| Module Title | ELECTRONIC CIRCUITS | | Module Delivery |
|--------------------------|---------------------|----------------------|---|
| Module Type | CORE | | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar |
| Module Code | RETE 203 | | |
| ECTS Credits | 7 | | |
| SWL (hr/sem) | 175 | | |
| Module Level | 2 | Semester of Delivery | |
| Administering Department | RETE | College | College of Oil & Gas Techniques Engineering/Kirkuk |

| | | | |
|------------------------------------|-------------|--------------------------------------|-------------|
| Module Leader | | e-mail | @ntu.edu.iq |
| Module Leader's Acad. Title | | Module Leader's Qualification | |
| Module Tutor | None | e-mail | None |
| Peer Reviewer Name | Asst. Lect. | e-mail | @ntu.edu.iq |
| Review Committee Approval | 01/06/2023 | Version Number | 1.0 |

| Relation with Other Modules العلاقة مع المواد الدراسية الأخرى | | | |
|---|--|-----------------|-----------------------|
| Prerequisite module | Electronics ECE102 | Semester | Level 1 Semester 2 |
| Co-requisites module | None | Semester | |
| Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية | | | |
| Module Aims أهداف المادة الدراسية | <p>Basically, the module aims to establish a strong foundation in electronic circuits, enabling the students to analyze and design basic electronic circuits and understand their applications in various fields such as control systems, telecommunications and consumer electronics. The main module aims are:</p> <ol style="list-style-type: none"> 1. Understanding fundamental concepts. 2. Developing electronic circuit analysis skills. 3. Familiarity with electronic components. 4. Developing amplifier design skills. 5. Practical circuit design and analysis. 6. Introduction to integrated circuits. | | |
| Module Learning Outcomes مخرجات التعلم للمادة الدراسية | <p>The module learning outcomes include the following:</p> <ol style="list-style-type: none"> 22. Knowledge and Understanding: Students should demonstrate a solid knowledge and understanding of the fundamental concepts, principles, and theories related to electronic circuits. They should be able to explain the behavior and characteristics of electronic components and their applications in circuit design. 23. Circuit Analysis Skills: Students should be able to apply circuit analysis techniques, including Kirchhoff's laws, nodal analysis, and mesh analysis, to solve electronic circuit problems. They should be able to analyze and predict the behavior of circuits under different conditions. 24. Design and Evaluation: Students should be able to design and evaluate basic electronic circuits, including amplifiers, using appropriate design principles and techniques. They should understand the trade-offs and considerations involved in circuit design, such as gain, bandwidth, | | |

| | |
|---|---|
| | <p>stability, and power efficiency.</p> <p>25. Practical Skills: Students should possess practical skills in building, testing, and troubleshooting electronic circuits. They should be able to use laboratory equipment and tools effectively and safely. They should also demonstrate the ability to analyze and interpret experimental data and draw conclusions based on the results.</p> <p>26. Integration of Knowledge: Students should be able to integrate their knowledge of electronic circuits with other relevant areas, such as mathematics, physics, and computer science. They should be able to apply their knowledge to solve interdisciplinary problems and understand the broader context of electronic circuits in various applications.</p> <p>27. Communication and Presentation Skills: Students should be able to communicate their ideas, analysis, and design concepts effectively, both orally and in written form. They should be able to present their work and findings in a clear and organized manner, using appropriate technical terminology.</p> |
| <p>Indicative Contents المحتويات الإرشادية</p> | <ol style="list-style-type: none"> 1. Review of basic concepts: <ul style="list-style-type: none"> o Diode structure, operation, types and applications. 2. Bipolar Junction Transistors (BJTs): BJT structure, operation, characteristics and biasing techniques. <ul style="list-style-type: none"> o Field-Effect Transistors (FETs): (JFET and MOSFET) structure, operation, characteristics and biasing techniques. 3. Amplifier configurations: <ul style="list-style-type: none"> o BJT amplifiers: common emitter, common base, and common collector configurations. o FET amplifiers: common source, common gate, and common drain configurations 4. Amplifier circuits: <ul style="list-style-type: none"> o BJT small-signal amplifiers: voltage gain, current gain, and power gain. o FET small-signal amplifiers: voltage gain, current gain, and power gain. o Multistage amplifiers and cascaded amplifiers. o Differential amplifiers. |

| | |
|--|--|
| | <p>5. Power Amplifiers:</p> <ul style="list-style-type: none"> o Class A, B, AB, and C power amplifiers <p>Amplifier frequency response and bandwidth:</p> <ul style="list-style-type: none"> o BJT and FET amplifiers. <p>6. Power supply basics:</p> <ul style="list-style-type: none"> o rectification, filtering, and regulation. |
| <p>Learning and Teaching Strategies استراتيجيات التعلم والتعليم</p> | |
| <p>Strategies</p> | <p>To effectively deliver the electronic circuits module, instructors may employ the following strategies:</p> <ol style="list-style-type: none"> 1. Lectures: Conducting lectures is a traditional method to deliver theoretical concepts and principles. Instructors can use multimedia resources, such as slides, visual aids, and demonstrations, to enhance understanding. They should focus on clear explanations, real-life examples, and engaging students through interactive discussions. 2. Practical Sessions: Practical sessions in a laboratory setting are essential for students to apply theoretical knowledge to hands-on circuit design, construction, and testing. Instructors can guide students through experiments and provide opportunities for them to troubleshoot and analyze circuit behavior. This approach reinforces understanding and builds practical skills. 3. Problem-Solving Exercises: Assigning problem-solving exercises encourages students to practice circuit analysis techniques and apply theoretical concepts to solve complex problems. Instructors can provide a range of problems at different difficulty levels, offering opportunities for students to work individually or in groups. Feedback and discussions on problem-solving strategies further enhance learning. 4. Design Projects: Design projects allow students to integrate their knowledge and skills to design and implement electronic circuits to meet specific requirements. Instructors can assign individual or group projects that involve circuit design, simulation, prototyping, and testing. This approach fosters creativity, critical thinking, and problem-solving abilities. 5. Simulation Tools: Using circuit simulation software, such as SPICE (Simulation Program with Integrated Circuit Emphasis), instructors can provide virtual environments for students to design and analyze circuits. Simulations allow students to experiment with different circuit |

configurations, evaluate performance, and observe behavior in a controlled manner. It also facilitates rapid prototyping and exploration of complex circuits.

6. **Interactive Demonstrations:** Instructors can conduct interactive demonstrations to illustrate the behavior of electronic circuits in real-time. These demonstrations can involve circuit construction on a breadboard or using simulation software. By engaging students through live demonstrations, instructors can reinforce concepts and clarify difficult topics.

7. **Group Discussions and Peer Learning:** Encouraging group discussions and peer learning can promote active engagement and knowledge sharing among students. Instructors can assign problem-solving tasks or case studies for group discussions, allowing students to collaborate, exchange ideas, and learn from each other's perspectives and approaches.

8. **Assessment and Feedback:** Assessments, including quizzes, tests, and assignments, are essential for evaluating students' understanding and progress. Instructors should provide timely and constructive feedback to help students identify areas for improvement. Feedback can be provided through individualized comments, grading rubrics, or face-to-face discussions.

9. **Guest Speakers and Industry Visits:** Inviting guest speakers from industry or academia and organizing visits to relevant companies or research labs can provide students with real-world insights and applications of electronic circuits. These opportunities allow students to connect theoretical knowledge with practical applications and gain exposure to industry practices.

By incorporating a combination of these strategies, instructors can create an engaging and comprehensive learning experience for students in the electronic circuits module. It is important to adapt and modify these strategies based on the specific needs of the students and the available resources.

Student Workload (SWL)

الحمل الدراسي للطالب

| | | | |
|--|----|--|------|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 93 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً | 6.2 |
| Unstructured SWL (h/sem) | 82 | Unstructured SWL (h/w) | 5.46 |

| | | | |
|---|-----|--|--|
| الحمل الدراسي غير المنتظم للطالب خلال الفصل | | الحمل الدراسي غير المنتظم للطالب أسبوعيا | |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 175 | | |

| Module Evaluation تقييم المادة الدراسية | | | | | |
|---|-------------------------------|-------------|------------------|--------------|---------------------------|
| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
| Formative assessment | Quizzes | 5 | 10% (10) | 1,3,5,8,11 | LO #1, 2, 10,11and 13 |
| | Assignments | 5 | 10% (10) | 2, 4,6,10,12 | LO # 3, 4, 6,7 and 8 |
| | Projects / Lab. Report | 14 | 10% (10) | Continuous | |
| | | 1 | 10% (10) | 13 | LO # 5, 8 and 10 |
| Summative assessment | Midterm Exam | 2 hr | 10% (10) | 7 | LO # 1-7 |
| | Final Exam | 2hr | 50% (50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

| Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري | |
|---|---|
| | Material Covered |
| Week 1 | Review of basic concepts: <ul style="list-style-type: none"> ○ Diode structure, operation, types and applications. ○ Bipolar Junction Transistors (BJTs): BJT structure, operation, characteristics and biasing techniques. ○ Field-Effect Transistors (FETs): (JFET and MOSFET) structure, operation, characteristics and biasing techniques. |
| Week 2-3 | Amplifier configurations: <ul style="list-style-type: none"> ○ BJT amplifiers: common emitter, common base, and common collector configurations. ○ FET amplifiers: common source, common gate, and common drain configurations |
| Week 4-7 | Amplifier circuits: <ul style="list-style-type: none"> ○ BJT small-signal amplifiers: voltage gain, current gain, and power gain. ○ FET small-signal amplifiers: voltage gain, current gain, and power gain. ○ Multistage amplifiers and cascaded amplifiers. ○ Differential amplifiers. |

| | |
|-------------------|---|
| | |
| Week 8-10 | Power Amplifiers: <ul style="list-style-type: none"> ○ Class A, B, AB, and C power amplifiers |
| Week 11-12 | Amplifier frequency response and bandwidth: <ul style="list-style-type: none"> ○ BJT and FET amplifiers. |
| Week 13-14 | Power supply basics: <ul style="list-style-type: none"> ○ rectification, filtering, and regulation. |
| Week 15 | Preparatory Week |
| Week 16 | Final Exam |

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

| | Material Covered |
|-------------------|--|
| Week 1 | BJT amplifier DC biasing techniques. |
| Week 2 | FET amplifier DC biasing techniques. |
| Week 3-4 | BJT small signal amplifier configurations. |
| Week 5-6 | FET small signal amplifier configurations. |
| Week 7-8 | Multistage amplifiers and cascaded amplifiers. |
| Week 9 | Differential amplifiers. |
| Week 10 | Power Amplifiers: Class A, B, AB, and C power amplifiers |
| Week 11-12 | Bandwidth and frequency response of BJT and FET amplifiers. |
| Week 13-14 | Power supply circuits: rectification, filtering, and regulation. |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|-----------------------|---|----------------------------------|
| Required Texts | Thomas L. Floyd. 2006. Electric Circuit Fundamentals (7th Edition) (Floyd Electronics Fundamentals Series). Prentice-Hall, Inc., USA. | Yes |

| | | |
|--------------------------|--|----|
| Recommended Texts | Adel S. Sedra and Kenneth C. Smith. 2007. Microelectronic Circuits Revised Edition (5th. ed.). Oxford University Press, Inc., USA. | No |
| Websites | https://www.coursera.org/ | |

Module 20

معلومات المادة الدراسية

| | | | |
|------------------------------------|---|-------------------------------|---|
| Module Title | Refrigeration & Air Conditioning Principles | | Module Delivery |
| Module Type | Core | | <input checked="" type="checkbox"/> Theory |
| Module Code | RETE 204 | | <input type="checkbox"/> Lecture |
| ECTS Credits | 5 | | <input checked="" type="checkbox"/> Lab |
| SWL (hr/sem) | 125 | | <input type="checkbox"/> Tutorial |
| | | | <input type="checkbox"/> Practical |
| | | | <input type="checkbox"/> Seminar |
| Module Level | 2 | Semester of Delivery | 4 |
| Administration Department | RETE | College | College of Oil and Gas Techniques Engineering - Kirkuk, Northern Technical University, Iraq |
| Module Leader | Marwa Khaleel Rashid | e-mail | marwa.khaleel23@ntu.edu.iq |
| Module Leader's Acad. Title | Assistant lecturer | Module Leader's Qualification | M.Sc. |
| Module Tutor | | e-mail | |
| Peer Reviewer Name | | e-mail | |
| Scientific Committee Approval Date | | Version Number | |

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

| | | | |
|----------------------|------|----------|--|
| Prerequisite module | None | Semester | |
| Co-requisites module | None | Semester | |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|--|---|
| <p>Module Aims أهداف المادة الدراسية</p> | <ol style="list-style-type: none"> 1. Understand the basic principles of refrigeration and air conditioning systems. 2. To understand the fundamental properties of Air and Water vapor mixture. 3. This course deals with the basic concept of air-conditioning processes. 4. Identify and describe the components of a typical refrigeration and air conditioning system. 5. To explain the thermodynamic principles involved in refrigeration and air conditioning processes. 6. Demonstrate knowledge of refrigerants and their properties, including safety considerations and environmental impacts. |
| <p>Module Learning Outcomes مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> 1. Define Refrigeration and Air conditioning and identify their applications. 2. Define and calculate moist air properties using related equations. 3. Recognize how to use a Psychrometric chart in solving various Air conditioning processes. 4. Analyze the simple vapor compression cycle. 5. Describe the factors affecting vapor compression cycle performance. 6. Identify the multi pressure Refrigeration systems. 7. Recognize the refrigerant types and their effect on Ozone and How to Number it |
| <p>Indicative Contents الإرشادية المحتويات</p> | <p>Indicative content includes the following.</p> <p>Part A - Air conditioning Air conditioning definition , Air conditioning systems and applications, SI units, Fundamental properties of Air and Water vapor mixture; definition of (moist air properties), Calculation of moist air properties using related equations. [14 hrs]</p> <p>Psychrometric chart and its construction, Air-conditioning processes, Air-conditioning processes (sensible cooling, and sensible heating). [14 hrs] Air-conditioning processes (Dehumidification, Humidification, Mixing of air streams, Cooling and dehumidification with reheat, and Pre heating with humidification and reheat). [14 hrs] Summer and winter cycle. [4 hrs]</p> <p>Part B - Refrigeration Refrigeration definition, Refrigeration systems and applications, heat pump, reversed Carnot cycle, [7 hrs] Simple vapor compression cycle components and analysis, Ideal and actual vapor compression cycle, factors affecting vapor compression cycle performance, Multi Pressure systems. [30 hrs] Refrigerants. [14 hrs]</p> |

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies

The Refrigeration and Air Conditioning module employs a range of effective learning and teaching strategies. Students engage in theoretical lectures, practical demonstrations, and hands-on laboratory sessions to grasp the underlying principles and gain practical skills. Case studies and real-world scenarios enhance problem-solving abilities, while group projects foster teamwork and communication skills. Continuous assessment methods, including assignments and practical assessments, ensure students' progress and understanding of the subject matter. The module promotes equipping students with the knowledge and skills necessary for success in the field of refrigeration and air conditioning.

Student Workload (SWL)

الحمل الدراسي للطالب

| | | | |
|---|-----|---|------|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 63 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً | 4.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 62 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.13 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 125 | | |

Module Evaluation

تقييم المادة الدراسية

| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
|----------------------|---------------|-------------|----------------|------------------|---------------------------|
| Formative assessment | Quizzes | 5 | 10% (10) | 3,6, 8 and 12,14 | LO #1, #3 #6, #8, and 10 |
| | Assignments | 4 | 10% (10) | 2,4,9,and 14 | LO #2, #4, #5 and #7 |
| | Lab Report | 10 | 20% (20) | Continuous | All |
| Summative assessment | Mid Term exam | 2 hr | 10% (10) | 7 | LO # 1-3 |
| | Final Exam | 3 hr | 50% (50) | 16 | All |
| 100% (100 Marks) | | | | | |

Delivery Plan (Weekly Syllabus)

المنهاج الأسبوعي النظري

| | |
|---------|--|
| Week 1 | Air conditioning, Air conditioning systems, SI units, Fundamental properties of Air and Water vapour mixture; definition of (moist air properties) , Dry bulb, wet bulb and Dew point temperatures, partial pressure, Relative humidity, moisture content, Specific volume and Enthalpy |
| Week 2 | The General Gas Law, Dalton's law of partial pressure, Calculation of moist air properties using related equations. |
| Week 3 | Psychrometric chart, Construction of psychrometric chart, Sensible Heat and Latent Heat. |
| Week 4 | Air-conditioning processes, Adiabatic saturation process, sensible cooling, and sensible heating. |
| Week 5 | Dehumidification; by pass factor, contact factor, Humidification – Humidification by water injection, steam injection. |
| Week 6 | Mixing of air streams, Cooling and dehumidification with reheat |
| Weeks 7 | Mid-Term Exam |
| Weeks 8 | Preheating with humidification and reheat. Summer and winter cycle. |
| Week 9 | Refrigeration application, refrigeration theory, heat pump, reversed Carnot cycle. |
| Week 10 | Simple vapour compression cycle, vapour compression cycle components, Simple vapour compression cycle analysis |
| Week 11 | Ideal and actual vapour compression cycle, factors affecting vapour compression cycle performance (effect of suction temperature, effect of condensing temperature, effect of subcooling, effect of superheating, effect of pressure loss). |
| Week 12 | Multi Pressure systems: Removing of flash gas, inter-cooler |
| Week 13 | Single evaporator and single compressor, single compressor and two evaporators. |
| Week 14 | Two compressors and two evaporators, multi-stage compression cycle using, water intercooler, flash intercooler, liquid refrigerants intercooler |
| Week 15 | Preparing for the final Exam |

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

| | Material Covered |
|---------------|--|
| Week 1 | Lab 1: Measuring of air velocity using Pitot tube and Manometer. |
| Week 2 | Lab 2: Air Properties. |
| Week 3 | Lab 3: Application on air Psychrometric chart. |

| | |
|----------------|---|
| Week 4 | Lab 4: Sensible heating. |
| Week 5 | Lab 5: Sensible cooling. |
| Week 6 | Lab 6: Dehumidification of air |
| Week 7 | Lab 7: Heating with humidification of air. |
| Week 8 | Lab 8: Mixing of air. |
| Week 9 | Lab 9: Refrigerator and Heat pump. |
| Week 10 | Lab 10: Calculation of the capacity and coefficient of performance of vapor compression unit. |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|-------------------|---|---------------------------|
| Required Texts | Refrigeration & Air Conditioning, W.F. Stoecker & J.W Jones, Second Edition, McGraw-Hill, Inc | NO |
| Recommended Texts | Air Conditioning Engineering , W.P. Jones, Fifth Edition Elsevier Butterworth-Heinemann | No |
| | https://www.ashrae.org/technical-resources/ashrae-handbook | |

Module 21

معلومات المادة الدراسية

| Module Title | Electrical machines | Module Delivery |
|--------------|---------------------|---|
| Module Type | Core | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar |
| Module Code | RETE 205 | |
| ECTS Credits | 6 | |
| SWL (hr/sem) | 150 | |

| | | | |
|---|---------------------|--------------------------------------|--|
| Module Level | 2 | Semester of Delivery | 4 |
| Administering Department | RETE | College | College of Oil & Gas Techniques Engineering/Kirkuk |
| Module Leader | Saygin Siddiq Ahmed | e-mail | Saygin.ahmed@ntu.edu.iq |
| Module Leader's Acad. Title | Assistant lecturer | Module Leader's Qualification | M.Sc |
| Module Tutor | | e-mail | |
| Peer Reviewer Name | | e-mail | |
| Scientific Committee Approval Date | | Version Number | 1.0 |

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

| | | | |
|-----------------------------|------|-----------------|--|
| Prerequisite module | None | Semester | |
| Co-requisites module | None | Semester | |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|--|---|
| Module Aims أهداف المادة الدراسية | <ul style="list-style-type: none"> 3- Connect electrical circuits and compare theoretical results with practical1. 4- Introduce the student to understand electrical theories and prove them in practice 5- The student can distinguish between direct current and alternating current |
| Module Learning Outcomes مخرجات التعلم للمادة الدراسية | <ul style="list-style-type: none"> 10. To familiarize the student with the importance of The most important electrical principles 11. Learning Outcomes, Teaching, Learning and Assessment Methods 12. To distinguish the electrical components and parts and their working principle. |

| | |
|---|---|
| Indicative Contents المحتويات الإرشادية | Indicative content includes the following. |
| | <u>Part A - Principles of circuits</u> |
| | To develop the student's mental ability to connect simple and complex circuits. |
| | The student learns how to develop a strategy to change a complex circuit to a simple circuit with the same results. |
| | <u>Part B – Principles to connect circuits</u> |
| | The student learns to connect circuits according to the circuit diagram. |

| Learning and Teaching Strategies استراتيجيات التعلم والتعليم | |
|--|---|
| Strategies | Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. |

| Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا | | | |
|--|-----|--|-----|
| Structured SWL (h/sem) | 78 | Structured SWL (h/w) | 5.2 |
| الحمل الدراسي المنتظم للطالب خلال الفصل | | الحمل الدراسي المنتظم للطالب أسبوعيا | |
| Unstructured SWL (h/sem) | 72 | Unstructured SWL (h/w) | 4.8 |
| الحمل الدراسي غير المنتظم للطالب خلال الفصل | | الحمل الدراسي غير المنتظم للطالب أسبوعيا | |
| Total SWL (h/sem) | 150 | | |
| الحمل الدراسي الكلي للطالب خلال الفصل | | | |

Module Evaluation

تقييم المادة الدراسية

| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
|----------------------|-----------------|-------------|------------------|------------|---------------------------|
| Formative assessment | Quizzes | 2 | 10% (10) | 5, 10 | LO #2, and |
| | Assignments | 2 | 10% (10) | 2, 12 | LO # 3, and 7 |
| | Projects / Lab. | 1 | 10% (10) | Continuous | All |
| | Report | 10 | 10% (10) | Continuous | All |
| Summative assessment | Midterm Exam | 2 hr | 10% (10) | 7 | LO # 1-7 |
| | Final Exam | 3 hr | 50% (50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

| | Material Covered |
|--------|--|
| Week 1 | Transformers: Operating principle, classification, construction |
| Week 2 | Emf equation, phasor diagrams, Equivalent circuit model, Losses & efficiency, |
| Week 3 | Voltage regulation, Frequency response, polarity test |
| Week 4 | Autotransformers, Isolation & instrument transformers |
| Week 5 | D.C. Machines: Operating principle, generator & motor action, construction, |
| Week 6 | Types of excitation, Emf & torque equations, Power stages & efficiency |
| Week 7 | Commutation, Armature Reaction, Characteristics & applications of d.c generators |
| Week 8 | Starting & speed control of d.c motors, Characteristics & applications of d.c motors |

| | |
|----------------|---|
| Week 9 | Midterm Exam |
| Week 10 | Induction Machines: Three-phase induction motors. Principle of operation, construction, types |
| Week 11 | Rotating magnetic field, emf equation of an AC Machine, Torque developed in an induction motor |
| Week 12 | Torque-speed characteristics, Starting & speed control, Single phase induction motors, Starting, application |
| Week 13 | Synchronous Machines: Construction, types & operating principle of synchronous generator, A.C armature windings, Equivalent circuit, Phasor diagrams |
| Week 14 | Voltage regulation, parallel operation, synchronization |
| Week 15 | Power Angle characteristics, effect of field excitation change |
| Week 16 | Final Exam |

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

| | Material Covered |
|---------------|--|
| Week 1 | Applications DC motors acquired, installed and types |
| Week 2 | Applications Electromotive force equalization velocity speed control |
| Week 3 | Applications DC motor torque in the laboratory |
| Week 4 | Torque and speed in the laboratory |
| Week 5 | Applications characteristics of all types of DC motors |
| Week 6 | Applications inductor motors in the laboratory |
| Week 7 | Applications Three-phase starter in the laboratory |
| Week 8 | star and a triangle in single & three phase |
| Week 9 | Midterm Exam |

| | |
|----------------|--|
| Week 10 | Students watching the types of DC motors in the laboratory |
| Week 11 | Students watching the shape of the transistor in the laboratory and how it works |
| Week 12 | Electromotive force equalization velocity speed control |
| Week 13 | Applications full wave uniform and see the wave on the OSC |
| Week14 | Applications uniform half wave and see the wave on the OSC |
| Week 15 | Preparatory week before the final Exam |
| Week16 | Final Exam |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|--------------------------|--|---------------------------|
| Required Texts | "Basic Electrical Engineering", THERAJA. | Yes |
| Recommended Texts | "Electrical and Electronic Principles and Technology", John Bird | Yes |
| Websites | Basic Electrical machines website tutorials | |

Module 22

معلومات المادة الدراسية

| Module Title | Computer | Module Delivery |
|---------------------|----------|--|
| Module Type | Basic | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial |
| Module Code | NTU 202 | |
| ECTS Credits | 3 | |

| | | | |
|------------------------------------|------|--|---|
| SWL (hr/sem) | 75 | <input type="checkbox"/> Practical <input type="checkbox"/> Seminar | |
| Module Level | 2 | Semester of Delivery | 4 |
| Administering Department | RETE | College | College of Oil and Gas Techniques Engineering – Kirkuk (COGTEK) |
| Module Leader | | e-mail | |
| Module Leader's Acad. Title | | Module Leader's Qualification | |
| Module Tutor | | e-mail | E-mail |
| Peer Reviewer Name | | e-mail | E-mail |
| Scientific Committee Approval Date | | Version Number | |

| | | | |
|--|----------|----------|---|
| Relation with other Modules العلاقة مع المواد الدراسية الأخرى | | | |
| Prerequisite module | Computer | Semester | 2 |
| Co-requisites module | None | Semester | |

| | |
|---|---|
| Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية | |
| Module Aims أهداف المادة الدراسية | <p>MATLAB is a widely used programming language and computational tool for numerical analysis, data visualization, and scientific computing. In undergraduate curricula, MATLAB teaching goals include developing students' skills in programming, data analysis, and problem solving, as well as providing them with a practical understanding of mathematical concepts and the analysis of complex computations and algorithms.</p> <p>The most crucial goals for teaching MATLAB include learning outcomes, which include:</p> <ol style="list-style-type: none"> 1- Introduction to Programming: MATLAB is frequently used in academic curriculum as an introductory programming language. The main goal is to familiarize students with fundamental ideas in programming, including variables, data types, control structures, |

| | |
|---|---|
| | <p>functions, and algorithms.</p> <ol style="list-style-type: none"> 2- Numerical Computation: MATLAB is frequently used for numerical computation, and one of the primary objectives of the MATLAB study program is to teach students how to conduct mathematical calculations, work with matrices, solve challenging equations, and put algorithms into practice for scientific, engineering, and mathematical applications. 3- Data Analysis and Visualization: MATLAB offers strong tools for data analysis and visualization. The built-in functions, toolboxes, and simulations of MATLAB are used by students to construct plots and graphs, show data in various forms, and do statistical analysis. 4- Simulation and Modeling: Many simulation and modeling jobs are performed using MATLAB. Students will learn how to create mathematical models, simulate systems, and analyze their behavior by utilizing MATLAB's simulation features. 5- Development of applications: MATLAB enables the creation of standalone programs and GUI-based user interfaces. For their projects and scientific research, students can learn how to write interactive programs, publish MATLAB code as standalone applications, and develop user-friendly interfaces. 6- Development of applications: MATLAB enables the creation of standalone programs and GUI-based user interfaces. For their projects and scientific research, students can learn how to write interactive programs, publish MATLAB code as standalone applications, and develop user-friendly interfaces. 7- Problem-solving abilities are a common topic of MATLAB study programs. Students are encouraged to use their MATLAB and programming expertise to address real-world issues, developing their analytical and critical thinking skills. |
| <p>Module Learning Outcomes</p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>MATLAB is a popular programming language and tool. It has many uses, including biology, engineering, economics, mathematics, data analysis, and complex mathematical equations. As a result, MATLAB learning objectives in undergraduate curricula can change based on the course and level of the student. In academic programs, MATLAB often produces the following learning outcomes:</p> <ol style="list-style-type: none"> 1- Understanding and Application of Programming Concepts: Students learn the basic structure of the MATLAB programming language, including variables, loops, functions, and conditional statements. They also learn how to write efficient and effective code using best programming practices. 2- Data analysis and visualization using equation solving, engineering diagrams, and visualization are all possible with MATLAB. Students |

gain knowledge of how to use MATLAB functions to import, modify, and analyze data. In order to visualize outcomes, they also learn how to make plots, charts, and graphs.

- 3- Modeling and Simulation: MATLAB is often used to model and simulate complex systems in engineering, physics, applied science, and other scientific fields. Students learn how to create mathematical models and simulations using MATLAB functions and tools.
- 4- Solve complex problems: MATLAB is a useful tool for solving complex problems in many fields. Students learn how to use MATLAB to solve problems related to optimization, numerical analysis, and differential and integral equations in advanced mathematics.
- 5- Interdisciplinary: MATLAB has applications in a wide range of disciplines, including engineering, physics, biology, economics, and mathematics. Students gain knowledge of how to use MATLAB to tackle issues in their particular fields of study.
- 6- Programming for scientific computing: MATLAB is often used in scientific computing, where efficient and accurate numerical calculations are required. Students learn how to code scientific computing applications using MATLAB's built-in functions and tools to analyze their data.
- 7- Algorithm development: MATLAB is a useful tool for developing and testing algorithms. Students learn how to develop and test algorithms for various applications using MATLAB.
- 8- Digital Image and Signal Processing: MATLAB contains built-in functions for processing digital images and signals, which makes it a popular tool in these fields. Students learn how to use MATLAB to analyze and process images and digital signal processors.
- 9- Machine Learning and Data Science: MATLAB has a variety of tools for machine learning and data science applications, including neural networks, classification algorithms, and data visualization tools. Students learn how to use these tools to solve problems and analyze data in machine learning.
- 10- Communication and Collaboration: MATLAB is frequently used in joint research projects where a large number of researchers contribute to the same code base. The built-in version control and code sharing facilities in MATLAB help students learn how to cooperate productively. Additionally, they gain communication skills by using MATLAB's visualization and simulation tools to present their findings.
- 11- Control Systems Design: When it comes to planning and assessing control systems, MATLAB is employed in control systems engineering. Students gain knowledge of how to utilize MATLAB to

| | |
|---|--|
| | <p>simulate closed-loop systems, create controllers, and assess system stability.</p> <p>12- Computational finance: MATLAB has built-in functions for financial modeling and analysis, making it a popular tool in computational finance. Students learn how to use MATLAB to model financial markets, analyze financial data, and develop trading strategies.</p> <p>13- Numerical methods: MATLAB is a powerful tool for numerical methods, such as solving differential equations, performing numerical integration, and solving optimization problems. Students learn how to use MATLAB to apply numerical methods to solve problems in their respective fields of study.</p> |
| <p>Indicative Contents المحتويات الإرشادية</p> | <p>Indicative content includes the following.</p> <p><u>Part A -</u></p> <p>Introduction to MATLAB environment & MATLAB windows, MATLAB commands & elementary mathematical functions [12 hrs]</p> <p>Vectors and Matrices [14 hrs]</p> <p>Solving basic algebraic equations & quadratic equations [14 hrs]</p> <p>Create function in files – MATLAB Introduction to Plotting, Plotting multiple plots & Plotting 3D [14 hrs]</p> <p><u>Part B-</u></p> <p>For-end loops, While- end loops & If statement [14hrs]</p> <p>Integration, differentiation and Fourier transform [12 hrs]</p> <p>Introduction to Simulink and Modeling equations in Simulink [14 hrs]</p> <p>Modeling electrical cct. in Simulink, Modeling electronic and communication cct. in Simulink [14 hrs]</p> |

| | |
|--|--|
| <p>Learning and Teaching Strategies استراتيجيات التعلم والتعليم</p> | |
| <p>Strategies</p> | <p>Learning and teaching strategies are methods used to help learners acquire knowledge and skills, and for teachers to effectively deliver instruction. There are various types of learning and teaching strategies, including:</p> |

| | |
|--|--|
| | <ol style="list-style-type: none"> 1- Active learning entails involving students in tasks that demand their participation, critical thinking, and application of what they have learned. Group discussions, practical exercises, and problem-based learning are a few examples. 2- Collaborative learning: This involves group work and collaboration among learners to achieve a common goal. Examples include group projects and peer learning. 3- Inquiry-based learning: This involves encouraging learners to ask questions, explore topics, and find answers through research and experimentation. Examples and reports include scientific investigations and case studies. 4- Direct instruction: This involves the teacher providing information to learners in a structured and organized manner. Examples include lectures, demonstrations, and tutorials. 5- Differentiated instruction: This involves tailoring instruction to meet the needs of individual learners, based on their learning style, abilities, and interests. 6- Technology-based instruction: This involves using technology tools and resources to enhance instruction and engage learners. Examples include online courses, interactive whiteboards, and educational apps. 7- Effective teaching and learning strategies often involve a combination of these approaches, tailored to the needs of the learners and the content being taught. |
|--|--|

| Student Workload (SWL) | | | |
|--|-----------|---|-----|
| الحمل الدراسي للطلاب محسوب ل ١٥ اسبوعا | | | |
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل | 33 | Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعيا | 2.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل | 42 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعيا | 2.8 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل | 75 | | |

| Module Evaluation | | | | | |
|-----------------------------|------------------------|-------------|----------------|------------|---------------------------|
| تقييم المادة الدراسية | | | | | |
| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
| Formative assessment | Quizzes | 2 | 10% (10) | 5, 10 | LO #2, and 11 |
| | Assignments | 2 | 10% (10) | 2, 12 | LO # 4, and 7 |
| | Projects / Lab. | 1 | 10% (10) | Continuous | All |

| | | | | | |
|-----------------------------|---------------------|------|------------------|----|----------|
| | Report | 1 | 10% (10) | 13 | LO # 8 |
| Summative assessment | Midterm Exam | 1 hr | 10% (10) | 7 | LO # 1-7 |
| | Final Exam | 3hr | 50% (50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

| Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري | |
|---|---|
| | Material Covered |
| Week 1 | Introduction to MATLAB environment & MATLAB windows |
| Week 2 | MATLAB commands & elementary mathematical functions |
| Week 3 | Vectors and Matrices |
| Week 4 | Matrices |
| Week 5 | Solving basic algebraic equations & quadratic equations |
| Week 6 | Create function in files - MATLAB |
| Week 7 | Introduction to Plotting, Plotting multiple plots & Plotting 3D |
| Week 8 | Operational & logical Statements |
| Week 9 | For-end loops & While- end loops |
| Week 10 | If statement |
| Week 11 | Integration & differentiation |
| Week 12 | Fourier transform |
| Week 13 | Introduction to Simulink |
| Week 14 | Modeling equations in Simulink |
| Week 15 | Modeling electrical cct. in Simulink |
| Week 16 | Modeling electronic cct. in Simulink |

| Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر | |
|---|------------------------------------|
| | Material Covered |
| Week 1 | Introduction to MATLAB environment |

| | |
|----------------|---|
| Week 2 | MATLAB windows |
| Week 3 | MATLAB commands & elementary mathematical functions |
| Week 4 | Vectors |
| Week 5 | Matrices |
| Week 6 | Solving basic algebraic equations & quadratic equations |
| Week 7 | Create function in files - MATLAB |
| Week 8 | Introduction to Plotting, Plotting multiple plots & Plotting 3D |
| Week 9 | Operational & logical Statements |
| Week 10 | For-end loops & While- end loops |
| Week 11 | If statement |
| Week 12 | Integration & differentiation |
| Week 13 | Fourier transform |
| Week 14 | Introduction to Simulink and Modeling equations in Simulink |
| Week 15 | Modeling electrical cct. in Simulink |
| Week 16 | Modeling electronic cct in Simulink |

| Learning and Teaching Resources مصادر التعلم والتدريس | | |
|---|---|----------------------------------|
| | Text | Available in the Library? |
| Required Texts | MATLAB An Introduction with Applications. | |
| Recommended Texts | An Introduction to Programming and Numerical Methods in MATLAB | |
| Websites | https://www.mathworks.com | |

| Module 23 معلومات المادة الدراسية | | |
|---|-----------------|--|
| Module Title | Arabic Language | Module Delivery |
| Module Type | Basic | <input checked="" type="checkbox"/> Theory |

| | | | | |
|------------------------------------|---------|-------------------------------|---|--|
| Module Code | NTU 203 | | <input type="checkbox"/> Lecture <input type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar | |
| ECTS Credits | 3 | | | |
| SWL (hr/sem) | 50 | | | |
| Module Level | 2 | Semester of Delivery | 4 | |
| Administering Department | RETE | College | College of Oil & Gas Techniques Engineering/Kirkuk | |
| Module Leader | | e-mail | | |
| Module Leader's Acad. Title | | Module Leader's Qualification | | |
| Module Tutor | | e-mail | | |
| Peer Reviewer Name | | e-mail | | |
| Scientific Committee Approval Date | | Version Number | 1.0 | |

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

| | | | |
|----------------------|------|----------|--|
| Prerequisite module | None | Semester | |
| Co-requisites module | None | Semester | |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|--------------------------------------|---|
| Module Aims أهداف المادة الدراسية | <p>1. تعزيز التواصل الفعال: يهدف تعلم اللغة العربية إلى تمكين الطلاب من التواصل بشكل فعال. في البيئة العربية، سواء كان ذلك في الحياة اليومية أو في السياق الأكاديمي والعمل.</p> <p>2. فهم الثقافة العربية: يعتبر تعلم اللغة العربية مفتاحًا لفهم الثقافة العربية وقيمها، ويساعد الطلاب على التعرف على التراث العربي الغني وفهم تعدد الثقافات في العالم العربي.</p> <p>3. تعزيز القدرات البحثية والأكاديمية: تعلم اللغة العربية يساهم في تطوير مهارات البحث والكتابة الأكاديمية للطلاب، مما يمكنهم من المشاركة بفاعلية في النقاشات الأكاديمية وإنتاج المعرفة.</p> <p>4. توفير فرص وظيفية: يعتبر إتقان اللغة العربية مهارة قيمة في سوق العمل، حيث يمكن للطلاب العربية العمل في مجالات متعددة مثل الترجمة، الإعلام، العلاقات العامة، والتعليم.</p> |
| Module Learning | <p>1. القدرة على التواصل الفعال: يكتسب الطلاب مهارات الاستماع والتحدث والقراءة والكتابة في اللغة العربية، مما يمكنهم من التواصل بطلاقة وفهم المحتوى بشكل صحيح.</p> |

| | |
|---|--|
| Outcomes مخرجات التعلم للمادة الدراسية | <p>2. القدرة على فهم النصوص والثقافة: يتعلم الطلاب قراءة وفهم النصوص الأدبية والثقافية باللغة العربية، مما يساهم في تطوير فهمهم للتراث العربي والتحليل النقدي للأعمال الأدبية.</p> <p>3. القدرة على البحث والكتابة الأكاديمية: يتعلم الطلاب كيفية إجراء البحوث والكتابة الأكاديمية باللغة العربية، ويتمكنون من تقديم أوراق بحثية وتقارير أكاديمية بشكل متميز.</p> <p>4. التفاعل الثقافي والاجتماعي: يتمكن الطلاب من المشاركة في المجتمع العربي بشكل أعمق وفهم التقاليد والقيم والعادات المحلية، مما يعزز التفاهم الثقافي والتعايش السلمي.</p> |
| Indicative Contents المحتويات الإرشادية | <p>1. مقدمة في المحتويات الإشارية: تعريف المحتويات الإشارية وأهميتها، ودورها في مجالات وتخصصات متنوعة.</p> <p>2. أنواع وصيغ المحتويات الإشارية: استكشاف مختلف أنواع وصيغ المحتويات الإشارية، مثل الجداول والرسوم البيانية والنقاط البارزة والملخصات.</p> <p>3. إنشاء المحتويات الإشارية: تقنيات واستراتيجيات إنشاء المحتويات الإشارية الفعالة، بما في ذلك اختيار المعلومات الرئيسية، وتبسيط المفاهيم المعقدة، وتنظيم المحتوى لسهولة الفهم.</p> <p>4. التمثيل البصري للمحتويات الإشارية: استخدام الوسائط البصرية، مثل الرسوم البيانية والمخططات والرسومات، لتقديم المحتويات الإشارية بشكل جذاب ومفيد بصرياً.</p> <p>5. أمثلة ودراسات الحالة: تحليل أمثلة ودراسات حالة حقيقية لفهم كيفية استخدام المحتويات الإشارية في سياقات مختلفة، مثل التقارير البحثية ومواد التسويق والموارد التعليمية.</p> |

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

| | |
|-------------------|---|
| Strategies | <ol style="list-style-type: none"> 1. Interactive Language Activities: Engaging students in interactive activities such as role-plays, group discussions, and language games to practice and reinforce language skills. 2. Communicative Approach: Emphasizing real-life communication and providing opportunities for students to actively engage in speaking, listening, reading, and writing tasks to develop their language proficiency. 3. Authentic Materials: Incorporating authentic materials such as newspaper articles, songs, videos, and literature to expose students to real-world language usage and cultural contexts |
|-------------------|---|

Student Workload (SWL)

الحمل الدراسي للطلاب محسوب لـ ١٥ اسبوعاً

| | | | |
|--|----|--|------|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل | 33 | Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً | 2.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل | 17 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً | 1.13 |

| | |
|---|----|
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 50 |
|---|----|

Module Evaluation
تقييم المادة الدراسية

| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
|-------------------------|--------------|-------------|------------------|-------------|---------------------------|
| Formative assessment | Quizzes | 4 | 15% (10) | 2, 5, 10,12 | LO #3, #6, #8, and #13 |
| | Assignments | 3 | 15% (10) | 2, 7,12 | LO # 3, #5,and #7 |
| | Report | 10 | 10% (10) | Continuous | All |
| Summative assessment | Midterm Exam | 1 hr | 10% (10) | 7 | LO # 1-7 |
| | Final Exam | 3 hr | 50% (50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

| Material Covered | |
|------------------|--|
| Week 1 | Introduction to Language Errors |
| Week 2 | Taa Marbuta and Taa Marbuta (Bound and Open Taa): Understanding the rules and usage of the Taa Marbuta and Open Taa in Arabic language. |
| Week 3 | Hamzat Al-Wasl and Al-Qat' (Hamza of Connection and Hamza of Disconnection): Differentiating between Hamzat Al-Wasl and Al-Qat' and their respective roles in pronunciation. |
| Week 4 | Alif Al-Maddooda and Alif Al-Muqassara Writing Rules: Exploring the rules for writing Alif Al-Maddooda (elongated Alif) and Alif Al-Muqassara (shortened Alif). |
| Week 5 | Solar and Lunar Letters: Identifying the distinction between solar and lunar letters in Arabic pronunciation. |
| Week 6 | Adad (Numbers): Learning about the numerical system in Arabic and its usage. |
| Week 7 | Verbs: Understanding verb conjugation and the different verb forms in Arabic. |

| | |
|----------------|--|
| Week 8 | Parts of Speech: Exploring the different parts of speech, including nouns, verbs, adjectives, adverbs, etc. |
| Week 9 | Meanings of Prepositions: Examining the meanings and usage of prepositions in Arabic. |
| Week 10 | Common Language Errors: Analyzing common language errors and their applications in practical contexts. |
| Week 11 | Noon and Tanween: Understanding the usage and pronunciation of Noon and Tanween in Arabic. |
| Week 12 | Taa Marbuta and Taa Marbuta (Bound and Open Taa): Understanding the rules and usage of the Taa Marbuta and Open Taa in Arabic language. |
| Week 13 | Hamzat Al-Wasl and Al-Qat' (Hamza of Connection and Hamza of Disconnection): Differentiating between Hamzat Al-Wasl and Al-Qat' and their respective roles in pronunciation. |
| Week 14 | Alif Al-Maddooda and Alif Al-Muqassara Writing Rules: Exploring the rules for writing Alif Al-Maddooda (elongated Alif) and Alif Al-Muqassara (shortened Alif). |
| Week 15 | Solar and Lunar Letters: Identifying the distinction between solar and lunar letters in Arabic pronunciation. |
| Week 16 | Final Exam |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|--------------------------|---|---------------------------|
| Required Texts | <p>1. الكافية "اللكندي: يعتبر من أهم الكتب في علم النحو، حيث يشرح القواعد والتراكيب النحوية بأسلوب مبسط وشامل.</p> <p>2. الصرف "لابن مالك: كتاب مشهور يتناول قواعد تصريف الأفعال والأسماء في اللغة العربية، ويعد من أعمال النحو الكلاسيكية.</p> <p>3. المفصل في علم العربية "لابن جني: كتاب شامل يغطي مجموعة واسعة من موضوعات النحو والصرف والبلاغة والأدب</p> | Yes |
| Recommended Texts | <p>1. الألفية "لابن مالك: كتاب مشهور في علم النحو والصرف، يعتبر من أهم المراجع الكلاسيكية في دراسة اللغة العربية.</p> <p>2. المستطرف في كل فن مستظرف "لابن الأنباري: كتاب يشمل العديد من الألفاظ والتعابير العربية المستخدمة في الأدب والشعر.</p> <p>3. البيان والتبيين "لابن حجر العسقلاني: كتاب يتناول موضوعات النحو والصرف والبلاغة، ويعتبر مرجعًا قيمًا في دراسة اللغة العربية.</p> | No |
| Websites | | |

المستوى الثالث

| Module 24 | | | |
|---|---|--------------------------------------|---|
| معلومات المادة الدراسية | | | |
| Module Title | Conduction & Radiation Heat Transfer | | Module Delivery |
| Module Type | Core | | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar |
| Module Code | RETE 300 | | |
| ECTS Credits | 7 | | |
| SWL (hr/sem) | 175 | | |
| Module Level | 3 | Semester of Delivery | 5 |
| Administering Department | Type Dept. Code | College | Technical Eng. College/ Kirkuk |
| Module Leader | | e-mail | @ntu.edu.iq |
| Module Leader's Acad. Title | Professor | Module Leader's Qualification | MSc |
| Module Tutor | Name (if available) | e-mail | E-mail |
| Peer Reviewer Name | | e-mail | @ntu.edu.iq |
| Scientific Committee Approval Date | 01/06/2023 | Version Number | 1.0 |

| Relation with other Modules | | | |
|-----------------------------------|------|-----------------|--|
| العلاقة مع المواد الدراسية الأخرى | | | |
| Prerequisite module | None | Semester | |
| Co-requisites module | None | Semester | |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|---|--|
| <p>Module Objectives</p> <p>أهداف المادة الدراسية</p> | <ol style="list-style-type: none">1. To develop problem solving skills and understanding of heat transfer through the application of techniques.2. To understand the principle of heat transfer3. This course deals with the basic concept of conduction and radiation heat transfer.4. This is the basic subject for all conduction and radiation heat transfer5. To understand the conduction heat transfer laws includes the one-dimensional steady state (cartesian, cylindrical, and spherical coordinates), the two-dimensional steady state (numerical solution), and the unsteady state (lumped analysis).6. To understand the laws of radiation heat transfer, including properties, emissivity, shape factor, and heat exchange between non-black bodies. |
| <p>Module Learning Outcomes</p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.</p> <ol style="list-style-type: none">1. Recognize the conduction heat transfer parameters.2. Derive thermal conduction resistance for cartesian, cylindrical, and spherical geometries, and they represented with Ohm's law3. Recognize the use of numerical analysis techniques for solving two-dimensional heat conduction problems.4. Describe thermal resistance and overall heat transfer coefficient.5. Discuss the unsteady state conduction heat transfer6. Discuss important points in the conduction heat transfer part.7. Identify the principle of radiation heat transfer.8. Define Kirchhoff's identity, shape factors9. Heat Exchange between non-black bodies. |

| | |
|--|---|
| | 10. Representing black and non-black bodies' heat exchange by electric circuits. |
| <p>Indicative Contents</p> <p>المحتويات الإرشادية</p> | <p>Indicative content includes the following.</p> <p><u>Part A – Conduction heat transfer</u></p> <p>Introduction to heat transfer, one-dimensional steady state heat transfer, overall heat transfer coefficient. [20 hrs]</p> <p>Heat source systems, fins theory. [15 hrs]</p> <p>Two-dimensional steady state conduction heat transfer. [10 hrs]</p> <p>Unsteady state heat transfer [5 hrs]</p> <p><u>Part B- Radiation heat transfer</u></p> <p>Introduction to Radiation heat transfer, basic concept, radiation properties, shape factors. [10 hrs]</p> <p>Heat exchanger between black bodies surface, heat exchange between non-black bodies surface [10 hrs].</p> <p>Radiation heat exchange between parallel plate shield [5 hrs]</p> <p>Final examination [2 hrs Lab. Section and 3 hrs theory section]</p> <p>Revision problem classes [6 hrs]</p> |

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

| | |
|-------------------|---|
| Strategies | The primary strategy for delivering this module is to encourage students' participation in solving the exercises while at the same time developing their critical thinking skills. This will be accomplished through classes, interactive tutorials, and simple experiments involving enjoyable sampling activities for students. |
|-------------------|---|

| Student Workload (SWL) | | | |
|--|------------|---|------|
| الحمل الدراسي للطلاب محسوب ل ١٥ اسبوعا | | | |
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل | 93 | Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعيا | 6.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل | 82 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعيا | 5.46 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل | 175 | | |

| Module Evaluation | | | | | |
|-----------------------------|------------------------|-------------|------------------|------------|---------------------------|
| تقييم المادة الدراسية | | | | | |
| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
| Formative assessment | Quizzes | 5 | 10% (10) | 5 and 10 | LO #1, #2 and #10, #11 |
| | Assignments | 5 | 10% (10) | 2 and 12 | LO #3, #4 and #6, #7 |
| | Projects / Lab. | 6 | 10% (10) | Continuous | All |
| | Report | 6 | 10% (10) | 13 | LO #5, #8 and #10 |
| Summative assessment | Midterm Exam | 2hr | 10% (10) | 7 | LO #1 - #7 |
| | Final Exam | 3hr | 50% (50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

| | Material Covered |
|-------------------------|--|
| Week 1 | An introduction to the basic principles of heat transfer and methods of heat transfer |
| Week 2 & 3 | Heat transfer by conduction in the steady state and one-dimensional in shapes (Cartesian, cylindrical, spherical) compound walls, compound cylinders, compound balls |
| Week 4 | Overall heat transfer coefficient, critical thickness of insulating material, thermal contact resistance |
| Week 5 | Heat source systems in walls and cylinders |
| Week 6 & 7 | Types of fins, fin design, fin efficiency, fin efficiency, heat transfer from heat sinks |
| Week 8 & 9 | Two-dimensional steady state conduction heat transfer (Numerical solution) |
| Week 10 | Unsteady state heat transfer (Lumped heat capacity system) |
| Week 11 & 12 | Introduction to heat by radiation, basic concepts, properties of radiation, shape factors |
| Week 13 & 14 | Radiation Heat exchange between the surface of black objects and between the surface of non-black bodies |
| Week 15 | Radiation heat exchange between parallel-plate shield |
| Week 16 | Preparatory week before the final Exam |

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

| | Material Covered |
|--------|---|
| Week 1 | Lab 1: Recognize heat transfer lab apparatuses, and learn how the report is written |
| Week 2 | Lab 2: The heat transfer rate is directly proportional to the temperature difference between the two ends of the sample. |
| Week 3 | Lab 3: The heat transfer rate is inversely proportional to the cross-sectional area. |
| Week 4 | Lab 4: Thermal Contact resistance |
| Week 5 | Lab 5: Determine the unknown material's thermal conductivity |
| Week 6 | Lab 6: Materials emissivity evaluation |
| Week 7 | Lab 7: Stefan-Boltzmann experiment |

| Learning and Teaching Resources | | |
|---------------------------------|---|---------------------------|
| مصادر التعلم والتدريس | | |
| | Text | Available in the Library? |
| Required Texts | Heat transfer, J. P. Holman, 13 rd Edition, Mc Graw Hill companies, Inc., 1221 | Yes |
| Recommended Texts | Heat transfer; A practical approach, Yunus A. Cengel, 2 nd addition, | Yes |
| Websites | | |

| Module 25 | | |
|-------------------------|-----------------------------|--|
| معلومات المادة الدراسية | | |
| Module Title | Engineering Analysis | Module Delivery |
| Module Type | Core | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture |
| Module Code | COGTEK 300 | |
| ECTS Credits | 6 | |

| | | | | |
|------------------------------------|-------------------------|-------------------------------|--|--|
| SWL (hr/sem) | 150 | | <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar | |
| Module Level | 3 | Semester of Delivery | 5 | |
| Administering Department | RETE | College | Oil and gas technical college/ Kirkuk | |
| Module Leader | | e-mail | | |
| Module Leader's Acad. Title | Assist. Lecture | Module Leader's Qualification | MSc | |
| Module Tutor | Ali Qani Mohammed Saleh | e-mail | ali.alkurdi23@ntu.edu.iq | |
| Peer Reviewer Name | Name | e-mail | E-mail | |
| Scientific Committee Approval Date | 01/06/2023 | Version Number | 1.0 | |

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

| | | | |
|----------------------|------|----------|--|
| Prerequisite module | None | Semester | |
| Co-requisites module | None | Semester | |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|---|--|
| Module Objectives أهداف المادة الدراسية | <ol style="list-style-type: none"> 1. Develop a solid foundation in mathematical concepts and techniques used in engineering analysis. 2. Understand the principles and applications of numerical methods for solving engineering problems. 3. Gain proficiency in using software tools and programming languages for numerical analysis. 4. Acquire the skills to analyze and interpret numerical results to make |
|---|--|

| | |
|---|---|
| | <p>informed engineering decisions.</p> <p>5. Apply mathematical modeling techniques to solve real-world engineering problems.</p> |
| <p>Module Learning Outcomes</p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>The intended subject specific learning outcomes. On successfully completing the module students will be able to:</p> <ol style="list-style-type: none"> 1- Acquire a comprehensive understanding of the fundamental principles and concepts underlying a broad range of basic methods used in engineering analysis. 2- Demonstrate proficiency in applying a variety of established techniques and effectively utilizing computational tools to solve engineering problems. 3- Apply the acquired knowledge and skills in basic numerical approximation to address complex problems in diverse contexts, demonstrating the ability to critically assess and select appropriate tools and techniques. 4- Effectively employ MATLAB commands and functions to implement and execute engineering analysis tasks, demonstrating competence in utilizing computational tools for problem-solving. |
| <p>Indicative Contents</p> <p>المحتويات الإرشادية</p> | <p>Part A</p> <ol style="list-style-type: none"> 1- Introduction, Mathematical Analysis, Function Analysis and Complex Function Analysis [20 hr.] 2- Mathematical Modeling, Logistic Regression Analysis, Probability and Statistics Analysis and Advanced Probability and Statistics Analysis [20 hr.] 3- Revision problem classes and quiz [3 hrs] <p>Part B</p> <ol style="list-style-type: none"> 4- Linear and Nonlinear Regression Analysis, Optimization Analysis and Optimal Control and Nonlinear Optimization Analysis [20 hr.] |

| | |
|---|--|
| <p>Learning and Teaching Strategies</p> <p>استراتيجيات التعلم والتعليم</p> | |
| <p>Strategies</p> | <ol style="list-style-type: none"> 1. Establish a solid foundation: Start by thoroughly understanding the fundamental concepts and principles of engineering analysis. This includes grasping the mathematical techniques and numerical methods commonly used in the field. 2. Practice problem-solving: Engineering analysis involves solving complex problems. Regularly practice solving a variety of problems to enhance your problem-solving skills and develop a deeper understanding of the subject matter. 3. Utilize resources: Take advantage of textbooks, online resources, and reference materials specific to engineering analysis. These resources can provide additional explanations, examples, and practice problems to reinforce your understanding. |

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

| | | | |
|--|------------|---|-----|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 63 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا | 4.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 87 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا | 5.8 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 150 | | |

Module Evaluation

تقييم المادة الدراسية

| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
|-----------------------------|------------------------|-------------|------------------|------------|---------------------------|
| Formative assessment | Quizzes | 2 | 10% (10) | 5 and 10 | 1, 2 and 3 |
| | Assignments | 2 | 10% (10) | 2 and 12 | 1, 2 and 3 |
| | Projects / Lab. | 1 | 10% (10) | Continuous | 1, 2 and 3 |
| | Report | 1 | 10% (10) | 13 | 1, 2 and 3 |
| Summative assessment | Midterm Exam | 2hr | 10% (10) | 7 | 1, 2 and 3 |
| | Final Exam | 3hr | 50% (50) | 16 | 1, 2 and 3 |
| Total assessment | | | 100% (100 Marks) | | |

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

| | Material Covered |
|----------------|---|
| Week 1 | Introduction to Engineering Analysis; Fundamental concepts in engineering analysis Tools and techniques of engineering analysis |
| Week 2 | Mathematical Analysis; Differential equations and their applications in engineering, Differentiation and integration |
| Week 3 | Function Analysis; Algebraic and transcendental functions, Trigonometric and exponential functions |
| Week 4 | Complex Function Analysis; Complex numbers and operations, Analysis of complex functions |
| Week 5 | Mathematical Modeling; Mathematical models of growth, Mathematical models of regression |
| Week 6 | Logistic Regression Analysis; Logistic regression analysis, Applications in engineering |
| Week 7 | Probability and Statistics Analysis; Probability and statistics concepts, Data analysis and probability distributions |
| Week 8 | Advanced Probability and Statistics Analysis; Joint and conditional probability analysis, Advanced statistics analysis and non-normal distributions |
| Week 9 | Linear Regression Analysis; Simple linear regression analysis, Multiple linear regression analysis |
| Week 10 | Nonlinear Regression Analysis; Nonlinear regression analysis, Applications in engineering |
| Week 11 | Optimization Analysis and Optimal Control; Optimization analysis and optimal control problems, Applications in engineering |
| Week 12 | Nonlinear Optimization Analysis; Nonlinear optimization analysis, Applications in engineering |
| Week 13 | Review 1 |
| Week 14 | Review 2 |
| Week 15 | Review 3 |
| Week 16 | Preparatory week before the final Exam |

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

| | Material Covered |
|---------------|--|
| Week 1 | Lab 1: Introduction to Engineering Analysis and MATLAB. |
| Week 2 | Lab 2: Numerical Methods for Root Finding |
| Week 3 | Lab 3: Interpolation and Curve Fitting |
| Week 4 | Lab 4: Numerical Integration |
| Week 5 | Lab 5: Numerical Solutions of Ordinary Differential Equations (ODEs) |
| Week 6 | Lab 6: Systems of Linear Equations |
| Week 7 | Lab 7: Partial Differential Equations (PDEs) |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|--------------------------|--|---------------------------|
| Required Texts | 1. "Numerical Methods for Engineers" by Steven C. Chapra and Raymond P. Canale 2. "Numerical Analysis" by Timothy Sauer 3. "Numerical Methods in Engineering with MATLAB" by Jaan Kiusalaas | No |
| Recommended Texts | 1. "Applied Numerical Methods with MATLAB for Engineers and Scientists" by Steven C. Chapra 2. "Numerical Methods: Design, Analysis, and Computer Implementation of Algorithms" by Anne Greenbaum and Timothy P. Chartier | No |
| Websites | 3. (https://www.mathworks.com/) 4. (http://www.numericalmethods.eng.usf.edu/) | |

Module 26**معلومات المادة الدراسية**

| | | | |
|------------------------------------|---------------------------------|---|--|
| Module Title | Renewable Energy systems | | |
| Module Type | Core | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input checked="" type="checkbox"/> Seminar | |
| Module Code | RETE 302 | | |
| ECTS Credits | 6 | | |
| SWL (hr/sem) | 150 | | |
| Module Level | 3 | Semester of Delivery | 5 |
| Administration Department | RETE | College | College of Oil & Gas Techniques Engineering/Kirkuk |
| Module Leader | Ali Qani Mohammed Saleh | e-mail | ali.alkurdi23@ntu.edu.iq |
| Module Leader's Acad. Title | Lecturer | Module Leader's Qualification | MSc. |
| Module Tutor | Name (if available) | e-mail | |
| Peer Reviewer Name | | e-mail | |
| Scientific Committee Approval Date | | Version Number | 1 |

Relation with other Modules**العلاقة مع المواد الدراسية الأخرى**

| | | | |
|----------------------|----------|----------|------|
| Prerequisite module | RETE 207 | Semester | Four |
| Co-requisites module | None | Semester | -- |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية

4. Comprehensive Understanding: The aim of this module is to provide students with a comprehensive understanding of various renewable energy systems, including solar, wind, hydropower, and biomass, enabling them to grasp the design, components, and operational principles of these systems.
5. Technical Proficiency: This module aims to equip students with the technical knowledge and skills necessary to analyze, evaluate, and design renewable energy systems. By the end of the module, students should be proficient in assessing the technical feasibility and performance of these systems.
6. Integration and Sustainability: Students will learn how to integrate renewable energy systems into the broader energy infrastructure and gain an appreciation for the role of these systems in achieving sustainability goals. They should be able to critically evaluate the environmental, economic, and social aspects of renewable energy technologies.

Module Learning Outcomes

مخرجات التعلم للمادة الدراسية

- (LO1). In-Depth Knowledge: Students will acquire in-depth knowledge of various renewable energy systems, including solar photovoltaic, wind, hydropower, and biomass, and understand their principles, components, and applications.
- (LO2). Technical Analysis: By the end of the course, students should be able to analyze the technical aspects of renewable energy systems, including system design, energy conversion processes, and efficiency considerations.
- (LO3). System Integration: Students will develop the skills to integrate renewable energy systems into existing energy infrastructures, including grid integration, storage solutions, and backup systems.
- (LO4). Performance Assessment: Students will be capable of assessing the performance and reliability of renewable energy systems, using key performance indicators and data analysis to evaluate their efficiency.
- (LO5). Environmental Impact Evaluation: Understanding the environmental implications of renewable energy technologies, students will be able to assess their positive and negative environmental impacts, contributing to more informed decision-making.
- (LO6). Economic Feasibility: Students will be able to conduct economic assessments of renewable energy projects, considering factors such as return on investment, cost-benefit analysis, and financial modeling.
- (LO7). Policy and Regulatory Awareness: Students should gain an understanding of the policy and regulatory frameworks related to renewable energy, allowing them to navigate the legal and administrative aspects of these technologies.
- (LO8). Innovation and Future Trends: Students will be aware of current innovations and emerging trends in renewable energy, preparing them for a dynamic and evolving field as they consider future opportunities.

| | |
|---|--|
| | and challenges. |
| <p style="text-align: center;">Indicative Contents الإرشادية المحتويات</p> | <p>Indicative content includes the following.</p> <ul style="list-style-type: none"> • Introduction to Renewable Energy <ul style="list-style-type: none"> • Definition and importance of renewable energy • Environmental and economic drivers for renewable energy • Solar Energy Systems <ul style="list-style-type: none"> • Solar photovoltaic (PV) technology • Solar thermal systems • Concentrated solar power (CSP) • Wind Energy Systems <ul style="list-style-type: none"> • Wind turbine technology • Wind resource assessment • Offshore wind energy • Hydropower Systems <ul style="list-style-type: none"> • Principles of hydropower generation • Types of hydropower systems (dam, run-of-river, tidal) • Environmental and social considerations • Biomass Energy Systems <ul style="list-style-type: none"> • Types of biomass sources (wood, crops, waste) • Biomass conversion processes (biogas, biofuels) • Cogeneration and combined heat and power (CHP) • Geothermal Energy Systems <ul style="list-style-type: none"> • Geothermal heat pumps • Geothermal power plants (flash, binary, dry steam) • Resource assessment and exploration • Integration and Grid Connection <ul style="list-style-type: none"> • Grid integration of renewable energy • Energy storage systems (batteries, pumped storage, etc.) • Backup power systems and grid stability • Energy Efficiency in Renewable Systems <ul style="list-style-type: none"> • Energy-efficient components and designs • Smart grids and demand-side management • Energy conservation measures • Environmental Impact and Sustainability <ul style="list-style-type: none"> • Life cycle assessment of renewable energy systems • Environmental benefits and challenges • Sustainability considerations • Economic Analysis and Financing <ul style="list-style-type: none"> • Economic evaluation of renewable energy projects • Financial modeling and cost-benefit analysis • Financing options and incentives • Regulation and Policy Framework <ul style="list-style-type: none"> • Regulatory challenges and incentives • Government policies and support mechanisms • International agreements and targets • Emerging Technologies and Trends <ul style="list-style-type: none"> • Exploration of cutting-edge renewable energy technologies |

| | |
|--|---|
| | <ul style="list-style-type: none"> • Market trends, innovation, and future prospects • The role of research and development • Practical Applications and Case Studies <ul style="list-style-type: none"> • Real-world case studies of successful renewable energy projects • Hands-on experience with renewable energy systems • Field trips and site visits (if applicable) • Group Projects and Student Presentations <ul style="list-style-type: none"> • Collaborative projects on renewable energy system design or analysis • Student presentations and discussions • Examinations and Assessment <ul style="list-style-type: none"> • Final examinations or assessments • Evaluation of student understanding and application of course content |
|--|---|

| Learning and Teaching Strategies استراتيجيات التعلم والتعليم | |
|---|---|
| Strategies | <p>Teaching Method 1 – Lectures Description: Attendance Recorded: Yes</p> <p>Teaching Method 2 – Asynchronous on-line course materials Description: Podcasts, videos and articles in thermodynamics Attendance Recorded: No</p> <p>Unscheduled Directed Student Hours (time spent away from the timetabled sessions but directed by the teaching staff).</p> <p>Teaching Method 3 - Tutorials Description: Attendance Recorded: Yes</p> <p>Teaching Method 4 - Practical Description: Practical homework assignments Attendance Recorded: No</p> <p>Unscheduled Directed Student Hours (time spent away from the timetabled sessions but directed by the teaching staff).</p> |

| Student Workload (SWL) الحمل الدراسي للطالب | | | |
|---|----|---|-----|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 63 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً | 4.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 87 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب | 5.8 |

| | | |
|--|---------|--|
| | أسبوعيا | |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 150 | |

| Module Evaluation تقييم المادة الدراسية | | | | | |
|--|------------------------|--------------|------------------|-------------------|----------------------------|
| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
| Formative assessment | Quizzes | 5 | 10% (10) | 3,5,7,9,11 and 15 | LO #2, #3,#5,#7,#9 and #11 |
| | Assignments | 5 | 10% (10) | 2,6,8 and 12 | LO #1, #4, #6and #10 |
| | Projects / Lab. Report | 4 | 20% (10) | Continuous | All |
| | Summative assessment | Midterm Exam | 2 hr | 10%(10) | 7 |
| | Final Exam | 3 hr | 50%(50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

| Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري | |
|--|--|
| Week 1 | Introduction to Renewable Energy - Overview of the course, Importance of renewable energy, Environmental and economic drivers |
| Week2 | Solar Energy Systems - Solar photovoltaic (PV) technology, Solar thermal systems, Solar resource assessment |
| Week3 | Wind Energy Systems - Wind turbine technology, Wind resource assessment, Offshore wind energy |
| Week4 | Hydropower Systems - Principles of hydropower generation, Types of hydropower systems, Environmental and social considerations |
| Week5 | Biomass Energy Systems - Types of biomass sources, Biomass conversion processes, Cogeneration and combined heat and power (CHP) |
| Week6 | Geothermal Energy Systems - Geothermal heat pumps, Geothermal power plants, Resource assessment and exploration |
| Week7 | Integration and Grid Connection - Grid integration of renewable energy, Energy storage systems, Backup power systems and grid stability |
| Week8 | Energy Efficiency in Renewable Systems - Energy-efficient components and designs, Smart grids and demand-side management, Energy conservation measures |
| Week9 | Environmental Impact and Sustainability - Life cycle assessment of renewable energy systems, Environmental benefits and challenges, Sustainability considerations |
| Week 10 | Economic Analysis and Financing - Economic evaluation of renewable energy projects, Financial modeling and cost-benefit analysis, Financing options and incentives |
| Week 11 | Regulation and Policy Framework - Regulatory challenges and incentives, Government policies and support mechanisms, International agreements and targets |

| | |
|---------|---|
| Week 12 | Emerging Technologies and Trends - Cutting-edge renewable energy technologies, Market trends, innovation, and future prospects, The role of research and development |
| Week 13 | Practical Applications and Case Studies - Real-world case studies of successful renewable energy projects, Hands-on experience with renewable energy systems, Field trips and site visits (if applicable) |
| Week 14 | Group Projects and Student Presentations - Collaborative projects on renewable energy system design or analysis, Student presentations and discussions |
| Week 15 | Final Examinations and Assessment - Final examinations or assessments, Evaluation of student understanding and application of course content |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|-------------------|---|---------------------------|
| Required Texts | Renewable Energy: Technology, Economics, and Environment by Martin Kaltschmitt, Wolfgang Streicher, and Andreas Wiese | No |
| Recommended Texts | Sustainable Energy: Choosing Among Options by Jefferson W. Tester, Elisabeth M. Drake, Michael J. Driscoll, et al. | No |
| | Renewable Energy: Power for a Sustainable Future by Godfrey Boyle | No |

Module 27

معلومات المادة الدراسية

| Module Title | Power electronics | | Module Delivery | |
|--------------------------|-------------------|----------------------|--|--|
| Module Type | Core | | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar | |
| Module Code | RETE 303 | | | |
| ECTS Credits | 5 | | | |
| SWL (hr/sem) | 125 | | | |
| Module Level | 3 | Semester of Delivery | 5 | |
| Administering Department | RETE | College | College of Oil & Gas Techniques Engineering/Kirkuk | |
| Module Leader | | e-mail | | |

| | | | |
|---|------------|--------------------------------------|-------------|
| Module Leader's Acad. Title | | Module Leader's Qualification | M.Sc. |
| Module Tutor | None | e-mail | None |
| Peer Reviewer Name | | e-mail | @ntu.edu.iq |
| Scientific Committee Approval Date | 01/06/2023 | Version Number | 1.0 |

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

| | | | |
|-----------------------------|------------------------|-----------------|---|
| Prerequisite module | AC Electrical Circuits | Semester | 1 |
| Co-requisites module | None | Semester | |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|---|--|
| Module Aims أهداف المادة الدراسية | <p>The aims of this module are:</p> <ol style="list-style-type: none"> 1. To introduce students to the basic theory of power semiconductor devices and passive components, their practical applications in power electronics. 2. To familiarize students to the principle of operation, design and synthesis of different power conversion circuits and their applications. 3. To give students the ability to practice problem solving and design skills individually and in small groups, reflecting the requirements of the engineering profession. 4. To further develop student's awareness of the multifaceted and often conflicting dimensions of electronics design including performance, cost and energy efficiency. |
|---|--|

| | |
|---|---|
| | <ol style="list-style-type: none"> 5. To inform and to allow students to question the practices of modern power electronics engineering via discussions, interactions and case studies led by leading industry professionals. 6. To provide strong foundation for further study of power electronic circuits and systems. |
| <p>Module Learning Outcomes</p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>On successful completion of this module a student will be able to:</p> <ol style="list-style-type: none"> 1. Relate basic semiconductor physics to properties of power devices, and combine circuit mathematics and characteristics of linear and non-linear devices. 2. Describe basic operation and compare performance of various power semiconductor devices, passive components and switching circuits. 3. Design and Analyze power converter circuits and learn to select suitable power electronic devices by assessing the requirements of application fields. 4. Formulate and analyze a power electronic design at the system level and assess the performance. 5. Identify the critical areas in application levels and derive typical alternative solutions, select suitable power converters to control Electrical Motors and other industry grade apparatus. 6. Recognize the role power electronics play in the improvement of energy usage efficiency and the applications of power electronics in emerging areas. |
| <p>Indicative Contents</p> <p>المحتويات الإرشادية</p> | <ul style="list-style-type: none"> • Concept of power electronics, application of power electronics, advantages and disadvantages of power electronics converters, power electronics systems. • Power diodes, Its characteristics, types. • Brief Discussion about uncontrolled converters (Diode rectifiers). • Power transistors, Steady state characteristics, switching performance, safe operating area. • Power mosfets, characteristics, comparison with BJT. • IGBT, characteristics. |

- Thyristors, V-I characteristics and applications. SCR turn on methods.
- Switching characteristics of thyristor, Two transistor model of SCR
- Gate characteristics, ratings.
- Thyristor protection
- Series and parallel operation of thyristor, Gate triggering circuits of thyristor.
- Different commutation techniques of SCR.
- Brief description of members of thyristor family with symbol, GTO.
- Principle of operation of single-phase half wave-controlled rectifiers with R, RL and RLE load, effects of freewheeling diodes. Calculation of performance parameters
- Principle of operation of single-phase full wave controlled and half controlled rectifiers with R, RL and RLE loads, effects of freewheeling diodes. Calculation of performance parameters
- Three phase half wave and full wave controlled and half controlled rectifiers with different loads. Effects of source inductance on the performance of converters
- Techniques of power factor improvement, single phase and three phase dual converters.
- DC-DC converters: Principle of operation, control strategies
- Step-down chopper, performance parameters.
- Step-up chopper, performance parameters.
- Step-down/ step-up chopper, performance parameters.
- Types of chopper circuits based on quadrant of operation.
- Multiphase choppers and switching mode regulators.
- Inverters: Definition, classification of inverters based on nature of input source, wave shape of output voltage, method of commutation & connections.
- Principle of operation of single-phase bridge inverter with R and R-L loads, performance parameters.
- Principle of operation of three phase bridge inverter with R and R-L loads, performance parameters
- Methods of voltage control and harmonic reduction of inverters
- Brief idea of Resonant Pulse inverters.
- AC controllers: Principle of on-off and phase control
- Single phase and three phase controllers with R and R-L loads, performance parameters.

| | |
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| | |
|--|--|

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

| | |
|-------------------|---|
| Strategies | <ul style="list-style-type: none"> • series of lectures. The lectures containing numerous practical design examples. Circuit simulation models of all of the circuits analyzed are provided and students are encouraged to use these to gain a better understanding. • Laboratory sessions are arranged in the form of a mini-project which is conducted over several sessions where students get the opportunity to design, simulate, build and test a DC-DC converter circuit and hence put into practice the theory covered in the lectures. • Bite-sized pre-recorded content and detailed lecture notes aimed at independent learning. • Guest lectures and discussion sessions from industry. • Visualization and sensory experience to correlate electronic circuit mathematical analysis and physical behavior. • person tutorials to focused on problem solving, case studies and discussion of engineering challenges. • In-class review of taught material during revision week • in-class tests where one or more of these are an assessment on the module. |
|-------------------|---|

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا

| | | | |
|--|-----|---|------|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 63 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا | 4.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 62 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا | 4.13 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 125 | | |

| Module Evaluation تقييم المادة الدراسية | | | | | |
|---|------------------------|-------------|------------------|-------------|---------------------------|
| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
| Formative assessment | Quizzes | 5 | 10% (10) | 1,4,6,8,11 | LO #1, 2 and 3 |
| | Assignments | 5 | 10% (10) | 3, 5,7,9,12 | LO # 3,4, 5 and 6 |
| | Projects / Lab. | 14 | 10% (10) | Continuous | |
| | Report | 1 | 10% (10) | 13 | LO # 5, 8 and 10 |
| Summative assessment | Midterm Exam | 2 hr | 10% (10) | 7 | LO # 1-7 |
| | Final Exam | 2hr | 50% (50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

| Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري | |
|---|--|
| | Material to be Covered |
| Week 1-2 | <ul style="list-style-type: none"> Introduction to power electronics |
| Week 3 | <ul style="list-style-type: none"> Switching devices, power and control devices |
| Week 4 | <ul style="list-style-type: none"> Type and characteristic, rating (diode, transistor, ...) |

| | |
|----------------|--|
| Week 5 | <ul style="list-style-type: none"> • Methods of turning – ON and turning – OFF |
| Week 6 | <ul style="list-style-type: none"> • Protection of power devices |
| Week 7 | Triggering and base drive circuits |
| Week 8 | <ul style="list-style-type: none"> • Controlled rectifiers, 1-phase and 3-phase circuits |
| Week 9 | <ul style="list-style-type: none"> • Half-wave and full-wave circuits |
| Week 10 | <ul style="list-style-type: none"> • DC choppers, step-up and step-down choppers |
| Week 11 | <ul style="list-style-type: none"> • AC phase controller |
| Week 12 | <ul style="list-style-type: none"> • Invertors, 1-phase and 3-phase bridges |
| Week 13 | <ul style="list-style-type: none"> • Some applications, a uninterrupt table power supply. |
| Week 14 | <ul style="list-style-type: none"> • (UPS) b-switched mode power supply (SMP) |
| Week 15 | Review for final exam |
| Week 16 | Final Exam |

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

| | Material to be Covered |
|------------------|--|
| Week 1-2 | Thyristor trigger angle & conduction angle |
| Week 3-4 | SCR half –wave rectifier with load resistance . |
| Week 5-6 | SCR half wave rectifier with inductive load |
| Week 7-8 | SCR Full - wave Rectifier with load resistance . |
| Week 9-11 | light dimmer circuit by using one scr |

| | |
|-------------------|------------------------------|
| Week 12-14 | AC voltage controlled |
| Week 15 | Review for final exam |
| Week 16 | Final exam |

| Learning and Teaching Resources | | |
|--|--|---------------------------|
| مصادر التعلم والتدريس | | |
| | Text | Available in the Library? |
| Required Texts | 1. Power Electronics by M.H. Rashid, PHI. 2. 2. Power Electronics by P.S. Bhimra, Khanna Publishers. 3. 3. Power Electronics by M.D. Singh and K.B. Khanchandani, TMH. | Yes |
| Recommended Texts | | Yes |
| Websites | | |

| Module 28 | | |
|-------------------------|---------------------|--|
| معلومات المادة الدراسية | | |
| Module Title | Gas Dynamics | Module Delivery |
| Module Type | Core | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar |
| Module Code | RETE 304 | |
| ECTS Credits | 6 | |
| SWL (hr/sem) | 150 | |

| | | | |
|---|----------------------|--------------------------------------|---|
| Module Level | 3 | Semester of Delivery | 5 |
| Administering Department | RETE | College | College of Oil and Gas Techniques Engineering - Kirkuk, Northern Technical University, Iraq |
| Module Leader | Marwa Khaleel Rashid | e-mail | marwa.khaleel23@ntu.edu.iq |
| Module Leader's Acad. Title | Assistant lecturer | Module Leader's Qualification | MSc |
| Module Tutor | Name (if available) | e-mail | E-mail |
| Peer Reviewer Name | Name | e-mail | E-mail |
| Scientific Committee Approval Date | 01/06/2023 | Version Number | 1.0 |

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

| | | | |
|-----------------------------|------|-----------------|--|
| Prerequisite module | None | Semester | |
| Co-requisites module | None | Semester | |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|---|---|
| Module Objectives أهداف المادة الدراسية | <ol style="list-style-type: none"> 1. Understand the compressible flow fundamentals. 2. Study the compressible flow with friction and heat transfer. 3. Know the application of normal shock in compressible flow. 4. Study the aircraft propulsion systems and rocket propulsion and its applications. |
|---|---|

| | |
|---|--|
| | <p>5. Recognize the working principles and characteristics of steam and gas turbines.</p> <p>6. Recognize the working principles and characteristics of compressors.</p> |
| <p>Module Learning Outcomes</p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>By the end of successful completion of this course, the student will be able to:</p> <ol style="list-style-type: none"> 1. Ability to solve the properties of compressible fluid flow ,one Dimensional isentropic flow 2. Ability to solve and analysis of Normal and Oblique shock waves . 3. The ability to determine the properties of the flow in constant area duct with friction (fanno flow) and its applications 4. The ability to determine the properties of the flow in constsnt area duct with heat transfer (Rayleigh flow) and its applications |
| <p>Indicative Contents</p> <p>المحتويات الإرشادية</p> | <p>Indicative content includes the following.</p> <p>Part A -</p> <p>Introduction to gas dynamics, Isentropic flow, Bryton cycle ideal and actual. [15hrs]</p> <p>Shock waves in supersonic flow, normal shock and oblique shock waves[15 hrs]</p> <p>Introduction to gas turbine power plant, [10 hrs]</p> <p>Introduction to rockets thrust equations, [15hrs]</p> <p>Part B</p> <p>Fundamentals . To understand the charts of oblique shock waves, [15 hrs] Types of pumps, pumps Characteristics, [7 hrs] Introduction to jet propulsion, The Kinds, Impulse Turbine, Blades Efficiency. [15 hrs]</p> |

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

| | |
|-------------------|---|
| Strategies | Implementing active learning in a class room requires preparation and some changes to the lecture. However, the lecture content is not changed or |
|-------------------|---|

replaced with new material. The same lecture content is delivered to the students in a better way and the lecture time is used more effectively. The following are some of the techniques of active learning and cooperative learning I personally use in my engineering classes to enhance student's understanding and retention of the material:

- **One Minute Paper:** Students are asked to write a one minute note (about the previous lecture, the homework or the material in general) to the instructor on a piece of paper. This provides a fast way for the teacher to have a quick feedback on students understanding of what was covered previously.
- **Muddiest Point:** When there is a long lecture with multiple topics covered, the students are given the chance to discuss the material covered in the lecture and list the most difficult parts of the lecture.
- **Clarification Pause:** During the lecture, the students are given the time to go over the material written on the board, think about it and ask if they have any questions. Then, the lecturer answers the different questions raised before resuming the next part of the lecture.
- **Questions and answers:** Usually during the lecture, questions are raised about the new material presented and questions are solved on the board. A sample of the questions asked include "Why do you think this topic is important?" or "what is the relation between what we were talking about and this technique?" or "which technique is best?"
- **Critical Thinking, Group Discussion:** Students are given a handout with multiple problems and they are asked to apply what they learned in the lecture to solve the problems in groups. They are asked to discuss it together and come up with a single solution that all members agree on.
- **Critical Thinking, Think-pair-share:** Students are asked to work individually on a problem for a short time; then students pair up to compare their answers. Then they have to explain their answer and share it with the rest of the class.
- **Peer Teaching:** If one member of the team solves the problem correctly, He will explain it to the rest of the group and discuss with them why his/her answer is correct and their answer is not. This allows the students to find out what went wrong and the mistake they made in solving the problem. This technique will help the student to avoid these mistakes when doing the homework or the exams.
- **Active Review Sessions:** For each exam, students are given a practice

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| | <p>test with a set of problems a week in advance. They are encouraged to work on the practice test individually first and then in groups to discuss the answers. During the review session, the students are asked questions about the problems in the practice test and they are given the choice to decide which problems they want the professor to concentrate on.</p> <ul style="list-style-type: none"> ○ Active presentations: Students are asked to do projects and then to submit reports and give presentations. Each member of the group is required to give part of the presentation and during the presentation, the students are given the chance to have an open discussion and answer questions about their projects. |
|--|---|

| Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا | | | |
|--|------------|---|-----|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 63 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا | 4.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 87 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا | 5.8 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 150 | | |

| Module Evaluation تقييم المادة الدراسية | | | | | |
|---|--------------------|-------------|----------------|------------|---------------------------|
| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
| Formative assessment | Quizzes | 5 | 10% (10) | 3,6,8,10 | LO 1-LO3 |
| | Assignments | 5 | 10% (10) | 2, 5,9, 12 | LO #3, #4 |

| | | | | | |
|-----------------------------|-------------------------------|------|------------------|------------|----------|
| | Projects /Lab.(report) | 10 | 20% (20) | Continuous | All |
| Summative assessment | | | | | |
| | Mid Term exam | 2 hr | 10% (10) | 7 | LO # 1-4 |
| | Final Exam | 3hr | 50% (50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

| | Material Covered |
|----------------|---|
| Week 1 | Introduction |
| Week 2 | Basic principles for compressible fluid flow |
| Week 3 | Isentropic flow with variable area. |
| Week 4 | Isentropic flow with variable area. |
| Week 5 | The Isotropic |
| Week 6 | Stationary Normal shock wave. |
| Week 7 | Mid Term exam |
| Week 8 | nozzle and diffusers |
| Week 9 | Constant area adiabatic flow (Fanno flow) |
| Week 10 | Constant area flow with heat transfer (Rayleigh flow). |
| Week 11 | Oblique shock wave . |
| Week 12 | Introduction to pumps, pumps classifications |
| Week 13 | Introduction to Compressors, types of compressors |

| | |
|----------------|---|
| Week 14 | Introduction to Compressors, types of compressors |
| Week 15 | Preparatory week before the final Exam |

| Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر | |
|---|--|
| | Material Covered |
| Week 1 | Lab 1: To study sound velocity in different solids and fluid |
| Week 2 | Lab 2: To study various gas properties for different altitude in atmosphere. |
| Week 3 | Lab 3: To study the wave propagation at different Mach number. |
| Week 4 | Lab 4: To study the isentropic flow from variable area duct. |
| Week 5 | Lab 5: To study the flow through constant area duct with friction. (Fanno flow). |
| Week 6 | Lab 6: To study the shock waves generated in the flow field. |
| Week 7 | Lab 7: To study different types of aerospace vehicles. |

| Learning and Teaching Resources مصادر التعلم والتدريس | | |
|---|--|----------------------------------|
| | Text | Available in the Library? |
| Required Texts | James E.A. John , Theo G , Keith , " Gas Dynamics " 3rd Edition , John –Wiely , 2006. | Yes |
| Recommended Texts | 1. The Dynamics and Thermodynamics of Compressible Fluid Flow (Vol,1) by A.H. Shapiro 2. Power plant Technology , by M.M.El-Wakil 3. Steam Turbines Theory and Practice by W.J. Keartin. | No |

Module 29

معلومات المادة الدراسية

| | | | |
|--|--------------------------|---|--|
| Module Title | Solar Energy Engineering | | |
| Module Type | Core | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar | |
| Module Code | RETE 305 | | |
| ECTS Credits | 6 | | |
| SWL (hr/sem) | 150 | | |
| Module Level | 3 | Semester of Delivery | 6 |
| Administration Department | RETE | College | College of Oil and Gas Techniques Engineering - Kirkuk |
| Module Leader | Afrah Turki Awad | e-mail | afrah.turki@ntu.edu.iq |
| Module Leader's Acad. Title | Lecturer | Module Leader's Qualification | PhD |
| Module Tutor | | e-mail | |
| Peer Reviewer Name | | e-mail | |
| Scientific Committee Approval Date | | Version Number | |
| Relation with other Modules العلاقة مع المواد الدراسية الأخرى | | | |
| Prerequisite module | None | Semester | -- |
| Co-requisites module | None | Semester | -- |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|--|--|
| Module Aims أهداف المادة الدراسية | The course content is designed to provide comprehensive knowledge on solar radiation, analysis of solar radiation data, fundamentals of the solar thermal and photovoltaic system along with storage of energy required for effective design of efficient solar energy conversion devices. The concepts will be illustrated with |
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| | <p>practical examples, schematics and block diagrams wherever required. A sufficient number of numerical problems with solutions will be discussed in the course. This course is specifically designed for undergraduate and postgraduate students of Energy Engineering and Technology. Further, the course will be very much useful for students and researchers from varied academic backgrounds for the synthesis of novel energy conversion devices and processes.</p> |
| <p>Module Learning Outcomes مخرجات التعلم للمادة الدراسية</p> | <ul style="list-style-type: none"> • Basic principles of Solar Power (Solar Photovoltaic, Solar Thermal, Dish Type, Solar Tower) • Design features of Solar Photovoltaic and Solar thermal equipment • Manufacturing process for Solar Photovoltaic and Solar thermal equipment • Quality assurance aspects of Solar Photovoltaic and Solar thermal equipment • Erection, Commissioning and Testing aspects of Solar Photovoltaic and Solar thermal equipment • Operation & Maintenance aspects of Solar Photovoltaic and Solar thermal equipment • Feasibility study & Economics of Solar Photovoltaic and Solar thermal power project, • How to prepare Feasibility Report / Detailed Project Report for Solar Photovoltaic and Solar thermal power project • Techno-Commercial appraisal of Solar Photovoltaic and Solar thermal power project from lenders perspective • Salient features of various Financing / Loan Agreements. • Financing options in the development of Solar Photovoltaic and Solar thermal power project • Tariff calculation of Solar Photovoltaic and Solar thermal power project and calculation of IRR, Payback period, etc. • Regulatory aspects/provisions in development of Solar Photovoltaic and thermal power project. |
| <p>Indicative Contents الإرشادية المحتويات</p> | <p>The undergraduate Solar Energy course covers a comprehensive range of topics to equip students with a fundamental understanding of renewable energy principles and solar technology applications. The course begins with an introduction to renewable energy sources, emphasizing the significance of solar energy in the global energy landscape. Students delve into the fundamentals of solar radiation, learning about solar geometry, radiation measurement, and influencing factors. The curriculum includes in-depth explorations of solar photovoltaic (PV) technology, covering semiconductor physics, various types of solar cells, module construction, and electrical basics for PV systems. Solar thermal systems, including solar water heating and concentrating solar power, are studied extensively, with a focus on system components and thermal energy storage methods. Practical aspects of PV system design, such as sizing, layout, and efficiency analysis, are explored, preparing students to design both grid-connected and off-</p> |

| | |
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| | <p>grid solar installations. Additionally, the course delves into the economic aspects of solar energy projects, including policy analysis, incentives, and financial evaluations. Environmental sustainability, project development, and emerging solar technologies are also integral components, allowing students to grasp the holistic aspects of solar energy engineering. Laboratory sessions and hands-on projects complement theoretical learning, providing students with practical skills and insights into solar energy applications. This comprehensive approach enables students to develop a strong foundation in solar energy, fostering their ability to contribute effectively to the renewable energy sector and sustainable development initiatives.</p> |
|--|--|

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

| | |
|-------------------|---|
| Strategies | <p>Teaching Method 1 – Lectures Description: Attendance Recorded: Yes</p> <p>Teaching Method 2 – Asynchronous online course materials Description: Podcasts, videos, and articles on Renewable Energy Attendance Recorded: No</p> <p>Unscheduled Directed Student Hours (time spent away from the timetabled sessions but directed by the teaching staff).</p> <p>Teaching Method 3 - Tutorials Description: Attendance Recorded: Yes</p> <p>Teaching Method 4 - Practical Description: Practical homework assignments Attendance Recorded: No</p> <p>Unscheduled Directed Student Hours (time spent away from the timetabled sessions but directed by the teaching staff).</p> |
|-------------------|---|

Student Workload (SWL)

الحمل الدراسي للطالب

| | | | |
|---|-----|---|-----|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 78 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً | 5.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 72 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.8 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 150 | | |

| Module Evaluation | | | | | |
|-----------------------|---------------|-------------|----------------|------------|---------------------------|
| تقييم المادة الدراسية | | | | | |
| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
| Formative assessment | Quizzes | 2 | 10% (10) | 5, 10 | LO #5 and 8 |
| | Seminar | 2 | 10% (10) | Continuous | All |
| | Lab Report | 2 | 20% (20) | 6, 13 | LO # 2, 9 |
| Summative assessment | Mid Term exam | 2 hr | 10% (10) | 10 | LO # 1-11 |
| | Final Exam | 3 hr | 50% (50) | 16 | All |
| 100% (100 Marks) | | | | | |

| Delivery Plan (Weekly Syllabus) | |
|---------------------------------|--|
| المنهاج الأسبوعي النظري | |
| Week 1 | Energy Scenario, overview of solar energy conversion devices and applications, physics of propagation of solar radiation from the sun to earth |
| Weeks 2 | Sun-Earth Geometry, Extra-Terrestrial and Terrestrial Radiation, Solar energy measuring instruments |
| Weeks 3 | Estimation of solar radiation under different climatic conditions, Estimation of total radiation |
| Week 4 | Fundamentals of solar PV cells, principles and performance analysis, modules, arrays, theoretical maximum power generation from PV cells. |
| Week 5 | PV standalone system components, Standalone PV-system design. |
| Week 6 | Components of grid-connected PV system, solar power plant design and performance analysis. |
| Week 7 | Fundamentals of solar collectors, Snails law, Bougers law, Physical significance of Transmissivity – absorptivity product. |
| Week 8 | Performance analysis of Liquid flat plate collectors and testing |
| Week 9 | Performance analysis of Solar Air heaters and testing |
| Week 10 | Mid-Term Exam |
| Week 11 | Solar thermal power generation (Solar concentrators). |

| | |
|---------------|---|
| Week 12 | Thermal Energy Storage (sensible, latent and thermochemical) and solar pond |
| Weeks (13-14) | Applications: Solar Refrigeration, Passive architecture, solar distillation, and emerging technologies. |
| Week 15 | Preparing for the final Exam |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|----------------|---|---------------------------|
| Required Texts | G. N. Tiwari, Solar Energy, Fundamentals, Design, Modeling and Applications, Narosa, 2002. | No |
| | S. P. Sukhatme and J. K. Nayak, Solar Energy: Principles of Thermal Collection and Storage, Tata McGraw Hill, 2006. | No |
| | | |

Module 30

معلومات المادة الدراسية

| | | | |
|-----------------------------|-----------------|-------------------------------|---|
| Module Title | Biofuel | | |
| Module Type | Core | | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input checked="" type="checkbox"/> Seminar |
| Module Code | RETE 306 | | |
| ECTS Credits | 5 | | |
| SWL (hr/sem) | 125 | | |
| Module Level | 3 | Semester of Delivery | |
| Administration Department | RETE | College | College of Oil and Gas Techniques Engineering - Kirkuk |
| Module Leader | | e-mail | @ntu.edu.iq |
| Module Leader's Acad. Title | Lecturer | Module Leader's Qualification | PhD |
| Module Tutor | | e-mail | |
| Peer Reviewer Name | | e-mail | |

| | | | |
|---------------------------------------|--|-------------------|-----|
| Scientific Committee Approval Date | | Version Number | 1.0 |
|---------------------------------------|--|-------------------|-----|

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

| | | | |
|----------------------|------|----------|----|
| Prerequisite module | None | Semester | -- |
| Co-requisites module | None | Semester | -- |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|--|---|
| Module Aims أهداف المادة الدراسية | <ol style="list-style-type: none"> 1. Provide an overview of existing energy utilization, production and infrastructure. 2. Cover the consequences of our energy choices on the environment. 3. Introduce the impact of energy on food production and delivery. 4. Examine the growing field of biofuels by introducing the basics of renewable biofuel production. |
| Module Learning Outcomes مخرجات التعلم للمادة الدراسية | <ol style="list-style-type: none"> 1. Define Biofuel and identify their applications. 2. Define the food which is used in preparation of biofuel. 3. Preparation of bio hydrogen. 4. Preparation of biogas. 5. Preparation of biodiesel. 6. Preparation of bioethanol. 7. Preparation of biobutanol. |
| Indicative Contents الإرشادية المحتويات | <p>After studying this chapter, the student is expected to master the following knowledge and skills:</p> <ol style="list-style-type: none"> 1. Biofuel production, microorganisms, biochemical pathway, and biological approaches [10 hrs]. 2. Biohydrogen and biomethanation production [20 hrs]. 3. Biodiesel, bioethanol, and biobutanol [15]. 4. Reactor configuration [5 hrs]. 5. Microbial Electrochemical Technologies [5 hrs]. 6. Energy analysis [5 hrs]. |

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

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|-------------------|--|
| Strategies | The biofuel module employs a range of effective learning and teaching strategies. Students engage in theoretical lectures, practical demonstrations, and hands-on laboratory sessions to grasp the underlying principles and gain practical skills. Case studies and real-world scenarios enhance problem-solving abilities, while group projects foster teamwork and communication skills. Continuous assessment methods, including assignments and practical assessments, ensure students' progress and understanding of the subject matter. The module promotes equipping students with the knowledge and skills necessary for success in the field of biofuel. |
|-------------------|--|

| Student Workload (SWL) الحمل الدراسي للطالب | | | |
|---|-----|---|------|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 63 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً | 4.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 62 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.13 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 125 | | |

| Module Evaluation تقييم المادة الدراسية | | | | | |
|---|-----------------|-------------|----------------|---------------|---------------------------|
| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
| Formative assessment | Quizzes | 4 | 10% (10) | 3,6,8, and 14 | LO #1,#2,#3, and#7 |
| | Seminar | 2 | 10% (10) | 7 and 13 | LO 4 and #6 |
| | Projects / Lab. | 10 | 20% (20) | Contentious | All |
| Summative assessment | Mid Term exam | 2 hr | 10% (10) | 7 | LO # 1-11 |
| | Final Exam | 3 hr | 50% (50) | 16 | All |
| 100% (100 Marks) | | | | | |

| Delivery Plan (Weekly Syllabus) المنهاج الأسبوعي النظري | |
|---|---|
| Week 1 | Introduction to Biofuels |
| Weeks 2 | Biofuels Production from Renewable Energy Sources |
| Weeks 3 | Microorganisms Involved in Biofuel Production Processes |
| Week 4 | Biochemical Pathways for the Biofuel Production |

| | |
|----------|--|
| Week 5 | Molecular Biological Approaches for the Improvement of Biofuels Production |
| Week 6 | Biohydrogen Production by the Dark Fermentation Process |
| Week 7 | Biohydrogen Production by Photobiological Processes |
| Week 8 | Biomethanation. |
| Week 9 | Bioethanol |
| Week 10 | Bioethanol |
| Week 11 | Biodiesel |
| Week 12 | Microbial Electrochemical Technologies and Their Applications |
| Weeks 13 | Effect of Reactor Configurations on Gaseous Biofuel Production |
| Weeks 14 | Scale-up and Case Studies of Biofuel Production Processes |
| Week 15 | Preparing for the final Exam |

Delivery Plan (Weekly Syllabus)

المنهاج الأسبوعي للمختبر

| | |
|---------|---|
| Week 1 | Lab 1: Fermentation experiment. |
| Weeks 2 | Lab 2: Anaerobic digestion experiment. |
| Weeks 3 | Lab 3: Stem Distillation experiment. |
| Week 4 | Lab 4: Adsorption experiment. |
| Week 5 | Lab 5: Gasification experiment. |
| Week 6 | Lab 6: Liquefaction experiment. |
| Week 7 | Lab 7: Trans esterification experiment. |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|----------------|---|---------------------------|
| Required Texts | Fundamental of biofuel production processes, Debabrata Das and Jhansi L. Varanasi Taylor & Francis Group, LLC | Yes |
| | Biofuel Technology Handbook, Dominik Rutz & Rainer | No |

| | |
|---|--|
| Janssen WIP Renewable Energies | |
| https://www.iche.org/topics/energy/biofuels-energy | |

| Module 31 معلومات المادة الدراسية | | | |
|---|--|--------------------------------------|---|
| Module Title | Convection heat transfer, and heat exchanger design | | Module Delivery |
| Module Type | Core | | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar |
| Module Code | RETE 301 | | |
| ECTS Credits | 7 | | |
| SWL (hr/sem) | 175 | | |
| Module Level | 3 | Semester of Delivery | |
| Administering Department | RETE | College | Oil and gas technical college/ Kirkuk |
| Module Leader | | e-mail | |
| Module Leader's Acad. Title | Assist. Lecture | Module Leader's Qualification | MSc |
| Module Tutor | Ali Qani Mohammed Saleh | e-mail | ali.alkurdi23@ntu.edu.iq |
| Peer Reviewer Name | Name | e-mail | E-mail |
| Scientific Committee Approval Date | 01/06/2023 | Version Number | 1.0 |

| Relation with other Modules العلاقة مع المواد الدراسية الأخرى | | | |
|---|----------|--|-----------------|
| Prerequisite module | RETE 300 | | Semester |
| Co-requisites module | None | | Semester |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|---|---|
| <p>Module Objectives أهداف المادة الدراسية</p> | <ol style="list-style-type: none"> 1. Introduce the student to the groups used in heat transfer and to know their composition and how they work. 2. Introduce the student Basic Concepts of Heat Transfer, Heat Transfer Mechanisms, Thermal conductivity –convection heat transfer –Radiation heat transfer 3. Introducing the student the main scientific principle in the field of heat transfer and its application in the Refrigeration, Cooling, and air conditioning fields, power plants . 4. Introducing students how calculation Overall Heat Transfer Coefficient 5. Introducing students study the heat conduction through a large plane wall cylinder and sphere as one dimension steady state case and a multilayer plane walls, cylinders, and spheres medium under steady conditions and unsteady conditions . 6. Providing the student with practical and technical experience in calculating the heat transfer from finned surfaces. 7. Introducing the student to Investigate the steady state one dimensional heat conduction in a cylinder and sphere, and estimate the critical radius of insulation for them 8 Introduce the student Basic Concepts convection heat transfer , viscous flow ,inviscid flow ,laminar boundary layer on flat plate . 9. Introducing students study Forced convection –Empirical relations for pipe and flow over flat plate and across tube banks , Empirical relation for free convection on a vertical and horizontal flat plate , vertical and horizontal cylinders . 10. Introduce the student Type of heat exchanger ,The log mean temperature difference Heat exchangers-The overall heat transfer coefficient . 11. Introduce the student Basic Concepts Radiation heat transfer ,physical mechanism ,Radiation Radiation shape factor, relation between shape factors ,heat exchange between non-black bodies, Infinite parallel planes –radiation shields. |
| <p>Module Learning</p> | <p>5- Show the student's ability to use knowledge to prepare scientific and applied research.</p> |

| | |
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| <p>Outcomes</p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>6- The ability to use electronic programs to solve the problems of heat transfer.</p> <p>7- The ability to think to extract engineering solutions to problems related to heat transfer.</p> <p>8- The ability to keep pace with scientific and technical modernity.</p> <p>9- Teaching leadership skills, the value of commitment, love of work and devotion to it.</p> <p>10- The ability to calculate the rate of heat transfer.</p> <p>11- The ability to calculate the heat transfer from finned surfaces.</p> <p>12- The ability to design heat exchangers.</p> |
| <p>Indicative Contents</p> <p>المحتويات الإرشادية</p> | <p>After studying this chapter, the student is expected to master the following knowledge and skills: .</p> <p>1-Basic Concepts of Heat Transfer, and Heat Transfer Mechanisms [10 hrs]</p> <p>2-Steady State One Dimensional Heat Conduction in a Large Plane Wall, and in a Cylinder [15 hrs]</p> <p>3-Conduction through Multilayer Plane Wall Overall Heat Transfer Coefficient, Critical Radius of Insulation [15 hrs]</p> <p>4-Unsteady State One Dimensional heat transfer . [5 hrs]</p> <p>5-Studying the heat transfer from finned surfaces [10 hrs]</p> <p>6-force and free convection [20 hrs].</p> <p>7- design heat exchangers[15 hrs] .</p> <p>8- Solve problem of Radiation heat transfer [20 hrs]</p> |

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

| | |
|--------------------------|---|
| <p>Strategies</p> | <p>Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students.</p> |
|--------------------------|---|

Student Workload (SWL)

الحمل الدراسي للطالب محسوب ل ١٥ اسبوعا

| | | | |
|--|------------|--|-----|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 93 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً | 6.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 82 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً | 5.4 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 175 | | |

| Module Evaluation تقييم المادة الدراسية | | | | | |
|---|------------------------|-------------|------------------|------------|---------------------------|
| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
| Formative assessment | Quizzes | 3 | 10% (10) | 2,6 and 7 | LO #3, #5 and #8 |
| | Assignments | 3 | 10% (10) | 2,6 and 12 | LO #2, #4 and #7 |
| | Projects / Lab. | 10 | 10% (10) | Continuous | All |
| | Report | | | | |
| Summative assessment | Midterm Exam | 2hr | 10% (10) | 7 | LO #1 - #7 |
| | Final Exam | 3hr | 50% (50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

| Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري | |
|---|---|
| | Material Covered |
| Week 1 | Introduction, Basic Concepts of Heat Transfer, Heat Transfer Mechanisms |
| Week 2 | Steady State One Dimensional Heat Conduction in a Large Plane Wall, and in a Cylinder. Conduction |

| | |
|----------------|---|
| | through Multilayer Plane Wall, and Cylinder. |
| Week 3 | Overall Heat Transfer Coefficient, Critical Radius of Insulation, Thermal Contact Resistance. |
| Week 4 | Heat transfer from finned surfaces. |
| Week 5 | Transient Heat Conduction, (Lumped System Analysis), Two-Dimensional Steady Heat Conduction |
| Week 6 | Fundamentals of convection –viscous flow –inviscid flow –laminar boundary layer on flat plate , The thermal boundary layer –turbulent flow in the tube . |
| Week 7 | Empirical Equations of Forced convection for Laminar and Turbulent Flow on Flat Plate , across cylinders and sphere |
| Week 8 | Empirical Equations of Forced convection for Laminar and Turbulent Flow across cylinders and sphere |
| Week 9 | Empirical Equations of Forced convection for Laminar and Turbulent Flow inside pipes and ducts |
| Week 10 | Empirical relation for free convection on a vertical and horizontal flat plate , vertical and horizontal cylinders |
| Week 11 | Introduction to Heat Exchangers, Kinds of Heat Exchangers, The Overall Heat Transfer Coefficient |
| Week 12 | Fouling Factor , The Log Mean Temperature Difference Method |
| Week 13 | The Effectiveness of the heat Exchangers, The Performances for Difference Kinds of the Heat Exchangers |
| Week 14 | Heat Radiation, Introduction, Basic Concepts, Characteristics of Radiation, The View Factor Radiation Heat Transfer Between Two Black Surfaces |
| Week 15 | Radiation Heat Transfer Between Two Gray Surfaces, Radiation Shields and The Radiation Effect |
| Week 16 | Preparatory week before the final Exam |

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

| | Material Covered |
|---------|---|
| Week 1 | Lab 1: Temperature measurements |
| Week 2 | Lab 2: Thermal conductivity. |
| Week 3 | Lab 3: Calibration of thermo-couple |
| Week 4 | Lab 4: Flow across tube banks |
| Week 5 | Lab 5: Heat exchangers |
| Week 6 | Lab 6: Critical Heat Flux |
| Week 7 | Lab 7: Heat Transfer through the Lagged Pipe |
| Week 8 | Lab 8: Thermal Conductivity of Insulating Powder |
| Week 9 | Lab 9 Heat Transfer from a Pin-Fin Apparatus |
| Week 10 | Lab 10: Heat Transfer through Composite Wall |
| Week 11 | Lab 11: Heat Transfer in Forced Convection |
| Week 12 | Lab 12: Parallel Flow / Counter Flow Heat Exchanger |
| Week 13 | Lab 13: Heat Transfer in Natural Convection |
| Week 14 | Lab 14: Thermal Conductivity of Metal Rod |
| Week 15 | Lab 15: Emissivity Measurement Apparatus |

| Learning and Teaching Resources | | |
|---------------------------------|---|---------------------------|
| مصادر التعلم والتدريس | | |
| | Text | Available in the Library? |
| Required Texts | . Heat transfer By : J.P. Holman, Heat and mass transfer By: YunusA.Gengel, | Yes |

| | | |
|--------------------------|--|-----|
| Recommended Texts | . Fundamentals of heat and mass transfer By: Incropera | Yes |
| Websites | https://www. Heat transfer handbook By: Bijan | |

| Module 32 معلومات المادة الدراسية | | | |
|---|---|--------------------------------------|---|
| Module Title | Combustion & Pollution Engineering | | Module Delivery |
| Module Type | Core | | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar |
| Module Code | RETE 307 | | |
| ECTS Credits | 6 | | |
| SWL (hr/sem) | 150 | | |
| Module Level | 3 | Semester of Delivery | 6 |
| Administering Department | RETE | College | Oil and gas technical college/ Kirkuk |
| Module Leader | | e-mail | |
| Module Leader's Acad. Title | | Module Leader's Qualification | |
| Module Tutor | | e-mail | @ntu.edu.iq |
| Peer Reviewer Name | Name | e-mail | E-mail |
| Scientific Committee Approval Date | 01/06/2023 | Version Number | 1.0 |

| Relation with other Modules العلاقة مع المواد الدراسية الأخرى | | | |
|---|------|-----------------|--|
| Prerequisite module | | Semester | |
| Co-requisites module | None | Semester | |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|---|---|
| <p>Module Objectives</p> <p>أهداف المادة الدراسية</p> | <ol style="list-style-type: none">1. Introduce the student to the types of Fuel & combustion process.2. Introduce the student Basic Concepts of Thermodynamics of combustion , stoichiometric combustion , incomplete combustion , complete combustion , Air fuel ratio (A/F),3. Introducing students how to calculate adiabatic flame temperature , constant pressure adiabatic flame temperature , constant volume adiabatic flame temperature.4. Introducing students to study Classifications of engines and Engine performance.5. Introducing the student to Air-Standard cycles .6. Introduce the student types of hydrocarbon fuels , Hydrocarbon fuels gasoline , Diesel fuel , Alternate fuels .7. Introducing students study Octane Number & Cetane Number, Self-Ignition Characteristics of Fuels , Octane Number and Engine Knock8. Introduce the student Basic Concepts of air pollution, physical and chemical fundamentals.9. Introduce the student Ambient air quality standards for criteria pollutants, Air pollution standards, Air pollution regulation.10. To understand Air pollutants classification, Transport and air pollution, Causes of air pollution from Transportation.11. Introducing students study the Strategies for control of emissions in SI engines; Add on systems to control emissions inside the engine: EGR, crankcase and evaporative emission control |
| <p>Module Learning Outcomes</p> <p>مخرجات التعلم للمادة الدراسية</p> | <p>Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Show the student's ability to use knowledge to prepare scientific and applied research. 2. The ability to use electronic programs to solve the problems of combustion process. 3. The ability to think to extract engineering solutions to problems related to combustion and pollution. 4. The ability to keep pace with scientific and technical modernity. 5. Teaching leadership skills, the value of commitment, love of work and devotion to it. 6. The ability to calculate the rate of adiabatic flame temperature. 7. The ability to calculate the Calculation of concentrations of air pollutants in the atmosphere. 8. The ability to control emissions in SI engines .</p> |
| <p>Indicative Contents</p> | <p>After studying this chapter, the student is expected to master the following</p> |

| | |
|---------------------|---|
| المحتويات الإرشادية | <p>knowledge and skills:</p> <p>1-Basic Concepts of combustion , and types of combustion [15 hrs] 2- calculations adiabatic flame temperature [10 hrs] 3- Classifications of engines and Engine performance. [15 hrs]</p> <p>4- Types of hydrocarbon fuels , Hydrocarbon fuels gasoline , Diesel fuel , Alternate fuels . [15 hrs] 5-Studying Octane Number &Cetane Number [10 hrs]</p> <p>6- air pollution and Air pollution regulation [20 hrs].</p> <p>7- Strategies for control of emissions in SI engines [15 hrs] .</p> |
|---------------------|---|

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

| | |
|-------------------|--|
| Strategies | Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students. |
|-------------------|--|

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

| | | | |
|--|------------|---|-----|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 63 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا | 4.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 87 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا | 5.8 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 150 | | |

Module Evaluation

تقييم المادة الدراسية

| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
|-----------------------------|------------------------|-------------|------------------|----------------|---------------------------|
| Formative assessment | Quizzes | 4 | 20% (20) | 2, 6 and 9, 12 | LO #1, #5 and #6, #8 |
| | Assignments | 3 | 15% (15) | 4, 8 and 14 | LO #2, #3 and #7 |
| | Projects / Lab. | | | | |
| | Report | 1 | 5% (5) | 13 | LO #4 |
| Summative assessment | Midterm Exam | 2hr | 10% (10) | 7 | LO #1 - #7 |
| | Final Exam | 3hr | 50% (50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

| | Material Covered |
|---------------|--|
| Week 1 | Thermodynamics of combustion, . Review of property relations ,latent heat of vaporization , Ideal gas mixtures ,Fuel & combustion , stoichiometric combustion , incomplete combustion , complete combustion , Air fuel ratio (A/F) |
| Week 2 | Excess of air , less of air ,theoretical of air , Equivalence ratio. |
| Week 3 | Application of 1st law of thermodynamic on combustion process, Closed system (non-flow process) , Open system (steady -flow process) |
| Week 4 | adiabatic flame temperature , constant pressure adiabatic flame temperature , constant volume adiabatic flame temperature |
| Week 5 | Classifications of engines, Types of Ignition, Engine Cycle, Basic Design, Air Intake Process, Method of Fuel Input for SI Engines, Fuel Used , Application , Type of Cooling |
| Week 6 | Engine performance , brake power , brake thermal efficiency , brake mean effective pressure , |

| | |
|----------------|---|
| | Specific fuel consumption , Mechanical efficiency , Volumetric efficiency |
| Week 7 | Air-Standard cycle , Air-Standard Assumptions , pressure volume diagram , Mean process on p-v diagram , Otto Cycle , Thermal efficiency of the ideal Otto cycle , diesel cycle , Thermal efficiency of the ideal diesel cycle |
| Week 8 | Air-fuel cycle , Air-fuel cycle assumption , constant volume cycle (gasoline engine cycle) , constant pressure cycle (Diesel engine cycle) |
| Week 9 | hydrocarbon fuels , Hydrocarbon fuels gasoline , Diesel fuel , Alternate fuels |
| Week 10 | Octane Number & Cetane Number , Self-Ignition Characteristics of Fuels , Octane Number and Engine Knock |
| Week 11 | Introduction to pollution , Ecological Systems and pollution , Toxic pollutants , Environmental factors affecting toxicity , Ambient air quality standards for criteria pollutants , Air pollution standards , Air pollution regulation |
| Week 12 | Air pollutants classification , Transport and air pollution , Causes of air pollution from Transportation |
| Week 13 | Calculation of concentrations of air pollutants in atmosphere , Description of air pollutants , A-Criteria Pollutants , Carbon Monoxide (CO) , Nitrogen Oxides (NO ₂) , Sulphur Oxides (SO _x) , Particulate Matter (PM-10) , Organic air pollutants (VOCs) , Hydrocarbons (HC) , Ozone (O ₃) , Lead(Pb) |
| Week 14 | Calculation of concentrations of air pollutants in atmosphere , |
| Week 15 | Global Climate Change - Greenhouse Gases Toxic Pollutants, Radioactive pollutants, indoor pollutants and Non-Criteria pollutants |
| Week 16 | Preparatory week before the final Exam |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|-----------------------|---|---------------------------|
| Required Texts | . Engineering Fundamentals of the Internal Combustion | Yes |

| | | |
|--------------------------|--|-----|
| | Engine By Willard W. Pulkrabek | |
| Recommended Texts | AN INTRODUCTION TO COMBUSTION Concepts and Application. BY Stephen R. Turns | Yes |
| Websites | | |

| Module 33 معلومات المادة الدراسية | | | |
|---|---------------------------|--------------------------------------|---|
| Module Title | Numerical Analysis | | Module Delivery |
| Module Type | Core | | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar |
| Module Code | COGTEK 301 | | |
| ECTS Credits | 6 | | |
| SWL (hr/sem) | 150 | | |
| Module Level | 3 | Semester of Delivery | |
| Administering Department | RETE | College | Oil and gas technical college/ Kirkuk |
| Module Leader | | | e-mail |
| Module Leader's Acad. Title | Assist. Lecture | Module Leader's Qualification | MSc |
| Module Tutor | Ali Qani Mohammed Saleh | e-mail | ali.alkurdi23@ntu.edu.iq |
| Peer Reviewer Name | Name | e-mail | E-mail |
| Scientific Committee Approval Date | 01/06/2023 | Version Number | 1.0 |

| Relation with other Modules العلاقة مع المواد الدراسية الأخرى | |
|---|--|
| | |

| | | | |
|-----------------------------|------|-----------------|--|
| Prerequisite module | None | Semester | |
| Co-requisites module | None | Semester | |

| Module Aims, Learning Outcomes and Indicative Contents | |
|--|---|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية | |
| Module Objectives أهداف المادة الدراسية | <ol style="list-style-type: none"> 1. Develop a solid foundation in numerical concepts and techniques used in numerical Analysis. 2. Understand the principles and applications of numerical methods for solving engineering problems. 3. Gain proficiency in using software tools and programming languages for numerical analysis. 4. Acquire the skills to analyze and interpret numerical results to make informed engineering decisions. 5. Apply mathematical modeling techniques to solve real-world engineering problems. |
| Module Learning Outcomes مخرجات التعلم للمادة الدراسية | <p>The intended subject specific learning outcomes. On successfully completing the module students will be able to:</p> <ol style="list-style-type: none"> 1. Acquire a comprehensive understanding of the fundamental principles and concepts underlying a broad range of basic methods used in Numerical Analysis. 2. Demonstrate proficiency in applying a variety of established techniques and effectively utilizing computational tools to solve engineering problems. 3. Apply the acquired knowledge and skills in basic numerical approximation to address complex problems in diverse contexts, demonstrating the ability to critically assess and select appropriate tools and techniques. 4. Effectively employ MATLAB commands and functions to implement and execute Numerical Analysis tasks, demonstrating competence in utilizing computational tools for problem-solving. |
| Indicative Contents المحتويات الإرشادية | Part A Introduction, Mathematical Analysis, Numerical Differentiation and Integration [20 hr.] Numerical Solutions of Ordinary Differential Equations, Systems of Linear Equations [|

| | |
|--|---|
| | 20 hr.] Revision problem classes and quiz [3 hrs] Part B Eigenvalues and Eigenvectors, Numerical Methods in Probability and Statistics, Numerical Methods for Control Systems [20 hr.] |
|--|---|

| Learning and Teaching Strategies استراتيجيات التعلم والتعليم | |
|--|---|
| Strategies | <ol style="list-style-type: none"> 1. Establish a solid foundation: Start by thoroughly understanding the fundamental concepts and principles of Numerical Analysis. This includes grasping the Numerical techniques and numerical methods commonly used in the field. 2. Practice problem-solving: Numerical Analysis involves solving complex problems. Regularly practice solving a variety of problems to enhance your problem-solving skills and develop a deeper understanding of the subject matter. 3. Utilize resources: Take advantage of textbooks, online resources, and reference materials specific to Numerical Analysis. These resources can provide additional explanations, examples, and practice problems to reinforce your understanding. |

| Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا | | | |
|--|------------|---|-----|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 78 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا | 5.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 72 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا | 4.8 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 150 | | |

Module Evaluation

تقييم المادة الدراسية

| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
|-----------------------------|------------------------|-------------|------------------|------------|---------------------------|
| Formative assessment | Quizzes | 2 | 10% (10) | 5 and 10 | LO 10, and #11 |
| | Assignments | 2 | 10% (10) | 2 and 12 | LO #3, and #7 |
| | Projects / Lab. | 1 | 10% (10) | Continuous | All |
| | Report | 1 | 10% (10) | 13 | LO #8 |
| Summative assessment | Midterm Exam | 2hr | 10% (10) | 7 | LO #1 - #7 |
| | Final Exam | 3hr | 50% (50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

| | Material Covered |
|---------------|--|
| Week 1 | Introduction to Numerical Analysis; numerical analysis and its applications in engineering, Sources of error in numerical computations |
| Week 2 | Numerical Methods for Solving Equations; Bisection method, Newton-Raphson method, Secant method |
| Week 3 | Interpolation and Approximation; Polynomial interpolation, Lagrange interpolation, Least squares approximation |
| Week 4 | Numerical Differentiation and Integration; Forward, backward, and central difference approximations, Trapezoidal rule, Simpson's rule |
| Week 5 | Numerical Solutions of Ordinary Differential Equations; Euler's method, Runge-Kutta methods, Multistep methods |

| | |
|----------------|---|
| Week 6 | Systems of Linear Equations; Direct methods: Gaussian elimination, LU decomposition, Iterative methods: Jacobi method, Gauss-Seidel method |
| Week 7 | Eigenvalues and Eigenvectors; Power method, QR method |
| Week 8 | Numerical Solutions of Partial Differential Equations; Finite difference methods, Finite element methods |
| Week 9 | Numerical Optimization; Unconstrained optimization: Golden section search, Newton's method, Constrained optimization: Linear programming, quadratic programming |
| Week 10 | Numerical Methods for Data Analysis; Curve fitting, Statistical regression |
| Week 11 | Numerical Methods in Probability and Statistics; Monte Carlo simulation, Numerical integration of probability density functions |
| Week 12 | Numerical Methods for Signal Processing; Discrete Fourier transform, Fast Fourier transform |
| Week 13 | Numerical Methods for Image Processing; Image enhancement techniques, Image restoration methods |
| Week 14 | Numerical Methods for Control Systems; Numerical simulation of control, systems, Model predictive control |
| Week 15 | Review and Project Presentations |
| Week 16 | Preparatory week before the final Exam |

| Delivery Plan (Weekly Lab. Syllabus) | |
|---|---|
| المنهاج الاسبوعي للمختبر | |
| | Material Covered |
| Week 1 | Lab 1: Introduction to Numerical Analysis and MATLAB. |
| Week 2 | Lab 2: Numerical Methods |
| Week 3 | Lab 3: Interpolation and Curve Fitting |

| | |
|---------------|--|
| Week 4 | Lab 4: Numerical Integration |
| Week 5 | Lab 5: Numerical Solutions of Ordinary Differential Equations |
| Week 6 | Lab 6: Systems of Linear Equations |
| Week 7 | Lab 7: Numerical Solutions of Partial Differential Equations; Finite difference methods, |

| Learning and Teaching Resources | | |
|--|--|---------------------------|
| مصادر التعلم والتدريس | | |
| | Text | Available in the Library? |
| Required Texts | <ol style="list-style-type: none"> "Numerical Analysis" by R. L. Burden and J. D. Faires: This book covers fundamental numerical methods and their applications in a concise and accessible manner. "Numerical Methods for Engineers" by S. C. Chapra and R. P. Canale: This textbook focuses on the practical aspects of numerical analysis and provides a wide range of examples and exercises. | No |
| Recommended Texts | <ol style="list-style-type: none"> "Numerical Analysis: Mathematics of Scientific Computing" by D. Kincaid and W. Cheney: This book emphasizes the mathematical foundations of numerical methods and includes rigorous analysis of algorithms. "Numerical Recipes: The Art of Scientific Computing" by W. H. Press et al.: This popular book provides a comprehensive collection of numerical algorithms, along with code implementation in various programming languages. | No |
| Websites | <ol style="list-style-type: none"> (https://www.mathworks.com/) (http://www.numericalmethods.eng.usf.edu/) (https://www.engineering.com/) | |

المستوى الرابع

| Module 34 معلومات المادة الدراسية | | | |
|--|------------------|---|---|
| Module Title | Wind Energy | | |
| Module Type | Core | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input checked="" type="checkbox"/> Seminar | |
| Module Code | RETE 400 | | |
| ECTS Credits | 5 | | |
| SWL (hr/sem) | 125 | | |
| Module Level | 4 | Semester of Delivery | 7 |
| Administration Department | RETE | College | College of Oil and Gas Techniques Engineering - Kirkuk, Northern Technical University, Iraq |
| Module Leader | Afrah Turki Awad | e-mail | afrah.turki@ntu.edu.iq |
| Module Leader's Acad. Title | Lecturer | Module Leader's Qualification | PhD |
| Module Tutor | | e-mail | |
| Peer Reviewer Name | | e-mail | |
| Scientific Committee Approval Date | | Version Number | |

| Relation with other Modules العلاقة مع المواد الدراسية الأخرى | | | |
|--|------|----------|----|
| Prerequisite module | None | Semester | -- |
| Co-requisites module | None | Semester | -- |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|--|---|
| <p>Module Aims أهداف المادة الدراسية</p> | <p>Wind energy is the fast growing renewable source for electricity generation. The objective of this course is to present a broad overview of the technology covering aspects such as the history of wind turbine development, the characteristics of the wind and its impact on site selection, and the design, manufacture, and operation of modern wind turbines. The course has a practical flavour, drawing on examples from the wind turbine engineering and development sectors. The political and economic implications of wind energy are explored in the final lecture.</p> |
| <p>Module Learning Outcomes مخرجات التعلم للمادة الدراسية</p> | <p>On completion of this module the student will:</p> <ul style="list-style-type: none">• i) be capable of conducting a basic wind resource estimation and site assessment.• ii) understand the fundamentals of wind turbine design and operation• iii) understand issues related to integrating wind energy into an electricity distribution network• iv) appreciate the strengths and limitations of wind energy in an economic and political context |
| <p>Indicative Contents الإرشادية المحتويات</p> | <p>A wind turbine module typically focuses on a specific aspect or subset of topics related to wind energy systems. Modules are usually part of a larger course or program and provide in-depth knowledge and skills in a particular area. Here are some indicative contents that might be included in a wind turbine module:</p> <ol style="list-style-type: none">1. Introduction to Wind Turbine Technology.2. Wind Turbine Aerodynamics.3. Wind Energy Conversion Systems.4. Wind Resource Assessment.5. Structural Analysis and Design.6. Operation and Maintenance.7. Grid Integration and Electrical Systems.8. Environmental Impact and Regulations. |

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

| | |
|-------------------|--|
| Strategies | Teaching Method 1 – Lectures Description: Attendance Recorded: Yes |
| | Teaching Method 2 – Asynchronous online course materials Description: Podcasts, videos, and articles on Renewable Energy Attendance Recorded: No |
| | Unscheduled Directed Student Hours (time spent away from the timetabled sessions but directed by the teaching staff). |
| | Teaching Method 3 - Tutorials Description: Attendance Recorded: Yes |
| | Teaching Method 4 - Practical Description: Practical homework assignments Attendance Recorded: No Unscheduled Directed Student Hours (time spent away from the timetabled sessions but directed by the teaching staff). |

Student Workload (SWL)

الحمل الدراسي للطالب

| | | | |
|---|-----|---|------|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 63 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً | 4.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 62 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.13 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 125 | | |

Module Evaluation

تقييم المادة الدراسية

| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
|----------------------|---------|-------------|----------------|------------|---------------------------|
| Formative assessment | Quizzes | 4 | 10% (10) | 5, 10 | LO #1 and 2 |
| | Seminar | 2 | 10% (10) | Continuous | All |

| | | | | | |
|----------------------|---------------|------|----------|-----------|---------------|
| | Lab Report | 5 | 20% (20) | 2,6,12,14 | LO # 3,4,8,12 |
| Summative assessment | Mid Term exam | 2 hr | 10% (10) | 11 | LO # 1-3 |
| | Final Exam | 3 hr | 50% (50) | 16 | All |
| 100% (100 Marks) | | | | | |

Delivery Plan (Weekly Syllabus)

المنهاج الأسبوعي النظري

| | |
|---------------|--------------------------------------|
| Week 1 | Background of wind turbines |
| Weeks (2 - 3) | Evolution of modern wind turbines |
| Weeks (4 - 5) | The wind and its characteristics |
| Week 6 | Wind Turbine Aerodynamics |
| Week 7 | Structural design and analysis |
| Week 8 | Electrical Aspects |
| Week 9 | Wind Turbine control and operation |
| Week 10 | materials and manufacture |
| Week 11 | Mid-Term Exam |
| Week 12 | Planning and Siting |
| Week 13 | Construction and offshore wind |
| Week 14 | Politics, economics and case studies |
| Week 15 | Preparing for the final Exam |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|----------------|---|---------------------------|
| Required Texts | Wind Energy Explained, Manwell, McGowan and Rogers, Wiley 2002, ISBN 0 471 49972 2 | No |
| | Wind Energy Handbook, Burton, Sharpe, Jenkins and Bossanyi; Wiley, 2001, ISBN 0 471 48997 2 | No |
| | Renewable Energy in Power Systems, Freris & Infield; Wiley, 2008, ISBN 978 0 471 01749 4 | No |

Module 35

معلومات المادة الدراسية

| | | | |
|------------------------------------|--------------------------------|---|---|
| Module Title | Photovoltaic Energy Conversion | | |
| Module Type | Core | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input checked="" type="checkbox"/> Seminar | |
| Module Code | RETE 401 | | |
| ECTS Credits | 5 | | |
| SWL (hr/sem) | 125 | | |
| Module Level | 4 | Semester of Delivery | 7 |
| Administration Department | RETE | College | College of Oil and Gas Techniques Engineering - Kirkuk, Northern Technical University, Iraq |
| Module Leader | Afrah Turki Awad | e-mail | afrah.turki@ntu.edu.iq |
| Module Leader's Acad. Title | Lecturer | Module Leader's Qualification | PhD |
| Module Tutor | | e-mail | |
| Peer Reviewer Name | | e-mail | |
| Scientific Committee Approval Date | | Version Number | |

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

| | | | |
|----------------------|----------|----------|----|
| Prerequisite module | RETE 305 | Semester | 6 |
| Co-requisites module | None | Semester | -- |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية

The module "Photovoltaic Energy Conversion" is designed with several key aims to provide students with a comprehensive understanding of the principles and applications of photovoltaic technology. Firstly, the module aims to establish a strong foundation in the fundamental principles of photovoltaic energy conversion, including semiconductor physics and the photovoltaic effect. Students will explore various photovoltaic technologies, delving into the intricacies of different types of solar cells and comprehending their specific applications and limitations. Moreover, the module aims to equip students with practical skills in designing and evaluating photovoltaic systems for diverse purposes, such as residential, commercial, and utility-scale applications. Emphasis is placed on integrating energy storage solutions to enhance the reliability of photovoltaic systems and promote grid stability. Additionally, the module aims to foster an understanding of the economic and environmental aspects of photovoltaic energy, encouraging students to analyze the cost-effectiveness of solar energy solutions and consider sustainable practices in the industry. By promoting problem-solving skills, encouraging research endeavors, and emphasizing the significance of grid integration and societal impact, this module aims to prepare students for careers in the rapidly evolving field of photovoltaic energy conversion, equipping them to contribute meaningfully to the renewable energy sector and address the challenges of a sustainable energy future.

Module Learning Outcomes

مخرجات التعلم للمادة الدراسية

Upon completing the course, students should be able to:

1. Understand Photovoltaic Principles: Demonstrate a deep understanding of the principles underlying photovoltaic energy conversion, including semiconductor physics, the photovoltaic effect, and the operation of solar cells.
2. Evaluate Solar Cell Technologies: Analyze and compare various types of solar cells, including monocrystalline, polycrystalline, and thin-film technologies, considering their efficiency, materials, and applications.
3. Assess Solar Radiation: Evaluate solar radiation data and understand its significance in photovoltaic system design, including site-specific considerations, shading analysis, and tilt optimization.
4. Design Photovoltaic Systems: Design photovoltaic systems for different scales of applications, considering energy demands, system sizing, orientation, and integration techniques such as inverters and charge controllers.
5. Integrate Energy Storage Solutions: Integrate energy storage solutions, including batteries, into photovoltaic systems, ensuring effective energy management, load balancing, and grid stability.
6. Analyze Balance of System Components: Understand and analyze balance of system components such as wiring, fuses, and grounding

| | |
|---|--|
| | <p>systems, ensuring the safe and efficient operation of photovoltaic installations.</p> <ol style="list-style-type: none"> 7. Perform System Simulation: Utilize software tools for system simulation, analyzing the performance of photovoltaic systems under various conditions, and optimizing for maximum efficiency and reliability. 8. Evaluate Environmental and Economic Aspects: Assess the environmental impact of photovoltaic technologies, considering life cycle analysis and carbon footprint. Conduct economic evaluations, including cost-benefit analysis, payback periods, and return on investment calculations. 9. Troubleshoot and Maintain Systems: Develop skills in diagnosing and troubleshooting common issues in photovoltaic systems. Understand maintenance practices, ensuring the long-term sustainability and efficiency of installations. 10. Apply Regulatory and Safety Standards: Apply knowledge of national and international regulatory standards, codes, and safety practices relevant to photovoltaic energy systems, ensuring compliance and safe operation. 11. Communicate Effectively: Present technical information related to photovoltaic energy conversion clearly and effectively, both in written reports and oral presentations, demonstrating effective communication skills. 12. Work in Interdisciplinary Teams: Collaborate effectively in interdisciplinary teams, integrating knowledge from engineering, environmental science, and economics to address complex challenges in photovoltaic energy conversion. 13. These Module Learning Outcomes are designed to equip students with a comprehensive skill set and knowledge base, enabling them to excel in the design, implementation, and evaluation of photovoltaic energy systems. |
| <p>Indicative Contents الإرشادية المحتويات</p> | <p>This module encompasses a wide range of indicative contents designed to provide students with a deep understanding of solar energy technology and its practical applications. The curriculum begins with fundamental concepts in semiconductor physics, elucidating the principles underlying the photovoltaic effect. Students delve into the study of various types of solar cells, including monocrystalline, polycrystalline, and thin-film technologies, comprehending their structures, materials, and efficiency factors. The module covers solar radiation analysis, emphasizing the importance of understanding the local solar resource for effective system design. Additionally, students explore the intricacies of solar module construction and characterization, gaining insights into the manufacturing processes and quality control standards.</p> |

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| | <p>A significant portion of the module is dedicated to photovoltaic system design and integration. Students learn the art of sizing photovoltaic systems based on energy demands, considering factors like shading, tilt, and orientation. Grid integration techniques, including inverters and energy storage solutions, are thoroughly explored to ensure seamless integration into existing electrical systems. The curriculum also includes an in-depth analysis of balance of system components such as charge controllers, batteries, and wiring, ensuring students grasp the holistic view of photovoltaic installations. Moreover, the module delves into practical aspects of photovoltaic energy conversion, including hands-on lab sessions for solar cell efficiency measurements, system simulation exercises, and troubleshooting scenarios. Environmental and economic considerations are incorporated, encouraging students to evaluate the life cycle analysis, carbon footprint, and cost-benefit aspects of photovoltaic projects. Case studies and real-world applications supplement theoretical knowledge, providing students with valuable insights into successful photovoltaic installations across various contexts. Overall, the indicative contents of the module offer a well-rounded education in photovoltaic energy conversion, preparing students for careers in solar energy research, design, and implementation.</p> |
|--|--|

| Learning and Teaching Strategies استراتيجيات التعلم والتعليم | |
|---|--|
| Strategies | <p>Teaching Method 1 – Lectures Description: Attendance Recorded: Yes</p> <p>Teaching Method 2 – Asynchronous online module materials Description: Podcasts, videos, and articles on Renewable Energy Attendance Recorded: No</p> <p>Unscheduled Directed Student Hours (time spent away from the timetabled sessions but directed by the teaching staff).</p> <p>Teaching Method 3 - Tutorials Description: Attendance Recorded: Yes</p> <p>Teaching Method 4 - Practical Description: Practical homework assignments Attendance Recorded: No Unscheduled Directed Student Hours (time spent away from the timetabled sessions but directed by the teaching staff).</p> |

| Student Workload (SWL) الحمل الدراسي للطالب | | | |
|---|-----|---|------|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 63 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً | 4.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 62 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.13 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 125 | | |

| Module Evaluation تقييم المادة الدراسية | | | | | |
|--|---------------|-------------|----------------|-------------|---------------------------|
| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
| Formative assessment | Quizzes | 4 | 20% (20) | 2, 5, 8, 10 | LO #1, 4, 9 and 13 |
| | Seminar | 2 | 10% (10) | Continuous | All |
| | Lab Report | 5 | 10% (10) | 2,6,12,14 | LO # 3,4,8,12 |
| Summative assessment | Mid Term exam | 2 hr | 10% (10) | 9 | LO # 1-11 |
| | Final Exam | 3 hr | 50% (50) | 16 | All |
| 100% (100 Marks) | | | | | |

| Delivery Plan (Weekly Syllabus) المنهاج الأسبوعي النظري | |
|--|---|
| Weeks (1-2) | Introduction to Photovoltaic Energy <ul style="list-style-type: none"> Overview of renewable energy sources Importance and applications of photovoltaic energy Historical development of photovoltaic technology Basic concepts of semiconductor physics relevant to solar cells |
| Week 3 | Solar Radiation and Solar Cells <ul style="list-style-type: none"> Solar radiation: measurement and data analysis Solar cell structure and operation Different types of solar cells: monocrystalline, polycrystalline, thin-film, and emerging technologies |

| | |
|---------------|---|
| | <ul style="list-style-type: none"> • Efficiency factors and characteristics of solar cells |
| Week 4 | Photovoltaic System Components <ul style="list-style-type: none"> • PV modules: construction, characterization, and testing • Inverters, charge controllers, and batteries in PV systems • Balance of system components: wiring, fuses, and grounding • Energy storage solutions: types and integration techniques |
| Weeks (5-6) | Photovoltaic System Design <ul style="list-style-type: none"> • Site assessment and solar resource analysis • System sizing: load estimation, energy production calculation • System configuration and layout for different applications • Grid-connected vs. off-grid PV systems: design considerations |
| Weeks (7-8) | Grid Integration and Power Electronics <ul style="list-style-type: none"> • Grid-tied PV systems: net metering, grid integration standards • Power electronics in PV systems: DC-DC converters, inverters, and maximum power point tracking (MPPT) • Microgrid and smart grid technologies in solar energy integration |
| Week 9 | Mid-Term Exam |
| Weeks (10-11) | Energy Storage and System Simulation <ul style="list-style-type: none"> • Energy storage technologies: batteries, thermal storage • System simulation tools: modeling and performance prediction • Hands-on simulation exercises: analyzing PV system performance under various conditions |
| Weeks (12-14) | Economic and Environmental Aspects <ul style="list-style-type: none"> • Economic analysis of PV systems: cost-benefit analysis, payback periods, return on investment • Environmental impact assessment: life cycle analysis, carbon footprint • Case studies of successful PV installations • Future trends and emerging technologies in photovoltaic energy conversion |
| Week 15 | Preparing for the final Exam |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|----------------|--|---------------------------|
| Required Texts | Reinders, A., Verlinden, P., Van Sark, W. and Freundlich, A., 2017. <i>Photovoltaic solar energy: from fundamentals to applications</i> . John Wiley & Sons. | No |
| | Lasnier, F., 2017. <i>Photovoltaic engineering handbook</i> . Routledge. | No |

Module 36

معلومات المادة الدراسية

| | | | |
|------------------------------------|--|---|--|
| Module Title | Simulation of renewable energy systems | | |
| Module Type | Core | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar | |
| Module Code | RETE 402 | | |
| ECTS Credits | 6 | | |
| SWL (hr/sem) | 150 | | |
| Module Level | 4 | Semester of Delivery | 7 |
| Administration Department | RETE | College | College of Oil & Gas Techniques Engineering/Kirkuk |
| Module Leader | Ali Qani Mohammed Saleh | e-mail | ali.alkurdi23@ntu.edu.iq |
| Module Leader's Acad. Title | Lecturer | Module Leader's Qualification | MSc. |
| Module Tutor | Name (if available) | e-mail | |
| Peer Reviewer Name | | e-mail | |
| Scientific Committee Approval Date | | Version Number | 1 |

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

| | | | |
|----------------------|----------|----------|----|
| Prerequisite module | RETE 302 | Semester | 5 |
| Co-requisites module | None | Semester | -- |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|--|---|
| <p>Module Aims أهداف المادة الدراسية</p> | <ol style="list-style-type: none"> 7. Simulation Proficiency: The aim of this module is to equip students with the knowledge and skills required to proficiently simulate and model the behavior of renewable energy systems. Students should be able to create accurate mathematical models of these systems and use simulation techniques to analyze their performance effectively. 8. Assessment and Optimization: The module aims to enable students to assess the efficiency and reliability of renewable energy systems through simulations. Students should gain the ability to identify opportunities for optimization and make informed decisions to enhance the performance of these systems. 9. Real-World Application: By the end of the module, students should be capable of applying simulation techniques to practical scenarios in the renewable energy sector. They will gain the competence to address real-world challenges and evaluate the impact of different factors on system behavior, making them valuable contributors to the renewable energy industry. |
| <p>Module Learning Outcomes مخرجات التعلم للمادة الدراسية</p> | <p>(LO9). Model Development: Students will be able to develop mathematical models that accurately represent the behavior and components of various renewable energy systems, including solar, wind, and hydropower.</p> <p>(LO10). Simulation Proficiency: Upon completion of the module, students will possess the skills to use simulation software and tools to create detailed and dynamic models of renewable energy systems.</p> <p>(LO11). Data Collection and Analysis: Students will learn to gather relevant data, perform data analysis, and integrate data into their simulation models to ensure realistic system behavior.</p> <p>(LO12). Performance Evaluation: The module will equip students to assess the performance of renewable energy systems under various conditions and scenarios, enabling them to identify areas for improvement.</p> <p>(LO13). Optimization Techniques: Students will gain knowledge of optimization methods and strategies to enhance the efficiency and reliability of renewable energy systems, considering factors such as resource availability and load demand.</p> <p>(LO14). System Integration: Students will understand how to simulate the integration of renewable energy systems into the wider energy infrastructure, taking into account grid compatibility and energy storage solutions.</p> <p>(LO15). Sensitivity Analysis: Graduates of the module will be proficient in</p> |

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| | <p>conducting sensitivity analyses to evaluate the impact of different variables and parameters on system performance and behavior.</p> <p>(LO16). Scenario Planning: Students will be capable of using simulation to explore various scenarios, allowing them to assess the resilience and adaptability of renewable energy systems in different conditions, including extreme weather events or changing energy demands.</p> <p>(LO17). Reporting and Communication: Students will be able to effectively communicate their simulation results and findings to various stakeholders, such as project managers, policymakers, and investors.</p> <p>(LO18). Practical Applications: Upon completion, students should be able to apply their simulation skills to practical situations in the renewable energy sector, contributing to the design, analysis, and optimization of real-world renewable energy projects.</p> |
| <p>Indicative Contents الإرشادية المحتويات</p> | <p>Indicative content includes the following.</p> <ul style="list-style-type: none"> • Introduction to Simulation <ul style="list-style-type: none"> • Definition and importance of simulation • Role of simulation in renewable energy systems • Mathematical Modeling <ul style="list-style-type: none"> • Basics of mathematical modeling • Differential equations and system representation • Energy balance equations for renewable systems • Simulation Software and Tools <ul style="list-style-type: none"> • Introduction to simulation software (e.g., Python, MATLAB/Simulink, RETScreen) • Hands-on training with simulation tools • Solar Energy System Simulation <ul style="list-style-type: none"> • Solar PV system modeling • Solar thermal system modeling • Impact of solar irradiance and weather conditions • Wind Energy System Simulation <ul style="list-style-type: none"> • Wind turbine modeling • Wind farm modeling • Wind resource assessment and simulation • Hydropower System Simulation <ul style="list-style-type: none"> • Hydroelectric power plant modeling • Run-of-river and dam-based systems • Impact of water flow and reservoir levels • Biomass Energy System Simulation <ul style="list-style-type: none"> • Biomass combustion and gasification modeling • Biogas and biofuel production simulation • Resource availability and feedstock analysis • Geothermal Energy System Simulation <ul style="list-style-type: none"> • Geothermal power plant modeling • Geothermal heat pump modeling • Ground heat exchanger simulations • Data Collection and Integration <ul style="list-style-type: none"> • Gathering data for simulation |

| | |
|--|---|
| | <ul style="list-style-type: none"> • Data analysis and validation • Integrating real data into simulations • Performance Assessment <ul style="list-style-type: none"> • Evaluating the performance of renewable energy systems using simulation • Performance indicators and metrics • Optimization Techniques <ul style="list-style-type: none"> • Strategies for optimizing renewable energy system performance • Sensitivity analysis and scenario planning • Grid Integration and Energy Storage <ul style="list-style-type: none"> • Simulation of grid-connected renewable energy systems • Battery energy storage and load balancing • Case Studies and Projects <ul style="list-style-type: none"> • Analysis of real-world renewable energy projects using simulation • Group projects and hands-on simulation exercises • Sustainability and Environmental Impact Assessment <ul style="list-style-type: none"> • Incorporating sustainability aspects into simulation • Environmental impact assessments • Report Writing and Communication <ul style="list-style-type: none"> • Communicating simulation results effectively • Presentation of findings to stakeholders • Emerging Technologies and Future Trends <ul style="list-style-type: none"> • Exploration of innovative simulation tools and techniques • Future trends in renewable energy system simulation |
|--|---|

| Learning and Teaching Strategies استراتيجيات التعلم والتعليم | |
|---|--|
| Strategies | <p>Teaching Method 1 – Lectures Description: Attendance Recorded: Yes</p> <p>Teaching Method 2 – Asynchronous on-line course materials Description: Podcasts, videos and articles in thermodynamics Attendance Recorded: No</p> <p>Unscheduled Directed Student Hours (time spent away from the timetabled sessions but directed by the teaching staff).</p> <p>Teaching Method 3 - Tutorials Description: Attendance Recorded: Yes</p> <p>Teaching Method 4 - Practical Description: Practical homework assignments Attendance Recorded: No Unscheduled Directed Student Hours (time spent away from the timetabled</p> |

sessions but directed by the teaching staff).

Student Workload (SWL)

الحمل الدراسي للطالب

| | | | |
|---|-----|---|-----|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 78 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً | 5.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 72 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.8 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 150 | | |

Module Evaluation

تقييم المادة الدراسية

| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
|----------------------|------------------------|-------------|------------------|--------------------|----------------------------|
| Formative assessment | Quizzes | 5 | 10% (10) | 4,6,8,10,12 and 14 | LO #2, #3,#5,#7,#9 and #11 |
| | Assignments | 5 | 10% (10) | 2,6,8 and 12 | LO #1, #4, #6and #10 |
| | Projects / Lab. Report | 4 | 20% (20) | Continuous | All |
| | | | | | |
| Summative assessment | Midterm Exam | 2 hr | 10%(10) | 7 | LO #1 - #5 |
| | Final Exam | 3 hr | 50%(50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

| | |
|--------|--|
| Week 1 | Introduction to Simulation - Overview of the course, Importance of simulation in renewable energy, Introduction to mathematical modeling |
| Week2 | Mathematical Modeling - Basics of mathematical modeling, Differential equations and system representation, Energy balance equations for renewable systems |
| Week3 | Simulation Software and Tools - Introduction to simulation software (e.g., Python, MATLAB/Simulink, RETScreen), Hands-on training with simulation tools, Creating simple simulations |
| Week4 | Solar Energy System Simulation - Modeling of solar PV systems, Modeling of solar thermal systems, Impact of solar irradiance and weather conditions on simulations |
| Week5 | Wind Energy System Simulation - Wind turbine modeling, Wind farm modeling, Wind resource assessment and simulation |
| Week6 | Hydropower System Simulation - Hydroelectric power plant modeling, Run-of-river and dam-based systems, Impact of water flow and reservoir levels |

| | |
|---------|--|
| Week7 | Biomass Energy System Simulation - Biomass combustion and gasification modeling, Biogas and biofuel production simulation, Resource availability and feedstock analysis |
| Week8 | Geothermal Energy System Simulation - Geothermal power plant modeling, Geothermal heat pump modeling, Ground heat exchanger simulations |
| Week9 | Data Collection and Integration - Gathering data for simulations, Data analysis and validation, Integrating real data into simulations |
| Week 10 | Performance Assessment - Evaluating the performance of renewable energy systems using simulation, Performance indicators and metrics |
| Week 11 | Optimization Techniques - Strategies for optimizing renewable energy system performance, Sensitivity analysis and scenario planning |
| Week 12 | Grid Integration and Energy Storage - Simulation of grid-connected renewable energy systems, Battery energy storage and load balancing simulations |
| Week 13 | Case Studies and Projects - Analysis of real-world renewable energy projects using simulation, Group projects and hands-on simulation exercises |
| Week 14 | Sustainability and Environmental Impact Assessment - Incorporating sustainability aspects into simulation, Environmental impact assessments in renewable energy projects |
| Week 15 | Report Writing and Communication - Communicating simulation results effectively, Presentation of findings to stakeholders |

| Learning and Teaching Resources | | |
|---------------------------------|---|---------------------------|
| مصادر التعلم والتدريس | | |
| | Text | Available in the Library? |
| Required Texts | Solar PV and Wind Energy Conversion Systems: An Introduction to Theory, Modeling with MATLAB/Simulink, and the Role of Soft Computing Techniques by S. Sumathi and L. Ashok Kumar | No |
| Recommended Texts | Modeling and Simulation of Green Energy Technologies by Michael M. Ohadi and S. Javad Ahmadi | No |
| | Simulation-Based Analysis of Energy and Carbon Emission Impacts by Yi-Ming Wei and Dabo Guan | No |

| Module 37 | | |
|-------------------------|---------------------------------|-----------------|
| معلومات المادة الدراسية | | |
| Module Title | Engineering projects management | Module Delivery |
| Module Type | Support | ☑ Theory |
| Module Code | COGTEK 400 | |

| | | | | |
|---|-----------------|--------------------------------------|---|--|
| ECTS Credits | 4 | | <input type="checkbox"/> Lecture <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input checked="" type="checkbox"/> Seminar | |
| SWL (hr/sem) | 100 | | | |
| Module Level | 4 | Semester of Delivery | 7 | |
| Administering Department | RETE | College | College of Oil & Gas Techniques Engineering/Kirkuk | |
| Module Leader | | e-mail | | |
| Module Leader's Acad. Title | Assist. Lecture | Module Leader's Qualification | MSc | |
| Module Tutor | | e-mail | @ntu.edu.iq | |
| Peer Reviewer Name | Name | e-mail | E-mail | |
| Scientific Committee Approval Date | 01/06/2023 | Version Number | 1.0 | |

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

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|-----------------------------|------|-----------------|--|
| Prerequisite module | None | Semester | |
| Co-requisites module | None | Semester | |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|---|--|
| <p>Module Objectives</p> <p>أهداف المادة الدراسية</p> | <ol style="list-style-type: none"> 1. Introduce the student to the methods of management and the appropriation each of them in different fields work. 2. Introduce the student to exercise the different methods of the management on the mini groups to elevate his ability in management. 3. Enhance the student skills in management by giving the typical solution on the assumed Problem. 4. Introducing students to different types of feasibility study and how can do assessment each of them. 5. Introducing students to make the network planning for the different engineering Processes. 6. Introducing the student to the administrative and production organization of industrial enterprises. 7. Introducing the student to Break-Even Analysis. |
| <p>Module Learning Outcomes</p> <p>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> 1. Enable the student to use knowledge to manage the different purposes organizations. 2. Enable engineers to use modern programs to solve the technical problems in Organizations where they managed. 3. Enable engineers to layout the administrative and production organization of industrial enterprises. 4. Enable engineers to layout the network planning for the different engineering processes and finding the typical path of the minimum duration that offers the best quality of the production. 5. Enable engineers to study the feasibility of the industrial processes which leads to Successful of the production. 6. Enable engineers to calculate the Break-Even of any production or trading process and calculating the duration of that case. 7. Enhance the student skills in management by giving the typical solution on the assumed problem |
| <p>Indicative Contents</p> <p>المحتويات الإرشادية</p> | <p>Indicative content includes the following.</p> <ul style="list-style-type: none"> ● BUILDING SURVEY <p>Introduction to the management [10 hrs]</p> <p>Modern methods of the management [15 hrs]</p> <p>Feasibility study [15 hrs]</p> |

| | |
|--|--|
| | <ul style="list-style-type: none"> ● BREAK-EVEN ESTIMATION <p>The necessity of calculations of the break-even point and its duration. [15 hrs]</p> <ul style="list-style-type: none"> ● FEASIBILITY STUDY <p>The necessity of the different field feasibility study [15 hrs]</p> <ul style="list-style-type: none"> ● Administrative and production organization of industrial enterprises <p>The meaning of the administrative and production organization of industrial enterprises and</p> <p>how can make the most appropriate administrative layout [15 hrs]</p> |
|--|--|

| Learning and Teaching Strategies استراتيجيات التعلم والتعليم | |
|--|---|
| Strategies | <p>The main strategy that will be adopted in delivering this module is to encourage Students' participation in the management exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students.</p> |

| Student Workload (SWL) الحمل الدراسي للطالب محسوب ل ١٥ اسبوعا | | | |
|--|------------|---|-----|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 47 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا | 3.1 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 53 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا | 3.5 |
| Total SWL (h/sem) | 100 | | |

Module Evaluation

تقييم المادة الدراسية

| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
|----------------------|--------------|-------------|------------------|------------|---------------------------|
| Formative assessment | Quizzes | 5 | 20% (20) | 3,5 and 10 | LO #1, #2 and #5 |
| | Assignments | 5 | 20% (20) | 4,8 and 12 | LO #3, #4, #6 and #7 |
| | Report | | | | |
| Summative assessment | Midterm Exam | 2hr | 10% (10) | 7 | LO #1 - #7 |
| | Final Exam | 3hr | 50% (50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

| | Material Covered |
|--------|---|
| Week 1 | Introduction – definition and examples related to the industrial engineering management - Functions of management |
| Week 2 | Establish Goals and Objectives |
| Week 3 | Feasibility Study, Technical feasibility, Economic feasibility |
| Week 4 | Feasibility Study, Schedule feasibility, Operational feasibility |
| Week 5 | Analyzing Costs vs. Benefits, Calculating Present Value, Net Present Value (NPV), Internal Rate of Return (IRR). |
| Week 6 | Administrative and production organization of industrial enterprises, Linear structure, Consulting |

| | |
|----------------|---|
| | structure, Functional structure. |
| Week 7 | Break-Even Analysis, Break-point calculations |
| Week 8 | Introduction in Network planning |
| Week 9 | Network planning, calculation of the critical path, float time, meaning of the early start, early finish, late start and late finish. |
| Week 10 | Network planning, Program Evaluation and Review Technique (PERT). |
| Week 11 | Cold Thermal Energy Storage |
| Week 12 | Quality Control and production inspection method |
| Week 13 | Industrial costs and controllable cost techniques |
| Week 14 | Maintenance |
| Week 15 | Replacement |
| Week 16 | Self-assessment control |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|--------------------------|---|---------------------------|
| Required Texts | | Yes |
| Recommended Texts | د. خليل العاني ، د. إسماعيل إبراهيم القزاز ، د. عادل عبد المالك أولير " إدارة الجودة الشاملة ومتطلبات أليزو 2000:9001 " الطبعة الأولى 2001 ، مطبعة الأشقر-بغداد | |
| Websites | <ol style="list-style-type: none"> https://www.workamajig.com/blog/critical-path-method https://www.editorialmanager.com/cherd/default2.aspx?pg=AuthorshipVerification.aspx&d ocid=50317&authorID=%7b0854344E-1B2D-43DE-9697-4095BA17131E%7d&msid=%7bC7C1D8B5-7EF8-4FDD-B449-5CE3CD0A947A%7d https://www.investopedia.com/terms/q/quality-control.asp | |

Module 38

معلومات المادة الدراسية

| | | | |
|------------------------------------|----------------------|-------------------------------|---|
| Module Title | Power Plants | | Module Delivery |
| Module Type | Core | | <input checked="" type="checkbox"/> Theory |
| Module Code | RETE 404 | | <input type="checkbox"/> Lecture |
| ECTS Credits | 5 | | <input checked="" type="checkbox"/> Lab |
| SWL (hr/sem) | 125 | | <input type="checkbox"/> Tutorial |
| | | | <input type="checkbox"/> Practical |
| Module Level | 4 | Semester of Delivery | 7 |
| Administration Department | RETE | College | College of Oil and Gas Techniques Engineering - Kirkuk, Northern Technical University, Iraq |
| Module Leader | Marwa Khaleel Rashid | e-mail | marwa.khaleel23@ntu.edu.iq |
| Module Leader's Acad. Title | Assistant lecturer | Module Leader's Qualification | M.Sc. |
| Module Tutor | | e-mail | |
| Peer Reviewer Name | | e-mail | |
| Scientific Committee Approval Date | | Version Number | |

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

| | | | |
|----------------------|------|----------|--|
| Prerequisite module | None | Semester | |
| Co-requisites module | None | Semester | |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|--------------------|--|
| Module Aims | 1. Power plant engineering deals with the study of energy, , its sources |
|--------------------|--|

| | |
|---|---|
| <p>أهداف المادة الدراسية</p> | <p>and</p> <ol style="list-style-type: none"> 1. Utilization of energy for power generation. 2. The power is generated by prime movers (example Hydraulic turbines, steam turbines, diesel engines) 3. Large amount of power is generated using prime movers in a site or layout 4. called power plants, where all the equipment and machineries required for power generation is located 5. 4. Energy may be defined as the capacity to do work. Energy exists in various forms, such as Mechanical Energy, thermal energy, electrical energy, solar energy etc 6. 5. Energy may be defined as the capacity to do work. Energy exists in various forms, such as Mechanical Energy, thermal energy, electrical energy, solar energy etc 7. energy etc |
| <p>Module Learning Outcomes</p> <p>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> 1. Explain about the plant steam cycles 2. To make the students understanding Binary cycle working on mercury and steam, combine condenser 3. To make the students understanding Combustion and Fuels 4. Enables the students to learn Steam Condensers, Kinds, Direct Contact Condensers, Surface Condenser 5. To make the students understanding all about the Steam Nozzles, Applications 6. To explain the Pumps, Kinds of Pumps 7. Explain the operation of Pumps in series and Parallel, Centrifugal pumps 8. To help student how to calculate Steam Turbines, The Kinds, Impulse Turbine, 9. Blades Efficiency 10. To help students understanding how to solve the water treatment and testing 11. in boiler <p>Skills outcomes</p> <ul style="list-style-type: none"> - Analysis - synthesis - interpretation, - report writing - laboratory - computational. |
| <p>Indicative Contents</p> <p>الإرشادية المحتويات</p> | <p>Indicative content includes the following.</p> <p>Part A -</p> |

| | |
|--|---|
| | <p>Introduction to power cycle, Carnot cycle, Rankin cycle ideal and actual, Rankin cycle with reheat. [15 hrs]</p> <p>Open feedwater heater and close feedwater heaters, binary cycle, combine cycle[15 hrs]</p> <p>Steam condenser are direct and indirect contact, the efficiency of steam condenser [10 hrs]</p> <p>Fuel and combustion, and how to calculate the air to fuel ratio [15 hrs] Calculate the heat of combustion [6hrs]</p> <p>Part B – Fundamentals . To understand the diagram of nozzle converge- diverge nozzles, Applications [15 hrs] System Characteristics, Pumps Characteristics, Matching Pumps to System Characteristics. [7 hrs] Steam Turbines, The Kinds, Impulse Turbine, Blades Efficiency. Water Treatment and Testing [15 hrs]</p> |
|--|---|

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

| | |
|-------------------|---|
| Strategies | Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students |
|-------------------|---|

Student Workload (SWL)

الحمل الدراسي للطالب

| | | | |
|---|-----|---|------|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 63 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً | 4.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 62 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً | 4.13 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 125 | | |

| Module Evaluation | | | | | |
|-----------------------|---------------|-------------|----------------|------------|---------------------------|
| تقييم المادة الدراسية | | | | | |
| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
| Formative assessment | Quizzes | 5 | 10% (10) | 3,6, 10,12 | LO #2, #3 and #7 |
| | Assignments | 5 | 10% (10) | 2, 5,9, 11 | LO #1, #4, #6 and #8 |
| | Lab Report | 10 | 20% (20) | Continuous | All |
| Summative assessment | Mid Term exam | 2 hr | 10% (10) | 7 | LO # 1-4 |
| | Final Exam | 3 hr | 50% (50) | 16 | All |
| 100% (100 Marks) | | | | | |

| Delivery Plan (Weekly Syllabus) | |
|---------------------------------|---|
| المنهاج الأسبوعي النظري | |
| Week 1 | Introductions ,Plant steam cycles, main cycles |
| Week 2 | reheat cycle , Regenerative cycle, open feed water heater |
| Week 3 | closed feed water heaters , combine cycles |
| Week 4 | Binary cycle working on mercury and steam, combine condenser |
| Week 5 | Combustion and Fuels |
| Week 6 | Correct Air/Fuel Ratio |
| Weeks 7 | Mid-Term Exam |
| Weeks 8 | Steam Condensers, Kinds |
| Week 9 | Direct Contact Condensers, Surface Condenser |
| Week 10 | Steam Nozzles, Applications |
| Week 11 | The Pumps, Kinds of Pumps, |
| Week 12 | System Characteristics, Pumps Characteristics, Matching Pumps to System Characteristics |
| Week 13 | Operation of Pumps in series and Parallel, Centrifugal pumps |
| Week 14 | Steam Turbines, The Kinds, Impulse Turbine, Blades Efficiency |
| Week 15 | Preparing for the final Exam |

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

| | Material Covered |
|--------|--|
| Week 1 | Lab 1: Introduction of boiler |
| Week 2 | Lab 2: Boiler feed water repeated for times with variable inputs |
| Week 3 | Lab 3: To calculate the efficiency of steam condenser |
| Week 4 | Lab 4: Air to fuel ratio of combustion |
| Week 5 | Lab 5: To calculation the power of pumps kinds |
| Week 6 | Lab 6: The steam nozzle repeated for times with variable inputs |
| Week 7 | Lab 7: Water treatment in boiler |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|-------------------|---|---------------------------|
| Required Texts | Thermal engineering (eighth edition) R. K. RAJPUT | No |
| Recommended Texts | Fundamentals Of engineering thermodynamics, Michael J. Moran and Howard N. Shapiro, Fifth edition | No |
| | | |

Module 39

معلومات المادة الدراسية

| Module Title | Methodology of Scientific Research | Module Delivery |
|--------------|------------------------------------|--|
| Module Type | Basic | <input checked="" type="checkbox"/> Theory |
| Module Code | NTU 400 | <input type="checkbox"/> Lecture |
| ECTS Credits | 5 | <input type="checkbox"/> Lab |
| | | <input type="checkbox"/> Tutorial |

| | | | |
|---------------------------------------|-----------------------|----------------------------------|---|
| SWL (hr/sem) | 125 | | <input type="checkbox"/> Practical <input checked="" type="checkbox"/> Seminar |
| Module Level | 4 | Semester of Delivery | 7 |
| Administration Department | RETE | College | College of Oil and Gas Techniques Engineering - Kirkuk, Northern Technical University, Iraq |
| Module Leader | Marwa Khaleel Rashid | e-mail | marwa.khaleel23@ntu.edu.iq |
| Module Leader's Acad. Title | Assistant lecturer | Module Leader's Qualification | M.Sc. |
| Module Tutor | | e-mail | |
| Peer Reviewer Name | | e-mail | |
| Scientific Committee Approval Date | | Version Number | |

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

| | | | |
|----------------------|------------|----------|---|
| Prerequisite module | None | Semester | |
| Co-requisites module | COGTEK 401 | Semester | 8 |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|---|--|
| Module Aims أهداف المادة الدراسية | <ol style="list-style-type: none"> To Understand the significance of scientific research and its role in advancing knowledge. To Identify the key characteristics of scientific research. This course deals with the basic concept of Formulate research questions and objectives. This is the basic subject for all ethical considerations in scientific research Recognize the importance of conducting a literature review in research. Familiarize with quantitative and qualitative data collection methods. Understand the principles of experimental design. |
| Module Learning Outcomes | <ol style="list-style-type: none"> Understand the nature and significance of scientific research. Identify the characteristics and principles of scientific research. Demonstrate an awareness of ethical considerations in scientific |

| | |
|---|--|
| مخرجات التعلم للمادة الدراسية | <p>research.</p> <ol style="list-style-type: none"> 2. Recognize between various research designs. 3. List the various Formulate clear research questions and objectives 4. Summarize what is literature review to identify relevant research articles. 5. Discuss and evaluate the credibility and relevance of research articles. 6. Design experiments that maximize internal and external validity. 7. Determine the appropriate sample size for a survey based on research objectives. 8. Demonstrate proficiency in employing different approaches to qualitative research. 9. Recognize and apply ethical principles and guidelines in research involving human subjects 10. Communicate research results in a clear and concise manner to different audiences. 11. Formulate a clear and concise research problem statement. |
| <p>Indicative Contents الإرشادية المحتويات</p> | <p>Indicative content includes the following.</p> <p>Part A - Definition and significance of scientific research [5 hrs.]</p> <p>Part B- Research Problem Formulation [5 hrs.]</p> <p>Part C- Research Design and Methodology [5 hrs.]</p> <p>Part D- Literature Review [5 hrs.]</p> <p>Part E- Data Collection and Measurement [5 hrs.]</p> <p>Part F- Homework and Discussion [7 hrs.]</p> |

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

| | |
|--------------------------|---|
| <p>Strategies</p> | <p>Studying the Methodology of Scientific Research requires a combination of active learning strategies and focused study techniques, such as;</p> <p>Read the Course Materials, Engage in Discussions, Take Detailed Notes, Practice with Examples, Review and Summarize, Create Visual Aids, and Work on Exercises and Assignments</p> |
|--------------------------|---|

Student Workload (SWL)

الحمل الدراسي للطالب

| | | | |
|---|--|---|-------------|
| <p>Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل</p> | <p>32</p> | <p>Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً</p> | <p>2.13</p> |
| <p>Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل</p> | <p>93</p> | <p>Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً</p> | <p>6.2</p> |
| <p>Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل</p> | <p style="text-align: center;">125</p> | | |

| Module Evaluation | | | | | |
|-----------------------|-----------------|-------------|----------------|--------------|---------------------------|
| تقييم المادة الدراسية | | | | | |
| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
| Formative assessment | Quizzes | 2 | 10% (10) | 3,5,8 and 10 | LO #1, #2 and #9 #10, #11 |
| | Assignments | 2 | 10% (10) | 2,4,6 and 12 | LO #3, #4 and #6, #7 |
| | Projects / Lab. | 1 | 10% (10) | Continuous | All |
| | Lab Report | 5 | 10% (10) | 3,7,13,14 | LO #5,#8,11,13 |
| Summative assessment | Mid Term exam | 2 hr | 10% (10) | 7 | LO #1 - #7 |
| | Final Exam | 3 hr | 50% (50) | 16 | All |
| 100% (100 Marks) | | | | | |

| Delivery Plan (Weekly Syllabus) | |
|---------------------------------|--------------------------------------|
| المنهاج الأسبوعي النظري | |
| Week 1 | Introduction to Scientific Research |
| Week 2 | Research Design |
| Week 3 | Literature Review |
| Week 4 | Data Collection Methods |
| Week 5 | Data Analysis |
| Week 6 | Experimental Design |
| Weeks 7 | Survey Design and Sampling |
| Weeks 8 | Qualitative Research Methods |
| Week 9 | Ethics in Scientific Research |
| Week 10 | Data Interpretation and Presentation |
| Week 11 | Peer Review and Publication Process |
| Week 12 | Research Proposal Writing |
| Week 13 | Project Management and Time Planning |

| | |
|---------|---|
| Week 14 | Presentations and Research Conferences |
| Week 15 | Research Ethics Review and Course Wrap-up |

| Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر | |
|---|------------------|
| | Material Covered |
| Week 1 | |
| Week 2 | |
| Week 3 | |
| Week 4 | |
| Week 5 | |
| Week 6 | |
| Week 7 | |

| Learning and Teaching Resources مصادر التعلم والتدريس | | |
|---|--|---------------------------|
| | Text | Available in the Library? |
| Required Texts | <ol style="list-style-type: none"> "Research Design: Qualitative, Quantitative, and Mixed Methods Approaches" by John W. Creswell and J. David Creswell "The Craft of Research" by Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams "Research Methodology: A Step-by-Step Guide for Beginners" by Ranjit Kumar | Yes |
| Recommended Texts | Academic Databases: Utilize academic databases such as PubMed, Google Scholar, JSTOR, and IEEE Xplore to search for research papers in the methodology of scientific research. Use relevant keywords such as "research methodology," "scientific research design," or specific methodologies you are interested in (e.g., "qualitative | No |

| | | |
|--|---|--|
| | research methods," "experimental design"). | |
| | (www.socialresearchmethods.net) | |
| | (www.researchmethodology.org) (www.qualres.org) | |

| Module 40 معلومات المادة الدراسية | | | |
|--|-------------------------|--|--|
| Module Title | Renewable Energy design | | |
| Module Type | Core | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture | |
| Module Code | RETE 405 | <input checked="" type="checkbox"/> Lab | |
| ECTS Credits | 6 | <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical | |
| SWL (hr/sem) | 150 | <input checked="" type="checkbox"/> Seminar | |
| Module Level | 4 | Semester of Delivery | 8 |
| Administration Department | RETE | College | College of Oil and Gas Techniques Engineering - Kirkuk |
| Module Leader | Afrah Turki Awad | e-mail | afrah.turki@ntu.edu.iq |
| Module Leader's Acad. Title | Lecturer | Module Leader's Qualification | PhD |
| Module Tutor | | e-mail | |
| Peer Reviewer Name | | e-mail | |
| Scientific Committee Approval Date | | Version Number | |

| Relation with other Modules العلاقة مع المواد الدراسية الأخرى | | | |
|--|------|----------|--|
| Prerequisite module | None | Semester | |
| Co-requisites module | None | Semester | |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|--|--|
| Module Aims أهداف المادة الدراسية | <ul style="list-style-type: none">• The module is intended to present and assess some of the important renewable energy technologies and give some sense of the engineering design and development of some of these technologies. Starting with a brief outline of existing and proposed renewable energy systems, the module adopts an active solution-seeking approach, assessing these technologies against economic, engineering and other criteria.• Two of the most promising technologies, wind power, and solar energy are treated in some depth as an example of optimisation in mechanical and electrical engineering design. Other technologies studied include geothermal, biomass, ocean and hydro power. |
| Module Learning Outcomes مخرجات التعلم للمادة الدراسية | <p>By the end of the module, students should be able to:</p> <ul style="list-style-type: none">• Interpret, apply and resolve the scientific concepts and principles underpinning renewable energy technologies.• Evaluate design processes and methodologies for renewable energy systems and apply them to new situations.• Autonomously apply mathematical models for solving problems in renewable energy systems, critique these methods and advance independent hypotheses for the scope of their applicability and the limitations of these models for practical application.• Discuss current practice and its limitations as well as likely new and advanced developments at the forefront of renewable energy technology. |
| Indicative Contents الإرشادية المحتويات | <p>The module on Renewable Energy Design encompasses a diverse array of indicative contents aimed at equipping students with the knowledge and skills necessary to navigate the complexities of designing sustainable energy systems. Beginning with an introduction to renewable energy sources, students delve into the principles and applications of solar, wind, hydro, biomass, and geothermal energy. Site assessment and resource mapping techniques are explored, allowing students to identify optimal locations for renewable energy installations. The curriculum delves into the intricacies of various renewable energy technologies, such as solar photovoltaic systems, wind turbines, and biomass conversion methods, emphasizing system components, design considerations, and integration techniques. Students learn to optimize renewable energy systems by studying system sizing, load matching, and energy storage solutions, ensuring reliable and efficient energy supply. Economic and financial aspects are</p> |

| | |
|--|---|
| | covered comprehensively, including cost-benefit analysis, financing options, and incentive programs. Environmental impact assessment and adherence to regulatory frameworks are emphasized, instilling an understanding of the environmental and legal considerations in renewable energy projects. The module also incorporates practical elements, including hands-on exercises, case studies of successful projects, and site visits, allowing students to apply theoretical knowledge to real-world scenarios. By exploring emerging technologies and innovations, students are encouraged to think critically and creatively, preparing them to contribute meaningfully to the ongoing global transition towards sustainable renewable energy solutions. |
|--|---|

| Learning and Teaching Strategies استراتيجيات التعلم والتعليم | |
|---|---|
| Strategies | <p>Teaching Method 1 – Lectures Description: Attendance Recorded: Yes</p> <p>Teaching Method 2 – Asynchronous online module materials Description: Podcasts, videos, and articles on Renewable Energy Attendance Recorded: No</p> <p>Unscheduled Directed Student Hours (time spent away from the timetabled sessions but directed by the teaching staff).</p> <p>Teaching Method 3 - Tutorials Description: Attendance Recorded: Yes</p> <p>Teaching Method 4 - Practical Description: Practical homework assignments Attendance Recorded: No</p> <p>Unscheduled Directed Student Hours (time spent away from the timetabled sessions but directed by the teaching staff).</p> |

| Student Workload (SWL) الحمل الدراسي للطالب | | | |
|---|-----|---|-----|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 63 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً | 4.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 87 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً | 5.8 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 150 | | |

| Module 41 | | | | | |
|-----------------------|---------------|-------------|----------------|---------------|---------------------------|
| تقييم المادة الدراسية | | | | | |
| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
| Formative assessment | Quizzes | 2 | 10% (10) | 5, 10 | LO # 2,6 |
| | Assignments | 5 | 10% (10) | 5,7,12 and 14 | LO# 1,2, 3 and 5 |
| | Seminar | 2 | 10% (10) | Continuous | All |
| | Lab Report | 2 | 10% (20) | 4,11 | LO # 3, 9 |
| Summative assessment | Mid Term exam | 2 hr | 10% (10) | 7 | LO # 1-7 |
| | Final Exam | 3 hr | 50% (50) | 16 | All |
| 100% (100 Marks) | | | | | |

| Delivery Plan (Weekly Syllabus) | |
|---------------------------------|---|
| المنهاج الأسبوعي النظري | |
| Week (1-3) | General introduction to renewable energy - renewable energy sources and applications - renewable energy and environmental problems (acid rain, ozone layer depletion, climate change, nuclear risks). |
| Weeks (4 - 5) | Resource scale and availability. |
| Weeks (6 - 7) | Available technologies and challenges. Technical and economical assessment of renewable technologies. |
| Week (8-9) | Detailed technical study of two major renewable energy technologies: Solar energy: solar thermal & solar PV, current technology and future potential. Wind energy: wind turbine configurations and power generating technologies. |
| Week (10-11) | Broad study of technologies with less potential: Hydro power energy: Principles of hydro power technology. Ocean current, tidal & wave energy: technology, economics, challenges and R&D. |
| Week 12 | Mid-Term Exam |
| Week 13 | Ground source and geothermal energy: principles, operation, future scope. |
| Week 14 | Biomass and Bioenergy: resources, sustainability, processing, combustion, scope. |
| Week 15 | Preparing for the final Exam |

| Learning and Teaching Resources مصادر التعلم والتدريس | | |
|--|--|---------------------------|
| | Text | Available in the Library? |
| Required Texts | Solar Energy Engineering, Kalogirou, S.A., 2nd Edition, Academic Press, 2013. E-book ISBN 9780123972569. | No |
| | Boyle, G., 1996. Renewable energy: power for a sustainable future. <i>(No Title)</i> . | No |
| | | |

| Module Information معلومات المادة الدراسية | | | |
|---|--------------------------|-------------------------------|---|
| Module Title | Store and recover energy | | Module Delivery |
| Module Type | Core | | <input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input checked="" type="checkbox"/> Practical <input checked="" type="checkbox"/> Seminar |
| Module Code | RETE 406 | | |
| ECTS Credits | 5 | | |
| SWL (hr/sem) | 125 | | |
| Module Level | 4 | Semester of Delivery | |
| Administering Department | RETE | College | College of Oil & Gas Techniques Engineering/Kirkuk |
| Module Leader | | e-mail | |
| Module Leader's Acad. Title | Assist. Lecture | Module Leader's Qualification | MSc |
| Module Tutor | | e-mail | @ntu.edu.iq |
| Peer Reviewer Name | Name | e-mail | E-mail |
| Scientific Committee Approval Date | 1/06/2023 | Version Number | 1.0 |

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

| | | | |
|-----------------------------|------|-----------------|--|
| Prerequisite module | None | Semester | |
| Co-requisites module | None | Semester | |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|--|--|
| Module Objectives أهداف المادة الدراسية | <ol style="list-style-type: none"> 1- Advanced energy technology driving growing interest in thermal applications such as space and water heating 2- types of energy storage technologies available 3- TES systems have a huge potential to facilitate the most efficient use of thermal equipment and economical large-scale energy alternatives. 4- energy storage enables electricity to be saved for a later, when and where it is most needed 5- Energy storage can reduce operating costs related to grid power |
| Module Learning Outcomes مخرجات التعلم للمادة الدراسية | <ol style="list-style-type: none"> 13- Able to recognize the energy storage types 14- Able to know thermal energy storage methods and its application. 15- identify the Waste energy recovery |
| Indicative Contents المحتويات الإرشادية | <ol style="list-style-type: none"> 5- understanding the fundamental of storage energy 6- able to know the types of energy storage Mechanical Energy Storage, Chemical Energy Storage, Biological Storage, Magnetic Storage 7- identify the application of energy thermal storage |

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

| | |
|-------------------|--|
| Strategies | |
|-------------------|--|

Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

| | | | |
|--|------------|---|-----|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 63 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا | 4.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 62 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا | 4.1 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 125 | | |

Module Evaluation

تقييم المادة الدراسية

| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
|-----------------------------|------------------------|-------------|----------------|----------|---------------------------|
| Formative assessment | Quizzes | 2 | 10% (10) | 5 and 10 | LO #2 and 3 |
| | Assignments | 2 | 10% (10) | 2 and 12 | LO #4 and 6 |
| | Projects / Lab. | 1 | 10% (10) | 6 | LO #8 |
| | Report | 1 | 10% (10) | 13 | LO #11 |
| Summative | Midterm Exam | 2hr | 10% (10) | 7 | LO #7-1 |

| | | | | | |
|------------------|------------|-----|------------------|----|-----|
| assessment | Final Exam | 3hr | 50% (50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

| Delivery Plan (Weekly Syllabus) | |
|--|--|
| المنهاج الاسبوعي النظري | |
| | Material Covered |
| Week 1 | Introduction , Fundamental Properties and Quantities |
| Week 2 | Mechanical Energy Storage, Chemical Energy Storage |
| Week 3 | Biological Storage, Magnetic Storage |
| Week 4 | Hydrogen for Energy Storage |
| Week 5 | Thermal energy storage method |
| Week 6 | Criteria for Thermal energy storage Evaluation |
| Week 7 | Thermal energy storage Heating and Cooling Applications |
| Week 8 | Thermal energy storage Heating and Cooling Applications |
| Week 9 | Types and Features of Various Stratified Thermal energy storage Tanks |
| Week 10 | Phase Change Materials (PCMs) |
| Week 11 | Cold Thermal Energy Storage |
| Week 12 | Environmental Impact and Thermal energy storage Systems and Applications |
| Week 13 | Thermal energy storage and Energy Savings |
| Week 14 | Energy Savings by Cold TES |
| Week 15 | WASTE energy RECOVERY |
| Week 16 | Preparatory week before the final Exam |

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

| | Material Covered |
|---------------|--|
| Week 1 | Lab 1: Introduction to laboratory & safety |
| Week 2 | Lab 2: flat plate solar collector |
| Week 3 | Lab 3: parabolic concentrating collector |
| Week 4 | Lab 4: Rock storage |
| Week 5 | Lab 5: ice storage |
| Week 6 | Lab 6: water storage |
| Week 7 | Lab 7: Evacuated Solar Collector |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|--------------------------|--|---------------------------|
| Required Texts | Ibrahim D. M. A. Rosen, <i>thermal energy storage and application</i> , Second. united kingdom: Wiley, 2011. | Yes |
| Recommended Texts | | |
| Websites | | |

Module 42

معلومات المادة الدراسية

| | | |
|---------------------|------------------------|---|
| Module Title | Control systems | Module Delivery |
| Module Type | Core | <input checked="" type="checkbox"/> Theory |

| | | | | |
|------------------------------------|-----------------|-------------------------------|---|-------------|
| Module Code | RETE 407 | | <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input checked="" type="checkbox"/> Practical <input checked="" type="checkbox"/> Seminar | |
| ECTS Credits | 5 | | | |
| SWL (hr/sem) | 125 | | | |
| Module Level | 4 | Semester of Delivery | 8 | |
| Administering Department | RETE | College | College of Oil & Gas Techniques Engineering/Kirkuk | |
| Module Leader | | | e-mail | |
| Module Leader's Acad. Title | Assist. Lecture | Module Leader's Qualification | | |
| Module Tutor | | | e-mail | @ntu.edu.iq |
| Peer Reviewer Name | Name | e-mail | E-mail | |
| Scientific Committee Approval Date | 1/06/2023 | Version Number | 1.0 | |

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

| | | | |
|----------------------|------|----------|--|
| Prerequisite module | None | Semester | |
| Co-requisites module | None | Semester | |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|---|---|
| Module Objectives أهداف المادة الدراسية | 1. Understanding Measurement Principles: Gain knowledge of measurement principles, including device selection, calibration, and measurement limitations. 2. Familiarity with Control Systems: Learn the basics of control systems, including feedback, closed-loop control, and the role of sensors, actuators, and controllers. |
|---|---|

| | |
|---|---|
| | <p>3. Application of Measurement Techniques: Develop practical skills in using measurement techniques and instruments to collect and analyze data in engineering systems.</p> <p>4. System Analysis and Optimization: Acquire the ability to analyze measurement and control systems, identify performance issues, and implement optimization strategies for enhanced system performance.</p> |
| <p>Module Learning Outcomes</p> <p>مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> 1. Understand Measurement Principles: Develop a solid understanding of the fundamental principles of measurement, including accuracy, precision, and uncertainty. Gain the ability to choose appropriate measurement devices and methods for different engineering applications. 2. Analyze and Design Control Systems: Acquire the skills to analyze and design control systems, including feedback loops, controllers, and actuators. Grasp concepts such as stability, transient response, and steady-state error in control systems. 3. Apply Measurement Techniques: Gain practical expertise in applying measurement techniques and instruments to collect and analyze data in engineering systems. Utilize statistical methods to effectively analyze and interpret measurement data. 4. Troubleshoot and Optimize Systems: Develop the ability to troubleshoot and optimize engineering systems by identifying and rectifying measurement and control issues. Learn techniques for |
| <p>Indicative Contents</p> <p>المحتويات الإرشادية</p> | <p>Part A:</p> <p>Fundamentals of measurement systems, General Measurement System, Error and uncertainty analysis and Static characteristics of measurement system elements [25 hours]</p> <p>Introduction to control system, Power circuit elements, Principles of electric control and Plc basics [25 hours]</p> <p>Revision Session and Quiz [2 hours]</p> <p>Part B:</p> <p>tutorial of symbols, equipment's and Counters, timers, introduction to inverter [25 hours] PLC system structure, Basic ladder logic Timers, Counters & Comparators [25 hours]</p> <p>Up Counter (CTU), Down Counter (CTD), Latch and Unlatch Logic</p> <p>Memory Concept in Allen Bradley PLC, and Hardware of PLC circuit, review of PLC ladder. [25 hours]</p> <p>Revision Session and Quiz [2 hours]</p> <p>Revised Description: Part A of the Engineering Measurement and Control Systems</p> |

| | |
|--|---|
| | <p>course provides students with a solid understanding of the fundamental principles in this field. The module begins by covering the basics of measurement, including different measurement techniques and the use of instruments. Students will then delve into the topic of control systems and explore considerations related to Programmable Logic Controllers (PLCs). To reinforce the learned concepts, a revision session and quiz will be conducted, allowing students to review and assess their understanding. This module serves as a crucial foundation for further studies in the field of Engineering Measurement and Control Systems.</p> |
|--|---|

| Learning and Teaching Strategies استراتيجيات التعلم والتعليم | |
|--|---|
| Strategies | <ol style="list-style-type: none"> 1. Active Participation: Actively engage in class discussions, ask questions, and contribute to group activities. This will help you better understand the concepts and reinforce your learning. 2. Practical Application: Apply the theoretical knowledge to real-world examples and projects. Participate in laboratory sessions and hands-on activities to gain practical experience in measurement and control systems. 3. Problem-Solving Approach: Develop strong problem-solving skills by practicing solving different types of measurement and control problems. Work on assignments and projects that require critical thinking and analytical skills |

| Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا | | | |
|--|------------|---|-----|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 63 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا | 4.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 62 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا | 4.1 |
| Total SWL (h/sem) | 125 | | |

Module Evaluation

تقييم المادة الدراسية

| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
|----------------------|-----------------|-------------|------------------|----------|---------------------------|
| Formative assessment | Quizzes | 2 | 10% (10) | 5 and 10 | LO #2 and 3 |
| | Assignments | 2 | 10% (10) | 2 and 12 | LO #4 and 6 |
| | Projects / Lab. | 1 | 10% (10) | 8 | LO #10 |
| | Report | 1 | 10% (10) | 11 | LO #13 |
| Summative assessment | Midterm Exam | 2hr | 10% (10) | 7 | LO #7-1 |
| | Final Exam | 3hr | 50% (50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

| | Material Covered |
|--------|---|
| Week 1 | Fundamentals of measurement systems - Definition of measurement and instrumentation - Significance of measurement |
| Week 2 | General Measurement System - Functions of instrument in measurements - Calibration and standards |

| | |
|----------------|--|
| Week 3 | <p>Error and uncertainty analysis</p> <ul style="list-style-type: none"> - Errors in Measurements - Accuracy and precision - Sources of errors |
| Week 4 | <p>Static characteristics of measurement system elements</p> <ul style="list-style-type: none"> - Characteristics of instruments - Static characteristics of measuring system - Environmental effects |
| Week 5 | <p>Introduction to control system</p> <ul style="list-style-type: none"> - Types of Control System - Block Diagrams |
| Week 6 | <p>Introduction to Block Diagrams</p> <ul style="list-style-type: none"> - Block Diagram Reduction Rules |
| Week 7 | <p>Power circuit elements Circuit breaker Overload Relay</p> <p>Contactors</p> |
| Week 8 | <p>Power circuit elements Circuit breaker Overload Relay</p> <p>Contactors</p> |
| Week 9 | Types and Features of Various Stratified. Thermal energy storage Tanks |
| Week 10 | Plc basics, tutorial of symbols, equipment's |
| Week 11 | Counters, timers, introduction to inverter |
| Week 12 | <p>PLC system structure, Basic ladder logic</p> <p>Timers, Counters & Comparators</p> |

| | |
|----------------|--|
| Week 13 | Up Counter (CTU) , Down Counter (CTD) |
| Week 14 | Latch and Unlatch Logic Memory Concept in Allen Bradley PLC |
| Week 15 | Hardware of PLC circuit, review of PLC ladder |
| Week 16 | Preparatory week before the final Exam |

| Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر | |
|---|---|
| | Material Covered |
| Week 1 | Over view on the control workshop , tools, and measuring devices |
| Week 2 | Knowledge of connection & operation of the measuring devices for temperature, pressure, humidity, fluid flow. |
| Week 3 | Built electric circuit (power & control) for domestic refrigerator or freezer and checking before operating the circuit. |
| Week 4 | Built electric circuit (power & control) for domestic water cooler and checking before operating the circuit. |
| Week 5 | Built electric circuit (power & control) for domestic window type A/C for cooling and checking before operating the circuit. |
| Week 6 | Built electric circuit (power & control) for domestic window type A/C for cooling & heating, and checking before operating the circuit. |
| Week 7 | Built electric circuit (power & control) for domestic defrost refrigerator and checking before operating the circuit. |
| Week 8 | Built electric circuit (power & control) for domestic clothes washer and checking before operating the circuit. |
| Week 9 | Check and calibration of thermal expansion valve. |

| | |
|----------------|--|
| Week 10 | Check and calibration for the contacts of the electric contactor & thermal switch. |
| Week 11 | Built a control circuit for motor power circuit (ON-OFF) start and stop from one location. |
| Week 12 | Built a control circuit for motor power circuit (ON-OFF) start and stop from two deferent locations. |
| Week 13 | Built a control circuit for motor power circuit (star-delta) rotate in one direction, and other in two directions. |

| Learning and Teaching Resources | | |
|--|--|---------------------------|
| مصادر التعلم والتدريس | | |
| | Text | Available in the Library? |
| Required Texts | 1. "Measurement and Control Basics" by Thomas A. Hughes 2. "Principles of Measurement Systems" by John P. Bentley 3. "Industrial Instrumentation and Control Systems" by William C. Dunn 4. "Process Control: A Practical Approach" by Myke King | Yes |
| Recommended Texts | 1. "Instrumentation and Control Systems Documentation" by Fred A. Meier 2. "Control Systems Engineering" by Norman S. Nise 3. "Automatic Control Systems" by Benjamin C. Kuo and Farid Golnaraghi 4. "Modern Control Engineering" by Katsuhiko Ogata 5. "Instrumentation for Process Measurement and Control" by Norman A. Anderson 6. "Introduction to Control System Technology" by Robert N. Bates | No |
| Websites | 1. National Instruments: www.ni.com 2. Automation.com: www.automation.com 3. Control Global: www.controlglobal.com | |

4. ISA - International Society of Automation: www.isa.org
5. Omega Engineering: www.omega.com
6. Emerson Automation Solutions: www.emerson.com

Module 43

معلومات المادة الدراسية

| | | | |
|------------------------------------|--|--|--|
| Module Title | Computer-based modeling and simulation of renewable energy systems | | |
| Module Type | Core | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar | |
| Module Code | RETE 403 | | |
| ECTS Credits | 8 | | |
| SWL (hr/sem) | 200 | | |
| Module Level | 4 | Semester of Delivery | 8 |
| Administration Department | RETE | College | College of Oil & Gas Techniques Engineering/Kirkuk |
| Module Leader | Ali Qani Mohammed Saleh | e-mail | ali.alkurdi23@ntu.edu.iq |
| Module Leader's Acad. Title | Lecturer | Module Leader's Qualification | MSc. |
| Module Tutor | Name (if available) | e-mail | |
| Peer Reviewer Name | | e-mail | |
| Scientific Committee Approval Date | | Version Number | 1 |

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

| | | | |
|----------------------|----------|----------|----|
| Prerequisite module | RETE 402 | Semester | 7 |
| Co-requisites module | None | Semester | -- |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية

10. Modeling Proficiency: The aim of this module is to develop students' proficiency in using computer-based modeling techniques to accurately represent and simulate the behavior of renewable energy systems, including solar, wind, hydropower, and biomass. Students will gain the skills to create realistic and dynamic models of these systems.
11. Performance Evaluation and Optimization: This module aims to enable students to assess the performance of renewable energy systems using computer-based models and simulations. Students should be able to identify opportunities for optimization and make informed decisions to enhance the performance, efficiency, and reliability of these systems.
12. Real-World Application: By the end of the module, students should be capable of applying computer-based modeling and simulation techniques to practical scenarios in the renewable energy sector. They will gain the competence to address real-world challenges, evaluate the impact of different factors on system behavior, and contribute to the design, analysis, and optimization of renewable energy projects.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية

- (LO19). Model Development: Students will be able to develop and implement computer-based models that accurately represent the behavior and components of various renewable energy systems, including solar, wind, hydropower, and biomass.
- (LO20). Simulation Proficiency: Upon completion of the module, students will possess the skills to use computer-based modeling and simulation tools to create detailed and dynamic models of renewable energy systems, allowing for the analysis of system performance under various conditions.
- (LO21). Data Collection and Integration: Students will learn to gather, process, and integrate relevant data into their computer-based models, ensuring that their simulations reflect real-world scenarios accurately.
- (LO22). Performance Evaluation: The module will equip students to assess the performance and efficiency of renewable energy systems using computer-based models and simulations, providing insights into system behavior.
- (LO23). Optimization Techniques: Students will gain knowledge of optimization methods and strategies to enhance the efficiency, reliability, and economic viability of renewable energy systems, considering factors such as resource availability and load demand.
- (LO24). Grid Integration and Energy Storage: Students will understand how to simulate the integration of renewable energy systems into the broader energy infrastructure, considering grid compatibility, energy storage solutions, and backup systems.
- (LO25). Scenario Analysis: Graduates of the module will be proficient in conducting scenario analysis, allowing them to evaluate the resilience

| | |
|---|--|
| | <p>and adaptability of renewable energy systems in different conditions, including extreme weather events and fluctuating energy demands.</p> <p>(LO26). Report Generation and Communication: Students will be able to effectively communicate their simulation results and findings to various stakeholders, such as project managers, policymakers, and investors.</p> <p>(LO27). Practical Applications: Upon completion, students should be able to apply their computer-based modeling and simulation skills to practical situations in the renewable energy sector, contributing to the design, analysis, and optimization of real-world renewable energy projects.</p> |
| <p style="text-align: center;">Indicative Contents الإرشادية المحتويات</p> | <p>Indicative content includes the following.</p> <ul style="list-style-type: none"> • Introduction to Computer-Based Modeling <ul style="list-style-type: none"> • Basics of computer-based modeling • Role of modeling and simulation in renewable energy systems • Mathematical Modeling Techniques <ul style="list-style-type: none"> • Differential equations and system representation • Development of mathematical models for renewable systems • Numerical methods and techniques • Software Tools for Simulation <ul style="list-style-type: none"> • Introduction to simulation software (e.g., MATLAB/Simulink, PSCAD, HOMER) • Hands-on training with simulation tools • Model development using software • Solar Energy System Modeling <ul style="list-style-type: none"> • Modeling of solar PV systems • Solar thermal system modeling • Simulation of solar irradiance and weather conditions • Wind Energy System Modeling <ul style="list-style-type: none"> • Wind turbine modeling • Wind farm modeling • Wind resource assessment and simulation • Hydropower System Modeling <ul style="list-style-type: none"> • Hydroelectric power plant modeling • Run-of-river and dam-based systems • Impact of water flow and reservoir levels • Biomass Energy System Modeling <ul style="list-style-type: none"> • Biomass combustion and gasification modeling • Biogas and biofuel production simulation • Resource availability and feedstock analysis • Geothermal Energy System Modeling <ul style="list-style-type: none"> • Geothermal power plant modeling • Geothermal heat pump modeling • Ground heat exchanger simulations • Data Collection and Integration <ul style="list-style-type: none"> • Gathering relevant data for simulation • Data processing and integration into models • Incorporating real data into simulations |

| | |
|--|---|
| | <ul style="list-style-type: none"> • Performance Evaluation <ul style="list-style-type: none"> • Assessing the performance of renewable energy systems through computer-based simulations • Evaluation of system efficiency and reliability • Optimization Techniques <ul style="list-style-type: none"> • Strategies for optimizing renewable energy system performance using computer-based tools • Sensitivity analysis and scenario planning for optimization • Grid Integration and Energy Storage <ul style="list-style-type: none"> • Simulating grid-connected renewable energy systems • Modeling energy storage solutions and load balancing • Case Studies and Projects <ul style="list-style-type: none"> • Analysis of real-world renewable energy projects using computer-based modeling and simulation • Group projects and hands-on simulation exercises • Sustainability and Environmental Impact Assessment <ul style="list-style-type: none"> • Incorporating sustainability aspects into computer-based simulations • Environmental impact assessments in renewable energy projects • Report Generation and Communication <ul style="list-style-type: none"> • Effective communication of simulation results to stakeholders • Presentation of findings and insights • Emerging Technologies and Future Trends <ul style="list-style-type: none"> • Exploration of innovative modeling and simulation techniques • Future trends in the modeling and simulation of renewable energy systems |
|--|---|

| Learning and Teaching Strategies استراتيجيات التعلم والتعليم | |
|---|--|
| Strategies | <p>Teaching Method 1 – Lectures Description: Attendance Recorded: Yes</p> <p>Teaching Method 2 – Asynchronous on-line course materials Description: Podcasts, videos and articles in thermodynamics Attendance Recorded: No</p> <p>Unscheduled Directed Student Hours (time spent away from the timetabled sessions but directed by the teaching staff).</p> <p>Teaching Method 3 - Tutorials Description:</p> |

| | |
|--|--|
| | Attendance Recorded: Yes Teaching Method 4 - Practical Description: Practical homework assignments Attendance Recorded: No Unscheduled Directed Student Hours (time spent away from the timetabled sessions but directed by the teaching staff). |
|--|--|

| Student Workload (SWL) الحمل الدراسي للطالب | | | |
|---|-----|---|------|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 93 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً | 6.2 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 107 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً | 7.13 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 200 | | |

| Module Evaluation تقييم المادة الدراسية | | | | | |
|---|------------------------|-------------|------------------|----------------|---------------------------|
| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
| Formative assessment | Quizzes | 5 | 10% (10) | 3,5,7,9 and 15 | LO #2, #3,#5 ,#9 and #11 |
| | Assignments | 4 | 10% (10) | 2,6,8 and 12 | LO #4, #8, #6and #10 |
| | Projects / Lab. Report | 4 | 20% (10) | Continuous | All |
| | | | | | |
| Summative assessment | Midterm Exam | 2 hr | 10%(10) | 7 | LO #1 - #5 |
| | Final Exam | 3 hr | 50%(50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

| Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري | |
|---|---|
| Week 1 | Introduction to Computer-Based Modeling - Overview of the course, Role of modeling and simulation in renewable energy, Introduction to mathematical modeling |
| Week2 | Mathematical Modeling Techniques - Basics of differential equations, Development of mathematical models for renewable systems, Numerical methods and techniques |
| Week3 | Software Tools for Simulation - Introduction to simulation software (e.g., MATLAB/Simulink, PSCAD, HOMER), Hands-on training with simulation tools, Model |

| | |
|---------|--|
| | development using software |
| Week4 | Solar Energy System Modeling - Modeling of solar PV systems, Solar thermal system modeling, Simulation of solar irradiance and weather conditions |
| Week5 | Wind Energy System Modeling - Wind turbine modeling, Wind farm modeling, Wind resource assessment and simulation |
| Week6 | Hydropower System Modeling - Hydroelectric power plant modeling, Run-of-river and dam-based systems, Impact of water flow and reservoir levels |
| Week7 | Biomass Energy System Modeling - Biomass combustion and gasification modeling, Biogas and biofuel production simulation, Resource availability and feedstock analysis |
| Week8 | Geothermal Energy System Modeling - Geothermal power plant modeling, Geothermal heat pump modeling, Ground heat exchanger simulations |
| Week9 | Data Collection and Integration - Gathering relevant data for simulation, Data processing and integration into models, Incorporating real data into simulations |
| Week 10 | Performance Evaluation - Assessing the performance of renewable energy systems through computer-based simulations, Evaluation of system efficiency and reliability |
| Week 11 | Optimization Techniques - Strategies for optimizing renewable energy system performance using computer-based tools, Sensitivity analysis and scenario planning for optimization |
| Week 12 | Grid Integration and Energy Storage - Simulating grid-connected renewable energy systems, Modeling energy storage solutions and load balancing |
| Week 13 | Case Studies and Projects - Analysis of real-world renewable energy projects using computer-based modeling and simulation, Group projects and hands-on simulation exercises |
| Week 14 | Sustainability and Environmental Impact Assessment - Incorporating sustainability aspects into computer-based simulations, Environmental impact assessments in renewable energy projects |
| Week 15 | Report Generation and Communication - Effective communication of simulation results to stakeholders, Presentation of findings and insights |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the Library? |
|-------------------|---|---------------------------|
| Required Texts | Renewable Energy Integration: Practical Management of Variability, Uncertainty, and Flexibility in Power Grids by Lawrence E. Jones | No |
| Recommended Texts | Modeling and Simulation for Electric Power Engineering by Dragan Jovcic and Damir Novosel | No |
| | Computer Simulation in Management Science by Michael Pidd | No |

Module 44

معلومات المادة الدراسية

| | | | |
|------------------------------------|--------------------|-------------------------------|---|
| Module Title | Graduation Project | | Module Delivery |
| Module Type | Core | | <input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input checked="" type="checkbox"/> Practical <input checked="" type="checkbox"/> Seminar |
| Module Code | COGTEK 401 | | |
| ECTS Credits | 6 | | |
| SWL (hr/sem) | 150 | | |
| Module Level | 4 | Semester of Delivery | |
| Administration Department | RETE | College | College of Oil and Gas Techniques Engineering - Kirkuk, Northern Technical University, Iraq |
| Module Leader | | e-mail | @ntu.edu.iq |
| Module Leader's Acad. Title | Assistant lecturer | Module Leader's Qualification | M.Sc. |
| Module Tutor | | e-mail | |
| Peer Reviewer Name | | e-mail | |
| Scientific Committee Approval Date | | Version Number | |

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

| | | | |
|----------------------|---------|----------|---|
| Prerequisite module | NTU 400 | Semester | 7 |
| Co-requisites module | None | Semester | |

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| | |
|--|--|
| <p>Module Aims أهداف المادة الدراسية</p> | <ol style="list-style-type: none"> 8. To Understand the significance of scientific research and its role in advancing knowledge. 9. To Identify the key characteristics of scientific research. 10. This course deals with the basic concept of Formulate research questions and objectives. 11. This is the basic subject for all ethical considerations in scientific research 12. Recognize the importance of conducting a literature review in research. 13. Familiarize with quantitative and qualitative data collection methods. 14. Understand the principles of experimental design. |
| <p>Module Learning Outcomes مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> 12. Understand the nature and significance of scientific research. Identify the characteristics and principles of scientific research. Demonstrate an awareness of ethical considerations in scientific research. 13. Recognize between various research designs. 14. List the various Formulate clear research questions and objectives 15. Summarize what is literature review to identify relevant research articles. 16. Discuss and evaluate the credibility and relevance of research articles. 17. Design experiments that maximize internal and external validity. 18. Determine the appropriate sample size for a survey based on research objectives. 19. Demonstrate proficiency in employing different approaches to qualitative research. 20. Recognize and apply ethical principles and guidelines in research involving human subjects 21. Communicate research results in a clear and concise manner to different audiences. 22. Formulate a clear and concise research problem statement. |
| <p>Indicative Contents الإرشادية المحتويات</p> | <p>Indicative content includes the following.</p> <p>Part A - Definition and significance of scientific research [5 hrs.]</p> <p>Part B- Research Problem Formulation [5 hrs.]</p> <p>Part C- Research Design and Methodology [5 hrs.]</p> <p>Part D- Literature Review [5 hrs.]</p> <p>Part E- Data Collection and Measurement [5 hrs.]</p> <p>Part F- Homework and Discussion [7 hrs.]</p> |

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

| | |
|-------------------|--|
| Strategies | Studying the Methodology of Scientific Research requires a combination of active learning strategies and focused study techniques, such as; Read the Course Materials, Engage in Discussions, Take Detailed Notes, Practice with Examples, Review and Summarize, Create Visual Aids, and Work on Exercises and Assignments |
|-------------------|--|

Student Workload (SWL)

الحمل الدراسي للطالب

| | | | |
|---|-----|---|------|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | 63 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً | 4.13 |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | 87 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً | 5.86 |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | 125 | | |

Module Evaluation

تقييم المادة الدراسية

| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
|----------------------|-----------------|-------------|----------------|--------------|---------------------------|
| Formative assessment | Quizzes | 2 | 10% (10) | 3, and 9 | LO #10, 11 |
| | Assignments | 2 | 10% (10) | 2, and 12 | LO #4 and 7 |
| | Projects / Lab. | 1 | 10% (10) | Continuous | All |
| | Lab Report | 5 | 10% (10) | 3,7,11,13,14 | LO #5,8,11,13,15 |
| Summative assessment | Mid Term exam | 2 hr | 10% (10) | 7 | LO #1 - 7 |
| | Final Exam | 3 hr | 50% (50) | 16 | All |
| 100% (100 Marks) | | | | | |

Delivery Plan (Weekly Syllabus)

المنهاج الأسبوعي النظري

| | |
|--------|-------------------------------------|
| Week 1 | Introduction to Scientific Research |
| Week 2 | Research Design |
| Week 3 | Literature Review |
| Week 4 | Data Collection Methods |

| | |
|---------|---|
| Week 5 | Data Analysis |
| Week 6 | Experimental Design |
| Weeks 7 | Survey Design and Sampling |
| Weeks 8 | Qualitative Research Methods |
| Week 9 | Ethics in Scientific Research |
| Week 10 | Data Interpretation and Presentation |
| Week 11 | Peer Review and Publication Process |
| Week 12 | Research Proposal Writing |
| Week 13 | Project Management and Time Planning |
| Week 14 | Presentations and Research Conferences |
| Week 15 | Research Ethics Review and Course Wrap-up |

| Learning and Teaching Resources مصادر التعلم والتدريس | | |
|--|--|---------------------------|
| | Text | Available in the Library? |
| Required Texts | 1. "Research Design: Qualitative, Quantitative, and Mixed Methods Approaches" by John W. Creswell and J. David Creswell 2. "The Craft of Research" by Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams 3. "Research Methodology: A Step-by-Step Guide for Beginners" by Ranjit Kumar | Yes |
| Recommended Texts | Academic Databases: Utilize academic databases such as PubMed, Google Scholar, JSTOR, and IEEE Xplore to search for research papers in the methodology of scientific research. Use relevant keywords such as "research methodology," "scientific research design," or specific methodologies you are interested in (e.g., "qualitative research methods," "experimental design"). (www.socialresearchmethods.net) (www.researchmethodology.org) (www.qualres.org) | No |