

اللائحة الداخلية لمرحلة البكالوريوس  
بنظام الساعات المعتمدة  
لكلية العلوم  
جامعة بنها

٢٠٢١

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## مقدمة

فى إطار تحقيق نقلة نوعية فى لوائح كليات العلوم بالجامعات المصرية لتواكب النظم العالمية الحديثة للتعليم الجامعى فى تخصص العلوم الأساسية. تم إعداد هذه اللائحة الداخلية لمرحلة البكالوريوس بالكلية بنظام الساعات المعتمدة طبقاً للإطار العام الموحد للوائح بقطاع العلوم الأساسية، حيث تم إضافة برامج جديدة لللائحة الداخلية للكلية بمرحلة البكالوريوس فى تخصصات متنوعة تُلبى إحتياجات سوق العمل وتُراعى تزويد الطالب بمهارات إضافية من خلال التدريبات والأنشطة والدراسات الحقلية والتعلم الذاتى وإعداد التقارير العلمية التى تُكسبه القدرة على المنافسة فى سوق العمل فى المجالات المختلفة.

إن تطبيق نظام الساعات المعتمدة فى اللوائح الدراسية يحقق جودة العملية التعليمية حيث انه يعتمد على التقويم المستمر للطلاب كما يُعطى الطالب فرصة فى اختيار برنامجه الأكاديمى وإمكانية اختيار الطالب للمقررات التى يدرسها فى كل فصل دراسى واختيار أستاذ المادة، كما يوفر نظام الإرشاد الأكاديمى فرص تقديم النصيحة للطلاب وتوجيههم حسب ميولهم وقدراتهم العلمية وحل أى مشاكل أو عقبات قد تواجههم طوال فترة الدراسة.

خالص امنياتى الطيبة لابنائنا الطلاب بالتوفيق والنجاح فى كافة المراحل الدراسية والعملية لتحقيق التقدم والازدهار لمصرنا الغالية.

عميد الكلية

أ.د/ لطفي أبو سالم

## رؤية الكلية

تسعى كلية العلوم بجامعة بنها أن تكون مؤسسة متميزة وبيت خبرة في مجال التعليم والبحث العلمي وخدمة المجتمع وتتطلع للتعاون وإبرام شراكات محلية وإقليمية ودولية لتحقيق أهدافها.

## رسالة الكلية

تقدم الكلية برامج أكاديمية وتطبيقية متكاملة في مختلف العلوم الأساسية بهدف :-

- ١- إعداد خريج متميز قادر على البحث والإبتكار والمنافسة في المجالات المختلفة لسوق العمل.
- ٢- إجراء بحوث علمية ذات قيمة عالية ونشر علمي متميز على المستوى الإقليمي والدولي.
- ٣- توظيف الموارد البشرية والبحوث التطبيقية وتقديم خدمات التدريب والإستشارات العلمية للمساهمة في حل مشكلات البيئة وتنمية المجتمع.

## أهداف الكلية

- ١- بناء مؤسسة تعليمية بحثية قادرة على مواكبة وإستيعاب التطور المستمر والمتواصل في العلوم الأساسية وتطبيقاتها المختلفة.
- ٢- تخريج أجيال متميزة قادرة على المنافسة في سوق العمل وإستيعاب التكنولوجيا الحديثة المتطورة من خلال مقاييس أكاديمية وعلامات مرجعية محلية وعالمية.
- ٣- التطوير والتحديث المستمر للبرامج التعليمية والبحثية.
- ٤- القيام بدور مؤثر في تنمية المجتمع من خلال برامج التدريب والتوعية والإستشارات والتفاعل التبادلي بين الكلية والمجتمع.
- ٥- العمل على خلق وتنمية العلاقات الدولية وخاصة العربية والأفريقية من خلال التبادل العلمي والثقافي.
- ٦- تعميق الولاء الوطني والمحافظة على مبادئ المجتمع والقيم الإنسانية النبيلة.

## مواصفات خريج كلية العلوم

- طبقاً للمعايير الأكاديمية القومية القياسية (NARS) والتي تبنتها الكلية فإن مواصفات الخريج تشمل على:
- التواصل مع الآخرين بشكل فعال مع إجادة المشاركة في العمل الجامعي متعدد التخصصات مع مراعاة المسؤولية الاجتماعية.
  - الإستخدام الفعال لتكنولوجيا المعلومات ذات الصلة التي تمكنه من البحث عن المعلومات المطلوبة وإعتماد التعلم الذاتي مع مراعاة القواعد القانونية والأخلاقية والمهنية.
  - وضع مفاهيم جديدة وإختيار الحلول المناسبة لحل المشكلات لتلبية إحتياجات المجتمع المطلوبة في مجالات متنوعة مع القدرة على القيادة وصنع القرار.
  - إستخدام الحقائق العلمية والنظريات لتفسير وتحليل النتائج التجريبية.
  - التخطيط والتصميم لإنجاز البحث العلمي بإستخدام الطرق المناسبة.

### الدرجات العلمية

تمنح جامعة بنها بناءً على طلب كلية العلوم الدرجات العلمية الآتية: -

- ١- درجة بكالوريوس العلوم في أحد مجالات التخصص المبينة في المادة (٩) من هذه اللائحة.
- ٢- دبلومة الدراسات العليا .
- ٣- درجة الماجستير في العلوم.
- ٤- درجة دكتوراه الفلسفة في العلوم.
- ٥- درجة الدكتوراه في العلوم.

### البرامج الجديدة بالكلية

يوجد بالكلية برامج جديدة بنظام الساعات المعتمدة صدر لها قرارات وزارية ولها لوائحها الخاصة هي:-

- ١- برنامج علوم المواد النانومترية وتطبيقاتها.
- ٢- برنامج الميكروبيولوجي والكيمياء الحيوية.
- ٣- برنامج الحوسبة والمعلوماتية الحيوية.

## المواد والأحكام العامة

### مادة ١ : الأقسام العلمية

تضم الكلية الأقسام العلمية التالية وتطرح البرامج الدراسية المذكورة، بالمادة (٩) في اللائحة بالإضافة إلى برامج نوعية صدر لها قرارات وزارية ولها لوائحها الخاصة :-

١ - قسم الرياضيات وعلوم الحاسب

٢ - قسم الفيزياء

٣ - قسم الكيمياء

٤ - قسم علم الحيوان

٥ - قسم النبات والميكروبيولوجي

٦ - قسم علم الحشرات

٧ - قسم الجيولوجيا

### مادة ٢ : الدرجات العلمية

تمنح جامعة بنها بناء على توصية مجلس الكلية درجة البكالوريوس في العلوم في أحد التخصصات التالية:

| التخصص                          |                       | م  |
|---------------------------------|-----------------------|----|
| English                         | عربي                  |    |
| Mathematics                     | الرياضيات             | ١  |
| Statistics                      | الاحصاء               | ٢  |
| Statistics and Computer Science | احصاء وعلوم الحاسب    | ٣  |
| Computer Science                | علوم الحاسب           | ٤  |
| Physics                         | فيزياء                | ٥  |
| Physics / Chemistry             | فيزياء/كيمياء         | ٦  |
| Biophysics                      | فيزياء حيوية          | ٧  |
| Chemistry                       | كيمياء                | ٨  |
| Applied Chemistry               | كيمياء تطبيقية        | ٩  |
| Chemistry / Radiation Chemistry | كيمياء/كيمياء إشعاعية | ١٠ |
| Botany/ Chemistry               | نبات/كيمياء           | ١١ |
| Microbiology/Chemistry          | ميكروبيولوجي/ كيمياء  | ١٢ |
| Zoology/ Chemistry              | حيوان/ كيمياء         | ١٣ |
| Zoology/Environmental Science   | حيوان وعلوم البيئة    | ١٤ |
| Biotechnology                   | بيوتكنولوجيا          | ١٥ |
| Entomology/ Chemistry           | الحشرات/الكيمياء      | ١٦ |
| Entomology/Microbiology         | احشرات/ ميكروبيولوجي  | ١٧ |
| Geology                         | جيولوجيا              | ١٨ |
| Geophysics                      | جيوفيزياء             | ١٩ |
| Geology/ Chemistry              | جيولوجيا/كيمياء       | ٢٠ |

### مادة ٣: نظام الدراسة

نظام الدراسة بالكلية هو نظام الساعات المعتمدة، وتمنح جامعة بنها بناءً على طلب مجلس كلية العلوم درجة البكالوريوس في العلوم في أحد التخصصات المبينة في اللائحة بعد تحقيق متطلبات التخرج التي تضمها اللائحة، ويجوز إضافة برامج جديدة أو تعديل البرامج التي تتضمنها لائحة الكلية بمبررات يوافق عليها مجلس الكلية والجامعة ولجنة قطاع العلوم الأساسية.

### مادة ٤: معيار الساعة المعتمدة

تحتسب ساعة معتمدة واحدة كل محاضرة مدتها ساعة نظرية واحدة أو ٢-٣ ساعات تمارين أو دراسة معملية في الأسبوع لمدة فصل دراسي كامل، ويمكن للساعات المعتمدة في مقرر ما أن تكون نظرية فقط أو عملية فقط، أو مزيج بين النظرى والعملى، كما تحتسب ساعة معتمدة واحدة أى فترة تدريبية مدتها ثلاث ساعات أسبوعياً لمدة فصل دراسي واحد أو ما يعادلها من تدريب صيفي أو رحلات علمية أو دراسة حقلية ويخصص لكل ساعة معتمدة ساعة للإمتحان التحريري وبحد أقصى ثلاثة ساعات.

### مادة ٥: مدة ومستويات الدراسة

مدة الدراسة لنيل درجة البكالوريوس في كلية العلوم هي أربع سنوات جامعية بشرط استكمال الطالب عدد الساعات المعتمدة المطلوبة للتخرج (١٣٦ ساعة) بنجاح، وتقسم هذه المدة إلى أربعة مستويات دراسية، ويشمل المستوى الواحد فصلين دراسيين وتحدد مستويات الدراسة بعدد الساعات التي اجتازها الطالب بنجاح كما يلي:-

(أ) المستوى الأول (Freshman) من صفر حتى ٣٠ ساعة.

(ب) المستوى الثانى (Sophomore) من ٣١ ساعة حتى ٦٤ ساعة.

(ت) المستوى الثالث (Junior) من ٦٥ ساعة حتى ١٠٠ ساعة.

(ث) المستوى الرابع (Senior) من ١٠١ ساعة وحتى ١٣٦ ساعة.

### مادة ٦: العام الدراسي

يتكون العام الدراسي من فصلين دراسيين إلزاميين هما الفصل الأول (فصل الخريف)، والفصل الثانى (فصل الربيع) مدة كل منهما سبعة عشر أسبوعاً، و فصل ثالث اختياري مكثف خلال فترة الصيف (فصل صيفي) لمدة ثمانية أسابيع .

### مادة ٧: الفصل الدراسي

(أ) يتكون الفصل الدراسى المعتاد من سبعة عشر أسبوعاً موزعة على النحو التالى :-

(ب) فترة التسجيل مدتها أسبوع واحد ويجوز التسجيل المبكر إلكترونياً قبل بدء الفصل الدراسى لطلاب المستويات الثانى والثالث والرابع .

(ت) فترة الدراسة أربعة عشر أسبوعاً منها أسبوع للامتحانات النصف فصلية.

(ث) فترة الامتحانات النهائية أسبوعين يحددها مجلس الكلية والجامعة.



## مادة ٨: الفصل الصيفي

(أ) هو فصل دراسي مكثف إختباري مدته ثمانية أسابيع خلال الأجازة الصيفية يسجل فيه الطلاب المقررات الدراسية المؤجلة ومقررات الرسوب وكذلك المقررات اللازمة للتخرج او دراسة مقررات يتطلبها التخصص الذى يرغبه الطالب (متطلبات سابقة) بحد أقصى تسع ساعات معتمدة، وتكون المقررات المطروحة طبقاً لضوابط يحددها مجلس الكلية .

(ب) يتم تحصيل رسوم إضافية لتسجيل مقررات الفصل الصيفي، ولإعادة الإمتحان فى مواد الرسوب، يحدد قيمتها لكل ساعة معتمدة مجلس الكلية، يصرف منها مكافآت للسادة أعضاء هيئة التدريس والعاملين تبعاً لضوابط يوافق عليها مجلس الكلية ومجلس الجامعة.

## مادة ٩: القبول وتخصصات المستوى الأول

تقبل كليات العلوم الطلاب الحاصلين على الثانوية العامة القسم العلمى (تخصص رياضيات وعلوم) أو ما يعادلها وفقاً لشروط القبول التى يحددها المجلس الأعلى للجامعات، ويجوز لمجلس الكلية أيضاً قبول طلاب وافدين بشروط القيد والتحويل المطبقة على المصريين وبشروط إضافية يقترحها مجلس الكلية ويوافق عليها مجلس الجامعة ويوزع طلاب المستوى الأول الحاصلين على الثانوية العامة أو ما يعادلها على ثلاث شعب هي:-

أ- شعبة العلوم الطبيعية وتقبل الحاصلين على الثانوية العامة شعبة رياضيات.

ب- شعبة العلوم البيولوجية وتقبل الحاصلين على الثانوية العامة شعبة علوم.

ج- شعبة العلوم الجيولوجية وتقبل الحاصلين على الثانوية العامة شعبة رياضيات أو شعبة علوم.

ويتضمن الجدول التالى توزيع مقررات العلوم الأساسية للمستوى الأول على الشعب الثلاث:

| شعبة العلوم الطبيعية   |         |         |         |         |         |
|------------------------|---------|---------|---------|---------|---------|
| رياضيات                | فيزياء  | كيمياء  | حاسب    | بيولوجي |         |
| ٨ ساعات                | ٦ ساعات | ٦ ساعات | ٤ ساعات | ٤ ساعات |         |
| شعبة العلوم البيولوجية |         |         |         |         |         |
| نبات                   | حيوان   | كيمياء  | فيزياء  | رياضيات | حاسب    |
| ٦ ساعات                | ٦ ساعات | ٦ ساعات | ٤ ساعات | ٣ ساعات | ٣ ساعات |
| شعبة العلوم الجيولوجية |         |         |         |         |         |
| جيولوجيا               | فيزياء  | كيمياء  | بيولوجي | رياضيات | حاسب    |
| ٦ ساعات                | ٦ ساعات | ٦ ساعات | ٤ ساعات | ٣ ساعات | ٣ ساعات |

فى حال ضم الرياضيات والعلوم فى شهادة الثانوية العامة يتم توزيع طلاب المستوى الأول بالشعب المختلفة طبقاً لتنسيق داخلى يوافق عليه مجلس الكلية و يعتمد على درجات الطلاب فى المواد المؤهلة للشعب المختلفة والقدرة الاستيعابية للاقسام العلمية بالكلية.

مادة ١٠ : التخصصات والبرامج الدراسية

(أ) يختار الطالب البرنامج الذى يرغب دراسته بعد المستوى الأول فى اطار الشعبة التى التحق بها، طبقا لقواعد التنسيق الداخلية التى يقرها مجلس الكلية استرشاداً بالجدول التالى :

| الرمز    | البرنامج الاكاديمى              |                       | القسم                  | الشعبة            |
|----------|---------------------------------|-----------------------|------------------------|-------------------|
| English  | English                         | عربى                  |                        | العلوم الطبيعية   |
| Mat      | Mathematics                     | الرياضيات             | رياضيات وعلوم الحاسب   |                   |
| Sta      | Statistics                      | احصاء                 |                        |                   |
| Sta/ Com | Statistics and Computer Science | احصاء وعلوم حاسب      |                        |                   |
| Com      | Computer Science                | علوم حاسب             |                        |                   |
| Phy      | Physics                         | فيزياء                | الفيزياء               |                   |
| Phy/Chm  | Physics / Chemistry             | فيزياء/ كيمياء        |                        |                   |
| Chm      | Chemistry                       | كيمياء                | الكيمياء               |                   |
| Chm /ACh | Applied Chemistry               | كيمياء تطبيقية        |                        |                   |
| Chm/RCh  | Chemistry / Radiation Chemistry | كيمياء/كيمياء إشعاعية |                        |                   |
| Mic/Chm  | Microbiology/ Chemistry         | ميكروبيولوجى/ كيمياء  | النبات والميكروبيولوجى | العلوم البيولوجية |
| Bot/Chm  | Botany/ Chemistry               | نبات/ كيمياء          |                        |                   |
| Zoo      | Zoology/ Chemistry              | حيوان/ كيمياء         | علم الحيوان            |                   |
| Zoo/Env  | Zoology/Environmental Science   | حيوان وعلوم البيئة    |                        |                   |
| BTC      | Biotechnology                   | بيوتكنولوجيا          |                        |                   |
| Ent/Chm  | Entomology/ Chemistry           | حشرات/ كيمياء         | علم الحشرات            |                   |
| Ent/Mic  | Entomology/Microbiology         | حشرات/ ميكروبيولوجى   |                        |                   |
| BPh      | Biophysics                      | فيزياء حيوية          | الفيزياء               |                   |
| Geo      | Geology                         | الجيولوجيا            | الجيولوجيا             |                   |
| GPh      | Geophysics                      | الجيوفيزياء           |                        |                   |
| Geo/Chm  | Geology/ Chemistry              | الجيولوجيا/الكيمياء   |                        |                   |

(ب) يجوز لمجلس الكلية قبول طلاب من الحاصلين على درجة البكالوريوس من كلية العلوم أو من الكليات العملية الأخرى من المصريين والوافدين للدراسة بالكلية وذلك بعد أخذ رأى مجالس الأقسام المختصة وعمل مقاصات لهم وبشرط ألا تقل مدة الدراسة بالكلية عن أربعة فصول دراسية على الأقل وبشروط قبول يقترحها مجلس الكلية ويوافق عليها مجلس الجامعة.

## مادة ١١ : إنشاء برامج تعليمية جديدة

يجوز أن تضم لائحة الكلية برامج تعليمية جديدة بناءً على اقتراح مجلس الكلية أو أحد الأقسام العلمية يكون لكل منها لائحة خاصة، كما يجوز تقديم برامج جديدة داخل الكلية بمشاركة بعض الأقسام أو بالتعاون مع كلية أو أكثر من كليات الجامعة أو جامعة أخرى أو مركز بحثي.

## مادة ١٢ : متطلبات التخرج

متطلبات التخرج لنيل درجة درجة البكالوريوس في العلوم هي إجتياز الطالب بنجاح ١٣٦ ساعة معتمدة بمعدل تراكمي لمتوسط النقاط (Comulative GPA) لا يقل عن ٢ وتوزع ساعات الدراسة كما يلي: -

(أ) متطلبات الجامعة: مقررات ثقافية وعلمية عامة بواقع ٨ ساعات معتمدة منها أربع ساعات إجبارية وأربعة ساعات إختيارية.

(ب) متطلبات الكلية: ٢٨ ساعة معتمدة تشارك في تقديمها كل أقسام الكلية.

(ت) متطلبات التخصص: ٨٨ ساعة معتمدة، توزع بين المقررات الإلجبارية (٦٠ ساعة معتمدة) والمقررات الاختيارية (٢٨ ساعة معتمدة) للتخصص.

(ث) مقررات اختيارية حرة: ٦ ساعات معتمدة من خارج مقررات التخصص .

(ج) مشروع تخرج: كتابة مقال مرجعي أو تنفيذ مشروع تخرج بحثي في التخصص بإشراف أحد أعضاء هيئة التدريس (٣) ساعات معتمدة.

(ح) تدريبات تطبيقية وميدانية لمدة ثمانية أسابيع داخل مؤسسات إنتاجية أو أحد المراكز البحثية أو الأقسام العلمية بالجامعة التي يدرس بها الطالب (٣) ساعات معتمدة.

ويُلخص الجدول التالي توزيع الساعات المعتمدة كمتطلبات التخرج لنيل درجة درجة البكالوريوس في العلوم وعدد الساعات الإلجبارية والاختيارية لكل مطلب:

| م | المُتطلب        | عدد الساعات |         |       | تعريف بالمُتطلب                | النسبة المئوية |
|---|-----------------|-------------|---------|-------|--------------------------------|----------------|
|   |                 | إلجبارى     | إختيارى | مجموع |                                |                |
| ١ | متطلبات الجامعة | ٤           | ٤       | ٨     | فى المستوى الأول غالبا         | ٥,٨٨           |
| ٢ | متطلبات الكلية  | ٢٨          | --      | ٢٨    | فى المستوى الأول غالبا         | ٢٠,٥٩          |
| ٣ | التخصص المنفرد  | ٦٠          | ٢٨      | ٨٨    | يبدأ دراستها من المستوى الثانى | ٦٤,٧١          |
| ٤ | التخصص الرئيسى  | ٤٦          | ٢٠      | ٦٦    | يبدأ دراستها من المستوى الثانى | ٤٨,٥٣          |
| ٥ | التخصص الفرعى   | ١٦          | ٦       | ٢٢    | يبدأ دراستها من المستوى الثانى | ١٦,١٧          |
| ٦ | التخصص المزدوج  | ٣٠          | ١٤      | ٤٤    | يبدأ دراستها من المستوى الثانى | ٣٢,٣٥          |
| ٧ | الإختيار الحر   |             | ٦       | ٦     | يبدأ دراستها من المستوى الثانى | ٤,٤١           |
| ٨ | تدريب ميدانى    | 3           | --      | ٣     | ٨ أسابيع بعد المستوى الثالث    | ٢,٢١           |
| ٩ | مشروع تخرج      | ٣           | --      | ٣     | مقال أو بحث معملى              | ٢,٢١           |

### مادة ١٣ : النظام الكودى للمقررات الدراسية

- ١- تكود المقررات بوضع الرمز الكودى للتخصص طبقاً للجدول الموضح بالمادة (٩) يليه رقم المقرر.
- ٢ - تُقسم المقررات الدراسية إلى: -

(أ) مقررات (كود ١٠٠) تدرس أساساً بالمستوى الأول.

(ب) مقررات (كود ٢٠٠) تدرس أساساً بالمستوى الثانى .

(ج) مقررات (كود ٣٠٠) تدرس أساساً بالمستوى الثالث .

(د) مقررات (كود ٤٠٠) تدرس أساساً بالمستوى الرابع .

٣- يُوضع الرقم الدال على مستوى المقرر فى خانة المئات ثم رقم المقرر فى خانتي الآحاد والعشرات.

٤- يتم طرح المقررات ذات الأرقام الفردية فى الفصل الدراسى الأول وطرح المقررات ذات الأرقام الزوجية فى الفصل الدراسى الثانى بالإضافة الى ان المقررات ذات الأرقام الأحادية (٠) و(٥) يجوز طرحها فى الفصلين الأول والثانى، ويجوز للجنة شئون الطالب اقتراح طرح مقرراً ما فى أكثر من فصل دراسى وذلك فى الحالات التى تستوجب ذلك وبعد تحديد الحد الأدنى من الطلاب اللازم لفتح المقرر وموافقة مجلس الكلية.

### مادة ١٤ : الإرشاد الأكاديمى والسجل الأكاديمى

(أ) يُخصص لكل طالب مرشد أكاديمى من بين أعضاء هيئة التدريس لتوجيه الطالب دراسياً ومساعدته على إختيار المقررات الدراسية وعدد الساعات التى يسجل بها وفقاً لقدراته .

(ب) يكون لكل طالب سجل أكاديمى لدى المرشد الأكاديمى يسجل فيه كافة المقررات التى درسها الطالب و المعدل الفصلى والتراكمى للطالب حتى تخرجه من الكلية .

(ت) لا تُقبل طلبات التسجيل أو الإضافة أو الانسحاب إلا باعتماد المرشد الأكاديمى.

### مادة ١٥ : التسجيل والنقل للمستوى الأعلى

(أ) يتم توزيع طلاب المستوى الأول على البرامج الأكاديمية التى تضمها اللائحة فى مادة ٣ طبقاً لرغبتهم وفق الشروط التى يقرها مجلس الكلية .

(ب) يتم تسجيل الطلاب الكترونياً قبل بداية الفصل الدراسى ويتم الإنتهاء من تسجيل المقررات فى الأسبوع الأول من الدراسة، ويجوز فى حالة وجود أعذار قهرية أن يتم التسجيل حتى نهاية الأسبوع الرابع (الحذف والإضافة)، ويراعى عند تسجيل الطالب لمقرر ما دراسته للمتطلب السابق .

### مادة ١٦ : العبء الدراسى

يسمح لكل طالب بالتسجيل فى ساعات تتراوح بين 16 و ١٨ ساعة معتمدة لكل فصل دراسى ويستثنى من ذلك الحالات الآتية: -

(أ) يجوز للطالب المتفوق الحاصل على (معدل تراكمى = 3.333 على الأقل) بعد المستوى الأول - أن يسجل ٢٠ ساعة معتمدة فى الفصل الدراسى الواحد وبحد أقصى ٤ مرات طوال فترة الدراسة .

(ب) يجوز لمجلس الكلية زيادة الحد الأقصى للعبء الدراسى إلى ٢٢ ساعة معتمدة لمرة واحدة للطالب بشرط اجتياز ١٠٠ ساعة معتمدة وان يكون معدله التراكمى لا يقل عن ٢ بغرض إتمام متطلبات التخرج اللازمة له.

(ت) لا يُسمح للطالب الذي لا يحقق معدل تراكمي ٢ (٦٠٪ من الحد الأقصى لمجموع درجات المقررات التي درسها) بالتسجيل في أكثر من ١٢ ساعة معتمدة في الفصل الدراسي الواحد ويراقب أكاديميا حتى يتجاوز هذا المعدل .

(ث) يجوز لمجلس الكلية أن يعفى الطالب المحول من كلية مناظرة من بعض المقررات إذا ثبت أنه قد درس ونجح في مقررات تعادلها في الكلية المحول منها، كما يجوز للطالب دراسة مقررات مناظرة في كلية من كليات العلوم الأخرى بجمهورية مصر العربية أو الخارج لظروف يقبلها مجلس الكلية بعد أخذ رأي مجلس القسم المختص.

(ج) يجوز تسجيل المقرر والمقرر المتطلب في نفس الفصل الدراسي عند الضرورة بعد موافقة مجلس الكلية.

#### مادة ١٧ : الحذف والإضافة والإنسحاب

(أ) يجوز للطالب بتوصية من المرشد الأكاديمي أن يحذف أو يضيف مقررا أو مقررين حتى نهاية الأسبوع الرابع من بدء التسجيل وذلك بما لا يخل بالعبء الدراسي المنصوص عليه في المادة (١٦) .

(ب) يجوز أن ينسحب الطالب من دراسة أى مقرر حتى نهاية الأسبوع الثامن من بدء التسجيل للفصل الدراسي، ويسجل هذا المقرر في سجل الطالب الأكاديمي بتقدير "منسحب" بشرط ألا يكون الطالب قد تجاوز نسبة الغياب المقررة قبل الانسحاب، وتعرض حالات الإنسحاب الإضطرارية بعد هذا الميعاد على لجنة شئون التعليم والطلاب بالكلية للنظر فيها وإقرارها من مجلس الكلية .

#### مادة ١٨ : تغيير أو تعديل البرنامج الدراسي

(أ) يجوز للطالب تغيير أو تعديل برنامجه الدراسي خلال المستوى الأول والثاني، بعد موافقة المرشد الأكاديمي ولجنة شئون التعليم والطلاب ومجلس الكلية بشرط توافر أماكن شاغرة وشروط القبول في برنامج التخصص الذي يرغب في التحويل إليه.

(ب) يدرس الطالب مقررات البرنامج الجديد ولا تحتسب مقررات البرنامج المحول منه ضمن متطلبات التخرج ما لم تكن ضمن مقررات البرنامج الجديد .

(ت) تُشطب من سجل الطالب جميع المقررات التي اجتازها الطالب ما لم تكن من متطلبات البرنامج الجديد (رئيسي/ فرعي)، ولا يتم احتسابها في المعدل التراكمي، ويجوز لمجلس الكلية فرض رسوم إضافية عن هذا التحويل .

#### مادة ١٩ : المواظبة

يتولى أستاذ المقرر تسجيل حضور الطلاب في بدء كل محاضرة نظرية أو فترة عملية في سجل معد لذلك من قبل شئون الطلاب مع مراعاة ما يلي: -

(أ) الحد المسموح به لغياب الطالب بدون عذر مقبول هو ٢٥٪ من مجموع ساعات المقرر، ويتولى أستاذ المقرر إخطار إدارة شئون الطلاب لإنذار الطالب مرتين؛ الإنذار الأول بعد تجاوز الطالب نسبة غياب ١٠٪ من ساعات المقرر والإنذار الثاني بعد تجاوزه نسبة غياب ٢٥٪ .

(ب) إذا زادت نسبة الغياب عن ٢٥٪ في المقرر وكان غياب الطالب بدون عذر تقبله لجنة شئون التعليم والطلاب ويعتمده مجلس الكلية، يسجل للطالب تقدير "محروم" في المقرر وتدخل نتيجة تقدير "محروم" في حساب المعدل الفصلي والمعدل التراكمي العام للطالب .

(ج) إذا زادت نسبة الغياب عن ٢٥٪ وكان غياب الطالب بعذر مقبول من مجلس الكلية يسجل للطالب تقدير "غائب بعذر" ولا تدخل في حساب المعدل الفصلي أو المعدل التراكمي العام للطالب.

## مادة ٢٠ : التأجيل وعدم الاكتمال وتكرار الرسوب

(أ) تُؤجل نتيجة مقرر من المقررات لعدم دخول الطالب الامتحان النهائي لعذر مقبول) ولمدة لا تتجاوز فصل دراسي واحد، ويُعطى الطالب في هذه الحالة تقدير مؤجل (م ج, Postponed) ويستكمل الطالب متطلبات المقرر بحضور الإمتحان النهائي للمقرر خلال الأسبوع الأول من الفصل الدراسي التالي مباشرة، وإذا لم يؤدي الطالب الاختبار حينئذ يُعتبر راسب ويرصد له تقدير راسب (ر).

(ب) إذا لم تستكمل متطلبات مقرر ما لأسباب ترجع للكلية، يعطى الطالب في هذه الحالة تقدير غير مكتمل (غ.م.) (Incomplete) وعند اكتمال متطلبات المقرر في الفصول الدراسية التالية ترفع نتيجته على النظام .  
(ت) إذا تكرر رسوب الطالب في مقرر ما، تسجل عدد المرات التي درس فيها هذا المقرر في سجله الأكاديمي، وتحسب له درجة النجاح التي حصل عليها عند اجتياز الإمتحان بحد أقصى (B) .

## مادة ٢١ : التقويم والدرجات

(أ) يتم تقييم إمتحان كل مقرر من (١٠٠) مائة درجة ويتم تقييم الطالب في المقررات النظرية والعملية بناءً على العناصر الواردة في الجدول التالي:-

| نوع الامتحان                                | المقرر نظري وعملي | المقرر نظري فقط | المقرر عملي فقط |
|---|-------------------|-----------------|-----------------|
| إمتحان نظري نهائي                           | ٥٠٪               | ٦٠٪             | -               |
| إمتحان عملي نهائي                           | ٢٥٪               | -               | ٦٠٪             |
| إمتحان شفوي نهائي                           | ٥٪                | ١٠٪             | ١٠٪             |
| إمتحان نصف فصلي نظري                        | ٥٪                | ١٠٪             | ١٠٪             |
| تقييم مستمر - واجبات<br>وتطبيقات - وتكليفات | ١٥٪               | ٢٠٪             | ٢٠٪             |
| مجموع درجات الإمتحانات                      | ١٠٠               | ١٠٠             | ١٠٠             |

(ب) بالنسبة للمقال المرجعي أو مشروع التخرج بالمستوى الأخير والمخصص له ٣ ساعات معتمدة توزع درجاته بواقع ٦٠٪ على جودة المقال أو تقرير المشروع، و ٣٠٪ للمناقشة الشفهية و ١٠٪ للمتابعة الدورية من أحد أعضاء هيئة التدريس.

(ت) بالنسبة للتدريب الميداني يخصص له ٣ ساعات معتمدة توزع درجاته بواقع ٤٠٪ على جودة تقرير الطالب، و ٤٠٪ لتقرير مشرف التدريب و ٢٠٪ للمناقشة .

(ث) يعتبر الطالب الذي يحصل على درجة أقل من 40% من درجة الإمتحان النهائي راسباً في المقرر.

مادة ٢٢: الدلالات الرقمية والرمزية للدرجات والتقدير

(أ) تقدر الدرجات التي يحصل عليها الطالب في كل مقرر دراسي على النحو التالي:-

| التقدير Grade | رمز التقدير | المكافئ الرقمية<br>بالنقاط من ٤ | الدرجة المئوية |
|---------------|-------------|---------------------------------|----------------|
| Excellent     | ممتاز       | A <sup>+</sup>                  | ٩٠ > - ١٠٠     |
| Excellent     | ممتاز       | A                               | ٨٥ > - ٩٠      |
| Very Good     | جيد جدا     | B <sup>+</sup>                  | ٨٠ > - ٨٥      |
| Very Good     | جيد جدا     | B                               | ٧٥ > - ٨٠      |
| Good          | جيد         | B <sup>-</sup>                  | ٧٠ > - ٧٥      |
| Good          | جيد         | C <sup>+</sup>                  | ٦٥ > - ٧٠      |
| Pass          | مقبول       | C                               | ٦٠ > - ٦٥      |
| Fail          | راسب        | F                               | ٠ > - ٦٠       |
| Postponed     | مؤجل        | P                               | ٠ > - ٦٠       |
| Incomplete    | غير مكتمل   | IC                              | ٠ > - ٦٠       |
| Denial        | محروم       | DN                              | ٠ > - ٦٠       |
| Withdrawn     | منسحب       | W                               | ٠ > - ٦٠       |

مادة 23: المعدل الفصل والمعدل التراكمي

(أ) المعدل الفصلي (GPA) Grade Point Average هو متوسط ما يحصل عليه الطالب من نقاط في فصل دراسي واحد ويقرب إلى رقمين عشريين فقط ويحسب كما يلي:-

مجموع حاصل ضرب نقاط كل مقرر فصلي × عدد ساعاته المعتمدة

المعدل الفصلي =

حاصل جمع الساعات المعتمدة لهذه المقررات في الفصل

(ب) المعدل التراكمي (CGPA) Cumulative Grade Point Average هو متوسط ما يحصل عليه الطالب من نقاط خلال كل الفصول الدراسية التي درسها ويقرب إلى ثلاثة أرقام عشرية، ويبين في شهادة الطالب النقاط المكتسبة والنسبة المئوية إلى جانب التقدير العام للتخرج ويحسب المعدل التراكمي كما يلي:-

مجموع حاصل ضرب نقاط كل مقرر تم دراسته × عدد ساعاته المعتمدة

المعدل التراكمي العام =

حاصل جمع الساعات المعتمدة لهذه المقررات التي تم دراستها

مادة 24: مرتبة الشرف

تمنح مرتبة الشرف للطالب الذي ينهي دراسته بالكلية في غضون المدة الإعتيادية للتخرج والتي لا تزيد عن ٨ فصول دراسية أساسية بتقدير ممتاز بحد أدنى يحقق معدل تراكمي من النقاط قدره ٣,٦٦٧ أو أكثر وبشرط ألا يقل معدله التراكمي في أي فصل دراسي عن ٣,٠ وألا يكون قد رسب في أي مقرر دراسي خلال دراسته في الكلية أو في الكلية المحول منها إذا كان قد قضى مدة دراسة لا تزيد عن عامين في كلية أخرى .

**مادة 25: الإنذار والمراقبة الأكاديمية**

(أ) الطالب الموضوع تحت الملاحظة الأكاديمية يجب أن يرفع معدله التراكمي إلى ٢ فأكثر وذلك في مدة أقصاها أربعة فصول دراسية متتالية، ويرسل إليه إنذار ثان لتذكيره إذا أكمل فصلين دراسيين دون الوصول إلى المعدل المطلوب، كما يُخطر ولي أمره بذلك ، وإذا لم يحقق الطالب تقدير تراكمي ٢ على الأقل بعد أربعة فصول دراسية يتم فصل الطالب نهائياً.

(ب) الطالب الذى لا يحقق معدل تراكمي ٢ أو أكثر عند إتمامه متطلبات التخرج يسمح له بالتسجيل فى عدد من المقررات الدراسية بحد أقصى ١٢ ساعة معتمدة فى الفصل الدراسى حتى يحقق المعدل المطلوب للتخرج، ويُحسب له التقدير الأعلى للمقررات التى نجح فيها بحد أقصى B ويضاف فى سجله الأكاديمي.

**مادة ٢٦: الإنقطاع عن الدراسة وإلغاء القيد والفصل**

(أ) يجوز للطالب أن يطلب تأجيل دراسته لمدة لاتزيد عن أربعة فصول دراسية، منفصلة أو متصلة، خلال مدة دراسته بالكلية على أن تقدم طلبات التأجيل فى موعد أقصاه نهاية الأسبوع الخامس من الفصل الدراسى ويكون التأجيل نافذاً بعد أخذ رأى المرشد الأكاديمي ولجنة شئون التعليم والطلاب وموافقة مجلس الكلية ومجلس الجامعة.

(ب) إذا إنقطع الطالب عن الدراسة بالكلية لمدة لاتجاوز فصلين دراسيين لأسباب قهرية وافقت عليها لجنة شئون التعليم والطلاب ومجلس الكلية، يتاح للطالب فرصة أخرى للتسجيل ويستأنف دراسته فى الفصل الدراسى التالى، وتُحتسب مدة الإنقطاع ضمن فرص التأجيل المتاحة للطالب .

(ت) يتعرض الطالب للفصل من الكلية طبقاً لعدد مرات الرسوب على النحو التالى:

١- يُفصل طالب المستوى الأول إذا لم يجتز ٣٠ ساعة معتمدة من المقررات التى سجل فيها وأدى فيها الإمتحان خلال أربعة فصول دراسية رئيسية.

٢- يُفصل طالب المستوى الثانى إذا لم يجتز ٦٤ ساعة معتمدة من المقررات التى سجل فيها وأدى فيها الإمتحان خلال ثمانية فصول دراسية رئيسية، مع إعطاء الطالب فرصة امتحان من الخارج بعد فصل دراسى تاسع بمصروفات يحددها مجلس الكلية ولمرة واحدة .

٣- يُفصل طالب المستوى الثالث إذا لم يجتز ١٠٠ ساعة معتمدة من المقررات التى سجل فيها وأدى فيها الإمتحان خلال عشرة فصول دراسية، مع اعطاء الطالب فرصة إمتحان من الخارج بعد فصل دراسى حادى عشر بمصروفات يحددها مجلس الكلية ولمرة واحدة.

٤- اذا اجتاز الطالب ١٠٠ ساعة معتمدة على الأقل يكون له حق الاستمرار فى الدراسة حتى التخرج بمصروفات يحددها مجلس الطلبة والجامعة.

**مادة ٢٧: نظام الإستماع والطالب الزائر**

(أ) يجوز لمجلس الكلية بعد أخذ رأى مجالس الأقسام العلمية المختصة أن يقبل طلاب من كليات الجامعة أو الجامعات الأخرى كطلاب زائرين او مستمعين للتسجيل فى بعض المقررات الدراسية بالكلية وفقاً لقواعد يحددها مجلس الكلية ويوافق عليها مجلس الجامعة.

(ب) الطالب الزائر يحق له التسجيل فى مقررات دراسية يتضمنها برنامج الدراسة بحد أقصى ٣٦ ساعة معتمدة لمدة عام دراسى بصفة Non-degree Student ويتقدم لجميع الامتحانات والاعمال الفصلية والنهائية وتسجل المواد التى درسها فى سجله الدراسى بالتقديرات والدرجات والنقاط التى حصل عليها، أما الطالب المستمع Audit فيتم تسجيله تحت هذا المسمى ولا يكون له نسبة حضور ولا يحضر الامتحانات و يحصل على إفادة فقط بحضور المقرر كطالب مستمع.



**مادة ٢٨ : تطبيق أحكام قانون تنظيم الجامعات**

- (أ) تُطبق هذه اللائحة إعتباراً من العام الجامعى التالى لتاريخ صدور ها على الطلاب المستجدين بالمستوى الأول بالكلية، أما الطلاب الباقون للإعادة بالمستوى الأول والطلاب المنقولون للمستويات الأعلى فتنطبق عليهم أحكام اللائحة الداخلية التى التحقوا فى ظلها حتى تخرجهم.
- (ب) تُطبق أحكام قانون تنظيم الجامعات ولائحته التنفيذية فيما لم يرد فيه نص فى هذه اللائحة.
- (ت) يُلغى الالتحاق بالبرامج الأخرى الموجودة باللائحة السابقة للكلية والتى لا تضمها هذه اللائحة وذلك اعتباراً من تاريخ قرار صدور ها .

**مادة ٢٩ : تطبيق المعدلات المرجعية للجودة والإعتماد**

تلتزم الكلية بضرورة توافق المضمون العلمى لبرامجها مع معايير الجودة فى التعليم الجامعى كما حددتها الهيئة القومية لضمان جودة التعليم والإعتماد، وخاصة عدد أعضاء هيئة التدريس على رأس العمل بالكلية أو بالجامعة وملاءمة التخصص العلمى لهم مع المقررات الدراسية المرفقة باللائحة ومحتواها العلمى، وكذلك توفر الإمكانيات المعملية الكافية لاكتساب الطلاب المهارات والمعارف المستهدفة لحصولهم على درجة بكالوريوس العلوم فى أحد البرامج المذكورة باللائحة.

**مادة ٣٠ : توصيف البرامج والمقررات الدراسية**

- ١- يقوم كل قسم من أقسام الكلية بإعداد توصيف كامل لمحتويات البرنامج والمقررات التى يقوم بطرحها فى هذه الاثحة وتصبح محتويات المقررات ملزمة لأعضاء هيئة التدريس القائمين على التدريس بما لا يخل بالحرية الأكاديمية للقائم بالتدريس ويجوز لمجلس الكلية بناء على اقتراح مجالس الأقسام المختصة الموافقة على تطوير المحتوى العلمى لاي مقرر من المقررات الدراسية فى حدود تحقيق النتائج التعليمية المستهدفة للمقرر وعرضها على مجلس الجامعة لاقرارها.

**مادة ٣١ : التعليم الهجين**

يجوز لمجلس الكلية بعد أخذ رأى مجلس القسم المختص وحسب طبيعة المقررات الدراسية أن: -

- ١- يقرر تدريس مقرر أو أكثر بنمط التعليم الهجين بحيث تكون الدراسة فى المقرر بنسبة ٦٠٪ - ٧٠٪ وجها لوجه وبنسبة ٣٠٪ - ٤٠٪ بنظام التعليم عن بعد او بأى نسبة أخرى تتوافق مع الظروف المستجدة.
- ٢- يجوز لمجلس الكلية بعد أخذ رأى مجلس القسم المختص وحسب طبيعة المقررات الدراسية أن يقرر عقد الامتحان الكترونياً أو بأى وسيلة تقييمية أخرى . كما يجوز عقد الامتحان فى كل المقرر أو جزء منه او تغيير زمن الامتحان بما تستدعيه إدارة أزمة لظروف استثنائية.

مادة ٣٢: متطلبات الجامعة

(أ) يدرس الطالب المقررات الاجبارية الاتية بالمستوي الاول (٤ ساعات معتمدة):

| Code    | Prerequisite | Course Title                    | Hours |     |       |
|---------|--------------|---------------------------------|-------|-----|-------|
|         |              |                                 | Lect. | T/P | Cred. |
| Uni 100 | -            | Scientific Thinking             | 2     | -/- | 2     |
| Uni 115 | -            | English Language (1)            | ٢     | -/- | ٢     |
| Uni 151 | -            | Human Rights and Anticorruption | ١     | -/- | -     |

(ب) يدرس الطالب ٤ ساعات معتمدة من المقررات الاختيارية الاتية:

| Code    | Prerequisite | Course Title           | Hours |     |       |
|---------|--------------|------------------------|-------|-----|-------|
|         |              |                        | Lect. | T/P | Cred. |
| Uni 105 | -            | Information Technology | 2     | -/- | 2     |
| Uni 142 | -            | History of Science     | 2     | -/- | 2     |
| Uni 152 | -            | Healthy Nutrition      | 2     | -/- | 2     |

مادة ٣٢: متطلبات الكلية

(أ) مقررات شعبة العلوم الطبيعية يدرس الطالب المقررات الاجبارية الاتية (٢٨ ساعة معتمدة):

| Code    | Prerequisite | Course Title                         | Hours |     |       |
|---------|--------------|--------------------------------------|-------|-----|-------|
|         |              | Compulsory Courses: 28 hours         | Lect. | T/P | Cred. |
| Bio 101 | -            | Biology (1)                          | 1     | -/2 | 2     |
| Chm 100 | -            | General Chemistry (1)                | 2     | 1/2 | 3     |
| Com 101 | -            | Introduction to Computer Science     | 1     | -/2 | 2     |
| Mat 101 | -            | Algebra and Geometry                 | 1     | 2/- | 2     |
| Phy 101 | -            | Heat and Properties of Matter        | 2     | 1/2 | 3     |
| Bio 102 | -            | Biology (2)                          | 1     | -/2 | 2     |
| Chm 105 | -            | General Chemistry (2)                | 2     | 1/2 | 3     |
| Com 102 | -            | Introduction to Computer Programming | 1     | -/2 | 2     |
| Mat 102 | -            | Statistics                           | 1     | 2/- | 2     |
| Phy 102 | -            | Optics, Electricity and Magnetism    | 2     | 1/2 | 3     |
| Mat 103 | -            | Differentiation and Integration      | 1     | 2/- | 2     |
| Mat 104 | -            | Dynamics                             | 1     | 2/- | 2     |

T/ P =Tutorial/ Practical

(ب) مقررات شعبة العلوم البيولوجية يدرس الطالب المقررات الاجبارية الاتية (٢٨ ساعة معتمدة):

| Code    | Prerequisite | Course Title                              | Hours |     |       |
|---------|--------------|---|-------|-----|-------|
|         |              | Compulsory Courses: 28 hours              | Lect. | T/P | Cred. |
| Bot 100 | -            | General Botany (1)                        | 2     | -/2 | 3     |
| Chm 100 | -            | General Chemistry (1)                     | 2     | -/2 | 3     |
| Com 10٤ | -            | Introduction to Data Base                 | ٢     | -/2 | ٣     |
| Chm 105 | -            | General Chemistry (2)                     | 2     | -/2 | 3     |
| Zoo 101 | -            | General Zoology (1)                       | 2     | -/2 | 3     |
| Zoo 102 | -            | General Zoology (2)                       | 2     | -/2 | 3     |
| Bot 105 | -            | General Botany (2)                        | 2     | -/2 | 3     |
| Phy ١٠٣ | -            | General Physics                           | 1     | -/3 | 2     |
| Phy 1٠٤ | -            | Electricity, Magnetism and Modern Physics | 1     | 1/2 | 2     |
| Mat 111 | -            | Calculus                                  | 2     | 2/- | 3     |

(ج) مقررات شعبة العلوم الجيولوجية يدرس الطالب المقررات الاجبارية الاتية (٢٨ ساعة معتمدة):

| Code    | Prerequisite | Course Title                          | Hours |      |       |
|---------|--------------|---------------------------------------|-------|------|-------|
|         |              | Compulsory Courses: 28 hours          | Lect. | T/P  | Cred. |
| Geo 100 | -            | Physical and Histroical Geology       | 2     | -/2  | 3     |
| Chm 100 | -            | General Chemistry (1)                 | 2     | 1/2  | 3     |
| Com 10٤ | -            | Introduction to Data Base             | ٢     | -/ 2 | ٣     |
| Phy 101 | -            | Heat and Proparties of Matter         | 2     | 1/2  | 3     |
| Bio 10١ | -            | Biology (1)                           | 1     | -/2  | 2     |
| Bio 102 | -            | Biology (2)                           | 1     | -/2  | 2     |
| Chm 105 | -            | General Chemistry (2)                 | 2     | 1/2  | 3     |
| Geo 105 | -            | Crystals, Minerals and Rocks          | 2     | -/3  | 3     |
| Phy 10٢ | -            | Electromagnetism and Geometric Optics | 2     | 1/2  | 3     |
| Mat 111 | -            | Calculus                              | 2     | 2/-  | 3     |

(١) برنامج الرياضيات

أولاً: المقررات الإجبارية (٦٠ ساعة معتمدة)

| Code    | Prerequisite | Compulsory Courses                  | Hours |     |       |
|---------|--------------|-------------------------------------|-------|-----|-------|
|         |              |                                     | Lect. | T/P | Cred. |
| Sta 200 | Mat 103      | Probability Theory (1)              | 1     | 2/- | 2     |
| Mat 201 | Mat 102      | Ordinary Differential Equations (1) | 1     | 2/- | 2     |
| Mat 202 | Mat 102      | Discrete Mathematics                | 1     | 2/- | 2     |
| Mat 203 | Mat 103      | Linear Algebra                      | 2     | 2/- | 3     |
| Mat 204 | Mat 101      | Numerical Analysis (1)              | 1     | 2/- | 2     |
| Mat 205 | Mat 101      | Real Analysis (1)                   | 1     | 2/- | 2     |
| Mat 206 | Mat 103      | Space Geometry                      | 1     | 2/- | 2     |
| Mat 211 | Mat 104      | Static and Vector Analysis          | 2     | 2/- | 3     |
| Mat 212 | Mat 104      | Mechanics                           | 2     | 2/- | 3     |
| Mat 301 | Mat 201      | Ordinary Differential Equations (2) | 1     | 2/- | 2     |
| Mat 302 | Mat 102      | Special Function                    | 1     | 2/- | 2     |
| Mat 303 | Mat 203      | Abstract Algebra (1)                | 2     | 2/- | 3     |
| Mat 304 | Mat 102      | Partial Differential Equations      | 1     | 2/- | 2     |
| Mat 305 | Mat 102      | Operation Research (1)              | 1     | 2/- | 2     |
| Mat 307 | Mat 202      | Functional Analysis                 | 2     | 2/- | 3     |
| Sta 308 | Mat 102      | Time Series (2)                     | 1     | 2/- | 2     |
| Mat 312 | Mat 212      | Analytical Mechanics                | 1     | 2/- | 2     |
| Mat 314 | Mat 212      | Fluid Mechanics (1)                 | 1     | 2/- | 2     |
| Mat 401 | Mat 102      | Integral Equations                  | 1     | 2/- | 2     |
| Mat 402 | Mat 307      | Complex Analysis                    | 2     | 2/- | 3     |
| Mat 403 | Mat 102      | Measure Theory                      | 2     | 2/- | 3     |
| Mat 404 | Mat 102      | Quantum Mechanics                   | 2     | -/- | 2     |
| Mat 405 | Mat 102      | Topology                            | 3     | -/- | 3     |
| Mat 406 | Mat 405      | Differential Geometry               | 2     | -/- | 2     |
| Mat 408 | Mat 303      | Abstract Algebra (2)                | 2     | -/- | 2     |
| Mat 411 | Mat 102      | Electrodynamics                     | 2     | -/- | 2     |

ثانياً: المقررات الاختيارية

يدرس الطالب ٢٨ ساعة معتمدة من المقررات الآتية: -

| Code    | Prerequisite | Elective Courses                              | Hours |     |       |
|---------|--------------|---|-------|-----|-------|
|         |              |   | Lect. | T/P | Cred. |
| Com 203 | Com 10٢      | Logic Design (2)                              | 1     | 2/- | 2     |
| Sta 203 | Mat 101      | Principle of Statistics                       | 1     | 2/- | 2     |
| Sta 205 | Sta 203      | Statistical Inference (1)                     | 2     | 2/- | 3     |
| Com 220 | Com 10٢      | Data Structure                                | 2     | -/2 | 3     |
| Com 221 | Com 101      | Object-oriented Programming                   | 2     | 2/- | 3     |
| Com 222 | Com 102      | Advanced Programming                          | 2     | -/2 | 3     |
| Phy 224 | Phy 101      | Thermodynamics                                | 2     | -/- | 2     |
| Phy 245 | Phy 101      | Introduction to Physical Optics               | 1     | -/3 | 2     |
| Mat 306 | Mat 305      | Operation Research (2)                        | 1     | 2/- | 2     |
| Mat 308 | Mat 204      | Mathematical Modeling                         | 1     | 2/- | 2     |
| Mat 309 | -            | Mathematical Methods                          | 1     | 2/- | 2     |
| Mat 310 | Mat ١٠4      | Mathematical Logic                            | 1     | 2/- | 2     |
| Mat 311 | Mat 104      | Number Theory                                 | 1     | 2/- | 2     |
| Mat 313 | Mat ١٠٢      | Dynamic of Rigid Body                         | 1     | 2/- | 2     |
| Mat 407 | Mat 204      | Mathematical Applications in Computer Science | 2     | -/2 | 3     |
| Mat 409 | Mat 205      | Real Analysis (2)                             | 2     | 2/- | 3     |
| Mat 410 | Mat 102      | Elasticity theory                             | 2     | -/- | 2     |
| Mat 412 | Mat 312      | Perturbation theory                           | 2     | -/- | 2     |
| Mat 413 | Mat 314      | Fluid Mechanics (٢)                           | 2     | 2/- | 3     |
| Mat 414 | Mat 307      | Relativity Theory                             | 2     | -/- | 2     |
| Mat 416 | Mat 204      | Numerical Analysis (2)                        | 1     | 2/- | 2     |

ثالثاً: مقررات الاختيار الحر

يدرس الطالب ٦ ساعات معتمدة من المقررات الآتية: -

| Code    | Prerequisite | Free Optional Courses                                   | Hours |     |       |
|---------|--------------|---|-------|-----|-------|
|         |              |   | Lect. | T/P | Cred. |
| Zoo 234 | -            | Introduction to Biotechnology                           | 2     | -/- | 2     |
| Phy 235 | -            | Renewable Energy  | 2     | -/- | 2     |
| Phy 240 | -            | Principles of Modern Physics                            | 1     | -/3 | 2     |
| Phy 250 | -            | Principles of Alternating Currents and Electromagnetism | 2     | -/- | 2     |
| Geo 260 | -            | Petroleum Reservoir Fluids                              | 1     | -/3 | 2     |
| Eco 290 | -            | Biodiversity  | 1     | -/3 | 2     |

رابعاً: التدريب الميداني (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title               | Lect. | T/P | Cred. |
|---------|--------------|----------------------------|-------|-----|-------|
| Mat 330 | -            | Applied and Field Training | -     | -/- | 3     |

خامساً: مقرر البحث والمقال (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title       | Lect. | T/P | Cred. |
|---------|--------------|--------------------|-------|-----|-------|
| Mat 400 | -            | Research and Essay | 3     | -/- | 3     |

سادساً: توزيع مقررات برنامج الرياضيات على المستويات الدراسية

المستوى الثاني: الفصل الدراسي الأول

| Level 2 / Semester 1  |                     | Course Title  | Hours |     |       |
|---|---------------------|---|-------|-----|-------|
| Code  | Prerequisite        | Compulsory Courses: 10 hours                            | Lect. | T/P | Cred. |
| Mat 201   | Mat 102             | Ordinary Differential Equations (1)                     | 1     | 2/- | 2     |
| Mat 203   | Mat 103             | Linear Algebra  | 2     | 2/- | 3     |
| Mat 205   | Mat 102             | Real Analysis (1)                                       | 1     | 2/- | 2     |
| Mat 211   | Mat 104             | Static and Vector Analysis                              | 2     | 2/- | 3     |
| <b>Elective Courses: (The student chooses 5 hours)</b>      |                     |   |       |     |       |
| Com 203   | Com 10 <sup>٢</sup> | Logic Design (2)  | 1     | 2/- | 2     |
| Sta 203   | Mat 101             | Principle of Statistics                                 | 1     | 2/- | 2     |
| Sta 205   | Sta 203             | Statistical Inference (1)                               | 2     | 2/- | 3     |
| Com 221   | Com 101             | Object-oriented Programming                             | 2     | 2/- | 3     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |                     |   |       |     |       |
| Phy 250   | -                   | Principles of Alternating Currents and Electromagnetism | 2     | -/- | 2     |
| Geo 260   | -                   | Petroleum Reservoir Fluids                              | 1     | -/3 | 2     |
| <b>Total: 10+<sup>٥</sup>+2=1٧ Hours</b>                    |                     |   |       |     |       |

المستوى الثاني: الفصل الدراسي الثاني

| Level 2 / Semester 2  |                     | Course Title                    | Hours |     |       |
|---|---------------------|---------------------------------|-------|-----|-------|
| Code  | Prerequisite        | Compulsory Courses: 11 hours    | Lect. | T/P | Cred. |
| Sta 200   | Mat 103             | Probability Theory (1)          | 1     | 2/- | 2     |
| Mat 202   | Mat 102             | Discrete Mathematics            | 1     | 2/- | 2     |
| Mat 204   | Mat 101             | Numerical Analysis (1)          | 1     | 2/- | 2     |
| Mat 206   | Mat 103             | Space Geometry                  | 1     | 2/- | 2     |
| Mat 212   | Mat 104             | Mechanics                       | 2     | 2/- | 3     |
| <b>Elective Courses: (The student chooses 5 hours)</b>      |                     |                                 |       |     |       |
| Com 220   | Com 10 <sup>٢</sup> | Data Structure                  | 2     | -/2 | 3     |
| Com 222   | Com 102             | Advanced Programming            | 2     | -/2 | 3     |
| Phy 224   | Phy 101             | Thermodynamics                  | 2     | -/- | 2     |
| Phy 245   | Phy 101             | Introduction to Physical Optics | 1     | -/3 | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |                     |                                 |       |     |       |
| Zoo 234   | -                   | Introduction to Biotechnology   | 2     | -/- | 2     |
| Phy 235   | -                   | Renewable Energy                | 2     | -/- | 2     |
| <b>Total: 11+<sup>٥</sup>+2=1٨ Hours</b>                    |                     |                                 |       |     |       |

المستوى الثالث: الفصل الدراسي الأول

| Level 3 / Semester 1  |              | Course Title                        | Hours |     |       |
|---|--------------|-------------------------------------|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 10 hours        | Lect. | T/P | Cred. |
| Mat 301   | Mat 201      | Ordinary Differential Equations (2) | 1     | 2/- | 2     |
| Mat 303   | Mat 203      | Abstract Algebra (1)                | 2     | 2/- | 3     |
| Mat 305   | Mat 102      | Operation Research (1)              | 1     | 2/- | 2     |
| Mat 307   | Mat 202      | Functional Analysis                 | 2     | 2/- | 3     |
| <b>Elective Courses: (The student chooses 4 hours)</b>      |              |                                     |       |     |       |
| Mat 309   | Mat 102      | Mathematical Methods                | 1     | 2/- | 2     |
| Mat 311   | Mat 104      | Number Theory                       | 1     | 2/- | 2     |
| Mat 313   | Mat ١٠٢      | Dynamic of Rigid Body               | 1     | 2/- | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |                                     |       |     |       |
| Phy 240   | -            | Principles of Modern Physics        | 1     | -/3 | 2     |
| Eco 290   | -            | Biodiversity                        | 1     | -/3 | 2     |
| <b>Total: 10+4+2=16 Hours</b>                               |              |                                     |       |     |       |

المستوى الثالث: الفصل الدراسي الثاني

| Level 3 / Semester 2                                   |              | Course Title                   | Hours |     |       |
|--|--------------|--------------------------------|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 10 hours   | Lect. | T/P | Cred. |
| Mat 302  | Mat 102      | Special Function               | 1     | 2/- | 2     |
| Mat 304  | Mat 102      | Partial Differential Equations | 1     | 2/- | 2     |
| Sta 308  | Mat 102      | Time Series (2)                | 1     | 2/- | 2     |
| Mat 312  | Mat 212      | Analytical Mechanics           | 1     | 2/- | 2     |
| Mat 314  | Mat 212      | Fluid Mechanics (1)            | 1     | 2/- | 2     |
| <b>Elective Courses: (The student chooses 4 hours)</b> |              |                                |       |     |       |
| Mat 306  | Mat 102      | Operation Research (2)         | 1     | 2/- | 2     |
| Mat 308  | Mat 204      | Mathematical Modeling          | 1     | 2/- | 2     |
| Mat 310  | Mat ١٠4      | Mathematical Logic             | 1     | 2/- | 2     |
| <b>Training: 3 hours</b>                               |              |                                |       |     |       |
| Mat 330  | -            | Applied and Field Training     | -     | -/- | 3     |
| <b>Total: 10+4+٣=١٧ Hours</b>                          |              |                                |       |     |       |



المستوى الرابع: الفصل الدراسي الأول

| Level 4 / Semester 1                                   |              | Course Title                                  | Hours |     |       |
|--|--------------|---|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 10 hours                  | Lect. | T/P | Cred. |
| Mat 401  | Mat 102      | Integral Equations                            | 1     | 2/- | 2     |
| Mat 403  | Mat 102      | Measure Theory                                | 2     | 2/- | 3     |
| Mat 405  | Mat 102      | Topology                                      | 3     | -/- | 3     |
| Mat 411  | Mat 102      | Electrodynamics                               | 2     | -/- | 2     |
| <b>Elective Courses: (The student chooses 6 hours)</b> |              |   |       |     |       |
| Mat 407  | Mat 204      | Mathematical Applications in Computer Science | 2     | -/2 | 3     |
| Mat 409  | Mat 205      | Real Analysis (2)                             | 2     | 2/- | 3     |
| Mat 413  | Mat 314      | Fluid Mechanics (2)                           | 2     | 2/- | 3     |
| <b>Total: 10+6= 16 Hours</b>                           |              |   |       |     |       |

المستوى الرابع: الفصل الدراسي الثاني

| Level 4 / Semester 2                                   |              | Course Title                | Hours |     |       |
|--|--------------|-----------------------------|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 9 hours | Lect. | T/P | Cred. |
| Mat 402  | Mat 307      | Complex Analysis            | 2     | 2/- | 3     |
| Mat 404  | Mat 102      | Quantum Mechanics           | 2     | -/- | 2     |
| Mat 406  | Mat 405      | Differential Geometry       | 2     | -/- | 2     |
| Mat 408  | Mat 303      | Abstract Algebra (2)        | 2     | -/- | 2     |
| <b>Elective Courses: (The student chooses 4 hours)</b> |              |                             |       |     |       |
| Mat 410  | Mat 102      | Elasticity Theory           | 2     | -/- | 2     |
| Mat 412  | Mat 312      | Perturbation Theory         | 2     | -/- | 2     |
| Mat 414  | Mat 307      | Relativity Theory           | 2     | -/- | 2     |
| Mat 416  | Mat 204      | Numerical Analysis (2)      | 1     | 2/- | 2     |
| <b>Research: 3 hours</b>                               |              |                             |       |     |       |
| Mat 400  | -            | Research and Essay          | 3     | -   | 3     |
| <b>Total: 9 + 4 + 3 = 16 Hours</b>                     |              |                             |       |     |       |

(٢) برنامج علوم الحاسب

أولاً: المقررات الإجبارية (٦٠ ساعة معتمدة)

| Code    | Prerequisite | Compulsory Courses                  | Hours |      |       |
|---------|--------------|-------------------------------------|-------|------|-------|
|         |              |                                     | Lect. | T/P  | Cred. |
| Mat 202 | Mat 102      | Discrete Mathematics                | 1     | 2/-  | 2     |
| Mat 203 | Mat 103      | Linear Algebra                      | 2     | 2/-  | 3     |
| Sta 203 | Mat 101      | Principles of Statistics            | 1     | 2/-  | 2     |
| Mat 204 | Mat 101      | Numerical Analysis (1)              | 1     | 2/-  | 2     |
| Com 220 | Com 10٢      | Data Structure                      | 2     | -/2  | 3     |
| Com 221 | Com 101      | Object-oriented Programming         | 2     | 2/-  | 3     |
| Com 222 | Com 102      | Advanced Programming                | 2     | -/2  | 3     |
| Com 223 | Com 102      | Logic Design (1)                    | 1     | 2/-  | 2     |
| Mat 305 | Mat 102      | Operation Research (1)              | 1     | 2/-  | 2     |
| Mat 311 | Mat 104      | Number Theory                       | 1     | 2/-  | 2     |
| Com 320 | Com 321      | Artificial Intelligence             | 2     | 2/-  | 3     |
| Com 321 | Com 221      | Algorithms Design and Analysis      | 2     | 2/-  | 3     |
| Com 322 | Com 222      | Scientific Computation (1)          | 2     | 2/-  | 3     |
| Com 323 | Com 102      | Database Management Systems         | 2     | 2/-  | 3     |
| Com 324 | Sta 203      | Computer Applications in Statistics | 1     | 2/-  | 2     |
| Com 326 | Com 221      | Modeling and Simulation             | 1     | 2/-  | 2     |
| Com 420 | Com 322      | Computer Graphics                   | 2     | -/2  | 3     |
| Com 421 | Com 220      | Data Mining                         | 2     | - /2 | 3     |
| Com 422 | Com 220      | Machine Learning                    | 2     | -/2  | 3     |
| Com 423 | Com 326      | Computer Security                   | 2     | 2/-  | 3     |
| Com 424 | Com 321      | Compiler Theory                     | 2     | -/-  | 2     |
| Com 425 | Com 321      | Theory of Computation               | 1     | 2/-  | 2     |
| Com 426 | Com 321      | Systems Analysis                    | 1     | 2/-  | 2     |
| Com 427 | Com 222      | Introduction to Bioinformatics      | 1     | 2/-  | 2     |

ثانياً: المقررات الاختيارية

يدرس الطالب ٢٨ ساعة معتمدة من المقررات الآتية: -

| Code    | Prerequisite | Elective Courses                        | Hours |     |       |
|---------|--------------|---|-------|-----|-------|
|         |              |   | Lect. | T/P | Cred. |
| Sta 200 | Mat103       | Probability Theory (1)                  | 1     | 2/- | 2     |
| Mat 201 | Mat 102      | Ordinary Differential Equations (1)     | 1     | 2/- | 2     |
| Sta 202 | Mat 203      | Statistical Theory (1)                  | 1     | 2/- | 2     |
| Mat 205 | Mat 102      | Real Analysis (1)                       | 1     | 2/- | 2     |
| Sta 204 | Sta 200      | Mathematical Statistics                 | 1     | 2/- | 2     |
| Com 224 | -            | Operating Systems                       | 1     | 2/- | 2     |
| Mat 306 | Mat 102      | Operation Research (2)                  | 1     | 2/- | 2     |
| Mat 310 | Mat ١٠٤      | Mathematical Logic                      | 1     | 2/- | 2     |
| Mat 313 | Mat ١٠٢      | Dynamic of Rigid body                   | 1     | 2/- | 2     |
| Com 325 | Com 220      | Web Programming                         | 1     | 2/- | 2     |
| Com 327 | -            | Selected Topics in Computer Science (1) | 1     | 2/- | 2     |
| Com 328 | Com 221      | Computer Network                        | 1     | 2/- | 2     |
| Mat 401 | -            | Integral Equations                      | 1     | 2/- | 2     |
| Mat 405 | -            | Topology                                | 3     | -/- | 3     |
| Mat 410 | Mat 313      | Elasticity theory                       | 2     | -/- | 2     |
| Mat 411 | -            | Electrodynamics                         | 2     | -/- | 2     |
| Mat 412 | Mat 312      | Perturbation Theory                     | 2     | -/- | 2     |
| Mat 414 | -            | Relativity Theory                       | 2     | -/- | 2     |
| Mat 416 | Mat 204      | Numerical Analysis (2)                  | 1     | 2/- | 2     |
| Com 429 | Com 102      | Scientific Computation (2)              | 2     | 2/- | 3     |
| Com 430 | Com 423      | Cryptography                            | 2     | 2/- | 3     |

ثالثاً: مقررات الاختيار الحر

يدرس الطالب ٦ ساعات معتمدة من المقررات الآتية: -

| Code    | Prerequisite | Free Optional Courses                                   | Hours |     |       |
|---------|--------------|---|-------|-----|-------|
|         |              |   | Lect. | T/P | Cred. |
| Zoo 234 | -            | Introduction to Biotechnology                           | 2     | -/- | 2     |
| Phy 235 | -            | Renewable Energy  | 2     | -/- | 2     |
| Phy 240 | -            | Principles of Modern Physics                            | 1     | -/3 | 2     |
| Phy 250 | -            | Principles of Alternating Currents and Electromagnetism | 2     | -/- | 2     |
| Gph 253 | -            | Marine Geophysical Exploration                          | 1     | -/3 | 2     |
| Geo 260 | -            | Petroleum Reservoir Fluids                              | 1     | -/3 | 2     |

رابعاً: التدريب الميداني (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title               | Lect. | T/P | Cred. |
|---------|--------------|----------------------------|-------|-----|-------|
| Com 330 | -            | Applied and Field Training | -     | -/- | 3     |

خامساً: مقرر البحث والمقال (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title       | Lect. | T/P | Cred. |
|---------|--------------|--------------------|-------|-----|-------|
| Com 434 | -            | Research and Essay | ٣     | -/- | 3     |

سادساً: توزيع مقررات برنامج علوم الحاسب على المستويات الدراسية

المستوى الثاني: الفصل الدراسي الأول

| Level 2 / Semester 1  |              | Course Title  | Hours |     |       |
|---|--------------|---|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 10 hours                            | Lect. | T/P | Cred. |
| Mat 203   | Mat 103      | Linear Algebra  | 2     | 2/- | 3     |
| Sta 203   | Mat 101      | Principles of Statistics                                | 1     | 2/- | 2     |
| Com 221   | Com 101      | Object-oriented Programming                             | 2     | 2/- | 3     |
| Com 223   | Com 102      | Logic Design (1)  | 1     | 2/- | 2     |
| <b>Elective Courses: (The student chooses 4 hours)</b>      |              |   |       |     |       |
| Sta 200   | Mat103       | Probability Theory (1)                                  | 1     | 2/- | 2     |
| Mat 201   | Mat 102      | Ordinary Differential Equations (1)                     | 1     | 2/- | 2     |
| Mat 205   | Mat 102      | Real Analysis (1)                                       | 1     | 2/- | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |   |       |     |       |
| Phy 250   | -            | Principles of Alternating Currents and Electromagnetism | 2     | -/- | 2     |
| Gph 253   | -            | Marine Geophysical Exploration                          | 1     | -/3 | 2     |
| <b>Total: 10 + 4 + 2 = 16 Hours</b>                         |              |   |       |     |       |

المستوى الثاني: الفصل الدراسي الثاني

| Level 2 / Semester 2  |              | Course Title                 | Hours |     |       |
|---|--------------|------------------------------|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 10 hours | Lect. | T/P | Cred. |
| Mat 202   | Mat 102      | Discrete Mathematics         | 1     | 2/- | 2     |
| Mat 204   | Mat 101      | Numerical Analysis (1)       | 1     | 2/- | 2     |
| Com 220   | Com 102      | Data Structure               | 2     | -/2 | 3     |
| Com 222   | Com 102      | Advanced Programming         | 2     | -/2 | 3     |
| <b>Elective Courses: (The student chooses 4 hours)</b>      |              |                              |       |     |       |
| Sta 202   | Mat 203      | Statistical Theory (1)       | 1     | 2/- | 2     |
| Sta 204   | Sta 200      | Mathematical Statistics      | 1     | 2/- | 2     |
| Com 224   | -            | Operating Systems            | 1     | 2/- | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |                              |       |     |       |
| Phy 235   | -            | Renewable Energy             | 2     | -/- | 2     |
| Geo 260   | -            | Petroleum Reservoir Fluids   | 1     | -/3 | 2     |
| <b>Total: 10 + 4 + 2 = 16 Hours</b>                         |              |                              |       |     |       |

المستوى الثالث: الفصل الدراسي الأول

| Level 3 / Semester 1  |              | Course Title                            | Hours |     |       |
|---|--------------|---|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 10 hours            | Lect. | T/P | Cred. |
| Mat 305   | Mat 102      | Operation Research (1)                  | 1     | 2/- | 2     |
| Mat 311   | Mat 104      | Number Theory                           | 1     | 2/- | 2     |
| Com 321   | Com 221      | Algorithms Design and Analysis          | 2     | 2/- | 3     |
| Com 323   | Com 102      | Database Management Systems             | 2     | 2/- | 3     |
| <b>Elective Courses: (The student chooses 4 hours)</b>      |              |   |       |     |       |
| Mat 313   | Mat ١٠٢      | Dynamic of Rigid Body                   | 1     | 2/- | 2     |
| Com 325   | Com 220      | Web Programming                         | 1     | 2/- | 2     |
| Com 327   | -            | Selected topics in Computer Science (1) | 1     | 2/- | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |   |       |     |       |
| Zoo 234   | -            | Introduction to Biotechnology           | 2     | -/- | 2     |
| Phy 240   | -            | Principles of Modern Physics            | 1     | -/3 | 2     |
| <b>Total: 10 + 4 + 2 = 16 Hours</b>                         |              |   |       |     |       |

المستوى الثالث: الفصل الدراسي الثاني

| Level 3 / Semester 2                                   |              | Course Title                        | Hours |     |       |
|--|--------------|-------------------------------------|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 10 hours        | Lect. | T/P | Cred. |
| Com 320  | Com 321      | Artificial Intelligence             | 2     | 2/- | 3     |
| Com 322  | -            | Scientific Computation (1)          | 2     | 2/- | 3     |
| Com 324  | Sta 203      | Computer Applications in Statistics | 1     | 2/- | 2     |
| Com 326  | Com 221      | Modeling and Simulation             | 1     | 2/- | 2     |
| <b>Elective Courses: (The student chooses 4 hours)</b> |              |                                     |       |     |       |
| Mat 306  | Mat 102      | Operation Research (2)              | 1     | 2/- | 2     |
| Mat 310  | Mat ١٠4      | Mathematical Logic                  | 1     | 2/- | 2     |
| Com 328  | Com 221      | Computer Network                    | 1     | 2/- | 2     |
| <b>Training: 3 hours</b>                               |              |                                     |       |     |       |
| Com 330  | -            | Applied and Field Training          | -     | -/- | 3     |
| <b>Total: 10 + 4 + 3 = 17 Hours</b>                    |              |                                     |       |     |       |

المستوى الرابع: الفصل الدراسي الأول

| Level 4 / Semester 1                                   |              | Course Title                   | Hours |      |       |
|--|--------------|--------------------------------|-------|------|-------|
| Code   | Prerequisite | Compulsory Courses: 10 hours   | Lect. | T/P  | Cred. |
| Com 421  | Com 220      | Data Mining                    | 2     | - /2 | 3     |
| Com 423  | -            | Computer Security              | 2     | 2/-  | 3     |
| Com 425  | -            | Theory of Computation          | 1     | 2/-  | 2     |
| Com 427  | Com 222      | Introduction to Bioinformatics | 1     | 2/-  | 2     |
| <b>Elective Courses: (The student chooses 8 hours)</b> |              |                                |       |      |       |
| Mat 401  | Mat 102      | Integral Equations             | 1     | 2/-  | 2     |
| Mat 405  | Mat 102      | Topology                       | 3     | -/-  | 3     |
| Mat 411  | Mat 102      | Electrodynamics                | 2     | -/-  | 2     |
| Com 429  | Com 102      | Scientific Computation (2)     | 2     | 2/-  | 3     |
| Com 430  | Com 423      | Cryptography                   | 2     | 2/-  | 3     |
| <b>Total: 10 + 8= 18 Hours</b>                         |              |                                |       |      |       |

المستوى الرابع: الفصل الدراسي الثاني

| Level 4 / Semester 2                                   |              | Course Title                 | Hours |     |       |
|--|--------------|------------------------------|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 10 hours | Lect. | T/P | Cred. |
| Com 420  | -            | Computer Graphics            | 2     | -/2 | 3     |
| Com 422  | Com 220      | Machine learning             | 2     | -/2 | 3     |
| Com 424  | Com 102      | Compiler Theory              | 2     | -/- | 2     |
| Com 426  | Com 102      | Systems Analysis             | 1     | 2/- | 2     |
| <b>Elective Courses: (The student chooses 4 hours)</b> |              |                              |       |     |       |
| Mat 410  | Mat 102      | Elasticity theory            | 2     | -/- | 2     |
| Mat 412  | Mat 312      | Perturbation Theory          | 2     | -/- | 2     |
| Mat 414  | Mat 104      | Relativity Theory            | 2     | -/- | 2     |
| Mat 416  | Mat 204      | Numerical Analysis (2)       | 1     | 2/- | 2     |
| <b>Research: 3 hours</b>                               |              |                              |       |     |       |
| Com 434  | -            | Research and Essay           | ٣     | -   | 3     |
| <b>Total: 10 + 4 + 3 = 17 Hours</b>                    |              |                              |       |     |       |

(٣) برنامج الاحصاء الرياضي

أولاً: المقررات الإجبارية (٦٠ ساعة معتمدة)

| Code    | Prerequisite | Compulsory Courses          | Hours |      |       |
|---------|--------------|-----------------------------|-------|------|-------|
|         |              |                             | Lect. | T/P  | Cred. |
| Sta 200 | Mat 103      | Probability Theory (1)      | 1     | 2/-  | 2     |
| Mat 202 | Mat 102      | Discrete Mathematics        | 1     | 2/-  | 2     |
| Sta 202 | Sta 203      | Statistical Theory (1)      | 1     | 2/-  | 2     |
| Sta 203 | Mat 101      | Principles of Statistics    | 1     | 2/-  | 2     |
| Sta 204 | Sta 200      | Mathematical Statistics     | 1     | 2/-  | 2     |
| Sta 205 | Sta 203      | Statistical Inference (1)   | 2     | 2/-  | 3     |
| Sta 206 | Sta 203      | Biostatistics               | 2     | 2/-  | 3     |
| Com 203 | Com 10٢      | Logic Design (2)            | 1     | 2/-  | 2     |
| Sta 301 | Sta 200      | Stochastic Processes (1)    | 2     | 2/-  | 3     |
| Mat 302 | Mat 102      | Special Function            | 1     | 2/-  | 2     |
| Sta 302 | Sta 203      | Nonparametric Analysis      | 2     | 2/-  | 3     |
| Sta 303 | Sta 200      | Probability Theory (٢)      | 2     | 2/-  | 3     |
| Sta 304 | Sta 202      | Statistical Theory (٢)      | 2     | 2/-  | 3     |
| Mat 305 | Mat 102      | Operation Research (1)      | 1     | 2/-  | 2     |
| Sta 305 | Mat 102      | Time Series (1)             | 2     | 2/-  | 3     |
| Sta 306 | Sta 303      | Experimental Design         | 2     | 2/-  | 3     |
| Mat 405 | Mat 102      | Topology                    | 3     | -/-  | 3     |
| Sta 401 | Sta 203      | Multivariate Analysis       | 1     | 2/-  | 2     |
| Sta 402 | Sta 303      | Renewal Theory              | 2     | 2/-  | 3     |
| Sta 403 | Sta 203      | Statistical Decision Theory | 2     | 2 /- | 3     |
| Sta 404 | Sta 203      | Baysian Statistics          | 2     | 2/-  | 3     |
| Sta 406 | Sta 303      | Queues Theory               | 2     | 2/-  | 3     |
| Com 491 | -            | Bioinformatics              | 2     | 2/-  | 3     |



ثانياً: المقررات الاختيارية

يدرس الطالب ٢٨ ساعة معتمدة من المقررات الآتية: -

| Code    | Prerequisite | Elective Courses                       | Hours |     |       |
|---------|--------------|--|-------|-----|-------|
|         |              |  | Lect. | T/P | Cred. |
| Mat 201 | Mat 102      | Ordinary Differential Equations (1)    | 1     | 2/- | 2     |
| Mat 205 | Mat 102      | Real Analysis                          | 1     | 2/- | 2     |
| Sta 209 | Mat 103      | Regression Analysis                    | 1     | 2/- | 2     |
| Mat 212 | Mat 104      | Mechanics                              | 2     | 2/- | 3     |
| Com 220 | Com 10٢      | Data Structure                         | 2     | -/2 | 3     |
| Com 222 | Com 102      | Advanced Programming                   | 2     | -/2 | 3     |
| Com 223 | Com 102      | Logic Design (1)                       | 1     | 2/- | 2     |
| Mat 304 | Mat 102      | Partial Differential Equations         | 1     | 2/- | 2     |
| Mat 306 | Mat 102      | Operation Research (2)                 | 1     | 2/- | 2     |
| Sta 308 | Sta 305      | Time Series (٢)                        | 1     | 2/- | 2     |
| Mat 309 | Mat 102      | Mathematical Methods                   | 1     | 2/- | 2     |
| Sta 309 | -            | Selected Topics in Statistics          | 1     | -/2 | 2     |
| Mat 311 | Mat 104      | Numbers Theory                         | 1     | 2/- | 2     |
| Mat 404 | Mat 102      | Quantum Mechanics                      | 2     | -/- | 2     |
| Sta 405 | Sta 301      | Stochastic Processes (٢)               | 1     | 2/- | 2     |
| Sta 407 | Sta 200      | Applications of Computer in Statistics | 1     | 2/- | 2     |
| Sta 409 | Sta 203      | Sampling Methods                       | 1     | 2/- | 2     |
| Mat 411 | Mat 102      | Electrodynamics                        | 2     | -/- | 2     |
| Com 424 | Com 102      | Compiler Theory                        | 2     | -/- | 2     |
| Com 426 | Com 102      | Systems Analysis                       | 1     | 2/- | 2     |

ثالثاً: مقررات الاختيار الحر

يدرس الطالب ٦ ساعات معتمدة من المقررات الآتية: -

| Code    | Prerequisite | Free Optional Courses                                   | Hours |     |       |
|---------|--------------|---|-------|-----|-------|
|         |              |   | Lect. | T/P | Cred. |
| Zoo 234 | -            | Introduction to Biotechnology                           | 2     | -/- | 2     |
| Phy 235 | -            | Renewable Energy  | 2     | -/- | 2     |
| Phy 240 | -            | Principles of Modern Physics                            | 1     | -/3 | 2     |
| Phy 250 | -            | Principles of Alternating Currents and Electromagnetism | 2     | -/- | 2     |
| Geo 260 | -            | Petroleum Reservoir Fluids                              | 1     | -/3 | 2     |
| Eco 290 | -            | Biodiversity  | 1     | -/3 | 2     |

رابعاً: التدريب الميداني (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title               | Lect. | T/P | Cred. |
|---------|--------------|----------------------------|-------|-----|-------|
| Sta 312 | -            | Applied and Field Training | -     | -/- | 3     |

خامساً: مقرر البحث والمقال (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title       | Lect. | T/P | Cred. |
|---------|--------------|--------------------|-------|-----|-------|
| Sta 400 | -            | Research and Essay | ٣     | -/- | 3     |

سادساً: توزيع مقررات برنامج الاحصاء الرياضى على المستويات الدراسية

المستوى الثانى: الفصل الدراسى الأول

| Level 2 / Semester 1  |              | Course Title  | Hours |     |       |
|---|--------------|---|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 9 hours                             | Lect. | T/P | Cred. |
| Sta 200   | Mat 103      | Probability Theory (1)                                  | 1     | 2/- | 2     |
| Sta 203   | Mat 101      | Principles of Statistics                                | 1     | 2/- | 2     |
| Sta 205   | Sta 203      | Statistical Inference (1)                               | 2     | 2/- | 3     |
| Com 203   | Com 102      | Logic Design (2)  | 1     | 2/- | 2     |
| <b>Elective Courses: (The student chooses 6 hours)</b>      |              |   |       |     |       |
| Mat 201   | Mat 102      | Ordinary Differential Equations (1)                     | 1     | 2/- | 2     |
| Mat 205   | Mat 102      | Real Analysis   | 1     | 2/- | 2     |
| Sta 209   | Mat 103      | Regression Analysis                                     | 1     | 2/- | 2     |
| Com 223   | Com 102      | Logic Design (1)  | 1     | 2/- | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |   |       |     |       |
| Phy 250   | -            | Principles of Alternating Currents and Electromagnetism | 2     | -/- | 2     |
| Geo 260   | -            | Petroleum Reservoir Fluids                              | 1     | -/3 | 2     |
| <b>Total: 9 + 6 + 2 = 17 Hours</b>                          |              |   |       |     |       |

المستوى الثانى: الفصل الدراسى الثانى

| Level 2 / Semester 2  |              | Course Title                  | Hours |     |       |
|---|--------------|-------------------------------|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 9 hours   | Lect. | T/P | Cred. |
| Mat 202   | Mat 102      | Discrete Mathematics          | 1     | 2/- | 2     |
| Sta 202   | Sta 203      | Statistical Theory (1)        | 1     | 2/- | 2     |
| Sta 204   | Sta 200      | Mathematical Statistics       | 1     | 2/- | 2     |
| Sta 206   | Sta 203      | Biostatistics                 | 2     | 2/- | 3     |
| <b>Elective Courses: (The student chooses 6 hours)</b>      |              |                               |       |     |       |
| Mat 212   | Mat 104      | Mechanics                     | 2     | 2/- | 3     |
| Com 220   | Com 102      | Data Structure                | 2     | -/2 | 3     |
| Com 222   | Com 102      | Advanced Programming          | 2     | -/2 | 3     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |                               |       |     |       |
| Zoo 234   | -            | Introduction to Biotechnology | 2     | -/- | 2     |
| Phy 235   | -            | Renewable Energy              | 2     | -/- | 2     |
| <b>Total: 9 + 6 + 2 = 17 Hours</b>                          |              |                               |       |     |       |

المستوى الثالث: الفصل الدراسي الأول

| Level 3 / Semester 1  |              | Course Title                  | Hours |     |       |
|---|--------------|-------------------------------|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 11 hours  | Lect. | T/P | Cred. |
| Sta 301   | Sta 200      | Stochastic Processes (1)      | 2     | 2/- | 3     |
| Sta 303   | Sta 200      | Probability Theory (٢)        | 2     | 2/- | 3     |
| Mat 305   | Mat 102      | Operation Research (1)        | 1     | 2/- | 2     |
| Sta 305   | Mat 102      | Time Series (1)               | 2     | 2/- | 3     |
| <b>Elective Courses: (The student chooses 4 hours)</b>      |              |                               |       |     |       |
| Mat 309   | Mat 102      | Mathematical Methods          | 1     | 2/- | 2     |
| Sta 3٠٩   | -            | Selected Topics in Statistics | 1     | -/2 | 2     |
| Mat 311   | Mat 104      | Numbers Theory                | 1     | 2/- | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |                               |       |     |       |
| Phy 240   | -            | Principles of Modern Physics  | 1     | -/3 | 2     |
| Eco 290   | -            | Biodiversity                  | 1     | -/3 | 2     |
| <b>Total: 11 + 4 + 2 = 17 Hours</b>                         |              |                               |       |     |       |

المستوى الثالث: الفصل الدراسي الثاني

| Level 3 / Semester 2                                   |              | Course Title                   | Hours |     |       |
|--|--------------|--------------------------------|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 11 hours   | Lect. | T/P | Cred. |
| Mat 302  | Mat 102      | Special Function               | 1     | 2/- | 2     |
| Sta 302  | Sta 203      | Nonparametric Analysis         | 2     | 2/- | 3     |
| Sta 304  | Sta 202      | Statistical Theory (٢)         | 2     | 2/- | 3     |
| Sta 306  | Sta 303      | Experimental Design            | 2     | 2/- | 3     |
| <b>Elective Courses: (The student chooses 2 hours)</b> |              |                                |       |     |       |
| Mat 304  | Mat 102      | Partial Differential Equations | 1     | 2/- | 2     |
| Mat 306  | Mat 102      | Operation Research (2)         | 1     | 2/- | 2     |
| Sta 308  | Sta 305      | Time Series (٢)                | 1     | 2/- | 2     |
| <b>Training: 3 hours</b>                               |              |                                |       |     |       |
| Sta 312  | -            | Applied and Field Training     | -     | -/- | 3     |
| <b>Total: 11 + 2 + 3 = 16 Hours</b>                    |              |                                |       |     |       |

المستوى الرابع: الفصل الدراسي الأول

| Level 4 / Semester 1                                   |              | Course Title                           | Hours |      |       |
|--|--------------|--|-------|------|-------|
| Code   | Prerequisite | Compulsory Courses: 11 hours           | Lect. | T/P  | Cred. |
| Sta 401  | Sta 203      | Multivariate Analysis                  | 1     | 2/-  | 2     |
| Sta 403  | Sta 203      | Statistical Decision Theory            | 2     | 2 /- | 3     |
| Mat 405  | Mat 102      | Topology                               | 3     | -/-  | 3     |
| Com 491  | -            | Bioinformatics                         | 2     | 2/-  | 3     |
| <b>Elective Courses: (The student chooses 6 hours)</b> |              |  |       |      |       |
| Sta 405  | Sta 301      | Stochastic Processes (٢)               | 1     | 2/-  | 2     |
| Sta 407  | Sta 200      | Applications of Computer in Statistics | 1     | 2/-  | 2     |
| Sta 409  | Sta 203      | Sampling Methods                       | 1     | 2/-  | 2     |
| Mat 411  | Mat 102      | Electrodynamics                        | 2     | -/-  | 2     |
| <b>Total: 11 + 6 = 17 Hours</b>                        |              |  |       |      |       |

المستوى الرابع: الفصل الدراسي الثاني

| Level 4 / Semester 2                                   |              | Course Title                | Hours |     |       |
|--|--------------|-----------------------------|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 9 hours | Lect. | T/P | Cred. |
| Sta 402  | Sta 303      | Renewal Theory              | 2     | 2/- | 3     |
| Sta 404  | Sta 203      | Baysian Statistics          | 2     | 2/- | 3     |
| Sta 406  | Sta 303      | Queues Theory               | 2     | 2/- | 3     |
| <b>Elective Courses: (The student chooses 4 hours)</b> |              |                             |       |     |       |
| Mat 404  | Mat 102      | Quantum Mechanics           | 2     | -/- | 2     |
| Com 424  | Com 102      | Compiler Theory             | 2     | -/- | 2     |
| Com 426  | Com 102      | Systems Analysis            | 1     | 2/- | 2     |
| <b>Research: 3 hours</b>                               |              |                             |       |     |       |
| Sta 4٠٠  | -            | Research and Essay          | ٣     | -   | 3     |
| <b>Total: 9 + 4 + 3 = 16 Hours</b>                     |              |                             |       |     |       |

(٤) برنامج الاحصاء وعلوم الحاسب

أولاً: المقررات الإجبارية (٦٠ ساعة معتمدة)

| Code    | Prerequisite | Compulsory Courses                  | Hours |      |       |
|---------|--------------|-------------------------------------|-------|------|-------|
|         |              |                                     | Lect. | T/P  | Cred. |
| Sta 200 | Mat 103      | Probability Theory (1)              | 1     | 2/-  | 2     |
| Mat 202 | Mat 102      | Discrete Mathematics                | 1     | 2/-  | 2     |
| Sta 202 | Sta 203      | Statistical Theory (1)              | 1     | 2/-  | 2     |
| Sta 203 | Mat 101      | Principles of Statistics            | 1     | 2/-  | 2     |
| Sta 204 | Sta 200      | Mathematical Statistics             | 1     | 2/-  | 2     |
| Sta 209 | Mat 103      | Regression Analysis                 | 1     | 2/-  | 2     |
| Com 220 | Com 10٢      | Data Structure                      | 2     | -/2  | 3     |
| Com 221 | Com 101      | Object-oriented Programming         | 2     | 2/-  | 3     |
| Sta 302 | Sta 203      | Nonparametric Analysis              | 2     | 2/-  | 3     |
| Sta 304 | Sta 202      | Statistical Theory (٢)              | 2     | 2/-  | 3     |
| Mat 309 | Mat 102      | Mathematical Methods                | 1     | 2/-  | 2     |
| Mat 311 | Mat 104      | Number Theory                       | 1     | 2/-  | 2     |
| Com 321 | Com 221      | Algorithms Design and Analysis      | 2     | 2/-  | 3     |
| Com 323 | Com 102      | Database Management Systems         | 2     | 2/-  | 3     |
| Com 324 | Sta 203      | Computer Applications in Statistics | 1     | 2/-  | 2     |
| Com 326 | Com 221      | Modeling and Simulation             | 1     | 2/-  | 2     |
| Sta 401 | Sta 203      | Multivariate Analysis               | 1     | 2/-  | 2     |
| Sta 403 | Sta 203      | Statistical Decision Theory         | 2     | 2/-  | 3     |
| Sta 404 | Sta 203      | Baysian Statistics                  | 2     | 2/-  | 3     |
| Com 420 | -            | Computer Graphics                   | 2     | -/2  | 3     |
| Com 421 | Com 220      | Data Mining                         | 2     | - /2 | 3     |
| Com 422 | Com 220      | Machine Learning                    | 2     | -/2  | 3     |
| Com 423 | -            | Computer Security                   | 2     | 2/-  | 3     |
| Com 426 | Com 102      | System Analysis                     | 1     | 2/-  | 2     |

ثانياً: المقررات الاختيارية

يدرس الطالب ٢٨ ساعة معتمدة من المقررات الآتية: -

| Code    | Prerequisite | Elective Courses                        | Hours |     |       |
|---------|--------------|---|-------|-----|-------|
|         |              |   | Lect. | T/P | Cred. |
| Com 203 | Com 10٢      | Logic Design (2)                        | 1     | 2/- | 2     |
| Com 224 | -            | Operating Systems                       | 1     | 2/- | 2     |
| Com 327 | -            | Selected Topics in Computer Science (1) | 1     | 2/- | 2     |
| Com 328 | Com 221      | Computer Network                        | 1     | 2/- | 2     |
| Com 411 | -            | Selected Topics in Computer Science (2) | 2     | 2/- | 3     |
| Com 423 | -            | Computer Security                       | 2     | 2/- | 3     |
| Com 429 | Com 102      | Scientific Computation (2)              | 2     | 2/- | 3     |
| Com 432 | Com 102      | Distributed Computing                   | 2     | ٢/- | ٣     |
| Sta 212 | -            | Simulation Modeling                     | 2     | ١/- | 2     |
| Mat 203 | Mat 103      | Linear Algebra                          | 2     | 2/- | 3     |
| Mat 204 | Mat 101      | Numerical Analysis (1)                  | 1     | 2/- | 2     |
| Mat 205 | Mat 102      | Real Analysis (1)                       | 1     | 2/- | 2     |
| Mat 206 | Mat 103      | Space Geometry                          | 1     | 2/- | 2     |
| Mat 302 | Mat 102      | Special Function                        | 1     | 2/- | 2     |
| Mat 305 | Mat 102      | Operation Research (1)                  | 1     | 2/- | 2     |
| Mat 310 | Mat ١٠4      | Mathematical Logic                      | 1     | 2/- | 2     |
| Sta 205 | Sta 203      | Statistical Inference (1)               | 2     | 2/- | 3     |
| Sta 3٠٩ | -            | Selected Topics in Statistics           | 1     | -/2 | 2     |
| Sta 408 | Sta 202      | Advanced Distribution Theory            | 2     | 2/- | 3     |

ثالثاً: مقررات الاختيار الحر

يدرس الطالب ٦ ساعات معتمدة من المقررات الآتية: -

| Code    | Prerequisite | Free Optional Courses                                   | Hours |     |       |
|---------|--------------|---|-------|-----|-------|
|         |              |   | Lect. | T/P | Cred. |
| Zoo 234 | -            | Introduction to Biotechnology                           | 2     | -/- | 2     |
| Phy 235 | -            | Renewable Energy  | 2     | -/- | 2     |
| Phy 240 | -            | Principles of Modern Physics                            | 1     | -/3 | 2     |
| Phy 250 | -            | Principles of Alternating Currents and Electromagnetism | 2     | -/- | 2     |
| Geo 260 | -            | Petroleum Reservoir Fluids                              | 1     | -/3 | 2     |
| Eco 290 | -            | Biodiversity  | 1     | -/3 | 2     |

رابعاً: التدريب الميداني (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title               | Lect. | T/P | Cred. |
|---------|--------------|----------------------------|-------|-----|-------|
| Com 330 | -            | Applied and Field Training | -     | -/- | 3     |

خامساً: مادة البحث والمقال (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title       | Lect. | T/P | Cred. |
|---------|--------------|--------------------|-------|-----|-------|
| Com 434 | -            | Research and Essay | ٣     | -/- | 3     |



سادساً: توزيع مقررات برنامج الاحصاء وعلوم الحاسب على المستويات الدراسية

المستوى الثاني: الفصل الدراسي الأول

| Level 2 / Semester 1  |                     | Course Title  | Hours |     |       |
|---|---------------------|---|-------|-----|-------|
| Code  | Prerequisite        | Compulsory Courses: 9 hours                             | Lect. | T/P | Cred. |
| Sta 200   | Mat 103             | Probability Theory (1)                                  | 1     | 2/- | 2     |
| Sta 203   | Mat 101             | Principles of Statistics                                | 1     | 2/- | 2     |
| Sta 209   | Mat 103             | Regression Analysis                                     | 1     | 2/- | 2     |
| Com 221   | Com 101             | Object-oriented Programming                             | 2     | 2/- | 3     |
| <b>Elective Courses: (The student chooses 5 hours)</b>      |                     |   |       |     |       |
| Com 203   | Com 10 <sup>٢</sup> | Logic Design (2)  | 1     | 2/- | 2     |
| Mat 203   | Mat 103             | Linear Algebra  | 2     | 2/- | 3     |
| Mat 205   | Mat 102             | Real Analysis (1)                                       | 1     | 2/- | 2     |
| Sta 205   | Sta 203             | Statistical Inference (1)                               | 2     | 2/- | 3     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |                     |   |       |     |       |
| Phy 250   | -                   | Principles of Alternating Currents and Electromagnetism | 2     | -/- | 2     |
| Geo 260   | -                   | Petroleum Reservoir Fluids                              | 1     | -/3 | 2     |
| <b>Total: 9 + 5 + ٢ = 16 Hours</b>                          |                     |   |       |     |       |

المستوى الثاني: الفصل الدراسي الثاني

| Level 2 / Semester 2  |                     | Course Title                  | Hours |     |       |
|---|---------------------|-------------------------------|-------|-----|-------|
| Code  | Prerequisite        | Compulsory Courses: 9 hours   | Lect. | T/P | Cred. |
| Mat 202   | Mat 102             | Discrete Mathematics          | 1     | 2/- | 2     |
| Sta 202   | Sta 203             | Statistical Theory (1)        | 1     | 2/- | 2     |
| Sta 204   | Sta 200             | Mathematical Statistics       | 1     | 2/- | 2     |
| Com 220   | Com 10 <sup>٢</sup> | Data Structure                | 2     | -/2 | 3     |
| <b>Elective Courses: (The student chooses ٦ hours)</b>      |                     |                               |       |     |       |
| Sta 212   | -                   | Simulation Modeling           | 2     | ١/- | 2     |
| Mat 204   | Mat 101             | Numerical Analysis (1)        | 1     | 2/- | 2     |
| Mat 206   | Mat 103             | Space Geometry                | 1     | 2/- | 2     |
| Com 224   | -                   | Operating Systems             | 1     | 2/- | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |                     |                               |       |     |       |
| Zoo 234   | -                   | Introduction to Biotechnology | 2     | -/- | 2     |
| Phy 235   | -                   | Renewable Energy              | 2     | -/- | 2     |
| <b>Total: 9 + ٦ + ٢ = ١٧ Hours</b>                          |                     |                               |       |     |       |

المستوى الثالث: الفصل الدراسي الأول

| Level 3 / Semester 1  |              | Course Title                            | Hours |     |       |
|---|--------------|---|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: ١0 hours            | Lect. | T/P | Cred. |
| Mat 311   | Mat 104      | Number Theory                           | 1     | 2/- | 2     |
| Mat 309   | Mat 102      | Mathematical Methods                    | 1     | 2/- | 2     |
| Com 321   | Com 221      | Algorithms Design and Analysis          | 2     | 2/- | 3     |
| Com 323   | Com 102      | Database Management Systems             | 2     | 2/- | 3     |
| <b>Elective Courses: (The student chooses ٤ hours)</b>      |              |   |       |     |       |
| Mat 305   | Mat 102      | Operation Research (1)                  | 1     | 2/- | 2     |
| Sta 3٠٩   | -            | Selected Topics in Statistics           | 1     | -/2 | 2     |
| Com 327   | -            | Selected Topics in Computer Science (1) | 1     | 2/- | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |   |       |     |       |
| Phy 240   | -            | Principles of Modern Physics            | 1     | -/3 | 2     |
| Eco 290   | -            | Biodiversity                            | 1     | -/3 | 2     |
| <b>Total: ١0 + ٤ + ٢ = ١6 Hours</b>                         |              |   |       |     |       |

المستوى الثالث: الفصل الدراسي الثاني

| Level 3 / Semester 2                                   |              | Course Title                        | Hours |     |       |
|--|--------------|-------------------------------------|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: ١٠ hours        | Lect. | T/P | Cred. |
| Sta 302  | Sta 203      | Nonparametric Analysis              | 2     | 2/- | 3     |
| Sta 304  | Sta 202      | Statistical Theory (٢)              | 2     | 2/- | 3     |
| Com 324  | Sta 203      | Computer Applications in Statistics | 1     | 2/- | 2     |
| Com 326  | Com 221      | Modeling and Simulation             | 1     | 2/- | 2     |
| <b>Elective Courses: (The student chooses ٤ hours)</b> |              |                                     |       |     |       |
| Mat 302  | Mat 102      | Special Function                    | 1     | 2/- | 2     |
| Mat 310  | Mat ١٠4      | Mathematical Logic                  | 1     | 2/- | 2     |
| Com 328  | Com 221      | Computer Network                    | 1     | 2/- | 2     |
| <b>Training: 3 hours</b>                               |              |                                     |       |     |       |
| Com 330  | -            | Applied and Field Training          | -     | -/- | 3     |
| <b>Total: ١٠ + ٤ + 3 = 17 Hours</b>                    |              |                                     |       |     |       |

المستوى الرابع: الفصل الدراسي الأول

| Level 4 / Semester 1                                   |              | Course Title                            | Hours |      |       |
|--|--------------|---|-------|------|-------|
| Code   | Prerequisite | Compulsory Courses: 11 hours            | Lect. | T/P  | Cred. |
| Sta 401  | Sta 203      | Multivariate Analysis                   | 1     | 2/-  | 2     |
| Sta 403  | Sta 203      | Statistical Decision Theory             | 2     | 2/-  | 3     |
| Com 421  | Com 220      | Data Mining                             | 2     | - /2 | 3     |
| Com 423  | -            | Computer Security                       | 2     | 2/-  | 3     |
| <b>Elective Courses: (The student chooses 6 hours)</b> |              |   |       |      |       |
| Com 411  | -            | Selected Topics in Computer Science (2) | 2     | 2/-  | 3     |
| Com 423  | -            | Computer Security                       | 2     | 2/-  | 3     |
| Com 429  | Com 102      | Scientific Computation (2)              | 2     | 2/-  | 3     |
| <b>Total: 11 + 6 = 17 Hours</b>                        |              |   |       |      |       |

المستوى الرابع: الفصل الدراسي الثاني

| Level 4 / Semester 2                                   |              | Course Title                 | Hours |     |       |
|--|--------------|------------------------------|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 11 hours | Lect. | T/P | Cred. |
| Sta 404  | Sta 203      | Baysian Statistics           | 2     | 2/- | 3     |
| Com 420  | -            | Computer Graphics            | 2     | -/2 | 3     |
| Com 422  | Com 220      | Machine Learning             | 2     | -/2 | 3     |
| Com 426  | Com 102      | System Analysis              | 1     | 2/- | 2     |
| <b>Elective Courses: (The student chooses 3 hours)</b> |              |                              |       |     |       |
| Sta 408  | Sta 202      | Advanced Distribution Theory | 2     | 2/- | 3     |
| Com 432  | Com 102      | Distributed Computing        | 2     | 2/- | 3     |
| <b>Research: 3 hours</b>                               |              |                              |       |     |       |
| Com 434  | -            | Research and Essay           | 3     | -/- | 3     |
| <b>Total: 11 + 3 + 3 = 17 Hours</b>                    |              |                              |       |     |       |

(٥) برنامج الفيزياء

أولاً: المقررات الإلزامية (٦٠ ساعة معتمدة)

| Code    | Prerequisite | Compulsory Courses                       | Hours |     |       |
|---------|--------------|--|-------|-----|-------|
|         |              |  | Lect. | T/P | Cred. |
| Mat 201 | Mat 102      | Ordinary Differential Equations (1)      | 1     | 2/- | 2     |
| Phy 221 | Phy 102      | Classical Physics                        | 2     | -/- | 2     |
| Phy 222 | Phy 102      | Atomic and Principles of Modern Physics  | 2     | -/- | 2     |
| BPh 223 | Phy 102      | Introduction to Biophysics               | 2     | -/- | 2     |
| Phy 224 | Phy 101      | Thermodynamics                           | 2     | -/- | 2     |
| Phy 225 | Phy 102      | Alternating Current and Electromagnetism | 2     | -/- | 2     |
| Phy 226 | Phy 102      | Mathematical Physics (1)                 | 2     | -/- | 2     |
| Phy 227 | Phy 101      | Vibrations and Waves                     | 2     | -/- | 2     |
| Phy 228 | Phy 102      | Physical Optics                          | 2     | -/- | 2     |
| Phy 230 | Phy 102      | Electromagnetism Theory                  | 2     | -/- | 2     |
| Phy 231 | Phy 102      | Physics Lab (١)                          | -     | -/3 | 1     |
| Phy 232 | Phy 102      | Physics Lab (٢)                          | -     | -/3 | 1     |
| Phy 341 | Phy 222      | Solid State (1)                          | 2     | -/- | 2     |
| Phy 342 | Phy 222      | Semiconductors                           | 2     | -/- | 2     |
| Phy 343 | Phy 226      | Quantum Mechanics (1)                    | 2     | -/- | 2     |
| Phy 344 | Phy 222      | Nuclear Physics (1)                      | 2     | -/- | 2     |
| Phy 345 | Phy 224      | Statistical Physics                      | 2     | -/- | 2     |
| Phy 346 | Phy 345      | Fluid Mechanics (1)                      | 2     | -/- | 2     |
| Phy 347 | Phy 222      | Laser Physics (1)                        | 2     | -/- | 2     |
| Phy 348 | Phy 230      | Plasma Physics (1)                       | 2     | -/- | 2     |
| Phy 349 | Phy 230      | Modern Physics Lab                       | -     | -/3 | 1     |
| Phy 350 | -            | Semiconductors Lab                       | -     | -/3 | 1     |
| Phy 351 | -            | Solid State Lab (1)                      | -     | -/3 | 1     |
| Phy 3٦٤ | -            | Laser Physics Lab                        | -     | -/3 | 1     |
| Phy 461 | Phy 343      | Quantum Mechanics (2)                    | 2     | -/- | 2     |
| Phy 462 | -            | Elementary Particles                     | 2     | -/- | 2     |
| Phy 463 | Phy 344      | Nuclear Physics (2)                      | 2     | -/- | 2     |
| Phy 464 | Phy 341      | Nanomaterials Physics                    | 2     | -/- | 2     |
| Phy 465 | Phy 341      | Solid State (2)                          | 2     | -/- | 2     |
| Phy 466 | Phy 226      | Computational Physics and Programming    | 2     | -/- | 2     |
| Phy 467 | Phy 342      | Electronics                              | 2     | -/- | 2     |
| Phy 469 | Phy 344      | Nuclear Physics Lab (1)                  | -     | -/3 | 1     |
| Phy 470 | Phy 351      | Solid State Lab (2)                      | -     | -/3 | 1     |
| Phy 471 | Phy 342      | Electronics Lab (1)                      | -     | -/3 | 1     |
| Phy 472 | Phy 342      | Electronics Lab (2)                      | -     | -/3 | 1     |

ثانياً: المقررات الاختيارية

يدرس الطالب ٢٨ ساعة معتمدة من المقررات الآتية: -

| Code    | Prerequisite | Elective Courses                                   | Hours |     |       |
|---------|--------------|--|-------|-----|-------|
|         |              |  | Lect. | T/P | Cred. |
| Mat 204 | Mat 101      | Numerical Analysis (1)                             | 1     | 2/- | 2     |
| BPh 231 | Phy101       | Vision and Hearing Biophysics                      | 2     | -/- | 2     |
| Phy 233 | -            | Theory of Relativity                               | 2     | -/- | 2     |
| Phy 234 | -            | Radiation Physics and Its Applications             | 2     | -/- | 2     |
| Phy 235 | -            | Renewable Energy                                   | 2     | -/- | 2     |
| Phy 237 | -            | Physics of Metals                                  | 2     | -/- | 2     |
| Phy 353 | Phy226       | Mathematical Physics (2)                           | 2     | -/- | 2     |
| Phy 354 | -            | Thin Film Technology                               | 2     | -/- | 2     |
| Phy 355 | Phy222       | Atomic and Molecular Spectra                       | 2     | -/- | 2     |
| Phy 356 | Phy230       | Electrodynamics                                    | 2     | -/- | 2     |
| Phy 357 | Phy 222      | Accelerators and Ionization Sources                | 2     | -/- | 2     |
| Phy 358 | -            | Cosmology  | 2     | -/- | 2     |
| Phy 366 | -            | Methods of Experimental Physics                    | 2     | -/- | 2     |
| Phy 473 | Phy 348      | Plasma Physics (2)                                 | 2     | -/- | 2     |
| Phy 474 | Phy 467      | Digital Electronics                                | 2     | -/- | 2     |
| Phy 475 | Phy 346      | Fluid Mechanics (2)                                | 2     | -/- | 2     |
| Phy 476 | Phy 344      | Reactors   | 2     | -/- | 2     |
| Phy 477 | Phy 341      | Superconductors                                    | 2     | -/- | 2     |
| Phy 478 | Phy 347      | Laser Physics (2)                                  | 2     | -/- | 2     |
| Phy 479 | -            | Non-Linear Optics                                  | 2     | -/- | 2     |
| Phy 480 | Phy 341      | Theory of Quantum Solid State and Its Applications | 2     | -/- | 2     |

ثالثاً: مقررات الاختيار الحر

يدرس الطالب ٦ ساعات معتمدة من المقررات الآتية: -

| Code    | Prerequisite | Free Optional Courses                      | Hours |     |       |
|---------|--------------|--|-------|-----|-------|
|         |              |  | Lect. | T/P | Cred. |
| Mat 203 | -            | Linear Algebra                             | 2     | 2/- | 3     |
| Com 221 | -            | Object- oriented Programming               | 2     | 2/- | 3     |
| Geo 233 | -            | Crystallography and Mineralogy             | 2     | -/2 | 3     |
| Geo 239 | -            | Crystallography and Optical Mineralogy (1) | 2     | -/2 | 3     |

رابعاً: التدريب الميداني (٣ ساعات معتمدة)

| Code   | Prerequisite | Course Title               | Lect. | T/P | Cred. |
|--------|--------------|----------------------------|-------|-----|-------|
| Phy362 | -            | Applied and Field Training | -     | -/- | 3     |

خامساً: مقرر البحث والمقال (٣ ساعات معتمدة)

| Code   | Prerequisite | Course Title       | Lect. | T/P | Cred. |
|--------|--------------|--------------------|-------|-----|-------|
| Phy468 | -            | Research and Essay | 3     | -/- | 3     |

المستوى الثانى: الفصل الدراسي الأول

| Level 3 / Semester 1                                   |              | Course Title                             | Hours |     |       |
|--|--------------|--|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 11 hours             | Lect. | T/P | Cred. |
| Mat 201  | Mat 102      | Ordinary Differential Equations (1)      | 1     | 2/- | 2     |
| Phy 221  | Phy 101      | Classical Physics                        | 2     | -/- | 2     |
| BPh 223  | -            | Introduction to Biophysics               | 2     | -/- | 2     |
| Phy 225  | Phy 102      | Alternating Current and Electromagnetism | 2     | -/- | 2     |
| Phy 227  | Phy 101      | Vibrations and Waves                     | 2     | -/- | 2     |
| Phy 231  | -            | Physics Lab (١)                          | -     | -/3 | 1     |
| <b>Elective Courses: (The student chooses 6 hours)</b> |              |  |       |     |       |
| BPh 231  | Phy101       | Vision and Hearing Biophysics            | 2     | -/- | 2     |
| Phy 233  | -            | Theory of Relativity                     | 2     | -/- | 2     |
| Phy 235  | -            | Renewable Energy                         | 2     | -/- | 2     |
| Phy 237  | -            | Physics of Metals                        | 2     | -/- | 2     |
| <b>Total: 11 + 6 = 17 Hours</b>                        |              |  |       |     |       |

المستوى الثانى: الفصل الدراسي الثاني

| Level 3 / Semester 2  |              | Course Title                               | Hours |     |       |
|---|--------------|--|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 11 hours               | Lect. | T/P | Cred. |
| Phy 222   | -            | Atomic and Principles of Modern Physics    | 2     | -/- | 2     |
| Phy 224   | Phy 101      | Thermodynamics                             | 2     | -/- | 2     |
| Phy 226   | -            | Mathematical Physics (1)                   | 2     | -/- | 2     |
| Phy 228   | Phy 102      | Physical Optics                            | 2     | -/- | 2     |
| Phy 230   | Phy 102      | Electromagnetism Theory                    | 2     | -/- | 2     |
| Phy 232   | -            | Physics Lab (٢)                            | -     | -/3 | 1     |
| <b>Elective Courses: (The student chooses 2 hours)</b>      |              |  |       |     |       |
| Mat 204   | Mat 101      | Numerical Analysis                         | 1     | 2/- | 2     |
| Phy 234   | -            | Radiation Physics and Its Applications     | 2     | -/- | 2     |
| <b>Free Optional Courses: (The student chooses 3 hours)</b> |              |  |       |     |       |
| Mat 203   | -            | Linear Algebra                             | 2     | 2/- | 3     |
| Geo 23 <sup>٩</sup>   | -            | Crystallography and Optical Mineralogy (١) | ٢     | -/3 | ٣     |
| <b>Total: 11 + 2 + 3 = 16 Hours</b>                         |              |  |       |     |       |

المستوى الثالث: الفصل الدراسي الأول

| Level 3 / Semester 1  |              | Course Title                        | Hours |     |       |
|---|--------------|-------------------------------------|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 10 hours        | Lect. | T/P | Cred. |
| Phy 341   | -            | Solid State (1)                     | 2     | -/- | 2     |
| Phy 343   | Phy 226      | Quantum Mechanics (1)               | 2     | -/- | 2     |
| Phy 345   | Phy 224      | Statistical Physics                 | 2     | -/- | 2     |
| Phy 347   | Phy 222      | Laser Physics (1)                   | 2     | -/- | 2     |
| Phy 349   | -            | Modern Physics Lab                  | -     | -/3 | 1     |
| Phy 351   | -            | Solid State Lab (1)                 | -     | -/3 | 1     |
| <b>Elective Courses: (The student chooses 4 hours)</b>      |              |                                     |       |     |       |
| Phy 353   | Phy 226      | Mathematical Physics (2)            | 2     | -/- | 2     |
| Phy 355   | Phy 222      | Atomic and Molecular Spectra        | 2     | -/- | 2     |
| Phy 357   | Phy 222      | Accelerators and Ionization Sources | 2     | -/- | 2     |
| <b>Free Optional Courses: (The student chooses 3 hours)</b> |              |                                     |       |     |       |
| Com 221   | -            | Object-oriented Programming         | 2     | 2/- | 3     |
| Geo 233   | -            | Crystallography and Mineralogy      | 2     | -/3 | 3     |
| <b>Total: 10 + 4 + 3 = 17 Hours</b>                         |              |                                     |       |     |       |

المستوى الثالث: الفصل الدراسي الثاني

| Level 3 / Semester 2                                   |              | Course Title                    | Hours |     |       |
|--|--------------|---------------------------------|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 10 hours    | Lect. | T/P | Cred. |
| Phy 342  | -            | Semiconductors                  | 2     | -/- | 2     |
| Phy 344  | -            | Nuclear Physics (1)             | 2     | -/- | 2     |
| Phy 346  | Phy 345      | Fluid Mechanics (1)             | 2     | -/- | 2     |
| Phy 348  | -            | Plasma Physics (1)              | 2     | -/- | 2     |
| Phy 350  | -            | Semiconductors Lab              | -     | -/3 | 1     |
| Phy 364  | -            | Laser Physics Lab               | -     | -/3 | 1     |
| <b>Elective Courses: (The student chooses 4 hours)</b> |              |                                 |       |     |       |
| Phy 354  | -            | Thin Film Technology            | 2     | -/- | 2     |
| Phy 356  | Phy 230      | Electrodynamics                 | 2     | -/- | 2     |
| Phy 358  | -            | Cosmology                       | 2     | -/- | 2     |
| Phy 366  | -            | Methods of Experimental Physics | 2     | -/- | 2     |
| <b>Training: 3 hours</b>                               |              |                                 |       |     |       |
| Phy 362  | -            | Applied and Field Training      | -     | -/- | 3     |
| <b>Total: 10 + 4 + 3 = 17 Hours</b>                    |              |                                 |       |     |       |



المستوى الرابع: الفصل الدراسي الأول

| Level 4 / Semester 1                                   |              | Course Title                 | Hours |     |       |
|--|--------------|------------------------------|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 10 hours | Lect. | T/P | Cred. |
| Phy 461  | Phy 343      | Quantum Mechanics (2)        | 2     | -/- | 2     |
| Phy 463  | Phy 344      | Nuclear Physics (2)          | 2     | -/- | 2     |
| Phy 465  | Phy 341      | Solid State (2)              | 2     | -/- | 2     |
| Phy 467  | Phy 342      | Electronics                  | 2     | -/- | 2     |
| Phy 469  | -            | Nuclear Physics Lab (1)      | -     | -/3 | 1     |
| Phy 471  | -            | Electronics Lab (1)          | -     | -/3 | 1     |
| <b>Elective Courses: (The student chooses 6 hours)</b> |              |                              |       |     |       |
| Phy 473  | Phy 348      | Plasma Physics (2)           | 2     | -/- | 2     |
| Phy 475  | Phy 346      | Fluid Mechanics (2)          | 2     | -/- | 2     |
| Phy 477  | Phy 341      | Superconductors              | 2     | -/- | 2     |
| Phy 479  | -            | Non-linear Optics            | 2     | -/- | 2     |
| <b>Total: 10 + 6 = 16 Hours</b>                        |              |                              |       |     |       |

المستوى الرابع: الفصل الدراسي الثاني

| Level 4 / Semester 2                                   |              | Course Title                                       | Hours |     |       |
|--|--------------|--|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 8 hours                        | Lect. | T/P | Cred. |
| Phy 462  | -            | Elementary Particles                               | 2     | -/- | 2     |
| Phy 464  | Phy 341      | Nanomaterials Physics                              | 2     | -/- | 2     |
| Phy 466  | -            | Computational Physics and Programming              | 2     | -/- | 2     |
| Phy 470  | -            | Solid State Lab (2)                                | -     | -/3 | 1     |
| Phy 472  | -            | Electronics Lab (2)                                | -     | -/3 | 1     |
| <b>Elective Courses: (The student chooses 6 hours)</b> |              |  |       |     |       |
| Phy 474  | Phy 467      | Digital Electronics                                | 2     | -/- | 2     |
| Phy 476  | Phy 344      | Reactors   | 2     | -/- | 2     |
| Phy 478  | Phy 347      | Laser Physics (2)                                  | 2     | -/- | 2     |
| Phy 480  | Phy 341      | Theory of Quantum Solid State and Its Applications | 2     | -/- | 2     |
| <b>Research: 3 hours</b>                               |              |  |       |     |       |
| Phy 468  | -            | Research and Essay                                 | 3     | -/- | 3     |
| <b>Total: 8 + 6 + 3 = 17 Hours</b>                     |              |  |       |     |       |

(٦) برنامج الفيزياء الحيوية

أولاً: المقررات الإجبارية (٦٠ ساعة معتمدة)

| Code    | Prerequisite | Compulsory Courses                                 | Hours |     |       |
|---------|--------------|--|-------|-----|-------|
|         |              |  | Lect. | T/P | Cred. |
| Sta 200 | Mat 102      | Probability Theory (1)                             | 2     | ١/- | 2     |
| Mat 201 | Mat 102      | Ordinary Differential Equations (1)                | 1     | 2/- | 2     |
| Zoo 214 | Zoo 102      | Human Physiology and Anatomy                       | 2     | -/3 | 3     |
| Phy 222 | -            | Atomic and Principles of Modern Physics            | 2     | -/- | 2     |
| BPh 223 | Phy 102      | Introduction to Biophysics                         | 2     | -/- | 2     |
| Phy 225 | Phy 102      | Alternating Current and Electromagnetism           | 2     | -/- | 2     |
| Phy 231 | -            | Physics Lab (١)                                    | -     | -/3 | 1     |
| Phy 232 | -            | Physics Lab. (٢)                                   | -     | -/3 | 1     |
| Chm 241 | Chm 105      | Analytical Chemistry (1)                           | 2     | -/3 | 3     |
| Phy 246 | Phy 102      | Principles of Physical Optics                      | 1     | -/- | 1     |
| Phy 301 | Phy 222      | Fundamental of Solid-state Physics                 | 2     | -/- | 2     |
| Phy 302 | Phy 222      | Fundamental of Nuclear Physics                     | 2     | -/- | 2     |
| BPh 303 | Phy 102      | Laser Physics and Application Biophysics           | 2     | -/- | 2     |
| Phy 304 | Phy 222      | Plasma Physics and Its Application.                | 2     | -/- | 2     |
| Phy 306 | Phy 101      | Fundamental of Fluid Mechanics                     | 2     | -/- | 2     |
| BCh 341 | Chm 105      | Advanced Biochemistry                              | 2     | -/3 | 3     |
| BPh 341 | Bph 223      | Ultrasound in Biological and Medicine              | 2     | -/- | 2     |
| Zoo 342 | Zoo 214      | Tumor and Immunity                                 | 2     | -/- | 2     |
| BPh 351 | -            | Biophysics Lab (1)                                 | -     | -/3 | 1     |
| BPh 352 | -            | Biophysics Lab. (2)                                | -     | -/3 | 1     |
| Zoo 355 | Zoo 102      | Principles of Genetic Engineering                  | 1     | -/- | 1     |
| Mic359  | Bot 105      | General Microbiology                               | 2     | -/3 | 3     |
| BPh 461 | Phy 222      | Quantum Mechanics and Its Biological Applications. | 2     | -/- | 2     |
| BPh 462 | BPh 223      | Control and Communication Biophysics .             | 2     | -/- | 2     |
| BPh 463 | Phy 301      | Polymer Physics and Its Applications in Medicine   | 2     | -/- | 2     |
| BPh 464 | Phy 102      | Medical Bioelectronic Devices                      | 2     | -/- | 2     |
| BPh 465 | Phy 302      | Isotopes and its Applications in Medicine          | 1     | -/3 | 2     |
| BPh 466 | Phy 102      | Radiotherapy                                       | 1     | -/3 | 2     |
| BPh 467 | BCh 341      | Molecular Biophysics                               | 2     | -/- | 2     |
| BPh 468 | BPh 463      | Principals of Nano-medical and Application         | 2     | -/- | 2     |
| BPh 471 | -            | Biophysics Lab. (3)                                |       | -/3 | 1     |
| BPh 472 | -            | Biophysics Lab. (4)                                |       | -/3 | 1     |

ثانياً: المقررات الاختيارية

يدرس الطالب ٢٨ ساعة معتمدة من المقررات الآتية:-

| Code    | Prerequisite | Elective Courses                           | Hours |     |       |
|---------|--------------|--|-------|-----|-------|
|         |              |  | Lect. | T/P | Cred. |
| BPh 224 | Mat 201      | Thermodynamics for Biological Systems      | 2     | -/- | 2     |
| Phy 226 | -            | Mathematical Physics (1)                   | 2     | -/- | 2     |
| Phy 227 | Phy 101      | Vibrations and Waves                       | 2     | -/- | 2     |
| BPh 231 | Phy 101      | Vision and Hearing Biophysics              | 2     | -/- | 2     |
| Phy 235 | -            | Renewable Energy                           | 2     | -/- | 2     |
| BPh 236 | BPh 223      | Cell and Membranes Biophysics              | 2     | -/- | 2     |
| Geo 261 | -            | Petroleum Biosafety                        | 1     | -/2 | 2     |
| Phy 303 | Phy 222      | Crystal Structure and X-ray Diffraction.   | 2     | -/- | 2     |
| Phy 305 | Phy 102      | Electronic and Electricity Circuit.        | 2     | -/- | 2     |
| Zoo 314 | Zoo 102      | Nutrients Metabolism                       | 2     | -/- | 2     |
| BPh 353 | BPh 223      | Biomaterials Substitutions                 | 2     | -/- | 2     |
| BPh 354 | -            | Health Physics                             | 2     | -/- | 2     |
| BPh 356 | Phy 301      | Physics of Digenesis Devices               | 2     | -/- | 2     |
| Bph 358 | Phy 102      | Radiation Dosimetry                        | 2     | -/- | 2     |
| Phy 401 | Phy 102      | Advanced Physical Optics                   | 2     | -/- | 2     |
| BPh 434 | Phy 302      | Radiation Physics and Its Bio-application. | 2     | -/- | 2     |
| BPh 445 | -            | Principles of Physical Therapy             | 2     | -/- | 2     |
| BPh 473 | -            | Biophysical Techniques in Medicine.        | 2     | -/- | 2     |
| BPh 474 | BPh 464      | Magnetic Resonance Imaging                 | 2     | -/- | 2     |
| BPh 475 | BPh 223      | Electric Simulation in Biosystems.         | 2     | -/- | 2     |
| BPh 476 | BPh 223      | Biomodelling                               | 2     | -/- | 2     |
| BPh 488 | Phy 222      | Biomedical Accelerators                    | 2     | -/- | 2     |

ثالثاً: مقررات الاختيار الحر

يدرس الطالب ٦ ساعات معتمدة من المقررات الآتية: -

| Code    | Prerequisite | Free Optional Courses                      | Hours |     |       |
|---------|--------------|--|-------|-----|-------|
|         |              |  | Lect. | T/P | Cred. |
| Mat 205 | -            | Real Analysis (1)                          | 1     | 2/- | 2     |
| Geo 231 | -            | Crystallography and Optical Mineralogy (2) | 1     | -/3 | 2     |
| Ent 258 | -            | Medical Entomology                         | 1     | -/2 | 2     |
| Mat 311 | -            | Number Theory                              | 1     | 2/- | 2     |
| Zoo 410 |              | Neurophysiology                            | 2     | -/- | 2     |
| Com 427 | -            | Introduction to Bioinformatics             | 2     | -/- | 2     |

رابعاً: التدريب الميداني (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title               | Lect. | T/P | Cred. |
|---------|--------------|----------------------------|-------|-----|-------|
| Phy 362 | -            | Applied and Field Training | -     | -/- | 3     |

خامساً: مقرر البحث والمقال (٣ ساعات معتمدة)

| Code               | Prerequisite | Course Title       | Lect. | T/P | Cred. |
|--------------------|--------------|--------------------|-------|-----|-------|
| Bph <sup>٤٧٠</sup> | -            | Research and Essay | ٣     | -/- | 3     |

سادساً: توزيع مقررات برنامج الفيزياء الحيوية على المستويات الدراسية

**المستوى الثاني: الفصل الدراسي الأول**

| Level 2 / Semester 1  |              | Course Title                               | Hours |     |       |
|---|--------------|--|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 10 hours               | Lect. | T/P | Cred. |
| Mat 201   | Mat 102      | Ordinary Differential Equations (1)        | 1     | 2/- | 2     |
| BPh 223   | Phy 102      | Introduction to Biophysics                 | 2     | -/- | 2     |
| Phy 225   | Phy 102      | Alternating Current and Electromagnetism   | 2     | -/- | 2     |
| Phy 231   | -            | Physics Lab (١)                            | -     | -/3 | 1     |
| Chm 241   | Chm 105      | Analytical Chemistry (1)                   | 2     | -/3 | 3     |
| <b>Elective Courses: (The student chooses ٤ hours)</b>      |              |  |       |     |       |
| Phy 227   | Phy 101      | Vibrations and Waves                       | 2     | -/- | 2     |
| BPh 231   | Phy 101      | Vision and Hearing Biophysics              | 2     | -/- | 2     |
| Phy 235   | -            | Renewable Energy                           | 2     | -/- | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |  |       |     |       |
| Mat 205   | -            | Real Analysis (1)                          | 1     | 2/- | 2     |
| Geo 231   | -            | Crystallography and Optical Mineralogy (2) | 1     | -/3 | 2     |
| <b>Total: 10 + 4 + 2 = 16 Hours</b>                         |              |  |       |     |       |

**المستوى الثاني: الفصل الدراسي الثاني**

| Level 2 / Semester 2                                   |              | Course Title                            | Hours |     |       |
|--|--------------|---|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 12 hours            | Lect. | T/P | Cred. |
| Sta 200  | Mat 102      | Probability Theory (1)                  | 2     | ١/- | 2     |
| Zoo 214  | Zoo 102      | Human Physiology and Anatomy            | 2     | -/3 | 3     |
| Phy 222  | -            | Atomic and Principles of Modern Physics | 2     | -/- | 2     |
| Phy 232  | -            | Physics Lab. (٢)                        | -     | -/3 | 1     |
| Phy 246  | Phy 102      | Principles of Physical Optics           | 1     | -/- | 1     |
| Mic 359  | Bot 105      | General Microbiology                    | 2     | -/3 | 3     |
| <b>Elective Courses: (The student chooses ٤ hours)</b> |              |   |       |     |       |
| BPh 224  | Mat 201      | Thermodynamics for Biological Systems   | 2     | -/- | 2     |
| Phy 226  | -            | Mathematical Physics (1)                | 2     | -/- | 2     |
| BPh 236  | BPh 223      | Cell and Membranes Biophysics           | 2     | -/- | 2     |
| Geo 261  | -            | Petroleum Biosafety                     | 1     | -/2 | 2     |
| <b>Total: 12 + 4 = 16 Hours</b>                        |              |   |       |     |       |

المستوى الثالث: الفصل الدراسي الأول

| Level 3 / Semester 1  |              | Course Title                             | Hours |     |       |
|---|--------------|--|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 10 hours             | Lect. | T/P | Cred. |
| Phy 301   | Phy 222      | Fundamentals of Solid-state Physics      | 2     | -/- | 2     |
| BPh 303   | Phy 102      | Laser Physics and Application Biophysics | 2     | -/- | 2     |
| BCh 341   | Chm 105      | Advanced Biochemistry                    | 1     | -/3 | 3     |
| BPh 341   | Bph 223      | Ultrasound in Biologicaland Medicine     | 2     | -/- | 2     |
| BPh 351   | -            | Biophysics Lab (1)                       | -     | -/3 | 1     |
| <b>Elective Courses: (The student chooses 4 hours)</b>      |              |  |       |     |       |
| Phy 303   | Phy 222      | Crystal Structure and X-ray Diffraction. | 2     | -/- | 2     |
| Phy 305   | Phy 102      | Electronic and Electricity Circuit.      | 2     | -/- | 2     |
| BPh 353   | BPh 223      | Biomaterials Substituted                 | 2     | -/- | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |  |       |     |       |
| Ent 258   | -            | Medical Entomology                       | 1     | -/2 | 2     |
| Mat 311   | -            | Number Theory                            | 1     | 2/- | 2     |
| <b>Total: 10 + 4 + 2 = 16 Hours</b>                         |              |  |       |     |       |

المستوى الثالث: الفصل الدراسي الثاني

| Level 3 / Semester 2                                   |              | Course Title                        | Hours |     |       |
|--|--------------|-------------------------------------|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 10 hours        | Lect. | T/P | Cred. |
| Phy 302  | Phy 222      | Fundamental of Nuclear Physics      | 2     | -/- | 2     |
| Phy 304  | Phy 222      | Plasma Physics and Its Application. | 2     | -/- | 2     |
| Phy 306  | Phy 101      | Fundamental of Fluid Mechanics      | 2     | -/- | 2     |
| Zoo 342  | Zoo 214      | Tumor and Immunity                  | 2     | -/- | 2     |
| BPh 352  | -            | Biophysics Lab. (2)                 | -     | -/3 | 1     |
| Zoo 355  | Zoo102       | Principles of Genetic Engineering   | 1     | -/- | 1     |
| <b>Elective Courses: (The student chooses 4 hours)</b> |              |                                     |       |     |       |
| Zoo 314  | Zoo 102      | Nutrients Metabolism                | 2     | -/- | 2     |
| BPh 354  | -            | Health Physics                      | 2     | -/- | 2     |
| BPh 356  | Phy 301      | Physics of Digenesis Devices        | 2     | -/- | 2     |
| Bph 358  | Phy 102      | Radiation Dosimetry                 | 2     | -/- | 2     |
| <b>Training: 3 hours</b>                               |              |                                     |       |     |       |
| Phy 362  | -            | Applied and Field Training          | -     | -/- | 3     |
| <b>Total: 10 + 4 + 3 = 17 Hours</b>                    |              |                                     |       |     |       |

المستوى الرابع: الفصل الدراسي الأول

| Level 4 / Semester 1  |              | Course Title                                       | Hours |     |       |
|---|--------------|--|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 9 hours                        | Lect. | T/P | Cred. |
| BPh 461   | Phy 222      | Quantum Mechanics and Its Biological Applications. | 2     | -/1 | 2     |
| BPh 463   | Phy 301      | Polymer Physics and Its Applications in Medicine   | 2     | -/- | 2     |
| BPh 465   | Phy 302      | Isotopes and Its Applications in Medicine          | 1     | -/3 | 2     |
| BPh 467   | BCh 341      | Molecular Biophysics                               | 2     | -/- | 2     |
| BPh 471   | -            | Biophysics Lab. (3)                                |       | -/3 | 1     |
| <b>Elective Courses: (The student chooses 6 hours)</b>      |              |  |       |     |       |
| Phy 401   | Phy 102      | Advanced Physical Optics                           | 2     | -/- | 2     |
| BPh 445   | -            | Principles of Physical Therapy                     | 2     | -/- | 2     |
| BPh 473   | -            | Biophysical Techniques in Medicine.                | 2     | -/- | 2     |
| BPh 475   | BPh 223      | Electric Simulation in Biosystems.                 | 2     | -/- | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |  |       |     |       |
| Zoo 410   | -            | Neurophysiology                                    | 2     | -/- | 2     |
| Com 427   | -            | Introduction to Bioinformatics                     | 2     | -/- | 2     |
| <b>Total: 9 + 6+ 2 = 17 Hours</b>                           |              |  |       |     |       |

المستوى الرابع: الفصل الدراسي الثاني

| Level 4 / Semester 2                                   |              | Course Title                               | Hours |     |       |
|--|--------------|--|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 9 hours                | Lect. | T/P | Cred. |
| BPh 462  | BPh 223      | Control and Communication Biophysics .     | 2     | -/- | 2     |
| BPh 464  | Phy 102      | Medical Devices Bioelectronics             | 2     | -/- | 2     |
| BPh 466  | Phy 102      | Radiotherapy                               | 1     | -/3 | 2     |
| BPh 468  | BPh 463      | Principals of Nano-medical and Application | 2     | -/- | 2     |
| BPh 472  | -            | Biophysics Lab. (4)                        |       | -/3 | 1     |
| <b>Elective Courses: (The student chooses 6 hours)</b> |              |  |       |     |       |
| BPh 434  | Phy 302      | Radiation Physics and Its Bio-application. | 2     | -/- | 2     |
| BPh 474  | BPh 464      | Magnetic Resonance Imaging                 | 2     | -/- | 2     |
| BPh 476  | BPh 223      | Biomodelling                               | 2     | -/- | 2     |
| BPh 488  | Phy 222      | Biomedical Accelerators                    | 2     | -/- | 2     |
| <b>Research: 3 hours</b>                               |              |  |       |     |       |
| Bph ٤٧٠  | -            | Research and Essay                         | 3     | -/- | 3     |
| <b>Total: 9 + 6 +3 = 18 Hours</b>                      |              |  |       |     |       |

(٧) برنامج الفيزياء والكيمياء

أولاً: المقررات الإجبارية (٦٠ ساعة معتمدة)

| The student studies 30 compulsory hours of Physics courses   |              |   |       |     |       |
|--|--------------|---|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses                                | Hours |     |       |
|  |              |   | Lect. | T/P | Cred. |
| Phy 222  | Phy 227      | Atomic Physics and Principles of Modern Physics   | 2     | -/- | 2     |
| Phy 224  | Phy 101      | Thermodynamics                                    | 2     | -/- | 2     |
| Phy 225  | Phy 102      | Alternating Current and Electromagnetism          | 2     | -/- | 2     |
| Phy 227  | Phy 101      | Vibrations and Waves                              | 2     | -/- | 2     |
| Phy 231  | Phy102       | Physics Lab (١)                                   | -     | -/3 | 1     |
| Phy 232  | Phy 231      | Physics Lab (٢)                                   | -     | -/3 | 1     |
| Phy 341  | -            | Solid State I                                     | 2     | -/- | 2     |
| Phy 342  | Phy 341      | Semiconductors                                    | 2     | -/- | 2     |
| Phy 344  | Phy 359      | Nuclear Physics (1)                               | 2     | -/- | 2     |
| Phy 352  | -            | Physics Lab                                       | -     | -/3 | 1     |
| Phy 359  | Phy 222      | Introduction to Quantum Mechanics                 | 2     | -/- | 2     |
| Phy 360  | Phy 222      | Optics and Introduction to Laser Physics          | 2     | -/- | 2     |
| Phy 464  | Phy 341      | Nanomaterials Physics                             | 2     | -/- | 2     |
| Phy 466  | -            | Computational Physics and Programming             | 2     | -/- | 2     |
| Phy 467  | Phy 342      | Electronics                                       | 2     | -/- | 2     |
| Phy 471  | -            | Physics Lab (1)                                   | -     | -/3 | 1     |
| Phy 481  | -            | Introduction to Plasma Physics                    | 2     | -/- | 2     |
| The student studies 30 compulsory hours of chemsitry courses |              |   |       |     |       |
| Chm 212  | Chm ١٠5      | Aromatic and Polynuclear Chemistry                | 2     | -/- | 2     |
| Chm 213  | Chm ١٠٥      | Petroleum and Petrochemicals                      | 2     | -/- | 2     |
| Chm 222  | Chm ١٠0      | Chemistry of Representative Elements              | 2     | -/٣ | ٣     |
| Chm 241  | Chm ١٠0      | Analytical Chemistry (1)                          | 2     | -/٣ | ٣     |
| Chm 304  | Chm 385      | Photochemistry                                    | 3     | -/- | 3     |
| Chm 323  | Chm 222      | Chemistry of Transition Metals                    | 2     | -/- | 2     |
| Chm 332  | Chm 222      | Surface Chemistry                                 | 2     | -/- | 2     |
| Chm 385  | Chm ١٠5      | Kinetic Chemistry                                 | 2     | -/- | 2     |
| Chm 400  | Chm 222      | Nanochemistry and Applications                    | 2     | -/- | 2     |
| Chm 405  | Chm 385      | Laser Spectroscopy (2)                            | 2     | -/- | 2     |
| Chm 411  | Chm 212      | Polymer Chemistry and Applications (1)            | 2     | -/٣ | ٣     |
| Chm 432  | Chm 439      | Computetional Chemistry and Chemical Applications | 2     | -/- | 2     |
| Chm 442  | Chm 241      | Analytical Chemistry (3) [selected topics]        | 2     | -/- | 2     |



ثانياً: المقررات الاختيارية

يدرس الطالب 28 ساعات معتمدة من المقررات الآتية: -

| The student chooses 14 elective hours of Physics courses   |              |  |       |     |       |
|--|--------------|--|-------|-----|-------|
| Code   | Prerequisite | Elective Courses                                       | Hours |     |       |
|  |              |  | Lect. | T/P | Cred. |
| Phy 223  | -            | Introduction to Biophysics                             | 2     | -/- | 2     |
| Phy 228  | Phy 102      | Physical Optics  | 2     | -/- | 2     |
| Phy 234  | Phy 102      | Radiation Physics and Its Applications                 | 2     | -/- | 2     |
| Phy 235  | -            | Renewable Energy                                       | 2     | -/- | 2     |
| Phy 346  | -            | Introduction to Fluid Mechanics                        | 2     | -/- | 2     |
| Phy 354  | Phy 341      | Thin Film Technology                                   | 2     | -   | 2     |
| Phy 355  | Phy 222      | Atomic and Molecular Spectra                           | 2     | -   | 2     |
| Phy 357  | Phy 222      | Accelerators and Ionization Sources                    | 2     | -/- | 2     |
| Phy 366  | -            | Methods of Experimental Physics                        | 2     | -/- | 2     |
| Phy 465  | Phy 341      | Solid State (2)  | 2     | -/- | 2     |
| Phy 467  | Phy 344      | Reactors   | 2     | -/- | 2     |
| Phy 477  | -            | Superconductors  | 2     | -/- | 2     |
| Phy 482  | -            | Laser's Applications                                   | 2     | -/- | 2     |
| The student chooses 14 elective hours of chemistry courses |              |  |       |     |       |
| Chm 216  | Chm 105      | Organic Environmental Green Chemistry (1)              | 2     | -/- | 2     |
| Chm 217  | Chm 105      | Industrial Chemistry and Economic studies              | 2     | -/- | 2     |
| Chm 221  | Chm 100      | Industrial Inorganic Chemistry (1)                     | 2     | -/- | 2     |
| Chm 232  | Chm 105      | Electrochemistry (1)                                   | 2     | -/- | 2     |
| Chm 310  | Chm 212      | Advanced Organic Chemistry                             | 2     | -/- | 2     |
| Chm 333  | Chm 222      | Chemistry of Molecular Spectroscopy                    | 2     | -/- | 2     |
| Chm 383  | Chm 222      | Irreversible Electrochemistry                          | 2     | -/- | 2     |
| Chm 418  | Chm 313      | Technology of Paints and Detergents                    | 2     | -/- | 2     |
| Chm 439  | Chm 222      | Basic of Quantum and Statistical Dynamics Chemistry    | 2     | -/- | 2     |
| Chm 470  | Chm 405      | Chemistry of Ceramics and Glass                        | 2     | -/- | 2     |
| Chm 475  | Chm 212      | Principles of Chemistry of Dyes and Textiles           | 1     | -/3 | 2     |
| Chm 487  | Chm 332      | Principles of Corrosion and Metal Protecting Chemistry | 2     | -/- | 2     |

ثالثاً: مقررات الاختيار الحر

يدرس الطالب ٦ ساعات معتمدة من المقررات الآتية: -

| Code    | Prerequisite | Free Optional Courses              | Hours |     |       |
|---------|--------------|------------------------------------|-------|-----|-------|
|         |              |                                    | Lect. | T/P | Cred. |
| Mic 200 | -            | Principles of General Microbiology | 2     | -/3 | 3     |
| Mat 203 | -            | Linear Algebra                     | 2     | 2/- | 3     |
| Com 221 | -            | Object-oriented Programming        | 2     | 2/- | 3     |
| Geo 233 | -            | Crystallography and Minaralogy     | 2     | -/3 | 3     |

رابعاً: التدريب الميداني (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title               | Lect. | T/P | Cred. |
|---------|--------------|----------------------------|-------|-----|-------|
| Phy 362 | -            | Applied and Field Training | -     | -/- | 3     |

خامساً: مقرر البحث والمقال (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title       | Lect. | T/P | Cred. |
|---------|--------------|--------------------|-------|-----|-------|
| Phy ٤٦٨ | -            | Research and Essay | ٣     | -/- | 3     |

سادساً: توزيع مقررات برنامج الفيزياء والكيمياء على المستويات الدراسية  
المستوى الثاني: الفصل الدراسي الأول

| Level 2 / Semester 1  |                  | Course Title                              | Hours |     |       |
|---|------------------|---|-------|-----|-------|
| Code  | Prerequisite     | Compulsory Courses: 10 hours              | Lect. | T/P | Cred. |
| Chm 213   | Chm ١٠٥          | Petroleum and Petrochemicals              | 2     | -/- | 2     |
| Phy 225   | Phy 102          | Alternating Current and Electromagnetism  | 2     | -/- | 2     |
| Phy 227   | Phy 101          | Vibrations and Waves                      | 2     | -/- | 2     |
| Phy 231   | Phy 101, Phy 102 | Physics Lab (١)                           | -     | -/3 | 1     |
| Chm 241   | Chm ١٠0          | Analytical Chemistry (1)                  | 2     | -/٣ | ٣     |
| <b>Elective Courses: (The student chooses 2 hours of Physics courses)</b>   |                  |   |       |     |       |
| Phy 223   | -                | Introduction to Biophysics                | 2     | -/- | 2     |
| Phy 235   | -                | Renewable Energy                          | 2     | -/- | 2     |
| <b>Elective Courses: (The student chooses 2 hours of Chemistry courses)</b> |                  |   |       |     |       |
| Chm 217   | Chm 105          | Industrial Chemistry and Economic Studies | 2     | -/- | 2     |
| Chm 221   | Chm 100          | Industrial Inorganic Chemistry (1)        | 2     | -/- | 2     |
| <b>Free Optional Courses: (The student chooses 3 hours)</b>                 |                  |   |       |     |       |
| Mat 203   | -                | Linear Algebra                            | 2     | 2/- | 3     |
| Geo 233   | -                | Crystallography and Mineralogy            | 2     | -/3 | 3     |
| <b>Total: 10 + 2+2+ 3 = 17 Hours</b>  |                  |   |       |     |       |

المستوى الثاني: الفصل الدراسي الثاني

| Level 2 / Semester 2  |                  | Course Title                                    | Hours |     |       |
|---|------------------|---|-------|-----|-------|
| Code  | Prerequisite     | Compulsory Courses: 10 hours                    | Lect. | T/P | Cred. |
| Chm 212   | Chm ١٠5          | Aromatic and Polynuclear Chemistry              | 2     | -/- | 2     |
| Chm 222   | Chm ١٠0          | Chemistry of Representative Elements            | 2     | -/٣ | ٣     |
| Phy 222   | Phy 227          | Atomic Physics and Principles of Modern Physics | 2     | -/- | 2     |
| Phy 224   | Phy 101          | Thermodynamics                                  | 2     | -/- | 2     |
| Phy 232   | Phy 231          | Physics Lab (٢)                                 | -     | -/3 | 1     |
| <b>Elective Courses: (The student chooses 2 hours of Physics courses)</b>   |                  |   |       |     |       |
| Phy 228   | Phy 102          | Physical Optics                                 | 2     | -/- | 2     |
| Phy 234   | Phy 101, Phy 102 | Radiation Physics and Its Applications          | 2     | -/- | 2     |
| <b>Elective Courses: (The student chooses 2 hours of Chemistry courses)</b> |                  |   |       |     |       |
| Chm 232   | Chm105           | Electrochemistry (1)                            | 2     | -/- | 2     |
| Chm 216   | Chm 105          | Organic Environmental Green Chemistry (1)       | 2     | -/- | 2     |
| <b>Free Optional Courses: (The student chooses 3 hours)</b>                 |                  |   |       |     |       |
| Mic 200   | -                | Principles of General Microbiology              | 2     | -/3 | 3     |
| Com 221   | -                | Object-oriented Programming                     | 2     | 2/- | 3     |
| <b>Total: 10 + 2+2 + 3 = 17 Hours</b>                                       |                  |   |       |     |       |

المستوى الثالث: الفصل الدراسي الأول

| Level 3 / Semester 1  |              | Course Title                             | Hours |     |       |
|---|--------------|--|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 10 hours             | Lect. | T/P | Cred. |
| Chm 323   | Chm 222      | Chemistry of Transition Metals           | 2     | -/- | 2     |
| Phy 341   | -            | Solid State I                            | 2     | -/- | 2     |
| Phy 359   | Phy 222      | Introduction to Quantum Mechanics        | 2     | -/- | 2     |
| Phy 360   | Phy 222      | Optics and Introduction to Laser Physics | 2     | -/- | 2     |
| Chm 385   | Chm ١٠5      | Kinetic Chemistry                        | 2     | -/- | 2     |
| <b>Elective Courses: (The student chooses 2 hours of Physics courses)</b>   |              |  |       |     |       |
| Phy 355   | Phy 222      | Atomic and Molecular Spectra             | 2     | -   | 2     |
| Phy 357   | Phy 222      | Accelerators and Ionization Sources      | 2     | -/- | 2     |
| <b>Elective Courses: (The student chooses 4 hours of Chemistry courses)</b> |              |  |       |     |       |
| Chm 310   | Chm 212      | Advanced Organic Chemistry               | 2     | -/- | 2     |
| Chm 333   | Chm222       | Chemistry of Molecular Spectroscopy      | 2     | -/- | 2     |
| Chm 383   | Chm222       | Irreversible Electrochemistry            | 2     | -/- | 2     |
| <b>Total: 10 + 2+4 = 16 Hours</b>   |              |  |       |     |       |

المستوى الثالث: الفصل الدراسي الثاني

| Level 3 / Semester 2  |              | Course Title                    | Hours |     |       |
|---|--------------|---------------------------------|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 10 hours    | Lect. | T/P | Cred. |
| Chm 304   | Chm 385      | Photochemistry                  | 3     | -/- | 3     |
| Chm 332   | Chm 222      | Surface Chemistry               | 2     | -/- | 2     |
| Phy 342   | Phy 341      | Semiconductors                  | 2     | -/- | 2     |
| Phy 344   | Phy 359      | Nuclear Physics (1)             | 2     | -/- | 2     |
| Phy 352   | -            | Physics Lab                     | -     | -/3 | 1     |
| <b>Elective Courses: (The student chooses 4 hours of Physics courses)</b> |              |                                 |       |     |       |
| Phy 346   | -            | Introduction to Fluid Mechanics | 2     | -/- | 2     |
| Phy 354   | Phy 341      | Thin Film Technology            | 2     | -   | 2     |
| Phy 366   | -            | Methods of Experimental Physics | 2     | -/- | 2     |
| <b>Training: 3 hours</b>  |              |                                 |       |     |       |
| Phy 302   | -            | Applied and Field Training      | -     | -/- | 3     |
| <b>Total: 10 + 4 + 3 = 17 Hours</b>                                       |              |                                 |       |     |       |

المستوى الرابع: الفصل الدراسي الأول

| Level 4 / Semester 1  |              | Course Title   | Hours |     |       |
|---|--------------|--|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 10 hours                           | Lect. | T/P | Cred. |
| Chm 405   | Chm 385      | Laser Chemistry (2)                                    | 2     | -/- | 2     |
| Chm 411   | Chm 212      | Polymer Chemistry and Applications (1)                 | 2     | -/3 | 3     |
| Phy 467   | Phy 342      | Electronics  | 2     | -/- | 2     |
| Phy 471   | -            | Physics Lab (1)  | -     | -/3 | 1     |
| Phy 481   | -            | Introduction to Plasma Physics                         | 2     | -/- | 2     |
| <b>Elective Courses: (The student chooses 2 hours of Physics courses)</b>   |              |  |       |     |       |
| Phy 467   | Phy 344      | Reactors   | 2     | -/- | 2     |
| Phy 477   | -            | Superconductors  | 2     | -/- | 2     |
| <b>Elective Courses: (The student chooses 4 hours of Chemistry courses)</b> |              |  |       |     |       |
| Chm 439   | Chm 222      | Basic of Quantum and Statistical Dynamics Chemistry    | 2     | -/- | 2     |
| Chm 475   | Chm 212      | Principles of Chemistry of Dyes and Textiles           | 1     | -/3 | 2     |
| Chm 487   | Chm 332      | Principles of Corrosion and Metal Protecting Chemistry | 2     | -/- | 2     |
| <b>Total: 10 + 2+4 = 16 Hours</b>   |              |  |       |     |       |

المستوى الرابع: الفصل الدراسي الثاني

| Level 4 / Semester 2  |              | Course Title                                      | Hours |     |       |
|---|--------------|---|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 10 hours                      | Lect. | T/P | Cred. |
| Chm 400   | Chm 222      | Nanochemistry and Applications                    | 2     | -/- | 2     |
| Chm 432   | Chm 439      | Computational Chemistry and Chemical Applications | 2     | -/- | 2     |
| Chm 442   | Chm 241      | Analytical Chemistry (3) [selected topics]        | 2     | -/- | 2     |
| Phy 464   | Phy 341      | Nanomaterials Physics                             | 2     | -/- | 2     |
| Phy 466   | -            | Computational Physics and Programming             | 2     | -/- | 2     |
| <b>Elective Courses: (The student chooses 2 hours of Physics courses)</b>   |              |   |       |     |       |
| Phy 465   | Phy 341      | Solid State (2)                                   | 2     | -/- | 2     |
| Phy 482   | -            | Laser's Applications                              | 2     | -/- | 2     |
| <b>Elective Courses: (The student chooses 2 hours of Chemistry courses)</b> |              |   |       |     |       |
| Chm 418   | Chm 313      | Technology of Paints and Detergents               | 2     | -/- | 2     |
| Chm 470   | Chm405       | Chemistry of Ceramics and Glass                   | 2     | -/- | 2     |
| <b>Research: 3 hours</b>  |              |   |       |     |       |
| Phy 483   | -            | Research and Essay in Physics                     | 3     | -/- | 3     |
| <b>Total: 10 + 2 + 2 +3 = 17 Hours</b>                                      |              |   |       |     |       |

(٨) برنامج الكيمياء

أولاً: المقررات الإجبارية (٦٠ ساعة معتمدة)

| Code    | Prerequisite | Compulsory Courses   | Hours |     |       |
|---------|--------------|--|-------|-----|-------|
|         |              |  | Lect. | T/P | Cred. |
| Chm 211 | Chm ١٠٥      | Aliphatic Organic Chemistry  | 2     | -/٣ | ٣     |
| Chm 212 | Chm ١٠5      | Aromatic and Polynuclear Chemistry                                       | 2     | -/- | 2     |
| Chm 213 | Chm ١٠٥      | Petroleum and Petrochemicals   | 2     | -/- | 2     |
| Chm 222 | Chm ١٠0      | Chemistry of Representative Elements                                     | 2     | -/٣ | ٣     |
| Chm 231 | Chm ١٠٥      | Chemical Thermodynamics  | 2     | -/- | 2     |
| Chm 232 | Chm ١٠5      | Electrochemistry (1)   | 2     | -/- | 2     |
| Chm 234 | Chm ١٠5      | Photo and Kinetic Chemistry  | 2     | -/٣ | ٣     |
| Chm 241 | Chm ١٠0      | Analytical Chemistry (1)   | 2     | -/٣ | ٣     |
| Chm 313 | Chm 212      | Reaction Mechanism and StereoChemistry                                   | 2     | -/٣ | ٣     |
| Chm 314 | Chm 211      | Chemistry of Carbohydrates, Lipids, Amino Acids and Natural Products (1) | 2     | -/٣ | ٣     |
| Chm 316 | Chm 212      | Organic Spectroscopy (1)   | 2     | -/٣ | ٣     |
| Chm 323 | Chm 222      | Chemistry of Transition Metals   | 2     | -/- | 2     |
| Chm 324 | Chm 323      | Co-ordination Chemistry  | 2     | -/- | 2     |
| Chm 332 | Chm 222      | Surface Chemistry  | 2     | -/- | 2     |
| Chm 343 | Chm 241      | Analytical Chemistry (2)   | 2     | -/٣ | ٣     |
| Chm 383 | Chm 222      | Irreversible Electrochemistry  | 2     | -/- | 2     |
| Chm 411 | Chm 212      | Polymer Chemistry and Applications (1)                                   | 2     | -/٣ | ٣     |
| Chm 412 | Chm 212      | Heterocyclic Chemistry and Applications                                  | 2     | -/٣ | ٣     |
| Chm 421 | Chm 324      | Nuclear and Radiation Chemistry  | 2     | -/- | 2     |
| Chm 422 | Chm 323      | Advanced Inorganic Chemistry (Chemical Applications of Group Theory)     | 2     | -/- | 2     |
| Chm 432 | Chm 439      | Computational Chemistry and Chemical Applications                        | 2     | -/- | 2     |
| Chm 439 | Chm 222      | Basis of Quantum and Statistical Dynamics Chemistry                      | 2     | -/- | 2     |
| Chm 441 | Chm 105      | Instrumental Analysis (1)  | 2     | -/٣ | ٣     |
| Chm 486 | Chm 222      | Materials Science (١)  | 2     | -/٣ | ٣     |

ثانياً: المقررات الاختيارية

يدرس الطالب ٢٨ ساعة معتمدة من المقررات الآتية: -

| Code    | Prerequisite | Elective Courses                          | Hours |     |       |
|---------|--------------|---|-------|-----|-------|
|         |              |   | Lect. | T/P | Cred. |
| Chm 201 | Chm 105      | Phase Rule (1)                            | 2     | -/- | 2     |
| Chm 216 | Chm 105      | Organic Environmental Green Chemistry (1) | 2     | -/- | 2     |
| Chm 217 | Chm 105      | Industrial Chemistry and Economic Studies | 2     | -/- | 2     |
| Chm 221 | Chm 100      | Industrial Inorganic Chemistry (1)        | 2     | -/- | 2     |
| Chm 242 | Chm 241      | Chemistry of Water Treatment (1)          | 2     | -/- | 2     |
| Chm 244 | Chm 241      | Environmental Analytical Chemistry (1)    | 2     | -/- | 2     |
| Chm 310 | Chm 212      | Advanced Organic Chemistry                | 2     | -/- | 2     |
| Chm 312 | Chm 212      | Therapeutic Chemistry and Vitamins        | 2     | -/3 | 3     |
| Chm 322 | Chm 222      | Characterization of Inorganic Compounds   | 2     | -/3 | 3     |
| Chm 327 | Chm 222      | Chemistry of Cement and Refractories (1)  | 2     | -/3 | 3     |
| Chm 331 | Chm 105      | Applied Electrochemistry                  | 2     | -/3 | 3     |
| Chm 333 | Chm 222      | Chemistry of Molecular Spectroscopy       | 2     | -/- | 2     |
| Chm 335 | Chm 241      | Electrochemical Instrumental Analysis     | 2     | -/- | 2     |
| Chm 342 | Chm 241      | Analytical Photochemistry                 | 2     | -/- | 2     |
| Chm 400 | Chm 222      | Nanochemistry and Applications            | 2     | -/- | 2     |
| Chm 404 | Chm 324      | Organometallic Chemistry                  | 2     | -/- | 2     |
| Chm 413 | Chm 313      | Chemistry of Petroleum Additives          | ٢     | -/3 | 3     |
| Chm 415 | Chm 316      | Chemistry of Dyes and Textiles            | 2     | -/٣ | ٣     |
| Chm 423 | Chm 324      | Industrial Inorganic Chemistry (3)        | 2     | -/3 | 3     |
| Chm 434 | Chm 343      | Chemistry of Catalysis Technology         | 2     | -/- | 2     |

ثالثاً: مقررات الاختيار الحر

يدرس الطالب ٦ ساعات معتمدة من المقررات الآتية: -

| Code    | Prerequisite | Free Optional Courses                      | Hours |     |       |
|---------|--------------|--|-------|-----|-------|
|         |              |  | Lect. | T/P | Cred. |
| Mat 201 | -            | Ordinary Differential Equations(1)         | 1     | 2/- | 2     |
| Com 224 | -            | Operating Systems                          | 1     | 2/- | 2     |
| Geo 231 | -            | Crystallography and Optical Mineralogy (2) | 1     | -/3 | 2     |
| Phy 237 | -            | Physics of Metals                          | 2     | -/- | 2     |
| Phy 245 | -            | Introduction to Physical Optics            | 1     | -/3 | 2     |
| Phy 391 | -            | X-ray and Crystallography                  | 2     | -/- | 2     |

رابعاً: التدريب الميداني (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title               | Lect. | T/P | Cred. |
|---------|--------------|----------------------------|-------|-----|-------|
| Chm 302 | -            | Applied and Field Training | -     | -/- | 3     |

خامساً: مقرر البحث والمقال (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title       | Lect. | T/P | Cred. |
|---------|--------------|--------------------|-------|-----|-------|
| Chm 402 | -            | Research and Essay | 3     | -/- | 3     |



سادساً: توزيع مقررات برنامج الكيمياء الخاص على المستويات الدراسية  
المستوى الثاني: الفصل الدراسي الأول

| Level 2 / Semester 1  |              | Course Title                               | Hours |     |       |
|---|--------------|--|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 10 hours               | Lect. | T/P | Cred. |
| Chm 211   | Chm ١٠٥      | Aliphatic Organic Chemistry                | 2     | -/٣ | ٣     |
| Chm 213   | Chm ١٠٥      | Petroleum and Petrochemicals               | 2     | -/- | 2     |
| Chm 231   | Chm ١٠٥      | Chemical Thermodynamics                    | 2     | -/- | 2     |
| Chm 241   | Chm ١٠0      | Analytical Chemistry (1)                   | 2     | -/٣ | ٣     |
| <b>Elective Courses: (The student chooses ٤ hours)</b>      |              |  |       |     |       |
| Chm 201   | Chm 105      | Phase Rule (1)                             | 2     | -/- | 2     |
| Chm 217   | Chm 105      | Industrial Chemistry and Economic Studies  | 2     | -/- | 2     |
| Chm 221   | Chm 100      | Industrial Inorganic Chemistry (1)         | 2     | -/- | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |  |       |     |       |
| Mat 201   | -            | Ordinary Differential Equations (1)        | 1     | 2/- | 2     |
| Geo 231   | -            | Crystallography and Optical Mineralogy (2) | 1     | -/3 | 2     |
| <b>Total: 10+4+2 = 16 Hours</b>                             |              |  |       |     |       |

المستوى الثاني: الفصل الدراسي الثاني

| Level 2 / Semester 2  |              | Course Title                              | Hours |     |       |
|---|--------------|---|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 10 hours              | Lect. | T/P | Cred. |
| Chm 212   | Chm ١٠5      | Aromatic and Polynuclear Chemistry        | 2     | -/- | 2     |
| Chm 222   | Chm ١٠0      | Chemistry of Representative Elements      | 2     | -/٣ | ٣     |
| Chm 232   | Chm ١٠5      | Electrochemistry (1)                      | 2     | -/- | 2     |
| Chm 234   | Chm ١٠5      | Photo and Kinetic Chemistry               | 2     | -/٣ | ٣     |
| <b>Elective Courses: (The student chooses ٤ hours)</b>      |              |   |       |     |       |
| Chm 216   | Chm 105      | Organic Environmental Green Chemistry (1) | 2     | -/- | 2     |
| Chm 242   | Chm 241      | Chemistry of Water Treatment (1)          | 2     | -/- | 2     |
| Chm 244   | Chm 241      | Environmental Analytical Chemistry (1)    | 2     | -/- | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |   |       |     |       |
| Com 224   | -            | Operating Systems                         | 1     | 2/- | 2     |
| Phy 245   | -            | Introduction to Physical Optics           | 1     | -/3 | 2     |
| <b>Total: 10+4+2= 16 Hours</b>                              |              |   |       |     |       |

المستوى الثالث: الفصل الدراسي الأول

| Level 3 / Semester 1  |              | Course Title                             | Hours |     |       |
|---|--------------|--|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 10 hours             | Lect. | T/P | Cred. |
| Chm 313   | Chm 212      | Reaction Mechanism and StereoChemistry   | 2     | -/٣ | ٣     |
| Chm 323   | Chm 222      | Chemistry of Transition Metals           | 2     | -/- | 2     |
| Chm 343   | Chm 241      | Analytical Chemistry (2)                 | 2     | -/٣ | ٣     |
| Chm 383   | Chm 222      | Irreversible Electrochemistry            | 2     | -/- | 2     |
| <b>Elective Courses: (The student chooses 5 hours)</b>      |              |  |       |     |       |
| Chm 327   | Chm 222      | Chemistry of Cement and Refractories (1) | 2     | -/3 | 3     |
| Chm 331   | Chm 105      | Applied Electrochemistry                 | 2     | -/3 | 3     |
| Chm 333   | Chm 222      | Chemistry of Molecular Spectroscopy      | 2     | -/- | 2     |
| Chm 335   | Chm 241      | Electrochemical Instrumental Analysis    | 2     | -/- | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |  |       |     |       |
| Phy 237   | -            | Physics of Metals                        | 2     | -/- | 2     |
| Phy 391   | -            | X-ray and Crystallography                | 2     | -/- | 2     |
| <b>Total: 10+3+2+2= 17 Hours</b>                            |              |  |       |     |       |

المستوى الثالث: الفصل الدراسي الثاني

| Level 3 / Semester 2                                   |              | Course Title   | Hours |     |       |
|--|--------------|--|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 10 hours   | Lect. | T/P | Cred. |
| Chm 314  | Chm 211      | Chemistry of Carbohydrates, Lipids, Amino Acids and Natural Products (1) | 2     | -/٣ | ٣     |
| Chm 316  | Chm 212      | Organic Spectroscopy (1)   | 2     | -/٣ | ٣     |
| Chm 324  | Chm 323      | Co-ordination Chemistry  | 2     | -/- | 2     |
| Chm 332  | Chm 222      | Surface Chemistry  | 2     | -/- | 2     |
| <b>Elective Courses: (The student chooses 5 hours)</b> |              |  |       |     |       |
| Chm 310  | Chm 212      | Advanced Organic Chemistry   | 2     | -/- | 2     |
| Chm 312  | Chm 212      | Therapeutic Chemistry and Vitamins                                       | 2     | -/3 | 3     |
| Chm 322  | Chm 222      | Characterization of Inorganic Compounds                                  | 2     | -/3 | 3     |
| Chm 342  | Chm 241      | Analytical Photochemistry  | 2     | -/- | 2     |
| <b>Training: 3 hours</b>                               |              |  |       |     |       |
| Chm 302  | -            | Applied and Field Training   | -     | -/- | 3     |
| <b>Total: 10+3+2+3= 18 Hours</b>                       |              |  |       |     |       |

المستوى الرابع: الفصل الدراسي الأول

| Level 4 / Semester 1                                   |              | Course Title  | Hours |     |       |
|--|--------------|---|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 10 hours                        | Lect. | T/P | Cred. |
| Chm 411  | Chm 212      | Polymer Chemistry and Applications (1)              | 2     | -/٣ | ٣     |
| Chm 421  | Chm 324      | Nuclear and Radiation Chemistry                     | 2     | -/- | 2     |
| Chm 439  | Chm 222      | Basis of Quantum and Statistical Dynamics Chemistry | 2     | -/- | 2     |
| Chm 441  | Chm 105      | Instrumental Analysis (1)                           | 2     | -/٣ | ٣     |
| <b>Elective Courses: (The student chooses 6 hours)</b> |              |   |       |     |       |
| Chm 413  | Chm 313      | Chemistry of Petroleum Additives                    | ٢     | -/3 | 3     |
| Chm 415  | Chm 316      | Chemistry of Dyes and Textiles (1)                  | 2     | -/٣ | ٣     |
| Chm 423  | Chm 324      | Industrial Inorganic Chemistry (3)                  | 2     | -/3 | 3     |
| <b>Total: 10+6= 16 Hours</b>                           |              |   |       |     |       |

المستوى الرابع: الفصل الدراسي الثاني

| Level 4 / Semester 2                                   |              | Course Title   | Hours |     |       |
|--|--------------|--|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 10 hours   | Lect. | T/P | Cred. |
| Chm 412  | Chm 212      | Heterocyclic Chemistry and Applications                              | 2     | -/٣ | ٣     |
| Chm 422  | Chm 323      | Advanced Inorganic Chemistry (Chemical Applications of Group Theory) | 2     | -/- | 2     |
| Chm 432  | Chm 439      | Computational Chemistry and Chemical Applications                    | 2     | -/- | 2     |
| Chm 486  | Chm 222      | Materials Science (١)  | 2     | -/٣ | ٣     |
| <b>Elective Courses: (The student chooses 4 hours)</b> |              |  |       |     |       |
| Chm 400  | Chm 222      | Nanochemistry and Applications                                       | 2     | -/- | 2     |
| Chm 404  | Chm 324      | Organometallic Chemistry   | 2     | -/- | 2     |
| Chm 434  | Chm 343      | Chemistry of Catalysis Technology                                    | 2     | -/- | 2     |
| <b>Research: 3 hours</b>                               |              |  |       |     |       |
| Chm 402  | -            | Research and Essay   | 3     | -/- | 3     |
| <b>Total: 10+4+3 = 17 Hours</b>                        |              |  |       |     |       |

(٩) برنامج الكيمياء والكيمياء التطبيقية

أولاً: المقررات الإلزامية (٦٠ ساعة معتمدة)

| Code    | Prerequisite | Compulsory Courses   | Hours |     |       |
|---------|--------------|--|-------|-----|-------|
|         |              |  | Lect. | T/P | Cred. |
| Chm 211 | Chm 105      | Aliphatic Organic Chemistry  | 2     | -/٣ | ٣     |
| Chm 213 | Chm 105      | Petroleum and Petrochemicals   | 2     | -/- | 2     |
| Chm 222 | Chm 100      | Chemistry of Representative Elements                                     | 2     | -/٣ | ٣     |
| Chm 231 | Chm 105      | Chemical Thermodynamics  | 2     | -/- | 2     |
| Chm 232 | Chm 105      | Electrochemistry (1)   | 2     | -/- | 2     |
| Chm 234 | Chm 105      | Photo and Kinetic Chemistry  | 2     | -/٣ | ٣     |
| Chm ٢38 | Chm 105      | Basis of Chemistry of Catalysis Technology                               | 2     | -/- | 2     |
| Chm 241 | Chm 100      | Analytical Chemistry (1)   | 2     | -/٣ | ٣     |
| Chm 313 | Chm 212      | Reaction Mechanism and StereoChemistry                                   | 2     | -/٣ | ٣     |
| Chm 314 | Chm 211      | Chemistry of Carbohydrates, Lipids, Amino Acids and Natural Products (1) | 2     | -/٣ | ٣     |
| Chm 316 | Chm 212      | Organic Spectroscopy (1)   | 2     | -/٣ | ٣     |
| Chm 323 | Chm 222      | Chemistry of Transition Metals   | 2     | -/- | 2     |
| Chm 324 | Chm 323      | Co-ordination Chemistry  | 2     | -/- | 2     |
| Chm 332 | Chm 222      | Surface Chemistry  | 2     | -/- | 2     |
| Chm 343 | Chm 241      | Analytical Chemistry (2)   | 2     | -/٣ | ٣     |
| Chm 369 | Chm 211      | Basis of Polymer Chemistry   | 1     | -/3 | 2     |
| Chm 410 | Chm 316      | Chemotherapy and Heteroorganic Chemistry                                 | 2     | -/- | 2     |
| Chm 414 | Chm 316      | Technology of Industrial Detergents                                      | 2     | -/٣ | ٣     |
| Chm 421 | Chm 324      | Nuclear and Radiation Chemistry  | 2     | -/- | 2     |
| Chm 424 | Chm 222      | Chemistry of Lanthanides and Actinides (٢)                               | 2     | -/- | 2     |
| Chm 429 | Chm 324      | Chemistry of Cement and Refractories (2)                                 | 2     | -/3 | 3     |
| Chm 439 | Chm 222      | Basis of Quantum and Statistical Dynamics Chemistry                      | 2     | -/- | 2     |
| Chm 441 | Chm 105      | Instrumental Analysis (1)  | 2     | -/٣ | ٣     |
| Chm 4^6 | Chm 222      | Materials Science (١)  | 2     | -/٣ | ٣     |

ثانياً: المقررات الاختيارية

يدرس الطالب ٢٨ ساعة معتمدة من المقررات الآتية: -

| Code    | Prerequisite | Elective Courses                            | Hours |     |       |
|---------|--------------|---|-------|-----|-------|
|         |              |   | Lect. | T/P | Cred. |
| Chm 216 | Chm 105      | Organic Environmental Green Chemistry (1)   | 2     | -/- | 2     |
| Chm 217 | Chm 105      | Industrial Chemistry and Economic Studies   | 2     | -/- | 2     |
| Chm 219 | Chm 105      | Cyclic Aliphatic Chemistry                  | 2     | -/- | 2     |
| Chm 221 | Chm 100      | Industrial Inorganic Chemistry (1)          | 2     | -/- | 2     |
| Chm 242 | Chm 241      | Chemistry of Water Treatment (1)            | 2     | -/- | 2     |
| Chm 29٢ | Chm 105      | Phase Rule (2)                              | 2     | -/- | 2     |
| Chm 311 | Chm 211      | Chemistry of Pesticides and Toxins          | 2     | -/3 | 3     |
| Chm 318 | Chm 212      | Applied Organic Chemistry (Selected Topics) | 3     | -/- | 3     |
| Chm 32٠ | Chm 222      | Chemistry of Ceramics Industry              | 2     | -/- | 2     |
| Chm 321 | Chm 222      | Industrial Inorganic Chemistry (2)          | 2     | -/3 | 3     |
| Chm 325 | Chm 222      | Applied RadioChemistry                      | 2     | -/- | 2     |
| Chm 326 | Chm 222      | Chemistry of Inorganic Pigments             | 2     | -/3 | 3     |
| Chm 335 | Chm 241      | Electrochemical Instrumental Analysis       | 2     | -/- | 2     |
| Chm 336 | Chm 323      | Chemistry of Glass Industry                 | 2     | -/- | 2     |
| Chm 400 | Chm 222      | Nanochemistry and Applications              | 2     | -/- | 2     |
| Chm 413 | Chm 313      | Chemistry of Petroleum Additives            | 2     | -/3 | 3     |
| Chm 415 | Chm 313      | Chemistry of Dyes and Textiles              | 2     | -/٣ | ٣     |
| Chm 416 | Chm 314      | Technology of Paints                        | 2     | -/- | 2     |
| Chm 417 | Chm 314      | Advanced Polymer Chemistry                  | 2     | -/3 | 3     |
| Chm 434 | Chm 343      | Chemistry of Catalysis Technology           | 2     | -/- | 2     |
| Chm 437 | Chm 313      | Chemistry of Corrosion and Metal Protecting | 2     | -/3 | 3     |

ثالثاً: مقررات الاختيار الحر

يدرس الطالب ٦ ساعات معتمدة من المقررات الآتية:-

| Code    | Prerequisite | Free Optional Courses                      | Hours |     |       |
|---------|--------------|--|-------|-----|-------|
|         |              |  | Lect. | T/P | Cred. |
| Mat 201 | -            | Ordinary Differential Equations (1)        | 1     | 2/- | 2     |
| Com 224 | -            | Operating Systems                          | 1     | 2/- | 2     |
| Geo 231 | -            | Crystallography and Optical Mineralogy (2) | 1     | -/3 | 2     |
| Phy 237 | -            | Physics of Metals                          | 2     | -/- | 2     |
| Phy 245 | -            | Introduction to Physical Optics            | 1     | -/3 | 2     |
| Phy 391 | -            | X-ray and Crystallography                  | 2     | -/- | 2     |

رابعاً: التدريب الميداني (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title               | Lect. | T/P | Cred. |
|---------|--------------|----------------------------|-------|-----|-------|
| Chm 302 | -            | Applied and Field Training | -     | -/- | 3     |

خامساً: مقرر البحث والمقال (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title       | Lect. | T/P | Cred. |
|---------|--------------|--------------------|-------|-----|-------|
| Chm 402 | -            | Research and Essay | 3     | -/- | 3     |

سادساً: توزيع مقررات برنامج الكيمياء والكيمياء التطبيقية على المستويات الدراسية  
المستوى الثاني: الفصل الدراسي الأول

| Level 2 / Semester 1  |              | Course Title                               | Hours |     |       |
|---|--------------|--|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 10 hours               | Lect. | T/P | Cred. |
| Chm 211   | Chm 105      | Aliphatic Organic Chemistry                | 2     | -/٣ | ٣     |
| Chm 213   | Chm 105      | Petroleum and Petrochemicals               | 2     | -/- | 2     |
| Chm 231   | Chm 105      | Chemical Thermodynamics                    | 2     | -/- | 2     |
| Chm 241   | Chm 100      | Analytical Chemistry (1)                   | 2     | -/٣ | ٣     |
| <b>Elective Courses: (The student chooses ٤ hours)</b>      |              |  |       |     |       |
| Chm 217   | Chm 105      | Industrial Chemistry and Economic Studies  | 2     | -/- | 2     |
| Chm 219   | Chm 105      | Cyclic Aliphatic Chemistry                 | 2     | -/- | 2     |
| Chm 221   | Chm 100      | Industrial Inorganic Chemistry (1)         | 2     | -/- | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |  |       |     |       |
| Mat 201   | -            | Ordinary Differential Equations (1)        | 1     | 2/- | 2     |
| Geo 231   | -            | Crystallography and Optical Mineralogy (2) | 1     | -/3 | 2     |
| <b>Total: ١٠ + ٤ + ٢ = ١٦ Hours</b>                         |              |  |       |     |       |

المستوى الثاني: الفصل الدراسي الثاني

| Level 2 / Semester 2  |              | Course Title                               | Hours |     |       |
|---|--------------|--|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 10 hours               | Lect. | T/P | Cred. |
| Chm 222   | Chm 100      | Chemistry of Representative Elements       | 2     | -/٣ | ٣     |
| Chm 232   | Chm 105      | Electrochemistry (1)                       | 2     | -/- | 2     |
| Chm 234   | Chm 105      | Photo and Kinetic Chemistry                | 2     | -/٣ | ٣     |
| Chm ٢38   | Chm 105      | Basis of Chemistry of Catalysis Technology | 2     | -/- | 2     |
| <b>Elective Courses: (The student chooses ٤ hours)</b>      |              |  |       |     |       |
| Chm 216   | Chm 105      | Organic Environmental Green Chemistry (1)  | 2     | -/- | 2     |
| Chm 242   | Chm 241      | Chemistry of Water Treatment (1)           | 2     | -/- | 2     |
| Chm 29٢   | Chm 105      | Phase Rule (2)                             | 2     | -/- | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |  |       |     |       |
| Com 224   | -            | Operating Systems                          | 1     | 2/- | 2     |
| Phy 245   | -            | Introduction to Physical Optics            | 1     | -/3 | 2     |
| <b>Total: ١٠ + ٤ + ٢ = ١٦ Hours</b>                         |              |  |       |     |       |

المستوى الثالث: الفصل الدراسي الأول

| Level 3 / Semester 1  |              | Course Title                           | Hours |     |       |
|---|--------------|--|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: ١٠ hours           | Lect. | T/P | Cred. |
| Chm 313   | Chm 212      | Reaction Mechanism and StereoChemistry | 2     | -/٣ | ٣     |
| Chm 323   | Chm 222      | Chemistry of Transition Metals         | 2     | -/- | 2     |
| Chm 343   | Chm 241      | Analytical Chemistry (2)               | 2     | -/٣ | ٣     |
| Chm 369   | Chm 211      | Basis of Polymer Chemistry             | 1     | -/3 | 2     |
| <b>Elective Courses: (The student chooses 5 hours)</b>      |              |  |       |     |       |
| Chm 311   | Chm 211      | Chemistry of Pesticides and Toxins     | 2     | -/3 | 3     |
| Chm 321   | Chm 222      | Industrial Inorganic Chemistry (2)     | 2     | -/3 | 3     |
| Chm 325   | Chm 222      | Applied RadioChemistry                 | 2     | -/- | 2     |
| Chm 335   | Chm 241      | Electrochemical Instrumental Analysis  | 2     | -/- | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |  |       |     |       |
| Phy 237   | -            | Physics of Metals                      | 2     | -/- | 2     |
| Phy 391   | -            | X-ray and Crystallography              | 2     | -/- | 2     |
| <b>Total: 1٠ + 3+2 + ٢ = 1٧ Hours</b>                       |              |  |       |     |       |

المستوى الثالث: الفصل الدراسي الثاني

| Level 3 / Semester 2                                   |              | Course Title   | Hours |     |       |
|--|--------------|--|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: ١٠ hours   | Lect. | T/P | Cred. |
| Chm 314  | Chm 211      | Chemistry of Carbohydrates, Lipids, Amino Acids and Natural Products (1) | 2     | -/٣ | ٣     |
| Chm 316  | Chm 212      | Organic Spectroscopy (1)   | 2     | -/٣ | ٣     |
| Chm 324  | Chm 323      | Co-ordination Chemistry  | 2     | -/- | 2     |
| Chm 332  | Chm 222      | Surface Chemistry  | 2     | -/- | 2     |
| <b>Elective Courses: (The student chooses 5 hours)</b> |              |  |       |     |       |
| Chm 318  | Chm 212      | Applied Organic Chemistry (Selected Topics)                              | 3     | -/- | 3     |
| Chm 32٠  | Chm 222      | Chemistry of Ceramics Industry   | 2     | -/- | 2     |
| Chm 326  | Chm 222      | Chemistry of Inorganic Pigments  | 2     | -/3 | 3     |
| Chm 336  | Chm 323      | Chemistry of Glass Industry  | 2     | -/- | 2     |
| <b>Training: 3 hours</b>                               |              |  |       |     |       |
| Chm 302  | -            | Applied and Field Training   | -     | -/- | 3     |
| <b>Total: ١٠ + 3+2 + 3 = 1٨ Hours</b>                  |              |  |       |     |       |



المستوى الرابع: الفصل الدراسي الأول

| Level 4 / Semester 1                                   |              | Course Title  | Hours |     |       |
|--|--------------|---|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 10 hours                        | Lect. | T/P | Cred. |
| Chm 421  | Chm 324      | Nuclear and Radiation Chemistry                     | 2     | -/- | 2     |
| Chm 429  | Chm 324      | Chemistry of Cement and Refractories (2)            | 2     | -/3 | 3     |
| Chm 439  | Chm 222      | Basis of Quantum and Statistical Dynamics Chemistry | 2     | -/- | 2     |
| Chm 441  | Chm 105      | Instrumental Analysis (1)                           | 2     | -/3 | 3     |
| <b>Elective Courses: (The student chooses 6 hours)</b> |              |   |       |     |       |
| Chm 413  | Chm 313      | Chemistry of Petroleum Additives                    | 2     | -/3 | 3     |
| Chm 415  | Chm 313      | Chemistry of Dyes and Textiles                      | 2     | -/3 | 3     |
| Chm 417  | Chm 314      | Advanced Polymer Chemistry                          | 2     | -/3 | 3     |
| Chm 437  | Chm 313      | Chemistry of Corrosion and Metal Protecting         | 2     | -/3 | 3     |
| <b>Total: 10 + 6 = 16 Hours</b>                        |              |   |       |     |       |

المستوى الرابع: الفصل الدراسي الثاني

| Level 4 / Semester 2                                   |              | Course Title                               | Hours |     |       |
|--|--------------|--|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 10 hours               | Lect. | T/P | Cred. |
| Chm 410  | Chm 316      | Chemotherapy and Heteroorganic Chemistry   | 2     | -/- | 2     |
| Chm 414  | Chm 316      | Technology of Industrial Detergents        | 2     | -/3 | 3     |
| Chm 424  | Chm 222      | Chemistry of Lanthanides and Actinides (2) | 2     | -/- | 2     |
| Chm 446  | Chm 222      | Materials Science (1)                      | 2     | -/3 | 3     |
| <b>Elective Courses: (The student chooses 4 hours)</b> |              |  |       |     |       |
| Chm 400  | Chm 222      | Nanochemistry and Applications             | 2     | -/- | 2     |
| Chm 416  | Chm 314      | Technology of Paints                       | 2     | -/- | 2     |
| Chm 434  | Chm 343      | Chemistry of Catalysis Technology          | 2     | -/- | 2     |
| <b>Research: 3 hours</b>                               |              |  |       |     |       |
| Chm 402  | -            | Research and Essay                         | 3     | -/- | 3     |
| <b>Total: 10 + 4 + 3 = 17 Hours</b>                    |              |  |       |     |       |

(١٠) برنامج الكيمياء والكيمياء الإشعاعية

أولاً: المقررات الإلزامية (٦٠ ساعة معتمدة)

| Code    | Prerequisite | Compulsory Courses                                  | Hours |     |       |
|---------|--------------|---|-------|-----|-------|
|         |              |   | Lect. | T/P | Cred. |
| Chm 211 | Chm 105      | Aliphatic Organic Chemistry                         | 2     | -/3 | 3     |
| Chm 212 | Chm 105      | Aromatic and Polynuclear Chemistry                  | 2     | -/- | 2     |
| Chm 213 | Chm 105      | Petroleum and Petrochemicals                        | 2     | -/- | 2     |
| Chm 222 | Chm 100      | Chemistry of Representative Elements                | 2     | -/3 | 3     |
| Chm 231 | Chm 105      | Chemical Thermodynamics                             | 2     | -/- | 2     |
| Chm 234 | Chm 105      | Photo and Kinetic Chemistry                         | 2     | -/٣ | ٣     |
| Chm 241 | Chm 100      | Analytical Chemistry (1)                            | 2     | -/3 | 3     |
| Chm 242 | Chm 241      | Chemistry of Water Treatment (1)                    | 2     | -/- | 2     |
| Chm 313 | Chm 212      | Reaction Mechanism and StereoChemistry              | 2     | -/3 | 3     |
| Chm 328 | Chm 222      | Transition Elements and Complexes                   | 2     | -/- | 2     |
| Chm 343 | Chm 241      | Analytical Chemistry (2)                            | 2     | -/3 | 3     |
| Chm 350 | Chm 222      | Radiation Protection                                | 2     | -/- | 2     |
| Chm 352 | Chm 222      | Nuclear Reactions                                   | 2     | -/- | 2     |
| Chm 353 | Chm 222      | Radioactivity and Properties of Nucleus             | 2     | -/- | 2     |
| Chm356  | Chm 222      | Nuclear Analysis Methods                            | 2     | -/- | 2     |
| Chm 357 | Chm 222      | Radioactive Decay                                   | 2     | -/- | 2     |
| Chm 372 | Chm 328      | Chemistry of Lanthanides and Actinides (1)          | 2     | -/- | 2     |
| Chm 439 | Chm 222      | Basis of Quantum and Statistical Dynamics Chemistry | 2     | -/- | 2     |
| Chm 451 | Chm 352      | Production of Radionuclides                         | 2     | -/- | 2     |
| Chm 452 | Chm 451      | High-Energy Particles                               | ٢     | -/- | ٢     |
| Chm 453 | Chm 352      | Radiation Technology                                | 2     | -/- | 2     |
| Chm 454 | Chm 451      | Radioisotope Separation                             | 2     | -/- | 2     |
| Chm 455 | Chm 352      | Nuclear Reactors                                    | 2     | -/- | 2     |
| Chm 456 | Chm 451      | RadioChemistry, Environment, and Applications       | 2     | -/- | 2     |
| Chm 457 | Chm 352      | Nuclear Fuel Cycle                                  | 2     | -/- | 2     |
| Chm ٤58 | Chm 451      | Treatment of Radioactive Wastes                     | 2     | -/- | 2     |
| Chm 474 | Chm 451      | Chemistry of Super Heavy Elements                   | 2     | -/- | 2     |

ثانياً: المقررات الاختيارية

يدرس الطالب ٢٨ ساعة معتمدة من المقررات الآتية:-

| Code    | Prerequisite | Elective Courses                            | Hours |     |       |
|---------|--------------|---|-------|-----|-------|
|         |              |   | Lect. | T/P | Cred. |
| Chm 216 | Chm 105      | Organic Environmental Green Chemistry (1)   | 2     | -/- | 2     |
| Chm 217 | Chm 105      | Industrial Chemistry and Economic Studies   | 2     | -/- | 2     |
| Chm 221 | Chm 100      | Industrial Inorganic Chemistry (1)          | 2     | -/- | 2     |
| Chm 233 | Chm 105      | Principle of Electrochemistry               | ٢     | -/- | ٢     |
| Chm 236 | Chm 105      | Thermodynamic of Solutions                  | ٢     | -/- | 2     |
| Chm 244 | Chm 241      | Environmental Analytical Chemistry (1)      | 2     | -/- | 2     |
| Chm 311 | Chm 211      | Chemistry of Pesticides and Toxins          | 2     | -/3 | 3     |
| Chm 329 | Chm 222      | Technetium Chemistry and Applications       | 2     | -/- | 2     |
| Chm 332 | Chm 222      | Surface Chemistry                           | 2     | -/- | 2     |
| Chm333  | Chm 222      | Chemistry of Molecular Spectroscopy         | 2     | -/- | 2     |
| Chm 337 | Chm 222      | Materials Science (2)                       | 2     | -/3 | 3     |
| Chm 342 | Chm 241      | Analytical Photochemistry                   | 2     | -/- | 2     |
| Chm 354 | Chm 353      | Radionuclide Standardization                | 2     | -/3 | 3     |
| Chm 362 | Chm 313      | Organic Spectroscopy (2)                    | 2     | -/3 | 3     |
| Chm 400 | Chm 222      | Nanochemistry and Applications              | 2     | -/- | 2     |
| Chm 418 | Chm 313      | Technology of Paints and Detergents         | 2     | -/- | 2     |
| Chm 427 | Chm 313      | Forensic Chemistry                          | 2     | -/3 | 3     |
| Chm 430 | Chm 232      | Electrochemistry (2)                        | 3     | -/- | 3     |
| Chm 434 | Chm 343      | Chemistry of Catalysis Technology           | 2     | -/- | 2     |
| Chm 437 | Chm 313      | Chemistry of Corrosion and Metal Protecting | ٢     | -/3 | 3     |

ثالثاً: مقررات الاختيار الحر

يدرس الطالب ٦ ساعات معتمدة من المقررات الآتية:-

| Code    | Prerequisite | Free Optional Courses                      | Hours |     |       |
|---------|--------------|--|-------|-----|-------|
|         |              |  | Lect. | T/P | Cred. |
| Mat 201 | -            | Ordinary Differential Equations (1)        | 1     | 2/- | 2     |
| Com 224 | -            | Operating Systems                          | 1     | 2/- | 2     |
| Geo 231 | -            | Crystallography and Optical Mineralogy (2) | 1     | -/3 | 2     |
| Phy 237 | -            | Physics of Metals                          | 2     | -/- | 2     |
| Phy 245 | -            | Introduction to Physical Optics            | 1     | -/3 | 2     |
| Phy 391 | -            | X-ray and Crystallography                  | 2     | -/- | 2     |

رابعاً: التدريب الميداني

| Code    | Prerequisite | Course Title               | Lect. | T/P | Cred. |
|---------|--------------|----------------------------|-------|-----|-------|
| Chm 302 | -            | Applied and Field Training | -     | -/- | 3     |

خامساً: مقرر البحث والمقال

| Code    | Prerequisite | Course Title       | Lect. | T/P | Cred. |
|---------|--------------|--------------------|-------|-----|-------|
| Chm 402 | -            | Research and Essay | 3     | -/- | 3     |

سادساً: توزيع مقررات برنامج الكيمياء والكيمياء الإشعاعية على المستويات الدراسية  
المستوى الثاني: الفصل الدراسي الأول

| Level 2 / Semester 1  |              | Course Title                               | Hours |     |       |
|---|--------------|--|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 10 hours               | Lect. | T/P | Cred. |
| Chm 211   | Chm 105      | Aliphatic Organic Chemistry                | 2     | -/3 | 3     |
| Chm 213   | Chm 105      | Petroleum and Petrochemicals               | 2     | -/- | 2     |
| Chm 231   | Chm 105      | Chemical Thermodynamics                    | 2     | -/- | 2     |
| Chm 241   | Chm 100      | Analytical Chemistry (1)                   | 2     | -/3 | 3     |
| <b>Elective Courses: (The student chooses 4 hours)</b>      |              |  |       |     |       |
| Chm 217   | Chm 105      | Industrial Chemistry and Economic Studies  | 2     | -/- | 2     |
| Chm 221   | Chm 100      | Industrial Inorganic Chemistry (1)         | 2     | -/- | 2     |
| Chm 233   | Chm 105      | Principle of Electrochemistry              | ٢     | -/- | ٢     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |  |       |     |       |
| Mat 201   | -            | Ordinary Differential Equations (1)        | 1     | 2/- | 2     |
| Geo 231   | -            | Crystallography and Optical Mineralogy (2) | 1     | -/3 | 2     |
| <b>Total: 10+4+2= 16 Hours</b>                              |              |  |       |     |       |

المستوى الثاني: الفصل الدراسي الثاني

| Level 2 / Semester 2  |              | Course Title                              | Hours |     |       |
|---|--------------|---|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 10 hours              | Lect. | T/P | Cred. |
| Chm 212   | Chm 105      | Aromatic and Polynuclear Chemistry        | 2     | -/- | 2     |
| Chm 222   | Chm 100      | Chemistry of Representative Elements      | 2     | -/3 | 3     |
| Chm 234   | Chm 105      | Photo and Kinetic Chemistry               | 2     | -/٣ | ٣     |
| Chm 242   | Chm 241      | Chemistry of Water Treatment (1)          | 2     | -/- | 2     |
| <b>Elective Courses: (The student chooses 4 hours)</b>      |              |   |       |     |       |
| Chm 216   | Chm 105      | Organic Environmental Green Chemistry (1) | 2     | -/- | 2     |
| Chm 236   | Chm 105      | Thermodynamic of Solutions                | ٢     | -/- | 2     |
| Chm 244   | Chm 241      | Environmental Analytical Chemistry (1)    | 2     | -/- | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |   |       |     |       |
| Com 224   | -            | Operating Systems                         | 1     | 2/- | 2     |
| Phy 245   | -            | Introduction to Physical Optics           | 1     | -/3 | 2     |
| <b>Total:10+4+2 = 16 Hours</b>                              |              |   |       |     |       |

المستوى الثالث: الفصل الدراسي الأول

| Level 3 / Semester 1  |              | Course Title                            | Hours |     |       |
|---|--------------|---|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 10 hours            | Lect. | T/P | Cred. |
| Chm 313   | Chm 212      | Reaction Mechanism and StereoChemistry  | 2     | -/3 | 3     |
| Chm 343   | Chm 241      | Analytical Chemistry (2)                | 2     | -/3 | 3     |
| Chm 353   | Chm 222      | Radioactivity and Properties of Nucleus | 2     | -/- | 2     |
| Chm 357   | Chm 222      | Radioactive Decay                       | 2     | -/- | 2     |
| <b>Elective Courses: (The student chooses 5 hours)</b>      |              |   |       |     |       |
| Chm 311   | Chm 211      | Chemistry of Pesticides and Toxins      | 2     | -/3 | 3     |
| Chm 329   | Chm 222      | Technetium Chemistry and Applications   | 2     | -/- | 2     |
| Chm 333   | Chm 222      | Chemistry of Molecular Spectroscopy     | 2     | -/- | 2     |
| Chm 337   | Chm 222      | Materials Science (2)                   | 2     | -/3 | 3     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |   |       |     |       |
| Phy 237   | -            | Physics of Metals                       | 2     | -/- | 2     |
| Phy 391   | -            | X-ray and Crystallography               | 2     | -/- | 2     |
| <b>Total: 10+5+2 = 17 Hours</b>                             |              |   |       |     |       |

المستوى الثالث: الفصل الدراسي الثاني

| Level 3 / Semester 2                                   |              | Course Title                               | Hours |     |       |
|--|--------------|--|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 10 hours               | Lect. | T/P | Cred. |
| Chm 328  | Chm 222      | Transition Elements and Complexes          | 2     | -/- | 2     |
| Chm 350  | Chm 222      | Radiation Protection                       | 2     | -/- | 2     |
| Chm 352  | Chm 222      | Nuclear Reactions                          | 2     | -/- | 2     |
| Chm 356  | Chm 222      | Nuclear Analysis Methods                   | 2     | -/- | 2     |
| Chm 372  | Chm 328      | Chemistry of Lanthanides and Actinides (1) | 2     | -/- | 2     |
| <b>Elective Courses: (The student chooses 5 hours)</b> |              |  |       |     |       |
| Chm 332  | Chm 222      | Surface Chemistry                          | 2     | -/- | 2     |
| Chm 342  | Chm 241      | Analytical Photochemistry                  | 2     | -/- | 2     |
| Chm 354  | Chm 353      | Radionuclide Standardization               | 2     | -/3 | 3     |
| Chm 362  | Chm 313      | Organic Spectroscopy (2)                   | 2     | -/3 | 3     |
| <b>Training: 3 hours</b>                               |              |  |       |     |       |
| Chm 302  | -            | Applied and Field Training                 | -     | -/- | 3     |
| <b>Total: 10+5+3 = 18 Hours</b>                        |              |  |       |     |       |

المستوى الرابع: الفصل الدراسي الأول

| Level 4 / Semester 1                                   |              | Course Title  | Hours |     |       |
|--|--------------|---|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 10 hours                        | Lect. | T/P | Cred. |
| Chm 439  | Chm 222      | Basis of Quantum and Statistical Dynamics Chemistry | 2     | -/- | 2     |
| Chm 451  | Chm 352      | Production of Radionuclides                         | 2     | -/- | 2     |
| Chm 453  | Chm 352      | Radiation Technology                                | 2     | -/- | 2     |
| Chm 455  | Chm 352      | Nuclear Reactors                                    | 2     | -/- | 2     |
| Chm 457  | Chm 352      | Nuclear Fuel Cycle                                  | 2     | -/- | 2     |
| <b>Elective Courses: (The student chooses 6 hours)</b> |              |   |       |     |       |
| Chm 427  | Chm 313      | Forensic Chemistry                                  | 2     | -/3 | 3     |
| Chm 430  | Chm 232      | Electrochemistry (2)                                | 3     | -/- | 3     |
| Chm 437  | Chm 313      | Chemistry of Corrosion and Metal Protecting         | ٢     | -/3 | 3     |
| <b>Total: 10+6= 16 Hours</b>                           |              |   |       |     |       |

المستوى الرابع: الفصل الدراسي الثاني

| Level 4 / Semester 2                                   |              | Course Title                                  | Hours |     |       |
|--|--------------|---|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 10 hours                  | Lect. | T/P | Cred. |
| Chm 452  | Chm 451      | High-Energy Particles                         | ٢     | -/- | ٢     |
| Chm 454  | Chm 451      | Radioisotope Separation                       | 2     | -/- | 2     |
| Chm 456  | Chm 451      | RadioChemistry, Environment, and Applications | 2     | -/- | 2     |
| Chm ٤58  | Chm 451      | Treatment of Radioactive Wastes               | 2     | -/- | 2     |
| Chm 474  | Chm 451      | Chemistry of Super Heavy Elements             | 2     | -/- | 2     |
| <b>Elective Courses: (The student chooses ٤ hours)</b> |              |   |       |     |       |
| Chm 400  | Chm 222      | Nanochemistry and Applications                | 2     | -/- | 2     |
| Chm 418  | Chm 313      | Technology of Paints and Detergents           | 2     | -/- | 2     |
| Chm 434  | Chm 343      | Chemistry of Catalysis Technology             | 2     | -/- | 2     |
| <b>Research: 3 hours</b>                               |              |   |       |     |       |
| Chm 402  | -            | Research and Essay                            | 3     | -/- | 3     |
| <b>Total:10+4+3 = 17 Hours</b>                         |              |   |       |     |       |

(١١) برنامج علم النبات والكيمياء

أولاً: المقررات الإلزامية (٦٠ ساعة معتمدة)

| The student studies 30 compulsory hours of Botany courses    |              |   |       |     |       |
|--|--------------|---|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses                        | Hours |     |       |
|  |              |   | Lect. | T/P | Cred. |
| Bot 221  | Bot 105      | Plant Morphology and Anatomy              | 2     | -/3 | 3     |
| Bot 232  | Bot 105      | Taxonomy of Flowering Plants              | 1     | -/3 | 2     |
| Bot 242  | Bot 105      | Plant Ecology and Its Applications        | 2     | -/3 | 3     |
| Bot 251  | Bot 105      | Plant Physiology (1)                      | 2     | -/3 | 3     |
| Bot 302  | Bot 242      | Flora and Phytosociology and Field Trip   | 2     | -/3 | 3     |
| Bot 313  | Bot 105      | Fundamentals of Cytology and Genetics     | 1     | -/3 | 2     |
| Bot 351  | Bot 251      | Plant Hormones and Tissue Culture         | 2     | -/3 | 3     |
| Bot 354  | Bot 251      | Plant Metabolism and Enzymes              | 2     | -/3 | 3     |
| Bot 432  | Bot 221      | Archegoniate                              | 1     | -/3 | 2     |
| Bot 441  | Bot 242      | Phytogeography                            | 2     | -/- | 2     |
| Bot 442  | Bot 251      | Medicinal Plants and PhytoChemistry       | 1     | -/3 | 2     |
| Mic 485  | Bot251       | Principles of Plant pathology             | 1     | -/2 | 2     |
| The student studies 30 compulsory hours of Chemistry courses |              |   |       |     |       |
| Chm 211  | Chm 105      | Aliphatic Organic Chemistry               | 2     | -/3 | 3     |
| Chm 212  | Chm 105      | Aromatic and Polynuclear Chemistry        | 2     | -/- | 2     |
| Chm 222  | Chm 100      | Chemistry of Representative Elements      | 2     | -/3 | 3     |
| Chm 232  | Chm 105      | Electrochemistry (1)                      | 2     | -/- | 2     |
| Chm 241  | Chm 100      | Analytical Chemistry (1)                  | 2     | -/3 | 3     |
| Chm 268  | Chm 105      | Organic Environmental Green Chemistry (2) | 2     | -/3 | 3     |
| Chm 316  | Chm 212      | Organic Spectroscopy (1)                  | 2     | -/3 | 3     |
| Chm 323  | Chm 222      | Chemistry of Transition metals            | 2     | -/- | 2     |
| Chm 343  | Chm 241      | Analytical Chemistry (2)                  | 2     | -/3 | 3     |
| Chm 4٠6  | Chm 222      | Nanochemistry and Biological Applications | 2     | -/3 | 3     |
| Chm 4٨6  | Chm 222      | Materials Science (١)                     | 2     | -/3 | 3     |



ثانياً: المقررات الاختيارية

(\*) يدرس الطالب ١٤ ساعة معتمدة من مقررات علم النبات و ١٤ ساعة معتمدة من مقررات الكيمياء كالآتي:

| The student chooses 14 elective hours of Botany courses    |              |   |       |     |       |
|--|--------------|---|-------|-----|-------|
| Code   | Prerequisite | Elective Courses                                    | Hours |     |       |
|  |              |   | Lect. | T/P | Cred. |
| Bot 255  | Bot 105      | Biofertilizer and Its Application                   | 2     | -/- | 2     |
| Bot 321  | Bot 221      | Advanced Plant Anatomy                              | 1     | -/2 | 2     |
| Bot 342  | Bot 105      | Plant Natural Essential Oils                        | 2     | -/- | 2     |
| Bot 411  | Bot100       | Principles of Molecular Biology                     | 2     | -/- | 2     |
| Bot 412  | Bot 105      | Genetic Engineering                                 | 2     | -/- | 2     |
| Bot 421  | Bot 232      | Plant Fossils                                       | 1     | -/2 | 2     |
| Bot 431  | Bot 232      | Advanced Taxonomy of Flowering Plants               | 1     | -/2 | 2     |
| Bot 444  | Bot 242      | Economic Botany                                     | 1     | -/3 | 2     |
| Bot 451  | Bot 354      | Secondary Plant Metabolism                          | 2     | -/- | 2     |
| Mic 265  | Bot 100      | Introduction to Mycology                            | 1     | -/2 | 2     |
| Mic 375  | Bot 100      | Introduction to Bacteriology                        | 1     | -/2 | 2     |
| Mic 386  | Bot 100      | Introduction to Virology                            | 1     | -/2 | 2     |
| Mic 471  | Bot 100      | Introduction to Phycology                           | 1     | -/2 | 2     |
| Mic 476  | Bot 105      | Biotechnology of Algae                              | 1     | -/2 | 2     |
| Mic 482  | Bot 105      | Molecular Plant-microbe Interaction                 | 2     | -/- | 2     |
| Mic 499  | Mic 375      | Principles of Medical Microbiology                  | 1     | -/2 | 2     |
| The student chooses 14 elective hours of Chemistry courses |              |   |       |     |       |
| Chm 213  | Chm 105      | Petroleum and Petrochemicals                        | 2     | -/- | 2     |
| Chm 217  | Chm 105      | Industrial Chemistry and Economic Studies           | 2     | -/- | 2     |
| Chm ٢٤٢  | Chm 241      | Chemistry of Water Treatment (١)                    | 2     | -/- | ٢     |
| Chm 24٤  | Chm 241      | Environmental Analytical Chemistry (١)              | 2     | -/- | ٢     |
| Chm 311  | Chm 211      | Chemistry of Pesticides and Toxins                  | 2     | -/3 | 3     |
| Chm 3٢٤  | Chm 323      | Coordination Chemistry                              | 2     | -/- | ٢     |
| Chm 331  | Chm 105      | Applied Electrochemistry                            | 2     | -/3 | 3     |
| Chm 332  | Chm 222      | Surface Chemistry                                   | 2     | -/- | ٢     |
| Chm 400  | Chm 222      | Nano- Chemistry and Applications                    | 2     | -/- | ٢     |
| Chm 425  | Chm 324      | Metallurgy and Ores                                 | 2     | -/3 | 3     |
| Chm 435  | Chm 332      | Laser Chemistry (1)                                 | 3     | -/- | 3     |
| Chm 439  | Chm 222      | Basis of Quantum and Statistical Dynamics Chemistry | 2     | -/- | ٢     |

ثالثاً: مقررات الاختيار الحر

يدرس الطالب ٦ ساعات معتمدة من المقررات الآتية:-

| Code    | Prerequisite | Free Optional Courses          | Hours |     |       |
|---------|--------------|--------------------------------|-------|-----|-------|
|         |              |                                | Lect. | T/P | Cred. |
| Com 427 | Com 222      | Introduction to Bioinformatics | 1     | 2/- | 2     |
| Bph 240 | -            | Fundamental of Biophysics      | 1     | -/2 | 2     |
| Geo ٣٣٩ | -            | Minerals and Rocks             | 1     | -/2 | 2     |
| Ent 411 | -            | Insect Pest Resistance         | 1     | -/2 | 2     |
| Phy 431 | -            | Radiological Physics           | 1     | -/2 | 2     |
| Zoo 499 | -            | Genomics and Biosafety         | 1     | -/2 | 2     |

رابعاً: التدريب الميداني (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title               | Lect. | T/P | Cred. |
|---------|--------------|----------------------------|-------|-----|-------|
| Bot 350 | -            | Applied and Field Training | -     | -/6 | 3     |

خامساً: مقرر البحث والمقال (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title       | Lect. | T/P | Cred. |
|---------|--------------|--------------------|-------|-----|-------|
| Bot 402 | -            | Research and Essay | 3     | -/- | 3     |

سادساً: توزيع مقررات برنامج علم النبات والكيمياء على المستويات الدراسية  
المستوى الثاني: الفصل الدراسي الأول

| Level 2 / Semester 1   |              | Course Title                              | Hours |     |       |
|--|--------------|---|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 12 hours              | Lect. | T/P | Cred. |
| Chm 211  | Chm 105      | Aliphatic Organic Chemistry               | 2     | -/3 | 3     |
| Bot 221  | Bot 105      | Plant morphology and Anatomy              | 2     | -/3 | 3     |
| Chm 241  | Chm 100      | Analytical Chemistry (1)                  | 2     | -/3 | 3     |
| Bot 251  | Bot 105      | Plant Physiology (1)                      | 2     | -/3 | 3     |
| <b>Elective Courses (The student chooses 2 hours of Botany courses)</b>      |              |   |       |     |       |
| Bot 255  | Bot 105      | Biofertilizer and Its Application         | 2     | -/- | 2     |
| Mic 265  | Bot 100      | Introduction to Mycology                  | 1     | -/2 | 2     |
| <b>Elective Courses : (The student chooses 2 hours of Chemistry courses)</b> |              |   |       |     |       |
| Chm 213  | Chm 105      | Petroleum and Petrochemicals              | 2     | -/- | 2     |
| Chm 217  | Chm 105      | Industrial Chemistry and Economic Studies | 2     | -/- | 2     |
| <b>Total: 12 + 2 + 2 = 16 Hours</b>  |              |   |       |     |       |

المستوى الثاني: الفصل الدراسي الثاني

| Level 2 / Semester 2  |              | Course Title                              | Hours |     |       |
|---|--------------|---|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 16 hours              | Lect. | T/P | Cred. |
| Chm 212   | Chm 105      | Aromatic and Polynuclear Chemistry        | 2     | -/- | 2     |
| Chm 222   | Chm 100      | Chemistry of Representative Elements      | 2     | -/3 | 3     |
| Bot 232   | Bot 105      | Taxonomy of Flowering Plants              | 2     | -/3 | 3     |
| Chm 232   | Chm 105      | Electrochemistry (1)                      | 2     | -/- | 2     |
| Bot 242   | Bot 105      | Plant Ecology and Its Applications        | 2     | -/3 | 3     |
| Chm 268   | Chm 105      | Organic Environmental Green Chemistry (2) | 2     | -/3 | 3     |
| <b>Elective Courses: (The student chooses 2 hours of Chemistry courses)</b> |              |   |       |     |       |
| Chm ٢٤٢   | Chm 241      | Chemistry of Water Treatment (١)          | 2     | -/- | ٢     |
| Chm 24٤   | Chm 241      | Environmental Analytical Chemistry (١)    | 2     | -/- | ٢     |
| <b>Total: 16 + 2 = 18 Hours</b>   |              |   |       |     |       |

المستوى الثالث: الفصل الدراسي الأول

| Level 3 / Semester 1  |              | Course Title                          | Hours |     |       |
|---|--------------|---------------------------------------|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 9 hours           | Lect. | T/P | Cred. |
| Bot 313   | Bot 105      | Fundamentals of Cytology and Genetics | 1     | -/3 | 2     |
| Chm 323   | Chm 222      | Chemistry of Transition Metals        | 2     | -/- | 2     |
| Chm 343   | Chm 241      | Analytical Chemistry (2)              | 2     | -/3 | 3     |
| Bot 351   | Bot 251      | Plant Hormones and Tissue Culture     | 2     | -/- | 2     |
| <b>Elective Courses: (The student chooses 2 hours of Botany courses)</b>    |              |                                       |       |     |       |
| Bot 321   | Bot 221      | Advanced Plant Anatomy                | 1     | -/2 | 2     |
| Mic 375   | Bot100       | Introduction to Bacteriology          | 1     | -/2 | 2     |
| <b>Elective Courses: (The student chooses 3 hours of Chemistry courses)</b> |              |                                       |       |     |       |
| Chm 311   | Chm 211      | Chemistry of Pesticides and Toxins    | 2     | -/3 | 3     |
| Chm 331   | Chm 105      | Applied Electrochemistry              | 2     | -/3 | 3     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b>                 |              |                                       |       |     |       |
| Bph 240   | -            | Fundamental of Biophysics             | 1     | -/2 | 2     |
| Geo 3 <sup>٣٩</sup>   | -            | Minerals and Rocks                    | 1     | -/3 | 2     |
| <b>Total: 9 + 2+٣ + 2 = 16 Hours</b>  |              |                                       |       |     |       |

المستوى الثالث: الفصل الدراسي الثاني

| Level 3 / Semester 2   |              | Course Title                            | Hours |     |       |
|--|--------------|---|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 9 hours             | Lect. | T/P | Cred. |
| Bot 302  | Bot 242      | Flora and Phytosociology and Field Trip | 2     | -/3 | 3     |
| Chm 316  | Chm 212      | Organic Spectroscopy (1)                | 2     | -/3 | 3     |
| Bot 354  | Bot 251      | Plant Metabolism and Enzymes            | 2     | -/3 | 3     |
| <b>Elective Courses: (The student chooses 2 hours of Botany courses)</b>     |              |   |       |     |       |
| Bot 342  | Bot 105      | Plant Natural Essential Oils            | 2     | -/- | 2     |
| Mic 386  | Bot 100      | Introduction to Virology                | 1     | -/2 | 2     |
| <b>Elective Courses : (The student chooses 2 hours of Chemistry courses)</b> |              |   |       |     |       |
| Chm 3٢٤  | Chm 323      | Co-ordination Chemistry                 | 2     | -/- | ٢     |
| Chm 332  | Chm 222      | Surface Chemistry                       | 2     | -/- | ٢     |
| <b>Training: 3 hours</b>   |              |   |       |     |       |
| Bot 350  | -            | Applied and Field Training              | -     | -/6 | 3     |
| <b>Total: 9+ 2+2 + 3 = 16 Hours</b>  |              |   |       |     |       |

المستوى الرابع: الفصل الدراسي الأول

| Level 4 / Semester 1   |              | Course Title                                       | Hours |     |       |
|--|--------------|--|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 4 hours                        | Lect. | T/P | Cred. |
| Bot 441  | Bot 242      | Phytogeography                                     | 2     | -/- | 2     |
| Mic 485  | Mic 375      | Principles of Plant Pathology                      | 1     | -/2 | 2     |
| <b>Elective Courses: (The student chooses 6 hours of Botany courses)</b>     |              |  |       |     |       |
| Bot 411  | Bot100       | Principles of Molecular Biology                    | 2     | -/- | 2     |
| Bot 421  | Bot 232      | Plant Fossils                                      | 1     | -/2 | 2     |
| Bot 431  | Bot 232      | Advanced Taxonomy of Flowering Plants              | 1     | -/2 | 2     |
| Bot 451  | Bot 354      | Secondary Plant Metabolism                         | 2     | -/- | 2     |
| Mic 471  | Bot 100      | Introduction to Phycology                          | 1     | -/2 | 2     |
| Mic 499  | Mic 375      | Principles of Medical Microbiology                 | 1     | -/2 | 2     |
| <b>Elective Courses : (The student chooses 2 hours of Chemistry courses)</b> |              |  |       |     |       |
| Chm 400  | Chm 222      | Nano-Chemistry and Applications                    | 2     | -/- | ٢     |
| Chm 439  | Chm 222      | Basis of Quantum and Statistical Dynamic Chemistry | 2     | -/- | ٢     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b>                  |              |  |       |     |       |
| Ent 411  | -            | Insect Pest Resistance                             | 1     | -/2 | 2     |
| Phy 431  | -            | Radiological Physics                               | 1     | -/2 | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b>                  |              |  |       |     |       |
| Com 427  | Com 222      | Introduction to Bioinformatics                     | 1     | 2/- | 2     |
| Zoo 499  | -            | Genomics and Biosafety                             | 1     | -/2 | 2     |
| <b>Total: 4 + 6+2 + 4 = 16 Hours</b>   |              |  |       |     |       |

المستوى الرابع: الفصل الدراسي الثاني

| Level 4 / Semester 2   |              | Course Title                              | Hours |     |       |
|--|--------------|---|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 10 hours              | Lect. | T/P | Cred. |
| Chm 4٠6  | Chm 222      | Nanochemistry and Biological Applications | 2     | -/3 | 3     |
| Bot 432  | Bot 221      | Archegoniate                              | 1     | -/3 | 2     |
| Bot 442  | Bot 251      | Medicinal Plants and PhytoChemistry       | 1     | -/3 | 2     |
| Chm 4٨6  | Chm 222      | Materials Science (١)                     | 2     | -/3 | 3     |
| <b>Elective Courses: (The student chooses 2 hours of Botany courses)</b>     |              |   |       |     |       |
| Bot 412  | Bot 105      | Genetic Engineering                       | 2     | -/- | 2     |
| Bot 444  | Bot 242      | Economic Botany                           | 1     | -/3 | 2     |
| Mic 476  | Bot105       | Biotechnology of Algae                    | 1     | -/2 | 2     |
| Mic 482  | Bot 105      | Molecular Plant-microbe Interaction       | 2     | -/- | 2     |
| <b>Elective Courses : (The student chooses 3 hours of Chemistry courses)</b> |              |   |       |     |       |
| Chm 425  | Chm 324      | Metallurgy and Ores                       | 2     | -/3 | 3     |
| Chm 435  | Chm 332      | Laser Chemistry (1)                       | 3     | -/- | 3     |
| <b>Research: 3 hours</b>   |              |   |       |     |       |
| Bot 402  | -            | Research and Essay in Botany              | 3     | -/- | 3     |
| <b>Total: 10 + 2 + 3+3 = 18 Hours</b>  |              |   |       |     |       |

**(١٢) برنامج الميكروبيولوجي والكيمياء**

أولاً: المقررات الإجبارية (٦٠ ساعة معتمدة)

(\*) يدرس الطالب ٣٠ ساعة معتمدة من مقررات الميكروبيولوجي و ٣٠ ساعة معتمدة من مقررات الكيمياء كالآتي:

| <b>The student studies 30 compulsory hours of microbiology courses</b> |              |  |       |     |       |
|--|--------------|--|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses   | Hours |     |       |
|  |              |  | Lect. | T/P | Cred. |
| Bot 253  | Bot 105      | Plant Physiology (2)   | 2     | -/- | 2     |
| Mic 262  | Bot 100      | Mycology   | 2     | -/3 | 3     |
| Mic 271  | Bot 100      | Bacteriology   | 2     | -/3 | 3     |
| Mic 275  | Bot 100      | Phycology  | 2     | -/3 | 3     |
| Mic 282  | Bot 100      | Molecular Biology  | 1     | -/3 | 2     |
| Mic 381  | Mic 271      | Virology   | 2     | -/3 | 3     |
| Mic 382  | Mic 271      | Microbial Immunology   | 2     | -/3 | 3     |
| Mic 391  | Mic271       | Physiology of Microorganisms   | 2     | -/3 | 3     |
| Mic 481  | Mic 271      | Plant Pathology  | 1     | -/3 | 2     |
| Mic 491  | Mic 391      | Industrial Microbiology  | 2     | -/3 | 3     |
| Mic 492  | Mic 271      | Medical Microbiology   | 2     | -/3 | 3     |
| <b>The student studies 30 compulsory hours of Chemistry courses</b>    |              |  |       |     |       |
| Chm 212  | Chm 105      | Aromatic and Polynuclear Chemistry                                       | 2     | -/- | 2     |
| Chm 213  | Chm 105      | Petroleum and Petrochemicals   | 2     | -/- | 2     |
| Chm 222  | Chm 100      | Chemistry of Representative Elements                                     | 2     | -/3 | 3     |
| Chm 241  | Chm 100      | Analytical Chemistry (1)   | 2     | -/3 | 3     |
| Chm 314  | Chm 211      | Chemistry of Carbohydrates, Lipids, Amino Acids and Natural Products (1) | 2     | -/3 | 3     |
| Chm 328  | Chm 222      | Transition Elements and Complexes  | 2     | -/3 | 3     |
| Chm 343  | Chm 241      | Analytical Chemistry (2)   | 2     | -/3 | 3     |
| Chm 40٦  | Chm 222      | Nanochemistry and Biological Applications                                | 2     | -/3 | 3     |
| Chm 431  | Chm 328      | Principle of Surface Chemistry   | 2     | -/- | 2     |
| Chm 46٥  | Chm 212      | Principles of Heterocyclic Chemistry and Applications                    | 2     | -/3 | 3     |
| Chm 486  | Chm 222      | Material Science (1)   | 2     | -/3 | 3     |

ثانياً: المقررات الاختيارية

(\*) يدرس الطالب ١٤ ساعة معتمدة من مقررات الميكروبيولوجى و ١٤ ساعة معتمدة من مقررات الكيمياء كالاتى:

| The student chooses 14 elective hours of microbiology courses |              |   |       |     |       |
|---|--------------|---|-------|-----|-------|
| Code  | Prerequisite | Elective Courses                                    | Hours |     |       |
|   |              |   | Lect. | T/P | Cred. |
| Bot 213   | Bot 105      | Principles of Cytology and Genetics                 | 1     | -/3 | 2     |
| Mic 272   | Bot 100      | Actinomycetes                                       | 1     | -/3 | 2     |
| Mic 291   | Bot 100      | Microbiological Laboratory Techniques               | 1     | -/3 | 2     |
| Mic 292   | Bot 100      | Yeasts  | 1     | -/3 | 2     |
| Mic 392   | Bot 100      | Microbial Toxins                                    | 1     | -/3 | 2     |
| Mic 394   | Bot 100      | Microbial Enzymes                                   | 1     | -/3 | 2     |
| Mic 395   | Bot 100      | Soil Microbiology                                   | 1     | -/3 | 2     |
| Mic 397   | Mic 282      | Microbial Genetics                                  | 2     | -/- | 2     |
| Mic 482   | Bot 105      | Molecular Plant-microbe Interaction                 | 2     | -/- | 2     |
| Mic 484   | Mic 382      | Genetic Engineering                                 | 2     | -/- | 2     |
| Mic 495   | Bot 100      | Antibiotics   | 1     | -/3 | 2     |
| Mic 496   | Bot 100      | Water and Food Microbiology                         | 1     | -/3 | 2     |
| Mic 497   | Mic 271      | Bio-fertilizers                                     | 1     | -/3 | 2     |
| Mic 498   | Bot 100      | Microbial Biotechnology                             | 1     | -/3 | 2     |
| The student chooses 14 elective hours of Chemistry courses    |              |   |       |     |       |
| Chm 213   | Chm 105      | Petroleum and Petrochemicals                        | 2     | -/- | 2     |
| Chm 221   | Chm 100      | Industrial Inorganic Chemistry (1)                  | 2     | -/- | 2     |
| Chm 234   | Chm 105      | Photo and Keinetic Chemistry                        | 2     | -/3 | 3     |
| Chm 246   | Chm 100      | Chemistry of Water Treatment (2)                    | 2     | -/3 | 3     |
| Chm 310   | Chm 212      | Advanced Organic Chemistry                          | 2     | -/- | 2     |
| Chm 311   | Chm 211      | Chemistry of Pesticides and Toxins                  | 2     | -/3 | 3     |
| Chm 331   | Chm 105      | Applied Electrochemistry                            | 2     | -/3 | 3     |
| Chm 332   | Chm 222      | Surface Chemistry                                   | 2     | -/- | 2     |
| Chm 400   | Chm 222      | Nano-Chemistry and Applications                     | 2     | -/- | 2     |
| Chm 424   | Chm 222      | Chemistry of Lanthanides and Actinides (2)          | 2     | -/- | 2     |
| Chm 439   | Chm 222      | Basis of Quantum and Statistical Dynamics Chemistry | 2     | -/- | 2     |
| Chm 466   | Chm 465      | Principles of Organic Spectroscopy                  | 2     | -/- | 2     |

ثالثاً: مقررات الاختيار الحر

يدرس الطالب ٦ ساعات معتمدة من المقررات الآتية:-

| Code    | Prerequisite | Free Optional Courses          | Hours |     |       |
|---------|--------------|--------------------------------|-------|-----|-------|
|         |              |                                | Lect. | T/P | Cred. |
| Bph 240 | -            | Fundamental of Biophysics      | 1     | -/2 | 2     |
| Zoo ٢97 | -            | Principles of Parasitology     | 1     | -/3 | 2     |
| Geo 361 | -            | Water Geochemistry             | ١     | -/٣ | 2     |
| Geo ٣٦٣ | -            | Hydrology                      | 1     | -/3 | 2     |
| Ent 412 | -            | Insect Borne Disease           | 1     | -/3 | 2     |
| Com 427 | Com 222      | Introduction to Bioinformatics | 1     | 2/- | 2     |

رابعاً: التدريب الميداني (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title               | Lect. | T/P | Cred. |
|---------|--------------|----------------------------|-------|-----|-------|
| Mic 302 | -            | Applied and Field Training | -     | -/- | 3     |

خامساً: مقرر البحث والمقال (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title       | Lect. | T/P | Cred. |
|---------|--------------|--------------------|-------|-----|-------|
| Mic 402 | -            | Research and Essay | 3     | -/- | 3     |



سادساً: توزيع مقررات برنامج الميكروبيولوجي والكيمياء على المستويات الدراسية  
المستوى الثاني: الفصل الدراسي الأول

| Level 2 / Semester 1  |              | Course Title                          | Hours |     |       |
|---|--------------|---------------------------------------|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 13 hours          | Lect. | T/P | Cred. |
| Chm 213   | Chm 105      | Petroleum and Petrochemicals          | 2     | -/- | 2     |
| Chm 241   | Chm 100      | Analytical Chemistry (1)              | 2     | -/3 | 3     |
| Bot 253   | Bot 105      | Plant Physiology (2)                  | 2     | -/- | 2     |
| Mic 271   | Bot 100      | Bacteriology                          | 2     | -/3 | 3     |
| Mic 275   | Bot 100      | Phycology                             | 2     | -/3 | 3     |
| <b>Elective Courses: (The student chooses 2 hours of Botany and Microbiology courses)</b> |              |                                       |       |     |       |
| Bot 213   | Bot 105      | Principles of Cytology and Genetics   | 1     | -/3 | 2     |
| Mic 291   | Bot 100      | Microbiological Laboratory Techniques | 1     | -/3 | 2     |
| <b>Elective Courses: (The student chooses 2 hours of Chemistry courses)</b>               |              |                                       |       |     |       |
| Chm 213   | Chm 105      | Petroleum and Petrochemicals          | 2     | -/- | 2     |
| Chm 221   | Chm 100      | Industrial Inorganic Chemistry (1)    | 2     | -/- | 2     |
| <b>Total: 13 + 2+2 = 17 Hours</b>   |              |                                       |       |     |       |

المستوى الثاني: الفصل الدراسي الثاني

| Level 2 / Semester 2   |              | Course Title                         | Hours |     |       |
|--|--------------|--------------------------------------|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 10 hours         | Lect. | T/P | Cred. |
| Chm 212  | Chm 105      | Aromatic and Polynuclear Chemistry   | 2     | -/- | 2     |
| Chm 222  | Chm 100      | Chemistry of Representative Elements | 2     | -/- | 3     |
| Mic 262  | Bot 100      | Mycology                             | 2     | -/3 | 3     |
| Mic 282  | Bot 100      | Molecular Biology                    | 1     | -/3 | 2     |
| <b>Elective Courses: (The student chooses 2 hours of Microbiology courses)</b> |              |                                      |       |     |       |
| Mic 272  | Bot 100      | Actinomycetes                        | 1     | -/3 | 2     |
| Mic 292  | Bot 100      | Yeasts                               | 1     | -/3 | 2     |
| <b>Elective Courses: (The student chooses 3 hours of Chemistry courses)</b>    |              |                                      |       |     |       |
| Chm 234  | Chm 105      | Photo and Kinetic Chemistry          | 2     | -/3 | 3     |
| Chm 246  | Chm 100      | Chemistry of Water Treatment (2)     | 2     | -/3 | 3     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b>                    |              |                                      |       |     |       |
| Bph 240  | -            | Fundamental of Biophysics            | 1     | -/2 | 2     |
| Zoo 297  | -            | Parasitology                         | 1     | -/3 | 2     |
| <b>Total: 10+2+3+2 = 17 Hours</b>  |              |                                      |       |     |       |

المستوى الثالث: الفصل الدراسي الأول

| Level 3 / Semester 1   |              | Course Title                       | Hours |     |       |
|--|--------------|------------------------------------|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 9 hours        | Lect. | T/P | Cred. |
| Chm 343  | Chm 241      | Analytical Chemistry (2)           | 2     | -/3 | 3     |
| Mic 381  | Mic 271      | Virology                           | 2     | -/3 | 3     |
| Mic 391  | Mic 271      | Physiology of Microorganisms       | 2     | -/3 | 3     |
| <b>Elective Courses: (The student chooses 2 hours of Microbiology courses)</b> |              |                                    |       |     |       |
| Mic 395  | Bot 100      | Soil Microbiology                  | 1     | -/3 | 2     |
| Mic 397  | Mic 282      | Microbial Genetics                 | 2     | -/- | 2     |
| <b>Elective Courses: (The student chooses 3 hours of Chemistry courses)</b>    |              |                                    |       |     |       |
| Chm 311  | Chm 211      | Chemistry of Pesticides and Toxins | 2     | -/3 | 3     |
| Chm 331  | Chm 105      | Applied Electrochemistry           | 2     | -/3 | 3     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b>                    |              |                                    |       |     |       |
| Geo 361  | -            | Water Geochemistry                 | 1     | -/3 | 2     |
| Geo 363  | -            | Hydrology                          | 1     | -/3 | 2     |
| <b>Total: 9 + 2+3 + 2 = 16 Hours</b>   |              |                                    |       |     |       |

المستوى الثالث: الفصل الدراسي الثاني

| Level 3 / Semester 2   |              | Course Title   | Hours |     |       |
|--|--------------|--|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 9 hours  | Lect. | T/P | Cred. |
| Chm 314  | Chm 211      | Chemistry of Carbohydrates, Lipids, Amino Acids and Natural Products (1) | 2     | -/3 | 3     |
| Chm 328  | Chm 222      | Transition Elements and Complexes  | 2     | -/3 | 3     |
| Mic 382  | Mic 271      | Microbial Immunology   | 2     | -/3 | 3     |
| <b>Elective Courses: (The student chooses 2 hours of Microbiology courses)</b> |              |  |       |     |       |
| Mic 392  | Bot100       | Microbial Toxins   | 1     | -/3 | 2     |
| Mic 394  | Bot100       | Microbial Enzymes  | 1     | -/3 | 2     |
| <b>Elective Courses: (The student chooses 2 hours of Chemistry courses)</b>    |              |  |       |     |       |
| Chm 310  | Chm 212      | Advanced Organic Chemistry   | 2     | -/- | 2     |
| Chm 332  | Chm 222      | Surface Chemistry  | 2     | -/- | 2     |
| <b>Training: 3 hours</b>   |              |  |       |     |       |
| Mic 302  | -            | Applied and Field Training   | -     | -/- | 3     |
| <b>Total: 9 + 2+2 + 3 = 16 Hours</b>   |              |  |       |     |       |

المستوى الرابع: الفصل الدراسي الأول

| Level 4 / Semester 1   |              | Course Title  | Hours |     |       |
|--|--------------|---|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 10 hours                          | Lect. | T/P | Cred. |
| Chm 431  | Chm 328      | Principle of Surface Chemistry                        | 2     | -/- | 2     |
| Chm 46 <sup>o</sup>  | Chm 212      | Principles of Heterocyclic Chemistry and Applications | 2     | -/3 | 3     |
| Mic 481  | Mic 271      | Plant Pathology                                       | 1     | -/3 | 2     |
| Mic 491  | Mic 391      | Industrial Microbiology                               | 2     | -/3 | 3     |
| <b>Elective Courses: (The student chooses 2 hours of Microbiology courses)</b> |              |   |       |     |       |
| Mic 495  | Bot 100      | Antibiotics   | 1     | -/3 | 2     |
| Mic 497  | Mic 271      | Bio-fertilizers                                       | 1     | -/3 | 2     |
| <b>Elective Courses: (The student chooses 2 hours of Chemistry courses)</b>    |              |   |       |     |       |
| Chm 400  | Chm 222      | Nano-Chemistry and Applications                       | 2     | -/- | 2     |
| Chm 439  | Chm 222      | Basis of Quantum and Statistical Dynamics Chemistry   | 2     | -/- | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b>                    |              |   |       |     |       |
| Ent 412  | -            | Insect Borne Disease                                  | 1     | -/2 | 2     |
| Com 427  | Com 222      | Introduction to Bioinformatics                        | 1     | 2/- | 2     |
| <b>Total: 10 + 2+2 + 2 = 16 Hours</b>  |              |   |       |     |       |

المستوى الرابع: الفصل الدراسي الثاني

| Level 4 / Semester 2   |              | Course Title                               | Hours |     |       |
|--|--------------|--|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 9 hours                | Lect. | T/P | Cred. |
| Chm 40 <sup>o</sup>  | Chm 222      | Nanochemistry and Biological Applications  | 2     | -/3 | 3     |
| Chm 486  | Chm 222      | Material Science (1)                       | 2     | -/3 | 3     |
| Mic 492  | Mic 271      | Medical Microbiology                       | 2     | -/3 | 3     |
| <b>Elective Courses: (The student chooses 4 hours of Microbiology courses)</b> |              |  |       |     |       |
| Mic 482  | Bot 105      | Molecular Plant-microbe Interaction        | 2     | -/- | 2     |
| Mic 484  | Mic 382      | Genetic Engineering                        | 2     | -/- | 2     |
| Mic 496  | Bot 100      | Water and Food Microbiology                | 1     | -/3 | 2     |
| Mic 498  | Bot 100      | Microbial Biotechnology                    | 1     | -/3 | 2     |
| <b>Elective Courses: (The student chooses 2 hours of Chemistry courses)</b>    |              |  |       |     |       |
| Chm 424  | Chm 222      | Chemistry of Lanthanides and Actinides (2) | 2     | -/- | 2     |
| Chm 466  | Chm 465      | Principles of Organic Spectroscopy         | 2     | -/- | 2     |
| <b>Research: 3 hours</b>   |              |  |       |     |       |
| Mic 402  | -            | Research and Essay                         | 3     | -/- | 3     |
| <b>Total: 9 + 4+2 + 3 = 18 Hours</b>   |              |  |       |     |       |

(١٣) برنامج علم الحيوان والكيمياء

أولاً: المقررات الإجبارية (٦٠ ساعة معتمدة)

(\*) يدرس الطالب ٣٠ ساعة معتمدة من مقررات علم الحيوان و ٣٠ ساعة معتمدة من مقررات الكيمياء كالاتى:

| The student studies 30 compulsory hours of Zoology courses   |              |   |       |     |       |
|--|--------------|---|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses                        | Hours |     |       |
|  |              |   | Lect. | T/P | Cred. |
| Zoo 221  | Zoo 102      | Invertebrates                             | 1     | -/3 | 2     |
| Zoo 223  | Zoo 102      | Genetics                                  | 2     | -/2 | 3     |
| Zoo 224  | Zoo 221      | Chordate                                  | 2     | -/3 | 3     |
| Zoo 343  | Zoo 101      | Physiology (1)                            | 2     | -/3 | 3     |
| Zoo 344  | Zoo 224      | Embryology and Experimental Embryology    | 2     | -/3 | 3     |
| Zoo 345  | Zoo 102      | Immunology                                | 1     | -/2 | 2     |
| Zoo 346  | Zoo 343      | Physiology (2)                            | 1     | -/3 | 2     |
| Zoo 460  | Zoo 101      | Histopathology and Histochemistry         | 2     | -/3 | 3     |
| Zoo 464  | Zoo 221      | Parasitology                              | 1     | -/3 | 2     |
| Zoo 465  | Zoo 224      | Ecology and Fauna                         | 1     | -/2 | 2     |
| Zoo 466  | Zoo 102      | Marin and Fish Biology                    | 2     | -/3 | 3     |
| Zoo 471  | Zoo 224      | Comparative Anatomy (2)                   | 1     | -/3 | 2     |
| The student studies 30 compulsory hours of Chemistry courses |              |   |       |     |       |
| Chm 211  | Chm 105      | Aliphatic Organic Chemistry               | 2     | -/3 | 3     |
| Chm 212  | Chm 105      | Aromatic and Polynuclear Chemistry        | 2     | -/- | 2     |
| Chm 222  | Chm 100      | Chemistry of Representative Elements      | 2     | -/3 | 3     |
| Chm 232  | Chm 105      | Electrochemistry (1)                      | 2     | -/- | 2     |
| Chm 241  | Chm 100      | Analytical Chemistry (1)                  | 2     | -/3 | 3     |
| Chm 268  | Chm 105      | Organic Environmental Green Chemistry (2) | 2     | -/3 | 3     |
| Chm 316  | Chm 212      | Organic Spectroscopy (1)                  | 2     | -/3 | 3     |
| Chm 323  | Chm 222      | Chemistry of Transition Metals            | 2     | -/- | 2     |
| Chm 343  | Chm 241      | Analytical Chemistry (2)                  | 2     | -/3 | 3     |
| Chm 4٠6  | Chm 222      | Nanochemistry and Biological Applications | 2     | -/3 | 3     |
| Chm 4٨6  | Chm 222      | Materials Science (١)                     | 2     | -/3 | 3     |

ثانياً: المقررات الاختيارية

(\*) يدرس الطالب ١٤ ساعة معتمدة من مقررات علم الحيوان و ١٤ ساعة معتمدة من مقررات الكيمياء كالآتي:

| The student chooses 14 elective hours of Zoology courses   |              |   |       |     |       |
|--|--------------|---|-------|-----|-------|
| Code   | Prerequisite | Elective Courses                                    | Hours |     |       |
|  |              |   | Lect. | T/P | Cred. |
| Zoo 229  | Zoo 102      | Aquaculture   | 1     | -/2 | 2     |
| Zoo 231  | Zoo 102      | Cell Biology  | ١     | -/2 | 2     |
| Zoo 232  | Zoo 102      | Toxicology and Environmental Pollution              | 1     | -/2 | 2     |
| Zoo 234  | Zoo 102      | Introduction to Biotechnology                       | 1     | -/2 | 2     |
| Zoo 349  | Zoo 102      | Microscopic Techniques                              | 2     | -/2 | 3     |
| Zoo 351  | Zoo ١٠١      | Molecular Biology                                   | 2     | -/2 | 3     |
| Zoo 354  | Zoo 102      | Animal Behavior and Evolution                       | 1     | -/2 | 2     |
| Zoo 356  | Zoo 102      | Animal Economy                                      | 1     | -/2 | 2     |
| Zoo 470  | Zoo 346      | Eco-physiology                                      | 2     | -/3 | 3     |
| Zoo 475  | Zoo 223      | Advanced Genetics and Genetic Engineering           | 2     | -/3 | 3     |
| Zoo 472  | Zoo 465      | Histopathology and Tissue Culture                   | 2     | -/3 | 3     |
| Zoo 473  | Zoo 224      | ImmunoHistochemistry                                | 2     | -/3 | 3     |
| The student chooses 14 elective hours of Chemistry courses |              |   |       |     |       |
| Chm 213  | Chm 105      | Petroleum and Petrochemicals                        | 2     | -/- | 2     |
| Chm 217  | Chm 105      | Industrial Chemistry and Economic Studies           | 2     | -/- | 2     |
| Chm 242  | Chm 241      | Chemistry of Water Treatment (1)                    | 2     | -/- | 2     |
| Chm 244  | Chm 241      | Environmental Analytical Chemistry (1)              | 2     | -/- | 2     |
| Chm 312  | Chm 212      | Therapeutic Chemistry and Vitamins                  | 2     | -/3 | 3     |
| Chm 322  | Chm 222      | Characterization of Inorganic Compounds             | 2     | -/3 | 3     |
| Chm 323  | Chm 222      | Chemistry of Transition Metals                      | 2     | -/- | 2     |
| Chm 335  | Chm 241      | Electrochemical Instrumental Analysis               | 2     | -/- | 2     |
| Chm 400  | Chm 222      | Nano-Chemistry and Applications                     | 2     | -/- | 2     |
| Chm 410  | Chm 316      | Chemo-therapy and Hetero-organic Chemistry          | 2     | -/- | 2     |
| Chm 421  | Chm 324      | Nuclear and Radiation Chemistry                     | 2     | -/- | 2     |
| Chm 439  | Chm 222      | Basis of Quantum and Statistical Dynamics Chemistry | 2     | -/- | 2     |

ثالثاً: مقررات الاختيار الحر

يدرس الطالب ٦ ساعات معتمدة من المقررات الآتية: -

| Code    | Prerequisite | Free Optional Courses | Hours |     |       |
|---------|--------------|-----------------------|-------|-----|-------|
|         |              |                       | Lect. | T/P | Cred. |
| Com 223 | -            | Logic Design (1)      | 1     | 2/- | 2     |
| Bph 280 | -            | Basis of Biophysics   | 1     | -/2 | 2     |
| Geo 339 | -            | Minerals and Rocks    | 1     | -/2 | 2     |
| Mic 359 | -            | General Microbiology  | 1     | -/2 | 2     |
| Geo 409 | -            | Paleontology          | 1     | -/2 | 2     |
| Com 479 | -            | Computer Programming  | 1     | -/2 | 2     |

رابعاً: التدريب الميداني (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title               | Lect. | T/P | Cred. |
|---------|--------------|----------------------------|-------|-----|-------|
| Zoo 300 | -            | Applied and Field Training | -     | -/- | 3     |

خامساً: مقرر البحث والمقال (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title       | Lect. | T/P | Cred. |
|---------|--------------|--------------------|-------|-----|-------|
| Zoo 442 | -            | Research and Essay | 3     | -/- | 3     |

سادساً: توزيع مقررات برنامج علم الحيوان والكيمياء على المستويات الدراسية  
المستوى الثاني: الفصل الدراسي الأول

| Level 2 / Semester 1  |              | Course Title                              | Hours |     |       |
|---|--------------|---|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 11 hours              | Lect. | T/P | Cred. |
| Chm 211   | Chm 105      | Aliphatic Organic Chemistry               | 2     | -/3 | 3     |
| Zoo 221   | Zoo 102      | Invertebrates                             | 1     | -/3 | 2     |
| Zoo 223   | Zoo 102      | Genetics                                  | 2     | -/2 | 3     |
| Chm 241   | Chm 100      | Analytical Chemistry (1)                  | 2     | -/3 | 3     |
| <b>Elective Courses: (The student chooses 2 hours of Zoology courses)</b>   |              |   |       |     |       |
| Zoo 229   | Zoo 102      | Aquaculture                               | 1     | -/2 | 2     |
| Zoo 231   | Zoo 102      | Cell Biology                              | 1     | -/2 | 2     |
| <b>Elective Courses: (The student chooses 2 hours of Chemistry courses)</b> |              |   |       |     |       |
| Chm 213   | Chm 105      | Petroleum and Petrochemicals              | 2     | -/- | 2     |
| Chm 217   | Chm 105      | Industrial Chemistry and Economic Studies | 2     | -/- | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b>                 |              |   |       |     |       |
| Com 223   | -            | Logic Design (1)                          | 1     | 2/- | 2     |
| Bph 280   | -            | Basis of Biophysics                       | 1     | -/2 | 2     |
| <b>Total: 11 + 2 + 2+2 = 17 Hours</b>                                       |              |   |       |     |       |

المستوى الثاني: الفصل الدراسي الثاني

| Level 2 / Semester 2  |              | Course Title                              | Hours |     |       |
|---|--------------|---|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 13 hours              | Lect. | T/P | Cred. |
| Chm 212   | Chm 105      | Aromatic and Polynuclear Chemistry        | 2     | -/- | 2     |
| Chm 222   | Chm 100      | Chemistry of Representative Elements      | 2     | -/3 | 3     |
| Zoo 224   | Zoo 221      | Chordate                                  | 2     | -/3 | 3     |
| Chm 232   | Chm 105      | Electrochemistry (1)                      | 2     | -/- | 2     |
| Chm 268   | Chm 105      | Organic Environmental Green Chemistry (2) | 2     | -/3 | 3     |
| <b>Elective Courses: (The student chooses 2 hours of Zoology courses)</b>   |              |   |       |     |       |
| Zoo 232   | Zoo 102      | Toxicology and Environmental Pollution    | 1     | -/2 | 2     |
| Zoo 234   | Zoo 102      | Introduction to Biotechnology             | 1     | -/2 | 2     |
| <b>Elective Courses: (The student chooses 2 hours of Chemistry courses)</b> |              |   |       |     |       |
| Chm 242   | Chm 241      | Chemistry of Water Treatment (1)          | 2     | -/- | 2     |
| Chm 244   | Chm 241      | Environmental Analytical Chemistry (1)    | 2     | -/- | 2     |
| <b>Total: 13+ 2 + 2= 17 Hours</b>   |              |   |       |     |       |

المستوى الثالث: الفصل الدراسي الأول

| Level 3 / Semester 1  |              | Course Title                          | Hours |     |       |
|---|--------------|---------------------------------------|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 10 hours          | Lect. | T/P | Cred. |
| Chm 323   | Chm 222      | Chemistry of Transition Metals        | 2     | -/- | 2     |
| Chm 343   | Chm 241      | Analytical Chemistry (2)              | 2     | -/3 | 3     |
| Zoo 343   | Zoo 101      | Physiology 1                          | 2     | -/3 | 3     |
| Zoo 345   | Zoo 102      | Immunology                            | 1     | -/2 | 2     |
| <b>Elective Courses: (The student chooses 3 hours of Zoology courses)</b>   |              |                                       |       |     |       |
| Zoo 349   | Zoo 102      | Microscopic Techniques                | 2     | -/2 | 3     |
| Zoo 351   | Zoo 101      | Molecular Biology                     | 2     | -/2 | 3     |
| <b>Elective Courses: (The student chooses 2 hours of Chemistry courses)</b> |              |                                       |       |     |       |
| Chm 323   | Chm 222      | Chemistry of Transition Metals        | 2     | -/- | 2     |
| Chm 335   | Chm 241      | Electrochemical Instrumental Analysis | 2     | -/- | 2     |
| <b>Free optional Courses: (The student chooses 2 hours)</b>                 |              |                                       |       |     |       |
| Geo 339   | -            | Minerals and Rocks                    | 1     | -/3 | 2     |
| Mic 359   | -            | General Microbiology                  | 1     | -/2 | 2     |
| <b>Total: 10 + 3 + 2 + 2 = 17 Hours</b>                                     |              |                                       |       |     |       |

المستوى الثالث: الفصل الدراسي الثاني

| Level 3 / Semester 2  |              | Course Title                            | Hours |     |       |
|---|--------------|---|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 8 hours             | Lect. | T/P | Cred. |
| Chm 316   | Chm 212      | Organic Spectroscopy (1)                | 2     | -/3 | 3     |
| Zoo 344   | Zoo 224      | Embryology and Experimental Embryology  | 2     | -/3 | 3     |
| Zoo 346   | Zoo 343      | Physiology 2                            | 1     | -/3 | 2     |
| <b>Elective Courses: (The student chooses 2 hours of Zoology courses)</b>   |              |   |       |     |       |
| Zoo 354   | Zoo 102      | Animal Behavior and Evolution           | 1     | -/2 | 2     |
| Zoo 356   | Zoo 102      | Animal Economy                          | 1     | -/2 | 2     |
| <b>Elective Courses: (The student chooses 3 hours of Chemistry courses)</b> |              |   |       |     |       |
| Chm 312   | Chm 212      | Therapeutic Chemistry and Vitamins      | 2     | -/3 | 3     |
| Chm 322   | Chm 222      | Characterization of Inorganic Compounds | 2     | -/3 | 3     |
| <b>Training: 3 hours</b>  |              |   |       |     |       |
| Zoo 300   | -            | Applied and Field Training              | -     | -/- | 3     |
| <b>Total: 8 + 2 + 3 + 3 = 16 Hours</b>                                      |              |   |       |     |       |



المستوى الرابع: الفصل الدراسي الأول

| Level 4 / Semester 1  |              | Course Title  | Hours |     |       |
|---|--------------|---|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 7 hours                         | Lect. | T/P | Cred. |
| Zoo 460   | Zoo 101      | Histopathology and Histochemistry                   | 2     | -/3 | 3     |
| Zoo 465   | Zoo 224      | Ecology and Fauna                                   | 1     | -/2 | 2     |
| Zoo 471   | Zoo 224      | Comparative Anatomy (2)                             | 1     | -/3 | 2     |
| <b>Elective Courses: (The student chooses 3 hours of Zoology courses)</b>   |              |   |       |     |       |
| Zoo 475   | Zoo 223      | Advanced Genetics and Genetic Engineering           | 2     | -/3 | 3     |
| Zoo 473   | Zoo 224      | Immuno Histochemistry                               | 2     | -/3 | 3     |
| <b>Elective Courses: (The student chooses 2 hours of Chemistry courses)</b> |              |   |       |     |       |
| Chm 400   | Chm 222      | Nano-Chemistry and Applications                     | 2     | -/- | 2     |
| Chm 410   | Chm 316      | Chemo-therapy and Hetero-organic Chemistry          | 2     | -/- | 2     |
| <b>Elective Courses: (The student chooses 2 hours of Chemistry courses)</b> |              |   |       |     |       |
| Chm 421   | Chm 324      | Nuclear and Radiation Chemistry                     | 2     | -/- | 2     |
| Chm 439   | Chm 222      | Basis of Quantum and Statistical Dynamics Chemistry | 2     | -/- | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b>                 |              |   |       |     |       |
| Geo 409   | -            | Paleontology  | 1     | -/2 | 2     |
| Com 479   | -            | Computer Programming                                | 1     | -/2 | 2     |
| <b>Total: 7 + 3 + 2+2+2 = 16 Hours</b>                                      |              |   |       |     |       |

المستوى الرابع: الفصل الدراسي الثاني

| Level 4 / Semester 2   |              | Course Title                              | Hours |     |       |
|--|--------------|---|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 11 hours              | Lect. | T/P | Cred. |
| Chm 406  | Chm 222      | Nanochemistry and Biological Applications | 2     | -/3 | 3     |
| Zoo 464  | Zoo 221      | Parasitology                              | 1     | -/3 | 2     |
| Zoo 466  | Zoo 102      | Marine and Fish Biology                   | 2     | -/3 | 3     |
| Chm 406  | Chm 222      | Materials Science (١)                     | 2     | -/3 | 3     |
| <b>Elective Course: (The student chooses 3 hours of Zoology courses)</b> |              |   |       |     |       |
| Zoo 470  | Zoo 346      | Eco-physiology                            | 2     | -/3 | 3     |
| Zoo 472  | Zoo 465      | Histopathology and Tissue Culture         | 2     | -/3 | 3     |
| <b>Research: 3 hours</b>   |              |   |       |     |       |
| Zoo 442  | -            | Research and Essay in Zoology             | 3     | -/- | 3     |
| <b>Total: 11+3+3 = 17 Hours</b>  |              |   |       |     |       |

(١٤) برنامج علم الحيوان والبيئة

أولاً: المقررات الإلزامية (٦٠ ساعة معتمدة)

| Code    | Prerequisite | Compulsory Courses                     | Hours |     |       |
|---------|--------------|--|-------|-----|-------|
|         |              |  | Lect. | T/P | Cred. |
| Zoo 221 | Zoo 101      | Invertebrate                           | 1     | -/2 | 2     |
| Zoo 223 | Zoo 101      | Genetics                               | 2     | -/2 | 3     |
| Zoo 224 | Zoo 101      | Chordates                              | 2     | -/2 | 3     |
| Zoo 231 | Zoo 101      | Cell Biology                           | 1     | -/2 | 2     |
| Zoo 241 | Zoo 101      | Introduction to Ecology                | 1     | -/2 | 2     |
| Eco 245 | Zoo 101      | Limnology                              | 2     | -/2 | 3     |
| Eco 246 | Zoo 101      | Zoogeography                           | 2     | -   | 2     |
| Eco 290 | Zoo 101      | Biodiversity                           | 1     | -/2 | 2     |
| Eco 292 | Zoo 241      | Terrestrial and Desert Ecology         | 1     | -/2 | 2     |
| Zoo 298 | -            | Fish Biology                           | 1     | -/2 | 2     |
| Eco 321 | Zoo 241      | (G I S) and Remote Sensing             | 1     | -/3 | 2     |
| Zoo 343 | Zoo 101      | Physiology                             | 2     | -/2 | 3     |
| Zoo 344 | Zoo 343      | Embryology and Experimental Embryology | 2     | -/2 | 3     |
| Zoo 345 | Zoo 101      | Immunology                             | 1     | -/2 | 2     |
| Zoo 348 | Zoo 231      | Cell and Tissue Culture                | 2     | -/2 | 3     |
| Zoo 349 | Zoo 101      | Microscopic Technique                  | 1     | -/2 | 2     |
| Eco 395 | Zoo 241      | Pollution Climate Change               | 2     | -   | 2     |
| Eco 422 | Zoo 241      | National Parks                         | 2-    | -   | 2     |
| Zoo 460 | Zoo 101      | Histopathology and Histochemistry      | 2     | -/2 | 3     |
| Zoo 463 | Zoo 101      | Comparative Anatomy (1)                | 2     | -/2 | 3     |
| Zoo 464 | Zoo 221      | Parasitology                           | 1     | -/3 | 2     |
| Zoo 469 | Zoo 231      | Molecular Anatomy                      | 1     | -/2 | 2     |
| Zoo 470 | Zoo 343      | Eco-physiology                         | 2     | -/2 | 3     |
| Zoo 484 | -            | Evolution and Co-evolution             | 2     | -   | 2     |
| Zoo 487 | Zoo 101      | Marine Biology                         | 2     | -/2 | 3     |

ثانياً: المقررات الاختيارية

يدرس الطالب ٢٨ ساعة معتمدة من المقررات الآتية:-

| Code    | Prerequisite | Elective Courses                      | Hours |     |       |
|---------|--------------|---------------------------------------|-------|-----|-------|
|         |              |                                       | Lect. | T/P | Cred. |
| Eco 205 | Zoo 101      | Energy and Sustainable Energy         | 2     | -   | 2     |
| Zoo 210 | Zoo 102      | Hematology                            | 1     | -/2 | 2     |
| Zoo 229 | Zoo 101      | Aquaculture                           | 1     | -/2 | 2     |
| Zoo 234 | Zoo 101      | Introduction of Biotechnology         | 2     | -   | 2     |
| Ent 260 | Zoo 101      | Entomology                            | 1     | -/2 | 2     |
| Eco 261 | Zoo 101      | Sustainable Development               | 2     | -   | 2     |
| Zoo 345 | Zoo 102      | Immunology                            | 1     | -/2 | 2     |
| Zoo 351 | Zoo ١٠١      | Molecular Biology                     | 1     | -/2 | 2     |
| Zoo 354 | Zoo 101      | Animal Behavior and Evolution         | 1     | -/2 | ٢     |
| Eco 35٥ | -            | Marine Biotechnology                  | 2     | -   | 2     |
| Zoo 356 | Zoo 102      | Animal Economy                        | 1     | -/2 | 2     |
| Eco 382 | -            | Eco-city and Green Architecture       | 2     | -   | 2     |
| Eco 383 | -            | Environmental Impact Assessment (EIA) | 2     | -   | 2     |
| Zoo 385 | Zoo 224      | Comparative Physiology                | 1     | -/2 | 2     |
| BTC 475 | Zoo 231      | Cancer Biology                        | 2     | -/2 | 3     |
| Zoo 477 | Zoo 343      | Enzymes                               | 2     | -/3 | 3     |
| Eco 485 | Zoo 343      | Molecular Ecology                     | 2     | -   | 2     |
| Mic 488 | Zoo 231      | Serums and Vaccines                   | 2     | -   | 2     |
| Zoo 494 | Zoo 349      | Frozen Zoo                            | 2     | -   | 2     |
| Zoo 496 | Zoo 343      | Adaptive Physiology                   | ١     | -/2 | 2     |

ثالثاً: مقررات الاختيار الحر

يدرس الطالب ٦ ساعات معتمدة من المقررات الآتية: -

| Code    | Prerequisite | Free Optional Courses               | Hours |     |       |
|---------|--------------|-------------------------------------|-------|-----|-------|
|         |              |                                     | Lect. | T/P | Cred. |
| Com 223 | -            | Logic Design (1)                    | 1     | 2/- | 2     |
| Geo 236 | -            | Rock Forming Minerals of Hard Rocks | 1     | -/3 | 2     |
| Chm 240 | -            | Organic Chemistry                   | 1     | -/2 | 2     |
| Ent 258 | -            | Medical Entomology                  | 1     | -/2 | 2     |
| Bph 280 | -            | Basis of Biophysics                 | 1     | -/2 | 2     |
| Bot 353 | -            | Food Science                        | 2     | -   | 2     |

رابعاً: التدريب الميداني (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title               | Lect. | T/P | Cred. |
|---------|--------------|----------------------------|-------|-----|-------|
| Zoo 300 | -            | Applied and Field Training | -     | -/- | 3     |

خامساً: مقرر البحث والمقال (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title       | Lect. | T/P | Cred. |
|---------|--------------|--------------------|-------|-----|-------|
| Zoo 442 | -            | Research and Essay | 3     | -/- | 3     |

سادساً: توزيع مقررات برنامج الحيوان والبيئة على المستويات الدراسية  
المستوى الثاني: الفصل الدراسي الأول

| Level 2 / Semester 1  |              | Course Title                        | Hours |     |       |
|---|--------------|-------------------------------------|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 12 hours        | Lect. | T/P | Cred. |
| Zoo 221   | Zoo 101      | Invertebrate                        | 1     | -/2 | 2     |
| Zoo 223   | Zoo 101      | Genetics                            | 2     | -/2 | 3     |
| Zoo 231   | Zoo101       | Cell Biology                        | 1     | -/2 | 2     |
| Zoo 241   | Zoo 101      | Introduction to Ecology             | 1     | -/2 | 2     |
| Eco 245   | Zoo 101      | Limnology                           | 2     | -/2 | 3     |
| <b>Elective Courses: (The student chooses 2 hours of Zoology and Ecology courses)</b> |              |                                     |       |     |       |
| Eco 205   | Zoo 101      | Energy and Sustainable Energy       | 2     | -   | 2     |
| Zoo 229   | Zoo 101      | Aquaculture                         | 1     | -/2 | 2     |
| Eco 261   | Zoo 101      | Sustainable Development             | 2     | -   | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b>                           |              |                                     |       |     |       |
| Com 223   | -            | Logic Design (1)                    | 1     | 2/- | 2     |
| Geo 236   | -            | Rock Forming Minerals of Hard Rocks | 1     | -/3 | 2     |
| <b>Total: 12 + 2 + 2 = 16 Hours</b>   |              |                                     |       |     |       |

المستوى الثاني: الفصل الدراسي الثاني

| Level 2 / Semester 2   |              | Course Title                   | Hours |     |       |
|--|--------------|--------------------------------|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 11 hours   | Lect. | T/P | Cred. |
| Zoo 224  | Zoo 101      | Chordates                      | 2     | -/2 | 3     |
| Eco 246  | Zoo 101      | Zoogeography                   | 2     | -   | 2     |
| Eco 290  | Zoo 101      | Biodiversity                   | 1     | -/2 | 2     |
| Eco 292  | Zoo 241      | Terrestrial and Desert Ecology | 1     | -/2 | 2     |
| Zoo 298  | -            | Fish Biology                   | 1     | -/2 | 2     |
| <b>Elective Courses: (The student chooses 4 hours of Zoology and Entomology courses)</b> |              |                                |       |     |       |
| Zoo 210  | Zoo 102      | Hematology                     | 1     | -/2 | 2     |
| Zoo 234  | Zoo 101      | introduction to Biotechnology  | 2     | -   | 2     |
| Ent 260  | Zoo 101      | Entomology                     | 1     | -/2 | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b>                              |              |                                |       |     |       |
| Ent 258  | -            | Medical Entomology             | 1     | -/2 | 2     |
| Bph 280  | -            | Basis of Biophysics            | 1     | -/2 | 2     |
| <b>Total: 11+ 4 + 2= 17 Hours</b>  |              |                                |       |     |       |

المستوى الثالث: الفصل الدراسي الأول

| Level 3 / Semester 1  |              | Course Title                          | Hours |     |       |
|---|--------------|---------------------------------------|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 11 hours          | Lect. | T/P | Cred. |
| Eco 321   | Zoo 241      | (G I S) and Remote Sensing            | 1     | -/3 | 2     |
| Zoo 343   | Zoo 101      | Physiology                            | 2     | -/2 | 3     |
| Zoo 345   | Zoo 101      | Immunology                            | 1     | -/2 | 2     |
| Zoo 349   | Zoo 101      | Microscopic Technique                 | 1     | -/2 | 2     |
| Eco 395   | Zoo 241      | Pollution Climate Change              | 2     | -   | 2     |
| <b>Elective Courses: (The student chooses 6 hours of Zoology and Ecology courses)</b> |              |                                       |       |     |       |
| Zoo 345   | Zoo 102      | Immunology                            | 1     | -/2 | 2     |
| Zoo 351   | Zoo 101      | Molecular Biology                     | 1     | -/2 | 2     |
| Eco 383   | -            | Environmental Impact Assessment (EIA) | 2     | -   | 2     |
| Zoo 385   | Zoo 224      | Comparative Physiology                | 1     | -/2 | 2     |
| <b>Total: 11 + 6 = 17 Hours</b>   |              |                                       |       |     |       |

المستوى الثالث: الفصل الدراسي الثاني

| Level 3 / Semester 2   |              | Course Title                           | Hours |     |       |
|--|--------------|--|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 6 hours            | Lect. | T/P | Cred. |
| Zoo 344  | Zoo 343      | Embryology and Experimental Embryology | 2     | -/2 | 3     |
| Zoo 348  | Zoo 231      | Cell and Tissue Culture                | 2     | -/2 | 3     |
| <b>Elective Courses: (The student chooses 6 hours Zoology and Ecology courses)</b> |              |  |       |     |       |
| Zoo 354  | Zoo 101      | Animal Behavior and Evolution          | 1     | -/2 | 2     |
| Eco 350  | -            | Marine Biotechnology                   | 2     | -   | 2     |
| Zoo 356  | Zoo 102      | Animal Economy                         | 1     | -/2 | 2     |
| Eco 382  | -            | Eco-city and Green Architecture        | 2     | -   | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b>                        |              |  |       |     |       |
| Chm 240  | -            | Organic Chemistry                      | 1     | -/2 | 2     |
| Bot 353  | -            | Food Science                           | 2     | -   | 2     |
| <b>Training: 3 hours</b>   |              |  |       |     |       |
| Zoo 300  | -            | Applied and Field Training             | -     | -/- | 3     |
| <b>Total: 6+ 6+ 2+3 = 17 Hours</b>   |              |  |       |     |       |

المستوى الرابع: الفصل الدراسي الأول

| Level 4 / Semester 1  |              | Course Title                      | Hours |     |       |
|---|--------------|-----------------------------------|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 11 hours      | Lect. | T/P | Cred. |
| Zoo 460   | Zoo 101      | Histopathology and Histochemistry | 2     | -/3 | 3     |
| Zoo 463   | Zoo 101      | Comparative Anatomy (1)           | 2     | -/2 | 3     |
| Zoo 469   | Zoo 231      | Molecular Anatomy                 | 1     | -/2 | 2     |
| Zoo 487   | Zoo 101      | Marine Biology                    | 2     | -/2 | 3     |
| <b>Elective Courses: (The student chooses 6 hours of Zoology and Ecology courses)</b> |              |                                   |       |     |       |
| Zoo 477   | Zoo 343      | Enzymes                           | 2     | -/3 | 3     |
| BTC 475   | Zoo 231      | Cancer Biology                    | 2     | -/2 | 3     |
| Eco 485   | Zoo 343      | Molecular Ecology                 | 2     | -/2 | 3     |
| <b>Total: 11 + 6 = 17 Hours</b>   |              |                                   |       |     |       |

المستوى الرابع: الفصل الدراسي الثاني

| Level 4 / Semester 2   |              | Course Title                | Hours |     |       |
|--|--------------|-----------------------------|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 9 hours | Lect. | T/P | Cred. |
| Eco 422  | Zoo 241      | National Parks              | 2     | -   | 2     |
| Zoo 464  | Zoo 221      | Parasitology                | 1     | -/3 | 2     |
| Zoo 470  | Zoo 343      | Eco-physiology              | 2     | -/2 | 3     |
| Zoo 484  | -            | Evolution and Co- evolution | 2     | -   | 2     |
| <b>Elective Courses: (The student chooses 4 hours of Zoology and microbiology courses)</b> |              |                             |       |     |       |
| Mic 488  | Zoo 231      | Serums and Vaccines         | 2     | -   | 2     |
| Zoo 494  | Zoo 349      | Frozen Zoo                  | 2     | -   | 2     |
| Zoo 496  | Zoo 343      | Adaptive Physiology         | 1     | -/2 | 2     |
| <b>Research: 3 hours</b>   |              |                             |       |     |       |
| Zoo 442  | -            | Research and Essay          | 3     | -/- | 3     |
| <b>Total: 9 + 4 + 3 = 16 Hours</b>   |              |                             |       |     |       |

(١٥) برنامج التكنولوجيا الحيوية

أولاً: المقررات الإلزامية (٦٠ ساعة معتمدة)

| Code    | Prerequisite | Compulsory Courses                             | Hours |     |       |
|---------|--------------|--|-------|-----|-------|
|         |              |  | Lect. | T/P | Cred. |
| Zoo 223 | Zoo 101      | Genetics                                       | 2     | -/2 | 3     |
| Mic 224 | Bot 100      | Microbiology and Introduction to Biotechnology | 2     | -/2 | 3     |
| BTC 226 | Zoo 101      | Biotechnology                                  | 2     | -/2 | 3     |
| Zoo 227 | Zoo 101      | Vertebrates                                    | 2     | -/2 | 3     |
| BCh 228 | Chm 105      | Biochemistry                                   | ١     | -/٢ | 2     |
| Zoo 231 | Zoo 101      | Cell Biology                                   | 1     | -/2 | 2     |
| BTC 233 | Zoo 101      | Environmental Biotechnology                    | 2     | -/2 | 3     |
| BTC 235 | -            | Nanotechnology                                 | 2     | -/3 | 3     |
| Zoo 345 | Zoo 101      | Immunology                                     | 1     | -/2 | 2     |
| Zoo 348 | Zoo 231      | Cell and Tissue Culture                        | 2     | -/2 | 3     |
| Bot 349 | Mic 224      | Bioremediation                                 | 2     | -/2 | 3     |
| Zoo 351 | Zoo ١٠١      | Molecular Biology                              | 2     | -/- | 2     |
| Bio 355 | -            | Biotechnology Management                       | 1     | -/- | 1     |
| Eco 355 | -            | Marine Biotechnology                           | 2     | -/- | 2     |
| BTC 357 | Zoo 223      | Proteomics                                     | 2     | -/2 | 3     |
| Zoo 461 | Zoo 101      | Bioinformatics                                 | 2     | -/2 | 3     |
| Zoo 462 | Zoo 223      | Genomic Analysis                               | 2     | -/2 | 3     |
| Zoo 467 | -            | Instrumentation Technology                     | 2     | -/- | 2     |
| Zoo 468 | Zoo 223      | Epigenetics                                    | 2     | -/2 | 3     |
| BTC 471 | Zoo 223      | Advanced Genetic and Protein Engineering       | 2     | -/٣ | 3     |
| BTC 475 | Zoo 231      | Cancer Biology                                 | 2     | -/2 | 3     |
| Zoo 485 | Zoo 351      | Molecular Ecology                              | 2     | -/- | 2     |
| Zoo 497 | Zoo 231      | Stem Cell Biology                              | 2     | -/2 | 3     |



ثانياً: المقررات الاختيارية

يدرس الطالب ٢٨ ساعة معتمدة من المقررات الآتية:

| Code    | Prerequisite | Elective Courses                        | Hours |     |       |
|---------|--------------|---|-------|-----|-------|
|         |              |   | Lect. | T/P | Cred. |
| Mat 204 | Mat 101      | Numerical Analysis (1)                  | 1     | 2/- | 2     |
| Com 220 | Com 10٢      | Data Structure                          | 2     | -/2 | 3     |
| Com 224 | -            | Operating Systems                       | 1     | 2/- | 2     |
| Zoo 230 | Zoo 102      | Toxicology and Animal Toxins            | 2     | -/3 | 3     |
| Chm 331 | Chm 105      | Applied Electrochemistry                | 2     | -/3 | 3     |
| Zoo 242 | Zoo 101      | Developmental Biology                   | 2     | -/2 | 3     |
| Com 323 | Com 102      | Database Management Systems             | 2     | 2/- | 3     |
| Zoo 343 | Zoo 101      | Physiology (1)                          | 2     | -/2 | 3     |
| Eco 245 | Zoo 101      | Limnology                               | 2     | -/2 | 3     |
| Zoo 346 | Zoo 343      | Physiology (2)                          | 2     | -/2 | 3     |
| Zoo 350 | Zoo 343      | Neuroendocrinology                      | 1     | -/2 | 2     |
| Bch 352 | Bch 228      | Clinical Biochemistry                   | 2     | -/2 | 3     |
| Zoo 352 | Zoo 345      | Immunotherapy                           | 2     | -/- | 2     |
| Zoo 362 | Zoo 223      | Genomics                                | 2     | -/2 | 3     |
| Eco 366 | Zoo 101      | Pollution and Climate Change            | 2     | -/- | 2     |
| Zoo 460 | Zoo 101      | Histopathology and Histochemistry       | 2     | -/2 | 3     |
| Zoo 466 | Zoo 102      | Marine and Fish Biology                 | 2     | -/3 | 3     |
| Zoo 470 | Zoo 346      | Eco-physiology                          | 2     | -/3 | 3     |
| Zoo 472 | Zoo 465      | Histopathology and Tissue Culture       | 2     | -/3 | 3     |
| Zoo 479 | Zoo 345      | Ontogeny and Phylogeny of Immune System | 2     | -/2 | 3     |

ثالثاً: مقررات الاختيار الحر

يدرس الطالب ٦ ساعات معتمدة من المقررات الآتية:

| Code    | Prerequisite | Free Optional Courses               | Hours |     |       |
|---------|--------------|-------------------------------------|-------|-----|-------|
|         |              |                                     | Lect. | T/P | Cred. |
| Com 223 | -            | Logic Design (1)                    | 1     | 2/- | 2     |
| Geo 236 | -            | Rock Forming Minerals of Hard Rocks | 1     | -/3 | 2     |
| Chm 240 | -            | Organic Chemistry                   | 1     | -/2 | 2     |
| Ent 258 | -            | Medical Entomology                  | 1     | -/2 | 2     |
| Bph 280 | -            | Basis of Biophysics                 | 1     | -/2 | 2     |
| Bot 353 | -            | Food Science                        | 2     | -/- | 2     |

رابعاً: التدريب الميداني (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title               | Lect. | T/P | Cred. |
|---------|--------------|----------------------------|-------|-----|-------|
| Zoo 300 | -            | Applied and Field Training | -     | -/- | 3     |

خامساً: مقرر البحث والمقال (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title       | Lect. | T/P | Cred. |
|---------|--------------|--------------------|-------|-----|-------|
| Zoo 442 | -            | Research and Essay | 3     | -/- | 3     |

سادساً: توزيع مقررات برنامج التكنولوجيا الحيوية على المستويات الدراسية  
المستوى الثاني: الفصل الدراسي الأول

| Level 2 / Semester 1  |              | Course Title                 | Hours |     |       |
|---|--------------|------------------------------|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 14 hours | Lect. | T/P | Cred. |
| Zoo 223   | Zoo 101      | Genetics                     | 2     | -/2 | 3     |
| Zoo 227   | Zoo 101      | Vertebrates                  | 2     | -/2 | 3     |
| Zoo 231   | Zoo 101      | Cell Biology                 | 1     | -/2 | 2     |
| BTC 233   | Zoo 101      | Environmental Biotechnology  | 2     | -/2 | 3     |
| BTC 235   | -            | Nanotechnology               | 2     | -/3 | 3     |
| <b>Elective Courses: (The student chooses 3 hours of Zoology courses)</b> |              |                              |       |     |       |
| Zoo 230   | Zoo 102      | Toxicology and Animal Toxins | 2     | -/3 | 3     |
| Eco 245   | Zoo 101      | Limnology                    | 2     | -/2 | 3     |
| <b>Total: 14 + 3 = 17 Hours</b>   |              |                              |       |     |       |

المستوى الثاني: الفصل الدراسي الثاني

| Level 2 / Semester 2  |              | Course Title                                   | Hours |     |       |
|---|--------------|--|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 8 hours                    | Lect. | T/P | Cred. |
| Mic 224   | Bot 100      | Microbiology and Introduction to Biotechnology | 2     | -/2 | 3     |
| BTC 226   | Zoo 101      | Biotechnology                                  | 2     | -/2 | 3     |
| BCh 228   | Chm 105      | Biochemistry                                   | 1     | -/2 | 2     |
| <b>Elective Courses: (The student chooses 5 hours)</b>      |              |  |       |     |       |
| Zoo 242   | Zoo 101      | Developmental Biology                          | 2     | -/2 | 3     |
| Mat 204   | Mat 101      | Numerical Analysis (1)                         | 1     | 2/- | 2     |
| Com 220   | Com 102      | Data Structure                                 | 2     | -/2 | 3     |
| Com 224   | -            | Operating Systems                              | 1     | 2/- | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |  |       |     |       |
| Com 223   | -            | Logic Design (1)                               | 1     | 2/- | 2     |
| Geo 236   | -            | Rock Forming Minerals of Hard Rocks            | 1     | -/3 | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |  |       |     |       |
| Ent 258   | -            | Medical Entomology                             | 1     | -/2 | 2     |
| Bph 280   | -            | Basis of Biophysics                            | 1     | -/2 | 2     |
| <b>Total: 8+ 5 + 2+ 2= 17 Hours</b>                         |              |  |       |     |       |

المستوى الثالث: الفصل الدراسي الأول

| Level 3 / Semester 1                                      |              | Course Title                | Hours |     |       |
|---|--------------|-----------------------------|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 8 hours | Lect. | T/P | Cred. |
| Bot 349   | Mic 224      | Bioremediation              | 2     | -/2 | 3     |
| Zoo 351   | Zoo 101      | Molecular Biology           | 2     | -/- | 2     |
| BTC 357   | Zoo 223      | Proteomics                  | 2     | -/2 | 3     |
| <b>Elective Courses: (The student chooses 4 hours)</b>    |              |                             |       |     |       |
| Com 323   | Com 102      | Database Management Systems | 2     | 2/- | 3     |
| Zoo 343   | Zoo 101      | Physiology (1)              | 2     | -/2 | 3     |
| Chm 331   | Chm 105      | Applied Electrochemistry    | 2     | -/3 | 3     |
| <b>Free Option Courses: (The student chooses 2 hours)</b> |              |                             |       |     |       |
| Chm 240   | -            | Organic Chemistry           | 1     | -/2 | 2     |
| Bot 353   | -            | Food Science                | 2     | -/- | 2     |
| <b>Total: 8 + 4 + 2 = 16 Hours</b>                        |              |                             |       |     |       |

المستوى الثالث: الفصل الدراسي الثاني

| Level 3 / Semester 2                                   |              | Course Title                 | Hours |     |       |
|--|--------------|------------------------------|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 8 hours  | Lect. | T/P | Cred. |
| Zoo 345  | Zoo 101      | Immunology                   | 1     | -/2 | 2     |
| Bio 355  | -            | Biotechnology Management     | 1     | -/- | 1     |
| Eco 355  | -            | Marine Biotechnology         | 2     | -/- | 2     |
| Zoo 348  | Zoo 231      | Cell and Tissue Culture      | 2     | -/2 | 3     |
| <b>Elective Courses: (The student chooses 5 hours)</b> |              |                              |       |     |       |
| Zoo 346  | Zoo 343      | Physiology (2)               | 2     | -/2 | 3     |
| Zoo 350  | Zoo 343      | Neuroendocrinology           | 1     | -/2 | 2     |
| Bch 352  | Bch 228      | Clinical Biochemistry        | 2     | -/2 | 3     |
| Zoo 352  | Zoo 345      | Immunotherapy                | 2     | -/- | 2     |
| Zoo 362  | Zoo 223      | Genomics                     | 2     | -/2 | 3     |
| Eco 366  | Zoo 101      | Pollution and Climate Change | 2     | -/- | 2     |
| <b>Training: 3 hours</b>                               |              |                              |       |     |       |
| Zoo 300  | -            | Applied and Field Training   | -     | -/- | 3     |
| <b>Total: 8+ 5+3 = 16 Hours</b>                        |              |                              |       |     |       |

المستوى الرابع: الفصل الدراسي الأول

| Level 4 / Semester 1                                   |              | Course Title                             | Hours |     |       |
|--|--------------|--|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 11 hours             | Lect. | T/P | Cred. |
| Zoo 461  | Zoo 101      | Bioinformatics                           | 2     | -/2 | 3     |
| Zoo 467  | -            | Instrumentation Technology               | 2     | -/- | 2     |
| BTC 471  | Zoo 223      | Advanced Genetic and Protein Engineering | 2     | -/3 | 3     |
| Zoo 497  | Zoo 231      | Stem Cell Biology                        | 2     | -/2 | 3     |
| <b>Elective Courses: (The student chooses 6 hours)</b> |              |  |       |     |       |
| Zoo 460  | Zoo 101      | Histopathology and Histochemistry        | 2     | -/3 | 3     |
| Zoo 470  | Zoo 346      | Eco-physiology                           | 2     | -/3 | 3     |
| Zoo 479  | Zoo 345      | Ontogeny and Phylogeny of Immune System  | 2     | -/2 | 3     |
| <b>Total: 11 + 6 + = 17 Hours</b>                      |              |  |       |     |       |

المستوى الرابع: الفصل الدراسي الثاني

| Level 4 / Semester 2                                   |              | Course Title                      | Hours |     |       |
|--|--------------|-----------------------------------|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 11 hours      | Lect. | T/P | Cred. |
| Zoo 462  | Zoo 223      | Genomic Analysis                  | 2     | -/2 | 3     |
| Zoo 468  | Zoo 223      | Epigenetics                       | 2     | -/2 | 3     |
| BTC 475  | Zoo 231      | Cancer Biology                    | 2     | -/2 | 3     |
| Zoo 485  | Zoo 351      | Molecular Ecology                 | 2     | -/- | 2     |
| <b>Elective Courses: (The student chooses 3 hours)</b> |              |                                   |       |     |       |
| Zoo 466  | Zoo 102      | Marine and Fish Biology           | 2     | -/3 | 3     |
| Zoo 472  | Zoo 465      | Histopathology and Tissue Culture | 2     | -/3 | 3     |
| <b>Research: 3 hours</b>                               |              |                                   |       |     |       |
| Bot 400  |              | Research and Essay                | 3     | -/- | 3     |
| <b>Total: 11 + 3 + 3 = 17 Hours</b>                    |              |                                   |       |     |       |

(١٦) برنامج علم الحشرات والكيمياء

أولاً: المقررات الإلزامية (٦٠ ساعة معتمدة)

(\*) يدرس الطالب ٣٠ ساعة معتمدة من مقررات علم الحشرات و ٣٠ ساعة معتمدة من مقررات الكيمياء كالاتي:

| The student studies 3 compulsory hours of Entomology courses |              |   |       |     |       |
|--|--------------|---|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses                        | Hours |     |       |
|  |              |   | Lect. | T/P | Cred. |
| Ent 220  | -            | Insect Embryology and Anatomy             | 2     | -/٢ | 3     |
| Ent 222  | Ent 223      | Insect Taxonomy (2)                       | 1     | -/2 | 2     |
| Ent 223  | Zoo 102      | Insect Morphology and Taxonomy (1)        | 2     | -/3 | 3     |
| Ent 225  | -            | Cell Biology and Molecular Biology        | 2     | -/- | 2     |
| Ent 340  | Ent 343      | Chemical Insecticides                     | 2     | -/2 | 3     |
| Ent 341  | -            | Insect Pests of Plants                    | 1     | -/2 | 2     |
| Ent 342  | -            | Biological Control of Pests and Immunity  | 2     | -/2 | 3     |
| Ent 343  | Ent 220      | Insect Physiology                         | 2     | -/3 | ٣     |
| Ent 461  | Ent 222      | Medical and Veterinary Entomology         | 2     | -/2 | 3     |
| Ent 462  | Ent 222      | Insect Ecology and Behavior               | 2     | -/2 | 3     |
| Ent 463  | Ent 340      | Integrated Pest Management                | 1     | -/2 | 2     |
| Ent 466  | Ent 22٢      | Insect Rearing and Preservation           | -     | -/3 | 1     |
| The student studies 30 compulsory hours of Chemistry courses |              |   |       |     |       |
| Chm 211  | Chm 105      | Aliphatic Organic Chemistry               | 2     | -/3 | 3     |
| Chm 212  | Chm 105      | Aromatic and Polynuclear Chemistry        | 2     | -/- | 2     |
| Chm 222  | Chm 100      | Chemistry of Representative Elements      | 2     | -/3 | 3     |
| Chm 232  | Chm 105      | ElectroChemistry (1)                      | 2     | -/- | 2     |
| Chm 241  | Chm 100      | Analytical Chemistry (1)                  | 2     | -/3 | 3     |
| Chm 268  | Chm 105      | Organic Environmental Green Chemistry (2) | 2     | -/3 | 3     |
| Chm 316  | Chm 212      | Organic Spectroscopy (1)                  | 2     | -/3 | 3     |
| Chm 323  | Chm 222      | Chemistry of Transition Metals            | 2     | -/- | 2     |
| Chm 343  | Chm 241      | Analytical Chemistry (2)                  | 2     | -/3 | 3     |
| Chm 4٠6  | Chm 222      | Nanochemistry and Biological Applications | 2     | -/3 | 3     |
| Chm 4٨6  | Chm 222      | Materials Science (١)                     | 2     | -/3 | 3     |

ثانياً: المقررات الاختيارية

(\*) يدرس الطالب ١٤ ساعة معتمدة من مقررات علم الحشرات و ١٤ ساعة معتمدة من مقررات الكيمياء كالاتى:

| The student chooses 14 elective hours of Entomology courses |              |   |       |     |       |
|---|--------------|---|-------|-----|-------|
| Code  | Prerequisite | Elective Courses  | Hours |     |       |
|   |              |   | Lect. | T/P | Cred. |
| Ent 230   | Ent 222      | Management of Beneficial Insects' Projects              | 1     | -/٢ | 2     |
| Ent 235   | Ent 222      | Beneficial Insects                                      | 1     | -/٢ | 2     |
| Ent 347   | -            | Selected Topics 1                                       | 2     | -/3 | 3     |
| Ent 349   | Ent 225      | Introduction in Insect Biotechnology and Bioinformatics | 2     | -/3 | 3     |
| Ent 350   | -            | Field Training  | 1     | -/4 | ٣     |
| Ent 355   | -            | Experimental Design for Insect Control                  | 2     | -/2 | ٣     |
| Ent 467   | Ent 461      | Forensic Entomology                                     | ١     | -/٣ | ٢     |
| Ent 470   | Ent 222      | Aquatic Insects   | 2     | -/- | ٢     |
| Ent 472   | Ent 463      | New Trends in Insect Control                            | 1     | -/3 | ٢     |
| Ent 475   | Ent 222      | Stored Product Insects                                  | ١     | -/٢ | ٢     |
| Ent 476   | -            | Insect Pathology  | 2     | -/- | ٢     |
| The student chooses 14 elective hours of Chemistry courses  |              |   |       |     |       |
| Chm 213   | Chm 105      | Petroleum and Petrochemicals                            | 2     | -/- | 2     |
| Chm 217   | Chm 105      | Industrial Chemistry and Economic Studies               | 2     | -/- | 2     |
| Chm 246   | Chm 241      | Chemistry of Water Treatment (2)                        | 2     | -/3 | 3     |
| Chm 248   | Chm 241      | Environmental Analytical Chemistry (2)                  | 2     | -/3 | 3     |
| Chm 311   | Chm 211      | Chemistry of Pesticides and Toxins                      | 2     | -/3 | 3     |
| Chm 312   | Chm 212      | Therapeutic Chemistry and Vitamins                      | 2     | -/3 | 3     |
| Chm 322   | Chm 222      | Characterization of Inorganic Compounds                 | 2     | -/3 | 3     |
| Chm 331   | Chm 105      | Applied Electrochemistry                                | 2     | -/3 | 3     |
| Chm 463   | Chm 316      | Polymer Chemistry and Applications (2)                  | 2     | -/3 | 3     |
| Chm 493   | Chm 323      | Instrumental Analysis (2)                               | 2     | -/3 | 3     |

ثالثاً: مقررات الاختيار الحر

يدرس الطالب ٦ ساعات معتمدة من المقررات الآتية:

| Code    | Prerequisite | Free Optional Courses        | Hours |     |       |
|---------|--------------|------------------------------|-------|-----|-------|
|         |              |                              | Lect. | T/P | Cred. |
| Geo 211 | -            | Macrofossils                 | 1     | -/2 | 2     |
| Com 223 | -            | Logic Design (1)             | 1     | 2/- | 2     |
| Bph 280 | -            | Basis of Biophysics          | 1     | -/2 | 2     |
| Mic 359 | -            | General Microbiology         | 1     | -/2 | 2     |
| Zoo 360 | -            | Fundamentals of Parasitology | 1     | -/2 | 2     |
| Zoo 370 | -            | Selected Topics in Zoology   | 1     | -/2 | 2     |

رابعاً: التدريب الميداني (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title               | Lect. | T/P | Cred. |
|---------|--------------|----------------------------|-------|-----|-------|
| Ent 358 | -            | Applied and Field Training | -     | -/- | 3     |

خامساً: مقرر البحث والمقال (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title       | Lect. | T/P | Cred. |
|---------|--------------|--------------------|-------|-----|-------|
| Ent 400 | -            | Research and Essay | 3     | -/- | 3     |



سادساً: توزيع مقررات برنامج علم الحشرات والكيمياء على المستويات الدراسية

**المستوى الثاني: الفصل الدراسي الأول**

| Level 2/Semester 1  |              | Course Title                              | Hours |     |       |
|---|--------------|---|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 14 hours              | Lect. | T/P | Cred. |
| Chm 211   | Chm 105      | Aliphatic Organic Chemistry               | 2     | -/3 | 3     |
| Ent 220   | -            | Insect Embryology and Anatomy             | 2     | -/٢ | 3     |
| Ent 223   | Zoo 102      | Insect Morphology and Taxonomy (1)        | 2     | -/3 | 3     |
| Ent 225   | -            | Cell Biology and Molecular Biology        | 2     | -/- | 2     |
| Chm 241   | Chm 100      | Analytical Chemistry (1)                  | 2     | -/3 | 3     |
| <b>Elective Courses: (The student chooses 2 hours of Chemistry courses)</b> |              |   |       |     |       |
| Chm 213   | Chm 105      | Petroleum and Petrochemicals              | 2     | -/- | 2     |
| Chm 217   | Chm 105      | Industrial Chemistry and Economic Studies | 2     | -/- | 2     |
| <b>Total: 14 + 2 = 16 Hours</b>   |              |   |       |     |       |

**المستوى الثاني: الفصل الدراسي الثاني**

| Level 2/Semester 2   |              | Course Title                               | Hours |     |       |
|--|--------------|--|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 12 hours               | Lect. | T/P | Cred. |
| Chm 212  | Chm 105      | Aromatic and Polynuclear Chemistry         | 2     | -/- | 2     |
| Ent 222  | Ent 223      | Insect Taxonomy (2)                        | 1     | -/2 | 2     |
| Chm 222  | Chm 100      | Chemistry of Representative Elements       | 2     | -/3 | 3     |
| Chm 232  | Chm 105      | Electrochemistry (1)                       | 2     | -/- | 2     |
| Chm 268  | Chm 105      | Organic Environmental Green Chemistry (2)  | 2     | -/3 | 3     |
| <b>Elective Courses: (The student chooses 2 hours of Entomology courses)</b> |              |  |       |     |       |
| Ent 230  | Ent 222      | Management of Beneficial Insects' Projects | 1     | -/٢ | 2     |
| Ent 235  | Ent 222      | Beneficial Insects                         | 1     | -/٢ | 2     |
| <b>Elective Courses: (The student chooses 3 hours of Chemistry courses)</b>  |              |  |       |     |       |
| Chm 246  | Chm241       | Chemistry of Water Treatment (2)           | 2     | -/3 | 3     |
| Chm 248  | Chm241       | Environmental Analytical Chemistry (2)     | 2     | -/3 | 3     |
| <b>Total: 12 + 2 + 3 = 17 Hours</b>  |              |  |       |     |       |

المستوى الثالث: الفصل الدراسي الأول

| Level 3/Semester 1   |              | Course Title  | Hours |     |       |
|--|--------------|---|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 10 hours                            | Lect. | T/P | Cred. |
| Chm 323  | Chm 222      | Chemistry of Transition Metals                          | 2     | -/- | 2     |
| Ent 341  | -            | Insect Pests of Plants                                  | 1     | -/2 | 2     |
| Chm 343  | Chm 241      | Analytical Chemistry (2)                                | 2     | -/3 | 3     |
| Ent 343  | Ent 220      | Insect Physiology                                       | 2     | -/3 | 3     |
| <b>Elective Courses: (The student chooses 3 hours of Entomology courses)</b> |              |   |       |     |       |
| Ent 347  | -            | Selected Topics 1                                       | 2     | -/3 | 3     |
| Ent 349  | Ent225       | Introduction in Insect Biotechnology and Bioinformatics | 2     | -/3 | 3     |
| <b>Elective Courses (Chemistry): (The student chooses 3 hours)</b>           |              |   |       |     |       |
| Chm 311  | Chm211       | Chemistry of Pesticides and Toxins                      | 2     | -/3 | 3     |
| Chm 331  | Chm 105      | Applied Electrochemistry                                | 2     | -/3 | 3     |
| <b>Total: 10 + 3+3 = 16 Hours</b>  |              |   |       |     |       |

المستوى الثالث: الفصل الدراسي الثاني

| Level 3/Semester 2   |              | Course Title                             | Hours |     |       |
|--|--------------|--|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 9 hours              | Lect. | T/P | Cred. |
| Chm 316  | Chm 212      | Organic Spectroscopy (1)                 | 2     | -/3 | 3     |
| Ent 340  | Ent 343      | Chemical Insecticides                    | 2     | -/2 | 3     |
| Ent 342  | -            | Biological Control of Pests and Immunity | 2     | -/2 | 3     |
| <b>Elective Courses: (The student chooses 3 hours of Entomology courses)</b> |              |  |       |     |       |
| Ent 350  | -            | Field Training                           | 1     | -/4 | 3     |
| Ent 355  | -            | Experimental Design for Insect Control   | 2     | -/2 | 3     |
| <b>Elective Courses: (The student chooses 3 hours of Chemistry courses)</b>  |              |  |       |     |       |
| Chm 312  | Chm 212      | Therapeutic Chemistry and Vitamins       | 2     | -/3 | 3     |
| Chm 322  | Chm 222      | Characterization of Inorganic Compounds  | 2     | -/3 | 3     |
| <b>Training: 3 hours</b>   |              |  |       |     |       |
| Ent 35 <sup>^</sup>  | -            | Applied and Field Training               | -     | -/- | 3     |
| <b>Total: 9 + 3 + 3 + 3 = 18 Hours</b>                                       |              |  |       |     |       |

المستوى الرابع: الفصل الدراسي الأول

| Level 4/Semester 1   |              | Course Title                           | Hours |     |       |
|--|--------------|--|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 5 hours            | Lect. | T/P | Cred. |
| Ent 461  | Ent 222      | Medical and Veterinary Entomology      | 2     | -/2 | 3     |
| Ent 463  | Ent 340      | Integrated Pest Management             | 1     | -/2 | 2     |
| <b>Elective Courses: (The student chooses 4 hours of Entomology courses)</b> |              |  |       |     |       |
| Ent 467  | Ent 461      | Forensic Entomology                    | ١     | -/٣ | ٢     |
| Ent 470  | Ent 222      | Aquatic Insects                        | 2     | -/- | ٢     |
| Ent 475  | Ent 222      | Stored Product Insects                 | ١     | -/٢ | ٢     |
| <b>Elective Courses: (The student chooses 3 hours of Chemistry courses)</b>  |              |  |       |     |       |
| Chm 463  | Chm 316      | Polymer Chemistry and Applications (2) | 2     | -/3 | 3     |
| Chm 493  | Chm 323      | Instrumental Analysis (2)              | 2     | -/3 | 3     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b>                  |              |  |       |     |       |
| Bph 280  | -            | Basis of Biophysics                    | 1     | -/2 | 2     |
| Mic 359  | -            | General Microbiology                   | 1     | -/2 | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b>                  |              |  |       |     |       |
| Geo 211  | -            | Macrofossils                           | 1     | -/٣ | 2     |
| Com 223  | -            | Logic Design (1)                       | 1     | 2/- | 2     |
| <b>Total: 5 + 4 +3+2 +2= 16 Hours</b>  |              |  |       |     |       |

المستوى الرابع: الفصل الدراسي الثاني

| Level 4/Semester 2   |              | Course Title                              | Hours |     |       |
|--|--------------|---|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 10 hours              | Lect. | T/P | Cred. |
| Chm 4٠6  | Chm 222      | Nanochemistry and Biological Applications | 2     | -/3 | 3     |
| Ent 462  | Ent 222      | Insect Ecology and Behavior               | 2     | -/2 | 3     |
| Ent 466  | Ent 22٢      | Insect Rearing and Preservation           | -     | -/3 | 1     |
| Chm 486  | Chm 222      | Materials Science (١)                     | 2     | -/3 | 3     |
| <b>Elective Courses: (The student chooses 2 hours of Entomology courses)</b> |              |   |       |     |       |
| Ent 472  | Ent463       | New Trends In Insect Control              | 1     | -/3 | ٢     |
| Ent 476  | -            | Insect Pathology                          | 2     | -/- | ٢     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b>                  |              |   |       |     |       |
| Zoo 360  | -            | Fundamentals of Parasitology              | 1     | -/2 | 2     |
| Zoo 370  | -            | Selected Topics in Zoology                | 1     | -/2 | 2     |
| <b>Research: 3 hours</b>   |              |   |       |     |       |
| Ent 400  | -            | Research and Essay in Insects             | 3     | -/- | 3     |
| <b>Total: 10 + 2 +2+ 3 = 17 Hours</b>  |              |   |       |     |       |

**(١٧) برنامج علم الحشرات والميكروبيولوجي**

أولاً: المقررات الإلزامية (٦٠ ساعة معتمدة)

(\*) يدرس الطالب ٣٠ ساعة معتمدة من مقررات علم الحشرات و ٣٠ ساعة معتمدة من مقررات الميكروبيولوجي كالاتي:

| The student studies 30 compulsory hours of Entomology courses   |              |  |       |     |       |
|---|--------------|--|-------|-----|-------|
| Code  | Prerequisite | compulsory courses                       | Hours |     |       |
|   |              |  | Lect. | T/P | Cred. |
| Ent 220   | -            | Insect Embryology and Anatomy            | 2     | -/٢ | 3     |
| Ent 222   | Ent 223      | Insect Taxonomy (2)                      | ١     | -/٢ | 2     |
| Ent 223   | Zoo 102      | Insect Morphology and Taxonomy (1)       | 2     | -/3 | 3     |
| Ent 225   | -            | Cell Biology and Molecular Biology       | 2     | -/- | 2     |
| Ent 340   | Ent 343      | Chemical Insecticides                    | 2     | -/2 | 3     |
| Ent 341   | -            | Insect Pests of Plants                   | 1     | -/٢ | 2     |
| Ent 342   | -            | Biological Control of Pests and Immunity | 2     | -/2 | 3     |
| Ent 343   | Ent 220      | Insect Physiology                        | 2     | -/٣ | 3     |
| Ent 461   | Ent 222      | Medical and Veterinary Entomology        | 2     | -/2 | 3     |
| Ent 462   | Ent 222      | Insect Ecology and Behavior              | 2     | -/2 | 3     |
| Ent 463   | Ent 340      | Integrated Pest Management               | 1     | -/2 | 2     |
| Ent 466   | Ent 22٢      | Insect Rearing and Preservation          | -     | -/3 | 1     |
| The student studies 30 compulsory hours of microbiology courses |              |  |       |     |       |
| Bot 251   | Bot 100      | Plant Physiology (1)                     | 2     | -/- | 2     |
| Mic 262   | Bot 100      | Mycology                                 | 2     | -/3 | 3     |
| Mic 271   | Bot 100      | Bacteriology                             | 2     | -/3 | 3     |
| Mic 272   | Bot 100      | Actinomycetes                            | 1     | -/3 | 2     |
| Mic 275   | Bot 100      | Phycology                                | 2     | -/3 | 3     |
| Mic 381   | Mic 271      | Virology                                 | 2     | -/3 | 3     |
| Mic 382   | Mic 271      | Microbial Immunology                     | 2     | -/3 | 3     |
| Mic 391   | Mic 271      | Physiology of Microorganisms             | 2     | -/3 | 3     |
| Mic 481   | Mic 271      | Plant Pathology                          | 1     | -/3 | 2     |
| Mic 491   | Mic 391      | Industrial Microbiology                  | 2     | -/3 | 3     |
| Mic 492   | Mic 271      | Medical Microbiology                     | 2     | -/3 | 3     |

## ثانياً: المقررات الاختيارية

(\*) يدرس الطالب ١٤ ساعة معتمدة من مقررات علم الحشرات و ١٤ ساعة معتمدة من مقررات الميكروبيولوجى كالاتى:

| The student chooses 14 elective hours of Entomology courses   |              |   |       |     |       |
|---|--------------|---|-------|-----|-------|
| Code  | Prerequisite | Elective Courses  | Hours |     |       |
|   |              |   | Lect. | T/P | Cred. |
| Bot 213   | Bot 105      | Principles of Cytology and Genetics                     | 1     | -/2 | 2     |
| Ent 230   | Ent 222      | Management of Beneficial Insects' Projects              | 1     | -/2 | 2     |
| Ent 235   | Ent 222      | Beneficial Insects                                      | 1     | -/2 | 2     |
| Ent 347   | -            | Selected Topics 1                                       | 2     | -/3 | 3     |
| Ent 349   | Ent 225      | Introduction in Insect Biotechnology and Bioinformatics | 2     | -/3 | 3     |
| Ent 350   | -            | Field Training  | 1     | -/4 | 3     |
| Ent 355   | -            | Experimental Design for Insect Control                  | 2     | -/2 | 3     |
| Ent 467   | Ent 461      | Forensic Entomology                                     | ١     | -/٣ | ٢     |
| Ent 470   | Ent 222      | Aquatic Insects   | 2     | -/- | ٢     |
| Ent 472   | Ent 463      | New Trends In Insect Control                            | 1     | -/3 | 2     |
| Ent 475   | Ent 222      | Stored Product Insects                                  | ١     | -/٢ | ٢     |
| Ent 476   | -            | Insect Pathology  | 2     | -/- | 2     |
| The student chooses 14 elective hours of microbiology courses |              |   |       |     |       |
| Mic 282   | Bot 100      | Molecular Biology                                       | 2     | -/- | 2     |
| Mic 291   | Bot 100      | Microbiological Laboratory Techniques                   | 1     | -/3 | 2     |
| Mic 292   | Bot 100      | Yeasts  | 1     | -/3 | 2     |
| Mic 392   | Bot 100      | Microbial Toxins  | 1     | -/3 | 2     |
| Mic 394   | Bot 100      | Microbial Enzymes                                       | 1     | -/3 | 2     |
| Mic 395   | Bot 100      | Soil Microbiology                                       | 1     | -/3 | 2     |
| Mic 397   | Mic 282      | Microbial Genetics                                      | 2     | -/- | 2     |
| Mic 482   | Bot 105      | Molecular Plant-microbe Interaction                     | 2     | -/- | 2     |
| Mic 495   | Bot 100      | Antibiotics   | 1     | -/3 | 2     |
| Mic 496   | Bot 100      | Water and Food Microbiology                             | 1     | -/3 | 2     |
| Mic 497   | Mic 271      | Bio-fertilizers   | 1     | -/3 | 2     |
| Mic 498   | Bot 100      | Microbial Biotechnology                                 | 1     | -/3 | 2     |

ثالثاً: مقررات الاختيار الحر

يدرس الطالب ٦ ساعات معتمدة من المقررات الآتية:

| Code    | Prerequisite | Free Optional Courses                     | Hours |     |       |
|---------|--------------|---|-------|-----|-------|
|         |              |   | Lect. | T/P | Cred. |
| Geo 211 | -            | Macrofossils                              | 1     | -/3 | 2     |
| Com 223 | -            | Logic Design (1)                          | 1     | 2/- | 2     |
| Chm 217 | -            | Industrial Chemistry and Economic Studies | 2     | -/- | 2     |
| Bph 280 | -            | Basis of Biophysics                       | 1     | -/2 | 2     |
| Zoo 360 | -            | Fundamentals of Parasitology              | 1     | -/2 | ٢     |
| Zoo 370 | -            | Selected Topics in Zoology                | 1     | -/2 | 2     |

رابعاً: التدريب الميداني (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title               | Lect. | T/P | Cred. |
|---------|--------------|----------------------------|-------|-----|-------|
| Ent 358 | -            | Applied and Field Training | -     | -/- | 3     |

خامساً: مقرر البحث والمقال (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title       | Lect. | T/P | Cred. |
|---------|--------------|--------------------|-------|-----|-------|
| Ent 400 | -            | Research and Essay | 3     | -/- | 3     |

سادساً: توزيع مقررات برنامج حشرات وميكروبيولوجى على المستويات الدراسية

**المستوى الثانى: الفصل الدراسى الأول**

| Level 2/Semester 1  |              | Course Title                          | Hours |     |       |
|---|--------------|---------------------------------------|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 13 hours          | Lect. | T/P | Cred. |
| Ent 223   | Zoo 102      | Insect Morphology and Taxonomy (1)    | 2     | -/3 | 3     |
| Ent 225   | -            | Cell Biology and Molecular Biology    | 2     | -/- | 2     |
| Bot 251   | Bot 100      | Plant Physiology                      | 2     | -/- | 2     |
| Mic 271   | Bot 100      | Bacteriology                          | 2     | -/3 | 3     |
| Mic 275   | Bot 100      | Phycology                             | 2     | -/3 | 3     |
| <b>Elective Courses: (The student chooses 2 hours of Botany and microbiology courses)</b> |              |                                       |       |     |       |
| Bot 213   | Bot 105      | Principles of Cytology and Genetics   | 1     | -/2 | 2     |
| Mic 291   | Bot 100      | Microbiological Laboratory Techniques | 1     | -/3 | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b>                               |              |                                       |       |     |       |
| Geo 211   | -            | Macrofossils                          | 1     | -/3 | 2     |
| Com 223   | -            | Logic Design (1)                      | 1     | 2/- | 2     |
| <b>Total: 13 + 2 + 2 = 17 Hours</b>   |              |                                       |       |     |       |

**المستوى الثانى: الفصل الدراسى الثانى**

| Level 2/Semester 2   |              | Course Title                              | Hours |     |       |
|--|--------------|---|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 10 hours              | Lect. | T/P | Cred. |
| Ent 220  | -            | Insect Embryology and Anatomy             | 2     | -/2 | 3     |
| Ent 222  | Ent 223      | Insect Taxonomy (2)                       | 1     | -/2 | 2     |
| Mic 262  | Bot 100      | Mycology                                  | 2     | -/3 | 3     |
| Mic 272  | Bot 100      | Actinomycetes                             | 1     | -/3 | 2     |
| <b>Elective Courses: (The student chooses 2 hours of Entomology courses)</b>   |              |   |       |     |       |
| Ent 230  | Ent 222      | Management of Beneficial Insects Projects | 1     | -/2 | 2     |
| Ent 235  | Ent 222      | Beneficial Insects                        | 1     | -/2 | 2     |
| <b>Elective Courses: (The student chooses 2 hours of microbiology courses)</b> |              |   |       |     |       |
| Mic282   | Bot 100      | Molecular Biology                         | 2     | -/- | 2     |
| Mic 292  | Bot 100      | Yeasts                                    | 1     | -/3 | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b>                    |              |   |       |     |       |
| Chm 217  | -            | Industrial Chemistry and Economic Studies | 2     | -/- | 2     |
| Bph 280  | -            | Basis of Biophysics                       | 1     | -/2 | 2     |
| <b>Total: 10+ 2+2+2 = 16 Hours</b>   |              |   |       |     |       |

المستوى الثالث: الفصل الدراسي الأول

| Level 3/Semester 1   |              | Course Title  | Hours |     |       |
|--|--------------|---|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 11 hours                            | Lect. | T/P | Cred. |
| Ent 341  | -            | Insect Pests of Plants                                  | 1     | -/٢ | 2     |
| Ent 343  | Ent 220      | Insect Physiology                                       | 2     | -/٣ | 3     |
| Mic 381  | Mic 271      | Virology  | 2     | -/3 | 3     |
| Mic 391  | Mic 271      | Physiology of Microorganisms                            | 2     | -/3 | 3     |
| <b>Elective Courses (Mic): (The student chooses 2 hours of microbiology courses)</b> |              |   |       |     |       |
| Mic 395  | Bot 100      | Soil Microbiology                                       | 1     | -/3 | 2     |
| Mic 397  | Mic 282      | Microbial Genetics                                      | 2     | -/- | 2     |
| <b>Elective Courses (Ent): (The student chooses 3 hours of Entomology courses)</b>   |              |   |       |     |       |
| Ent 347  | -            | Selected Topics 1                                       | 2     | -/3 | 3     |
| Ent 349  | Ent225       | Introduction in Insect Biotechnology and Bioinformatics | 2     | -/3 | 3     |
| <b>Total: 11+ 2+3 = 16 Hours</b>   |              |   |       |     |       |

المستوى الثالث: الفصل الدراسي الثاني

| Level 3/Semester 2  |              | Course Title                             | Hours |     |       |
|---|--------------|--|-------|-----|-------|
| Code  | Prerequisite | Compulsory Courses: 9 hours              | Lect. | T/P | Cred. |
| Ent 340   | Ent 343      | Chemical Insecticides                    | 2     | -/2 | 3     |
| Ent 342   | -            | Biological Control of Pests and Immunity | 2     | -/2 | 3     |
| Mic 382   | Mic 271      | Microbial Immunology                     | 2     | -/3 | 3     |
| <b>Elective Courses: (The student chooses 3 hours of Entomology courses)</b>              |              |  |       |     |       |
| Ent 350   | -            | Field Training                           | 1     | -/4 | 3     |
| Ent 355   | -            | Experimental Design for Insect Control   | 2     | -/2 | 3     |
| <b>Elective Courses: (The student chooses 2 hours of Botany and microbiology courses)</b> |              |  |       |     |       |
| Mic 392   | Bot 100      | Microbial Toxins                         | 1     | -/3 | 2     |
| Mic 394   | Bot 100      | Microbial Enzymes                        | 1     | -/3 | 2     |
| <b>Training: 3 hours</b>  |              |  |       |     |       |
| Ent 358   | -            | Applied and Field Training               | -     | -/- | 3     |
| <b>Total: 9+ 3+2 + 3= 17 Hours</b>  |              |  |       |     |       |



المستوى الرابع: الفصل الدراسي الأول

| Level 4/Semester 1   |              | Course Title                      | Hours |     |       |
|--|--------------|-----------------------------------|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 10 hours      | Lect. | T/P | Cred. |
| Ent 461  | Ent 222      | Medical and Veterinary Entomology | 2     | -/2 | 3     |
| Ent 463  | Ent 340      | Integrated Pest Management        | 1     | -/2 | 2     |
| Mic 481  | Mic 271      | Plant Pathology                   | 1     | -/3 | 2     |
| Mic 491  | Mic 391      | Industrial Microbiology           | 2     | -/3 | 3     |
| <b>Elective Courses: (The student chooses 2 hours of microbiology courses)</b> |              |                                   |       |     |       |
| Mic 495  | Bot 100      | Antibiotics                       | 1     | -/3 | 2     |
| Mic 497  | Mic 271      | Bio-fertilizers                   | 1     | -/3 | 2     |
| <b>Elective Courses: (The student chooses 4 hours of Entomology courses)</b>   |              |                                   |       |     |       |
| Ent 467  | Ent 461      | Forensic Entomology               | ١     | -/٣ | ٢     |
| Ent 470  | Ent 222      | Aquatic Insects                   | 2     | -/- | ٢     |
| Ent 475  | Ent 222      | Stored Product Insects            | ١     | -/٢ | ٢     |
| <b>Total: 10+ 2+ 4 = 16 Hours</b>  |              |                                   |       |     |       |

المستوى الرابع: الفصل الدراسي الثاني

| Level 4/Semester 2   |              | Course Title                        | Hours |     |       |
|--|--------------|-------------------------------------|-------|-----|-------|
| Code   | Prerequisite | Compulsory Courses: 7 hours         | Lect. | T/P | Cred. |
| Ent 462  | Ent 222      | Insect Ecology and Behavior         | 2     | -/2 | 3     |
| Ent 466  | Ent 22٢      | Insect Rearing and Preservation     | -     | -/3 | 1     |
| Mic 492  | Mic 271      | Medical Microbiology                | 2     | -/3 | 3     |
| <b>Elective Courses : (The student chooses 2 hours of Entomology courses)</b>  |              |                                     |       |     |       |
| Ent 472  | Ent 463      | New Trends in Insect Control        | 1     | -/3 | 2     |
| Ent 476  | -            | Insect Pathology                    | 2     | -/- | 2     |
| <b>Elective Courses: (The student chooses 4 hours of microbiology courses)</b> |              |                                     |       |     |       |
| Mic 482  | Bot 105      | Molecular Plant-microbe Interaction | 2     | -/- | 2     |
| Mic 496  | Bot 100      | Water and Food Microbiology         | 1     | -/3 | 2     |
| Mic 498  | Bot 100      | Microbial Biotechnology             | 1     | -/3 | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b>                    |              |                                     |       |     |       |
| Zoo 360  | -            | Fundamentals of Parasitology        | 1     | -/2 | ٢     |
| Zoo 370  | -            | Selected Topics in Zoology          | 1     | -/2 | 2     |
| <b>Research: 3 hours</b>   |              |                                     |       |     |       |
| Ent 400  | -            | Research and Essay in insects       | 3     | -/- | 3     |
| <b>Total: 7+ 2+4+ +2+3 = 18 Hours</b>  |              |                                     |       |     |       |

(١٨) برنامج الجيولوجيا

أولاً: مقررات التخصص الاجباري (٦٠ ساعة معتمدة)

| Code    | Prerequisite | Compulsory Courses                         | Hours |       |       |
|---------|--------------|--|-------|-------|-------|
|         |              |  | Lect. | E./P. | Cred. |
| Geo 205 | Geo 100      | Planar Survey                              | 1     | -/3   | 2     |
| Geo 215 | Geo 100      | Invertebrate Paleontology                  | 2     | -/3   | 3     |
| Geo 216 | Geo 215      | Micropaleontology                          | 2     | -/3   | 3     |
| Geo 220 | Geo 105      | Sedimentary Environments and Facies        | 1     | -/3   | 2     |
| Geo 225 | Geo 105      | Sedimentary Petrology                      | 2     | -/3   | 3     |
| Geo 239 | Geo 105      | Crystallography and Optical Mineralogy (1) | 2     | -/3   | 3     |
| Gph 250 | Geo 105      | Principals of Geophysics                   | 2     | -/3   | 3     |
| Geo 305 | Geo 105      | Field Trip (1)                             |       | -/3   | 1     |
| Geo 308 | Geo 310      | Geomorphology and Remote Sensing           | 1     | -/3   | 2     |
| Geo 310 | Geo 216      | Stratigraphy                               | 2     | -/3   | 3     |
| Geo 333 | Geo 239      | Igneous Petrology                          | 2     | -/3   | 3     |
| Geo 334 | Geo 333      | Basement Complex                           | 1     | -/3   | 2     |
| Geo 335 | Geo 333      | Geochemistry                               | 2     | -/3   | 3     |
| Geo 338 | Geo 239      | Metamorphic Petrology                      | 1     | -/3   | 2     |
| Geo 340 | Geo 100      | Structural Geology and Geotectonics        | 2     | -/3   | 3     |
| Gph 352 | Gph 250      | Subsurface Geology                         | 1     | -/3   | 2     |
| Geo 365 | Geo 100      | Hydrogeology                               | 2     | -/3   | 3     |
| Geo 403 | Geo 310      | Engeeniring Geology                        | ١     | -/3   | ٢     |
| Geo 405 | Geo 310      | Field Trip (2)                             | -     | -/3   | 1     |
| Geo 415 | Geo 310      | Geology of Egypt                           | 2     | -/3   | 3     |
| Geo 430 | Geo 334      | Ore Microscopy and Ore Petrology           | 2     | -/3   | 3     |
| Geo 435 | Geo 334      | Economic Geology                           | 2     | -/3   | 3     |
| Geo 460 | Geo 365      | Hydrogeochemistry                          | 1     | -/3   | 2     |
| Geo 466 | Geo 340      | Petroleum Geology                          | 2     | -/3   | 3     |

ثانياً: المقررات الاختيارية

يدرس الطالب ٢٨ ساعة معتمدة من المقررات الآتية:

| Code    | Prerequisite | Elective Courses                             | Hours |       |       |
|---------|--------------|--|-------|-------|-------|
|         |              |  | Lect. | E./P. | Cred. |
| Geo 234 | Geo 105      | Gemstones                                    | 1     | -/2   | 2     |
| Geo 235 | Geo 105      | Volcanology                                  | 1     | -/3   | 2     |
| Geo 236 | Geo 105      | Rock Forming Minerals of Hard Rocks          | 1     | -/3   | 2     |
| Geo 240 | -            | Geographic Information System                | 1     | -/3   | 2     |
| Gph 253 | -            | Marine Geophysical Exploration               | 1     | -/3   | 2     |
| Gph 255 | Geo 100      | Principles of Seismic Survey                 | 1     | -/3   | 2     |
| Geo 300 | -            | Environmental Geology                        | 1     | -/3   | 2     |
| Geo 302 | Geo 310      | Mining Geology                               | 2     | -/-   | 2     |
| Geo 314 | Geo 310      | Vertbrate Paleontology                       | 1     | -/3   | 2     |
| Geo 317 | Geo 216      | Paleontology                                 | 1     | -/3   | 2     |
| Geo 319 | Geo 216      | Paleoecology                                 | 1     | -/3   | 2     |
| Geo 330 | Geo 333      | Analytical Techniques                        | 1     | -/3   | 2     |
| Geo 332 | Geo 333      | Isotope Geochemistry                         | 1     | -/3   | 2     |
| Geo 341 | Geo 225      | Rock Mechanics                               | 1     | -/3   | 2     |
| Geo 411 | Geo 310      | Quaternary Geology                           | 1     | -/3   | 2     |
| Geo 414 | Geo 310      | Magneto- and Chemostratigraphy               | 1     | -/3   | 2     |
| Geo 425 | Geo 320      | Sequence Stratigraphy and Sedimentary Basins | 1     | -/3   | 2     |
| Geo 427 | Geo 320      | Marine Geology                               | 1     | -/3   | 2     |
| Geo 432 | Geo 335      | Geology of Mineral Exploration               | 1     | -/3   | 2     |
| Geo 436 | Geo 335      | Geochemistry of Hard Rocks                   | 1     | -/3   | 2     |
| Geo 438 | Geo 430      | Ore Geochemistry                             | 1     | -/3   | 2     |
| Geo 440 | Geo 340      | Structural Analysis                          | 1     | -/3   | 2     |
| Geo 464 | Geo 310      | Petroleum Exploration                        | 1     | -/3   | 2     |
| Geo 468 | Geo 310      | Petroleum Geochemistry                       | 1     | -/3   | 2     |
| Gph 470 | Gph 250      | Well Logging                                 | 1     | -/3   | 2     |

ثالثاً: مقررات الاختيار الحر

يدرس الطالب ٦ ساعات معتمدة من المقررات الآتية:

| Code    | Prerequisite | Free Optional Courses                 | Hours |       |       |
|---------|--------------|---------------------------------------|-------|-------|-------|
|         |              |                                       | Lect. | E./P. | Cred. |
| Zoo 205 | -            | Introduction to Invertebrates         | 1     | -/2   | 2     |
| Chm 216 | -            | Organic Environmental Green Chemistry | 1     | -/2   | 2     |
| Zoo 227 | -            | Vertebrates                           | 1     | -/2   | 2     |
| Chm 236 | -            | Thermodynamics of Solutions           | 2     | -/-   | 2     |
| Phy 238 | -            | Radiation Physics                     | 1     | -/2   | 2     |
| Phy 240 | -            | Principles of Modern Physics          | 1     | -/3   | 2     |

رابعاً: التدريب الميداني (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title               | Lect. | E./P. | Cred. |
|---------|--------------|----------------------------|-------|-------|-------|
| Geo 306 | -            | Applied and Field Training | -     | -/-   | 3     |

خامساً: مقرر البحث والمقال (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title       | Lect. | E./P. | Cred. |
|---------|--------------|--------------------|-------|-------|-------|
| Geo 406 | -            | Research and Essay | 3     | -/-   | 3     |

سادساً: توزيع مقررات برنامج الجيولوجيا على المستويات الدراسية  
المستوى الثاني: الفصل الدراسي الأول

| Level 2 / Semester 1  |              | Course Title                               | Hours |       |       |
|---|--------------|--|-------|-------|-------|
| Code  | Prerequisite | Compulsory Courses: 11 hours               | Lect. | E./P. | Cred. |
| Geo 205   | Geo 100      | Planar Survey                              | 1     | -/3   | 2     |
| Geo 215   | Geo 100      | Invertebrate Paleontology                  | 2     | -/3   | 3     |
| Geo 239   | Geo 105      | Crystallography and Optical Mineralogy (1) | 2     | -/3   | 3     |
| Gph 250   | Geo 105      | Principals of Geophysics                   | 2     | -/3   | 3     |
| <b>Elective Courses: (The student chooses 4 hours)</b>      |              |  |       |       |       |
| Geo 240   | -            | Geographic Information System              | 1     | -/3   | 2     |
| Gph 253   | Gph 250      | Marine Geophysical Exploration             | 1     | -/3   | 2     |
| Gph 255   | Geo 100      | Principles of Seismic Survey               | 1     | -/3   | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |  |       |       |       |
| Zoo 205   | -            | Introduction to Invertebrates              | 1     | -/2   | 2     |
| Zoo 227   | -            | Vertebrates                                | 1     | -/2   | 2     |
| <b>Total: 11 + 4 + 2 = 17 Hours</b>                         |              |  |       |       |       |

المستوى الثاني: الفصل الدراسي الثاني

| Level 2 / Semester 2  |              | Course Title                          | Hours |       |       |
|---|--------------|---------------------------------------|-------|-------|-------|
| Code  | Prerequisite | Compulsory Courses: 8 hours           | Lect. | E./P. | Cred. |
| Geo 216   | Geo 215      | Micropaleontology                     | 2     | -/3   | 3     |
| Geo 220   | Geo 105      | Sedimentary Environments and Facies   | 1     | -/3   | 2     |
| Geo 225   | Geo 105      | Sedimentary Petrology                 | 2     | -/3   | 3     |
| <b>Elective Courses: (The student chooses 4 hours)</b>      |              |                                       |       |       |       |
| Geo234  | Geo 105      | Gemstones                             | 1     | -/3   | 2     |
| Geo235  | Geo 105      | Volcanology                           | 1     | -/3   | 2     |
| Geo236  | Geo 105      | Rock Forming Minerals of Hard Rocks   | 1     | -/3   | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |                                       |       |       |       |
| Chm 216   | -            | Organic Environmental Green Chemistry | 2     | -/-   | 2     |
| Chm 236   | -            | Thermodynamics of Solutions           | 2     | -/-   | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |                                       |       |       |       |
| Phy 238   | -            | Radiation Physics                     | 1     | -/2   | 2     |
| Phy 240   | -            | Principles of Modern Physics          | 1     | -/3   | 2     |
| <b>Total 8 + 4 + 2 + 2 = 16 Hours</b>                       |              |                                       |       |       |       |

المستوى الثالث: الفصل الدراسي الأول

| Level 3 / Semester 1                                   |              | Course Title                 | Hours |       |       |
|--|--------------|------------------------------|-------|-------|-------|
| Code   | Prerequisite | Compulsory Courses: 13 hours | Lect. | E./P. | Cred. |
| Geo 305  | Geo 105      | Field Trip (1)               | -     | -/3   | 1     |
| Geo 310  | Geo 216      | Stratigraphy                 | 2     | -/3   | 3     |
| Geo 333  | Geo 239      | Igneous Petrology            | 2     | -/3   | 3     |
| Geo 335  | Geo 333      | Geochemistry                 | 2     | -/3   | 3     |
| Geo 365  | Geo 100      | Hydrogeology                 | 2     | -/3   | 3     |
| <b>Elective Courses: (The student chooses 4 hours)</b> |              |                              |       |       |       |
| Geo 300  | -            | Environmental Geology        | 1     | -/3   | 2     |
| Geo 317  | Geo 216      | Paleontology                 | 1     | -/3   | 2     |
| Geo 319  | Geo 216      | Paleoecology                 | 1     | -/3   | 2     |
| Geo 341  | Geo 225      | Rock Mechanics               | 1     | -/3   | 2     |
| <b>Total: 13 + 4 = 17 Hours</b>                        |              |                              |       |       |       |

المستوى الثالث: الفصل الدراسي الثاني

| Level 3 / Semester 2                                   |              | Course Title                        | Hours |       |       |
|--|--------------|-------------------------------------|-------|-------|-------|
| Code   | Prerequisite | Compulsory Courses: 11 hours        | Lect. | E./P. | Cred. |
| Geo 308  | Geo 310      | Geomorphology and Remote Sensing    | 1     | -/3   | 2     |
| Geo 334  | Geo 333      | Basement Complex                    | 1     | -/3   | 2     |
| Geo 338  | Geo 239      | Metamorphic Petrology               | 1     | -/3   | 2     |
| Geo 340  | Geo 100      | Structural Geology and Geotectonics | 2     | -/3   | 3     |
| Gph 352  | Gph 250      | Subsurface Geology                  | 1     | -/3   | 2     |
| <b>Elective Courses: (The student chooses 4 hours)</b> |              |                                     |       |       |       |
| Geo 302  | Geo 310      | Mining Geology                      | 2     | -/-   | 2     |
| Geo 314  | Geo 310      | Vertebrate Paleontology             | 1     | -/3   | 2     |
| Geo 330  | Geo 333      | Analytical Techniques               | 1     | -/3   | 2     |
| Geo 332  | Geo 333      | Isotope Geochemistry                | 1     | -/3   | 2     |
| <b>Training: 3 hours</b>                               |              |                                     |       |       |       |
| Geo 306  | -            | Applied and Field Training          | -     | -/-   | 3     |
| <b>Total: 11 + 4 + 3 = 18 Hours</b>                    |              |                                     |       |       |       |

المستوى الرابع: الفصل الدراسي الأول

| Level 4 / Semester 1                                   |              | Course Title                                 | Hours |       |       |
|--|--------------|--|-------|-------|-------|
| Code   | Prerequisite | Compulsory Courses: 12 hours                 | Lect. | E./P. | Cred. |
| Geo 403  | Geo 310      | Engineering Geology                          | ١     | -/3   | ٢     |
| Geo 405  | Geo 310      | Field Trip (2)                               | -     | -/3   | 1     |
| Geo 415  | Geo 310      | Geology of Egypt                             | 2     | -/3   | 3     |
| Geo 430  | Geo 334      | Ore Microscopy and Ore Petrology             | 2     | -/3   | 3     |
| Geo 435  | Geo 333      | Economic Geology                             | 2     | -/3   | 3     |
| <b>Elective Courses: (The student chooses 4 hours)</b> |              |  |       |       |       |
| Geo 411  | Geo 310      | Quaternary Geology                           | 1     | -/3   | 2     |
| Geo 425  | Geo 320      | Sequence Stratigraphy and Sedimentary Basins | 1     | -/3   | 2     |
| Geo 427  | Geo 320      | Marine Geology                               | 1     | -/3   | 2     |
| Geo 440  | Geo 340      | Structural Analysis                          | 1     | -/3   | 2     |
| <b>Total: 12 + 4 = 16 Hours</b>                        |              |  |       |       |       |

المستوى الرابع: الفصل الدراسي الثاني

| Level 4 / Semester 2                                   |              | Course Title                    | Hours |       |       |
|--|--------------|---------------------------------|-------|-------|-------|
| Code   | Prerequisite | Compulsory Courses: 5 hours     | Lect. | E./P. | Cred. |
| Geo 460  | Geo 365      | Hydrogeochemistry               | 1     | -/3   | 2     |
| Geo 466  | Geo 340      | Petroleum Geology               | 2     | -/3   | 3     |
| <b>Elective Courses: (The student chooses 8 hours)</b> |              |                                 |       |       |       |
| Geo 414  | Geo 310      | Magneto- and Chemostratigraphy  | 1     | -/3   | 2     |
| Geo 432  | Geo 335      | Geology for Mineral Exploration | 1     | -/3   | 2     |
| Geo 436  | Geo 335      | Geochemistry of Hard Rocks      | 1     | -/3   | 2     |
| Geo 438  | Geo 430      | Ore Geochemistry                | 1     | -/3   | 2     |
| Geo 464  | Geo 310      | Petroleum Exploration           | 1     | -/3   | 2     |
| Geo 468  | Geo 310      | Petroleum Geochemistry          | 1     | -/3   | 2     |
| Gph 470  | Gph 250      | Well Logging                    | 1     | -/3   | 2     |
| <b>Research: 3 hours</b>                               |              |                                 |       |       |       |
| Geo 406  | -            | Research and Essay in Geology   | 3     | -/-   | 3     |
| <b>Total: 5 + 8 + 3 = 16 Hours</b>                     |              |                                 |       |       |       |

(١٩) برنامج الجيوفيزياء

أولاً: مقررات التخصص الاجباري (٦٠ ساعة معتمدة)

| Code    | Prerequisite | Compulsory Courses  | Hours |       |       |
|---------|--------------|---|-------|-------|-------|
|         |              |   | Lect. | E./P. | Cred. |
| Geo 205 | Geo 100      | Planner Survey  | 1     | -/3   | 2     |
| Geo 210 | Geo 100      | Paleontology  | 2     | -/3   | 3     |
| Geo 230 | Geo 105      | Rock Forming Minerals   | 2     | -/3   | 3     |
| Gph 250 | Geo 100      | Principals of Geophysics                                      | 2     | -/3   | 3     |
| Gph 254 | Gph 250      | Seismic Survey  | 2     | -/3   | 3     |
| Gph 256 | Gph 250      | Electric and Electromagnetic Survey                           | 2     | -/3   | 3     |
| Gph 258 | Gph 250      | Gravity and Magnetic Survey                                   | 1     | -/3   | 2     |
| Gph 305 | Geo 105      | Field Trip (1)  | -     | -/3   | 1     |
| Geo 310 | Geo 210      | Stratigraphy  | 2     | -/3   | 3     |
| Geo 321 | Geo 105      | Sedimentary Petrology and Sedimentation                       | 2     | -/3   | 3     |
| Geo 336 | Geo 105      | Igneous and Metamorphic Petrology                             | 2     | -/3   | 3     |
| Geo 340 | Geo 100      | Structural Geology and Geotectonics                           | ٢     | -/3   | 3     |
| Gph 350 | Gph 250      | Seismology (Earthquakes)                                      | 1     | -/3   | 2     |
| Gph 351 | Gph 254      | Seismic Processing and Interpretation                         | 2     | -/3   | 3     |
| Gph 352 | Gph 250      | Subsurface Geology  | 1     | -/3   | 2     |
| Gph 355 | Gph 258      | Processing and Interpretation of Potential Field Data         | 2     | -/3   | 3     |
| Gph 356 | Gph 256      | Geoelectric and Electromagnetic Processing and Interpretation | ١     | -/3   | ٢     |
| Geo 365 | Geo 100      | Hydrogeology  | 2     | -/3   | 3     |
| Gph 405 | Geo 310      | Field Trip (2)  | -     | -/3   | 1     |
| Geo 415 | Geo 310      | Geology of Egypt  | 2     | -/3   | 3     |
| Gph 453 | Gph 250      | Geothermal and Radiation Methods                              | 1     | -/3   | 2     |
| Gph 454 | Gph 457      | Petrophysics  | 1     | -/3   | 2     |
| Gph 457 | Gph 250      | Well Logging and Formations Evaluation                        | 1     | -/3   | 2     |
| Geo 463 | Geo 100      | Principals of Petroleum Geology                               | 2     | -/3   | 3     |



ثانياً: المقررات الاختيارية

يدرس الطالب ٢٨ ساعة معتمدة من المقررات الآتية:

| Code    | Prerequisite | Elective Courses                       | Hours |       |       |
|---------|--------------|--|-------|-------|-------|
|         |              |  | Lect. | E./P. | Cred. |
| Geo 203 | Geo 100      | Geomorphology                          | 1     | -/3   | 2     |
| Geo 232 | Geo 105      | Crystallography                        | 1     | -/3   | 2     |
| Geo 234 | Geo 105      | Gemstones                              | 1     | -/3   | 2     |
| Geo 235 | Geo 105      | Volcanology                            | 1     | -/3   | 2     |
| Geo 237 | Geo 105      | Optical Mineralogy                     | 1     | -/3   | 2     |
| Geo 240 | Geo 105      | Geographic Information System          | 1     | -/3   | 2     |
| Gph 252 | -            | Introduction to Paython and Matlab     | 1     | -/3   | 2     |
| Geo 319 | Geo 212      | Paleoecology                           | 1     | -/3   | 2     |
| Geo 330 | Geo 230      | Analytical Techniques                  | 1     | -/3   | 2     |
| Geo 331 | Geo 230      | Radioisotopes                          | 1     | -/3   | 2     |
| Geo 337 | Geo 230      | Basement Rocks of Egypt                | 1     | -/3   | 2     |
| Geo 433 | Geo 336      | Economic Geology of Egypt              | 1     | -/3   | 2     |
| Geo 436 | Geo 336      | Geochemistry of Hard Rocks             | 1     | -/3   | 2     |
| Gph 450 | Gph 254      | Seismic Stratigraphy                   | 2     | -/3   | 3     |
| Gph 451 | Gph 250      | Geophysics of Mineral Exploration      | 2     | -/3   | 3     |
| Gph 452 | Gph 250      | Marine Geophysics                      | 2     | -/-   | 2     |
| Gph 455 | Gph 250      | Engineering Drilling                   | 2     | -/3   | 3     |
| Gph 456 | Gph 250      | Environmental Geophysics               | 2     | -/3   | 3     |
| Gph 458 | Gph 250      | Geophysical Data Integration           | 2     | -/3   | 3     |
| Gph 459 | Gph 250      | Engineering Geophysics                 | 2     | -/3   | 3     |
| Geo 460 | Geo 365      | Hydrogeochemistry                      | 1     | -/3   | 2     |
| Geo 461 | Geo 340      | Petroleum of Egypt                     | 2     | -/3   | 3     |
| Geo 465 | Geo 340      | Physical Properties of Reservoir Rocks | 2     | -/3   | 3     |
| Gph 469 | Gph 250      | Paleomagnetism                         | 2     | -/3   | 3     |

ثالثاً: مقررات الاختيار الحر

يدرس الطالب ٦ ساعات معتمدة من المقررات الآتية:

| Code    | Prerequisite | Free Optional Courses             | Hours |       |       |
|---------|--------------|-----------------------------------|-------|-------|-------|
|         |              |                                   | Lect. | E./P. | Cred. |
| Chm 213 | -            | Petroleum and Petrochemicals      | 2     | -/-   | 2     |
| Phy 229 | -            | Principals of Wave and Vibrations | 1     | -/2   | 2     |
| Chm 236 | -            | Thermodynamics of Solutions       | 2     | -/-   | 2     |
| Phy 239 | -            | Electromagnetism                  | 1     | -/2   | 2     |
| Bot 275 | -            | Introduction to Bacteria          | 1     | -/2   | 2     |
| Phy 245 | -            | Introduction to Physical Optics   | 1     | -/3   | 2     |

رابعاً: التدريب الميداني (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title               | Lect. | E./P. | Cred. |
|---------|--------------|----------------------------|-------|-------|-------|
| Gph 306 | -            | Applied and Field Training | -     | -/-   | 3     |

خامساً: مقرر البحث والمقال (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title       | Lect. | E./P. | Cred. |
|---------|--------------|--------------------|-------|-------|-------|
| Gph 406 | -            | Research and Essay | 3     | -/-   | 3     |

سادساً: توزيع مقررات برنامج الجيوفيزياء على المستويات الدراسية  
المستوى الثاني: الفصل الدراسي الأول

| Level 2 / Semester 1  |              | Course Title                      | Hours |       |       |
|---|--------------|-----------------------------------|-------|-------|-------|
| Code  | Prerequisite | Compulsory Courses: 9 hours       | Lect. | E./P. | Cred. |
| Geo 210   | Geo 100      | Paleontology                      | 2     | -/3   | 3     |
| Geo 230   | Geo 105      | Rock Forming Minerals             | 2     | -/3   | 3     |
| Gph 250   | Geo 100      | Principals of Geophysics          | 2     | -/3   | 3     |
| <b>Elective Courses: (The student chooses 4 hours)</b>      |              |                                   |       |       |       |
| Geo 203   | Geo 100      | Geomorphology                     | 1     | -/3   | 2     |
| Geo 235   | Geo 105      | Volcanology                       | 1     | -/3   | 2     |
| Geo 237   | Geo 105      | Optical Mineralogy                | 1     | -/3   | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |                                   |       |       |       |
| Chm 213   | -            | Petroleum and Petrochemicals      | 2     | -/-   | 2     |
| Phy 229   | -            | Principals of Wave and Vibrations | 1     | -/2   | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |                                   |       |       |       |
| Phy 239   | -            | Electromagnetism                  | 1     | -/2   | 2     |
| Bot 275   | -            | Introduction to Bacteria          | 1     | -/2   | 2     |
| <b>Total: 9 + 4 + 4 = 17 Hours</b>                          |              |                                   |       |       |       |

المستوى الثاني: الفصل الدراسي الثاني

| Level 2 / Semester 2  |              | Course Title                        | Hours |       |       |
|---|--------------|-------------------------------------|-------|-------|-------|
| Code  | Prerequisite | Compulsory Courses: 10 hours        | Lect. | E./P. | Cred. |
| Geo 20°   | Geo 100      | Planner Survey                      | 1     | -/3   | 2     |
| Gph 254   | Gph 250      | Seismic Survey                      | 2     | -/3   | 3     |
| Gph 256   | Gph 250      | Electric and Electromagnetic Survey | 2     | -/3   | 3     |
| Gph 258   | Gph 250      | Gravity and Magnetic Survey         | 1     | -/3   | 2     |
| <b>Elective Courses: (The student chooses 4 hours)</b>      |              |                                     |       |       |       |
| Geo 232   | Geo 105      | Crystallography                     | 1     | -/3   | 2     |
| Geo 234   | Geo 105      | Gemstones                           | 1     | -/3   | 2     |
| Geo 240   | Geo 105      | Geographic Information System       | 1     | -/3   | 2     |
| Gph 252   | -            | Introduction to Paython and Matlab  | 1     | -/3   | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b> |              |                                     |       |       |       |
| Chm 236   | -            | Thermodynamics of Solutions         | 2     | -/-   | 2     |
| Phy 245   | -            | Introduction to Physical Optics     | 1     | -/3   | 2     |
| <b>Total 10 + 4 + 2 = 16 Hours</b>                          |              |                                     |       |       |       |

المستوى الثالث: الفصل الدراسي الأول

| Level 3 / Semester 2                                   |              | Course Title                            | Hours |       |       |
|--|--------------|---|-------|-------|-------|
| Code   | Prerequisite | Compulsory Courses: 13 hours            | Lec.  | E./P. | Cred. |
| Gph 305  | Geo 105      | Field Trip (1)                          | -     | -/3   | 1     |
| Geo 310  | Geo 210      | Stratigraphy                            | 2     | -/3   | 3     |
| Geo 321  | Geo 105      | Sedimentary Petrology and Sedimentation | 2     | -/3   | 3     |
| Gph 351  | Gph 254      | Seismic Processing and Interpretation   | 2     | -/3   | 3     |
| Geo 365  | Geo 100      | Hydrogeology                            | 2     | -/3   | 3     |
| <b>Elective Courses: (The student chooses 4 hours)</b> |              |   |       |       |       |
| Geo 319  | Geo 212      | Paleoecology                            | 1     | -/3   | 2     |
| Geo 330  | Geo 230      | Analytical Techniques                   | 1     | -/3   | 2     |
| Geo 331  | Geo 230      | Radioisotopes                           | 1     | -/3   | 2     |
| Geo 337  | Geo 230      | Basement Rocks of Egypt                 | 1     | -/3   | 2     |
| <b>Total: 13 + 4 = 17 Hours</b>                        |              |   |       |       |       |

المستوى الثالث: الفصل الدراسي الثاني

| Level 3 / Semester 2            |              | Course Title  | Hours |       |       |
|---------------------------------|--------------|---|-------|-------|-------|
| Code                            | Prerequisite | Compulsory Courses: 15 hours                                  | Lect. | E./P. | Cred. |
| Geo 336                         | Geo 105      | Igneous and Metamorphic Petrology                             | 2     | -/3   | 3     |
| Geo 340                         | Geo 100      | Structural Geology and Geotectonics                           | 2     | -/3   | 3     |
| Gph 350                         | Gph 250      | Seismology (Earthquakes)                                      | 1     | -/3   | 2     |
| Gph 352                         | Gph 250      | Subsurface Geology  | 1     | -/3   | 2     |
| Gph 355                         | Gph 258      | Processing and Interpretation of Potential Field Data         | 2     | -/3   | 3     |
| Gph 356                         | Gph 256      | Geoelectric and Electromagnetic Processing and Interpretation | 1     | -/3   | 2     |
| <b>Training: 3 hours</b>        |              |   |       |       |       |
| Gph 306                         | -            | Applied and Field Training                                    | -     | -/-   | 3     |
| <b>Total: 15 + 3 = 18 Hours</b> |              |   |       |       |       |

المستوى الرابع: الفصل الدراسي الأول

| Level 4 / Semester 1                                   |              | Course Title                           | Hours |       |       |
|--|--------------|--|-------|-------|-------|
| Code   | Prerequisite | Compulsory Courses: 10 hours           | Lect. | E./P. | Cred. |
| Geo 415  | Geo 310      | Geology of Egypt                       | 2     | -/3   | 3     |
| Gph 453  | Gph 250      | Geothermal and Radiation Methods       | 1     | -/3   | 2     |
| Gph 457  | Gph 250      | Well Logging and Formations Evaluation | 1     | -/3   | 2     |
| Geo 463  | Geo 100      | Principals of Petroleum Geology        | 2     | -/3   | 3     |
| <b>Elective Courses: (The student chooses 6 hours)</b> |              |  |       |       |       |
| Gph 451  | Gph 250      | Geophysics of Mineral Exploration      | 1     | -/3   | 2     |
| Gph 459  | Gph 250      | Engineering Geophysics                 | 2     | -/3   | 3     |
| Geo 460  | Geo 365      | Hydrogeochemistry                      | 1     | -/3   | 2     |
| Geo 461  | Geo 100      | Petroleum in Egypt                     | 2     | -/3   | 3     |
| Gph 469  | Gph 250      | Paleomagnetism                         | 1     | -/3   | 2     |
| <b>Total: 10 + 6 = 16 Hours</b>                        |              |  |       |       |       |

المستوى الرابع: الفصل الدراسي الثاني

| Level 4 / Semester 2   |              | Course Title                           | Hours |       |       |
|--|--------------|--|-------|-------|-------|
| Code   | Prerequisite | Compulsory Courses: 3 hours            | Lect. | E./P. | Cred. |
| Gph 405  | Geo 310      | Field Trip (2)                         | -     | -/3   | 1     |
| Gph 454  | Gph 250      | Petrophysics                           | 1     | -/3   | 2     |
| <b>Elective Courses: (The student chooses 10 hours of Geology courses)</b> |              |  |       |       |       |
| Geo 433  | Geo 336,     | Economic Geology of Egypt              | 1     | -/3   | 2     |
| Geo 436  | Geo 336      | Geochemistry of Hard Rocks             | 1     | -/3   | 2     |
| Gph 450  | Gph 254      | Seismic Stratigraphy                   | 2     | -/3   | 3     |
| Gph 452  | Gph 250      | Marine Geophysics                      | 2     | -/-   | 2     |
| Gph 455  | Gph 250      | Engineering Drilling                   | 2     | -/3   | 3     |
| Gph 456  | Gph 250      | Environmental Geophysics               | 1     | -/3   | 2     |
| Gph 458  | Gph 250      | Geophysical Data Integration           | 2     | -/3   | 3     |
| Geo 465  | Geo 340      | Physical Properties of Reservoir Rocks | 2     | -/3   | 3     |
| <b>Research: 3 hours</b>   |              |  |       |       |       |
| Gph 406  | -            | Research and Essay in Geology          | 3     | -/-   | 3     |
| <b>Total: 3+10+3 = 16 Hours</b>  |              |  |       |       |       |

**(٢٠) برنامج الجيولوجيا والكيمياء**

أولاً: مقررات التخصص الاجباري (٦٠ ساعة معتمدة)

(\*) يدرس الطالب ٣٠ ساعة معتمدة من مقررات الجيولوجيا و ٣٠ ساعة معتمدة من مقررات الكيمياء كالآتي:

| The student studies 30 compulsory hours of Geology courses   |              |  |       |       |       |
|--|--------------|--|-------|-------|-------|
| Code   | Prerequisite | Compulsory Courses                         | Hours |       |       |
|  |              |  | Lect. | E./P. | Cred. |
| Geo 213  | Geo 100      | Macro and Micro Fossils                    | 2     | -/3   | 3     |
| Geo 237  | Geo 105      | Optical Mineralogy                         | 1     | -/3   | 2     |
| Geo 238  | Geo 105      | Principals of Petrology                    | 2     | -/3   | 3     |
| Geo 305  | Geo 105      | Field Trip (1)                             | -     | -/3   | 1     |
| Geo 310  | Geo 213      | Stratigraphy                               | 2     | -/3   | 3     |
| Geo 321  | Geo 105      | Sedimentary Petrology and Sedimentation    | 2     | -/3   | 3     |
| Geo 340  | Geo 100      | Structural Geology and Geotectonics        | 2     | -/3   | 3     |
| Geo 365  | Geo100       | Hydrogeology                               | 2     | -/3   | 3     |
| Geo 405  | Geo 310      | Field Trip (2)                             | -     | -/3   | 1     |
| Geo 419  | Geo 310      | Geology of Egypt and Basement Rocks        | 2     | -/3   | 3     |
| Geo 437  | Geo 237      | Geochemistry and Ore Geology               | 2     | -/3   | 3     |
| Geo 468  | Geo 321      | Petroleum Geochemistry                     | 1     | -/3   | 2     |
| The student studies 30 compulsory hours of Chemistry courses |              |  |       |       |       |
| Chm 212  | Chm 105      | Aromatic and Poly Nuclear Chemistry        | 2     | -/-   | 2     |
| Chm 213  | Chm 105      | Petroleum and Petrochemicals               | 2     | -/-   | 2     |
| Chm 222  | Chm 105      | Chemistry of Representative Elements       | 2     | -/3   | 3     |
| Chm 241  | Chm 105      | Analytical Chemistry (1)                   | 2     | -/3   | 3     |
| Chm 244  | Chm 241      | Environmental Analytical Chemistry (1)     | 2     | -/-   | 2     |
| Chm 310  | Chm 212      | Advanced Organic Chemistry                 | 2     | -/-   | 2     |
| Chm 324  | Chm 222      | Co-ordination Chemistry                    | 2     | -/-   | 2     |
| Chm 332  | Chm 222      | Surface Chemistry                          | 2     | -/-   | 2     |
| Chm 343  | Chm 241      | Analytical Chemistry (2)                   | 2     | -/3   | 3     |
| Chm 404  | Chm 324      | Organometallic Chemistry                   | 2     | -/-   | 2     |
| Chm 421  | Chm 324      | Nuclear and Radiation Chemistry            | 2     | -/-   | 2     |
| Chm 424  | Chm 222      | Chemistry of Lanthanides and Actinides (1) | 2     | -/-   | 2     |
| Chm 441  | Chm 105      | Instrumental Analysis (1)                  | 2     | -/3   | 3     |

ثانياً: المقررات الاختيارية

(\*) يدرس الطالب ١٤ ساعة معتمدة من مقررات الجيولوجيا و ١٤ ساعة معتمدة من مقررات الكيمياء كالآتي:

| The student chooses 14 elective hours of Geology courses   |              |   |       |       |       |
|--|--------------|---|-------|-------|-------|
| Code   | Prerequisite | Elective Courses                                    | Hours |       |       |
|  |              |   | Lect. | E./P. | Cred. |
| Geo 232  | Geo 105      | Crystallography                                     | 1     | -/3   | 2     |
| Geo 235  | Geo 105      | Volcanology   | 1     | -/3   | 2     |
| Geo 236  | Geo 105      | Rock Forming Minerals of Hard Rocks                 | 1     | -/3   | 2     |
| Gph 255  | Geo 100      | Principles of Seismic Survey                        | 1     | -/3   | 2     |
| Geo 313  | Geo 100      | Planar Survey and Chemostratigraphy                 | 2     | -/3   | 3     |
| Geo 315  | Geo 213      | Geomorphology and Paleocology                       | 2     | -/3   | 3     |
| Geo 333  | Geo 237      | Igneous Petrology                                   | 2     | -/3   | 3     |
| Geo 338  | Geo 237      | Metamorphic Petrology                               | 1     | -/3   | 2     |
| Geo 342  | Geo 340      | Remote Sensing                                      | 1     | -/3   | 2     |
| Geo 344  | Geo 340      | Engineering Geology and Mining                      | 1     | -/3   | 2     |
| Gph 352  | Geo 100      | Subsurface Geology                                  | 1     | -/3   | 2     |
| Geo 430  | Geo 334      | Ore Microscopy and Ore Petrology                    | 2     | -/3   | 3     |
| Geo 435  | Geo 237      | Economic Geology                                    | 2     | -/3   | 3     |
| Geo 460  | Geo 365      | Hydrogeochemistry                                   | 1     | -/3   | 2     |
| Geo 462  | Geo 365      | Hydrogeology of Egypt                               | 1     | -/3   | 2     |
| The student chooses 14 elective hours of Chemistry courses |              |   |       |       |       |
| Chm 221  | Chm 100      | Industrial Inorganic Chemistry (1)                  | 2     | -/-   | 2     |
| Chm 231  | Chm 105      | Chemical Thermodynamics                             | 2     | -/-   | 2     |
| Chm 232  | Chm 105      | Electrochemistry (1)                                | 2     | -/-   | 2     |
| Chm 242  | Chm 241      | Chemistry of Water Treatment (1)                    | 2     | -/-   | 2     |
| Chm 321  | Chm 222      | Industrial Inorganic Chemistry (2)                  | 2     | -/3   | 3     |
| Chm 322  | Chm 222      | Characterization of Inorganic Compounds             | 2     | /-3   | 3     |
| Chm 326  | Chm 222      | Chemistry of Inorganic Pigments                     | 2     | -/3   | 3     |
| Chm 331  | Chm 105      | Applied Electrochemistry                            | 2     | /-3   | 3     |
| Chm 400  | Chm222       | Nanochemistry and Applications                      | 2     | -/-   | 2     |
| Chm 434  | Chm 343      | Chemistry of Catalysis Technology                   | 2     | -/-   | 2     |
| Chm 439  | Chm 222      | Basis of Quantum and Statistical Dynamics Chemistry | 2     | -/-   | 2     |
| Chm 442  | Chm 343      | Analytical Chemistry (3) (Selected Topics)          | 1     | -/2   | 2     |

ثالثاً: مقررات الاختيار الحر

يدرس الطالب ٦ ساعات معتمدة من المقررات الآتية:

|         |              | Course Title                           | Hours |       |       |
|---------|--------------|--|-------|-------|-------|
| Code    | Prerequisite | Free Optional: 6 hours                 | Lect. | E./P. | Cred. |
| Com 223 | -            | Logic Design (1)                       | 1     | 2/-   | 2     |
| Phy 229 | -            | Principals of Wave and Vibrations      | 1     | -/2   | 2     |
| Phy 234 | -            | Radiation Physics and Its Applications | 2     | -/-   | 2     |
| Ent 235 | -            | Beneficial Insects                     | 2     | -/-   | 2     |
| Phy 239 | -            | Electromagnetism                       | 1     | -/2   | 2     |
| Ent 280 | -            | General insect Taxonomy and Ecology    | 2     | -/-   | 2     |

رابعاً: التدريب الميداني (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title               | Lect. | E./P. | Cred. |
|---------|--------------|----------------------------|-------|-------|-------|
| Geo 306 | -            | Applied and Field Training | -     | -/-   | 3     |

خامساً: مقرر البحث والمقال (٣ ساعات معتمدة)

| Code    | Prerequisite | Course Title       | Lect. | E./P. | Cred. |
|---------|--------------|--------------------|-------|-------|-------|
| Geo 406 | -            | Research and Essay | 3     | -/-   | 3     |



سادساً: توزيع مقررات برنامج الجيولوجيا والكيمياء على المستويات الدراسية  
المستوى الثاني: الفصل الدراسي الأول

| Level 2 / Semester 1  |              | Course Title                       | Hours |       |       |
|---|--------------|------------------------------------|-------|-------|-------|
| Code  | Prerequisite | Compulsory Courses: 10 hours       | Lect. | E./P. | Cred. |
| Chm 213   | Chm 105      | Petroleum and Petrochemicals       | 2     | -/-   | 2     |
| Geo 213   | Geo 100      | Macro and Micro Fossils            | 2     | -/3   | 3     |
| Geo 237   | Geo 105      | Optical Mineralogy                 | 1     | -/3   | 2     |
| Chm 241   | Chm 105      | Analytical Chemistry (1)           | 2     | -/3   | 3     |
| <b>Elective Courses: (The student chooses 2 hours of Chemistry courses)</b> |              |                                    |       |       |       |
| Chm 221   | Chm 105      | Industrial Inorganic Chemistry (1) | 2     | -/-   | 2     |
| Chm 231   | Chm 105      | Chemical Thermodynamics            | 2     | -/-   | 2     |
| <b>Elective Courses: (The student chooses 2 hours of Geology courses)</b>   |              |                                    |       |       |       |
| Geo 235   | Geo 105      | Volcanology                        | 1     | -/3   | 2     |
| Gph 255   | Geo100       | Principles of Seismic Survey       | 1     | -/3   | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b>                 |              |                                    |       |       |       |
| Com 223   | -            | Logic Design (1)                   | 1     | 2/-   | 2     |
| Phy 239   | -            | Electromagnetism                   | 1     | -/2   | 2     |
| <b>Total: 10 + 2+2 + 2 = 16 Hours</b>                                       |              |                                    |       |       |       |

المستوى الثاني: الفصل الدراسي الثاني

| Level 2 / Semester 2  |              | Course Title                           | Hours |       |       |
|---|--------------|--|-------|-------|-------|
| Code  | Prerequisite | Compulsory Courses: 10 hours           | Lect. | E./P. | Cred. |
| Chm 212   | Chm 105      | Aromatic and Polynuclear Chemistry     | 2     | -/-   | 2     |
| Chm 222   | Chm 105      | Chemistry of Representative Elements   | 2     | -/2   | 3     |
| Geo 238   | Geo 105      | Principals of Petrology                | 2     | -/3   | 3     |
| Chm 244   | Chm 241      | Environmental Analytical Chemistry (1) | 2     | -/-   | 2     |
| <b>Elective Courses: (The student chooses 2 hours of Geology courses)</b>   |              |  |       |       |       |
| Geo 232   | Geo 105      | Crystallography                        | 1     | -/3   | 2     |
| Geo 236   | Geo 105      | Rock Forming Minerals of Hard Rocks    | 1     | -/3   | 2     |
| <b>Elective Courses: (The student chooses 2 hours of Chemistry courses)</b> |              |  |       |       |       |
| Chm 232   | Chm 105      | Electrochemistry (1)                   | 2     | -/-   | 2     |
| Chm 242   | Chm 241      | Chemistry of Water Treatment           | 2     | -/-   | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b>                 |              |  |       |       |       |
| Ent 235   | -            | Beneficial Insects                     | 2     | -/-   | 2     |
| Phy 234   | -            | Radiation Physics and Its Applications | 2     | -/-   | 2     |
| <b>Total 10+ 2+2 +2 = 16 Hours</b>  |              |  |       |       |       |

المستوى الثالث: الفصل الدراسي الأول

| Level 3 / Semester 1  |              | Course Title                            | Hours |       |       |
|---|--------------|---|-------|-------|-------|
| Code  | Prerequisite | Compulsory Courses: 12 hours            | Lect. | E./P. | Cred. |
| Geo 310   | Geo 213      | Stratigraphy                            | 2     | -/3   | 3     |
| Geo 321   | Geo 105      | Sedimentary Petrology and Sedimentation | 2     | -/3   | 3     |
| Geo 340   | Geo 100      | Structural Geology and Geotectonics     | 2     | -/3   | 3     |
| Chm 343   | Chm 241      | Analytical Chemistry (2)                | 2     | -/3   | 3     |
| <b>Elective Courses: (The student chooses 3 hours of Geology courses)</b>   |              |   |       |       |       |
| Geo 313   | Geo 100      | Planar Survey and Chemostratigraphy     | 2     | -/3   | 3     |
| Geo 315   | Geo 213      | Geomorphology and Paleoecology          | 2     | -/3   | 3     |
| Geo 333   | Geo 237      | Igneous Petrology                       | 2     | -/3   | 3     |
| <b>Elective Courses: (The student chooses 3 hours of Chemistry courses)</b> |              |   |       |       |       |
| Chm 321   | Chm 222      | Industrial Inorganic Chemistry (2)      | 2     | -/3   | 3     |
| Chm 331   | Chm 105      | Applied Electrochemistry                | 2     | -/2   | 3     |
| <b>Total: 12 + 3+3 = 18 Hours</b>   |              |   |       |       |       |

المستوى الثالث: الفصل الدراسي الثاني

| Level 3 / Semester 2  |              | Course Title                            | Hours |       |       |
|---|--------------|---|-------|-------|-------|
| Code  | Prerequisite | Compulsory Courses: 10 hours            | Lect. | E./P. | Cred. |
| Geo 305   | Geo 105      | Field Trip (1)                          | -     | -/3   | 1     |
| Chm 310   | Chm 212      | Advanced Organic Chemistry              | 2     | -/-   | 2     |
| Chm 324   | Chm 222      | Co-ordination Chemistry                 | 2     | -/-   | 2     |
| Chm 332   | Chm 222      | Surface Chemistry                       | 2     | -/-   | 2     |
| Geo 365   | Geo 100      | Hydrogeology                            | 2     | -/3   | 3     |
| <b>Elective Courses: (The student chooses 2 hours of Geology courses)</b>   |              |   |       |       |       |
| Geo 334   | Geo 237      | Metamorphic Petrology                   | 1     | -/3   | 2     |
| Geo 342   | Geo 340      | Remote Sensing                          | 1     | -/3   | 2     |
| Geo 344   | Geo 340      | Engineering Geology and Mining          | 1     | -/3   | 2     |
| Gph 352   | Geo 100      | Subsurface Geology                      | 1     | -/3   | 2     |
| <b>Elective Courses: (The student chooses 3 hours of Chemistry courses)</b> |              |   |       |       |       |
| Chm 322   | Chm 222      | Characterization of Inorganic Compounds | 2     | -/3   | 3     |
| Chm 326   | Chm 222      | Chemistry of Inorganic Pigments         | 2     | -/3   | 3     |
| <b>Training: 3 hours</b>  |              |   |       |       |       |
| Geo 306   | -            | Applied and Field Training              | -     | -/6   | 3     |
| <b>Total: 10 + 2+ 3+3 = 18 Hours</b>  |              |   |       |       |       |

المستوى الرابع: الفصل الدراسي الأول

| Level 4 / Semester 1  |              | Course Title  | Hours |       |       |
|---|--------------|---|-------|-------|-------|
| Code  | Prerequisite | Compulsory Courses: 12 hours                        | Lect. | E./P. | Cred. |
| Geo 405   | Geo 310      | Field Trip (2)                                      | -     | -/3   | 1     |
| Geo 419   | Geo 310      | Geology of Egypt and Basement Rocks                 | 2     | -/3   | 3     |
| Chm 421   | Chm 324      | Nuclear and Radiation Chemistry                     | 2     | -/-   | 2     |
| Geo 437   | Geo 237      | Geochemistry and Ore Geology                        | 2     | -/3   | 3     |
| Chm 441   | Chm 105      | Instrumental Analysis (1)                           | 2     | -/3   | 3     |
| <b>Elective Courses: (The student chooses 2 hours of Chemistry courses)</b> |              |   |       |       |       |
| Chm 400   | Chm 222      | Nanochemistry and Applications                      | 2     | -/-   | 2     |
| Chm 439   | -            | Basis of Quantum and Statistical Dynamics Chemistry | 2     | -/-   | 2     |
| <b>Free Optional Courses: (The student chooses 2 hours)</b>                 |              |   |       |       |       |
| Phy 229   | -            | Principals of Wave and Vibrations                   | 1     | -/2   | 2     |
| Ent 280   | -            | General Insect Taxonomy and Ecology                 | 2     | -/-   | 2     |
| <b>Total: 12 + 2 + 2 = 16 Hours</b>   |              |   |       |       |       |

المستوى الرابع: الفصل الدراسي الثاني

| Level 4 / Semester 2  |              | Course Title                               | Hours |       |       |
|---|--------------|--|-------|-------|-------|
| Code  | Prerequisite | Compulsory Courses: 6 hours                | Lect. | E./P. | Cred. |
| Chm 404   | Chm 324      | Organometallic Chemistry                   | 2     | -/-   | 2     |
| Chm 424   | Chm 222      | Chemistry of Lanthanides and Actinides (1) | 2     | -/-   | 2     |
| Geo 468   | Geo 321      | Petroleum Geochemistry                     | 1     | -/3   | 2     |
| <b>Elective Courses: (The student chooses 5 hours of Geology courses)</b>   |              |  |       |       |       |
| Geo 430   | Geo 334      | Ore Microscopy and Ore Petrology           | 2     | -/3   | 3     |
| Geo 435   | Geo 237      | Economic Geology                           | 1     | -/3   | 3     |
| Geo 460   | Geo 365      | Hydro-Geochemistry                         | 1     | -/3   | 2     |
| Geo 462   | Geo 365      | Hydrogeology of Egypt                      | 1     | -/3   | 2     |
| <b>Elective Courses: (The student chooses 2 hours of Chemistry courses)</b> |              |  |       |       |       |
| Chm 434   | Chm 343      | Chemistry of Catalysis Technology          | 2     | -/-   | 2     |
| Chm 442   | Chm 343      | Analytical Chemistry (3) (Selected Topics) | 2     | -/-   | 2     |
| <b>Research: 3 hours</b>  |              |  |       |       |       |
| Geo 406   | -            | Research and Essay                         | 3     | -/-   | 3     |
| <b>Total: 6 + 5 + 2+3 = 16 Hours</b>  |              |  |       |       |       |