جامعة القاهرة

كلية العلوم

برنامج الكيمياء الحيوية ـ الميكروبيولوجي

Biochemistry and Microbiology Program

(برنامج لمرحلة البكالوريوس بنظام الساعات المعتمدة برسوم دراسية)

2023

مقدمة:

في اطار رؤية جامعة القاهرة نحو التوجة الي جامعات الجيل الرابع وذلك من خلال اعداد برامج دراسية جديدة تتوافق مع متطلبات سوق العمل المحلية والاقليمية والدولية وتسد الفجوة المعرفية وتلبي الحاجة الوظيفية في المشروعات القومية المصرية وتقدم خريجا بمواصفات عالمية يساهم في تكامل خطة الجامعة التعليمية والبحثية مع رؤية مصر الاستراتيجية ٢٠٣٠ واهداف الامم المتحدة للتنمية المستدامة ، تقدمت كلية العلوم بجامعة القاهرة بمقترح انشاء برنامج الكيمياء الحيوية و الميكروبيولوجي بعد متابعه توظيف خريجي كلية العلوم و دراسة احتياجات سوق العمل و تزايد و تهافت اعداد كبيرة من الطلاب علي كل من تخصصي الكيمياء الحيوية و الميكروبيولوجي لذلك رأت كلية العلوم تقديم مقترح انشاء برنامج جامعي متخصص جديد دامج بينهم (برنامج الكيمياء الحيوية والميكروبيولوجي) يتوافق مع متطلبات سوق العمل المحلية والاقليمية والدولية وتسد الفجوة المعرفية بينهم وتلبي الحاجة الوظيفية و ذلك بإعداد خريجين يتمتعون بمستوى متميز من الكفاءة العلمية والخبرة المعملية لكلا التخصصين معا مما يؤهل خريج البرنامج الي الالتحاق بسوق العمل مباشرة و الانخراط فيه بسهولة.

تم تشكيل لجنة من قبل سيادة عميد الكلية / **الاستاذ الدكتورأحمد عبده الشريف** لوضع لائحة البرنامج "الكيمياء الحيوية و الميكروبيولوجي " كبرنامج لمرحلة البكالوريوس بنظام الساعات المعتمدة برسوم دراسية تضم نخبة من أساتذة التخصص بالكلية بعضوية كلا من:.

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مواد اللائحة

مادة (١) : تمنح جامعة القاهرة بناء على طلب مجلس كلية العلوم درجة البكالوريوس في العلوم تخصص " الكيمياء الحيوية و الميكروبيولوجي" .

مادة (٢) : نظام الدراسة المتبع فى الكلية هو نظام الساعات المعتمدة فى إطار الفصل الدراسى.

مادة (٣) : مدة الدراسة لنيل درجة البكالوريوس أربع سنوات جامعية أومتى استكمل الطالب عدد الساعات المعتمدة المطلوبة للتخرج (١٣٦ ساعة) بنجاح بحد أدني ثلاث سنوات. وتحقق هذه المدة أربعة مستويات دراسية ويشمل المستوى الواحد فصلين دراسيين أولهما فى الخريف ، والآخر فى الربيع يفصل بينهما عطلة نصف العام. تحدد مستويات الدارسة بعدد الساعات التى اجتازها الطالب بنجاح كما يلى:-

(١) المستوى الأول (Freshman) من صفر حتى ٣٠ ساعة

(٢) المستوى الثانى (Sophomore) من ٣١ ساعة حتى ٦٤ ساعة

(٣) المستوى الثالث (Junior) من ٦٥ ساعة حتى ١٠٠ ساعة

(٤) المستوى الرابع (Senior) من ١٠١ ساعة وحتى ١٣٦ ساعة

مادة (٤) : يتكون الفصل الدراسى المعتاد من سبعة عشر أسبوعا موزعة على النحو التالي :

أ- فترة التسجيل مدتها أسبوع واحد .

ب- فترة الدراسة تمتد أربعة عشر أسبوعا .

ج- فترة الامتحانات النهائية في نهاية كل فصل دراسي، مدتها أسبوعين".

مادة (٥) : يجوز لمجلس الكلية أن يوافق على فتح فصل دراسى صيفي مكثف، يكون إختيارى للطالب، مدته ثمانية أسابيع خلال الأجازة الصيفية يسجل فيه الطلاب المقررات الدراسية المؤجلة ومقررات الرسوب وكذلك المقررات اللازمة للتخرج أو دراسة مقررات تحسين التقدير بحد أقصى تسعة ساعات معتمدة، وتكون المقررات المطروحة متاحة طبقاً لضوابط يحددها مجلس الكلية.

مادة (٦) : معيار الساعة المعتمدة :

أ - بالنسبة للمحاضرات النظرية:
تحتسب ساعة معتمدة واحدة لكل محاضرة مدتها ساعة واحدة أسبوعيا خلال الفصل الدراسى الواحد .
ب- بالنسبة للدروس العملية والتدريبات التطبيقية:
تحتسب ساعة معتمدة واحدة لكل فترة عملية أو تدريبية مدتها من ٢ إلى ٣ ساعات أسبوعيا خلال الفصل الدراسى الواحد.
مادة (٧): متطلبات التخرج لنيل درجة البكالوريوس فى العلوم هى ١٣٦ ساعة معتمدة ، توزع وفقاً لما يلي:

١- متطلبات الجامعة : ٨ ساعات معتمدة منها ٤ إجبارية و ٤ اختيارية توزع على النحو التالي :

-٢ ساعة معتمدة فى دراسة الحاسب الآلي (إجباري).

-٢ ساعة معتمدة فى دراسة اللغة الإنجليزية (إجباري).

-٤ ساعة معتمدة (إختياري) يختارها الطالب من المقررات المطروحة : مبادئ الإدارة والمحاسبة
- مبادىء القانون وقانون المهنة – ثقافة بيئية – تاريخ وفلسفة العلوم – ريادة الأعمال – التفكير النقدي.

- ٢ ساعة إجباري "قضايا مجتمعية معاصرة" بدون إحتساب ساعات معتمدة.

٢- متطابات الكلية: ٢٨ ساعة معتمدة في الكيمياء و الفيزياء و الرياضيات و العلوم البيولوجية و علوم الحاسب معظمها في المستوي الأول.

٣- متطلبات التخصص: متطلبات التخصص والبرنامج ١٠٠ ساعة معتمدة لنيل درجة البكالوريوس:

أ- ٨٨ ساعة معتمدة متطلبات التخصص
ب- ٦ ساعة معتمدة من تخصصات داعمة للتخصص.
ت- ٣ ساعات معتمدة مشروع التخرج .
ث- ٣ ساعة معتمدة تدريبات تطبيقية: يؤدى طلاب البرنامج بعد إجتيازهم ٦٣ ساعة معتمدة تدريبات تطبيقية لمدة ٨ أسابيع فى شركات أو مصانع أو هيئات ذات صلة بالتخصص أو بالكلية إذا تعذر إيجاد موقع خارجها وذلك مع إحتساب ٣ ساعة معتمدة. ويختار المرشد الأكاديمي الوقت المناسب للتدريب خلال الأجازات الصيفية .

مادة (٨) : القبول ، التسجيل الأكاديمى والعبء الدراسى :

أولا القبول :

أ- تقبل كلية العلوم الطلاب الحاصلين على الثانوية العامة (القسم العلمى) أو مايعادلها من الشهادات الأجنبية وفقاً لشروط القبول التى يحددها المجلس الأعلى للجامعات. واجتياز الطالب للمقابلة الشخصية و إمتحان القبول التحريري و الشفوي.

ب- تقبل طلبات التحويل من الجامعات الأخرى طبقاً لقواعد مكتب التنسيق المركزي والجامعة والكلية.

جـ- يجوز لمجلس الكلية قبول طلاب من الحاصلين على درجة البكالوريوس بتقديرعام جيد على الأقل من الكليات العملية للدراسة بالكلية وذلك بعد أخذ رأى اللجنة التنفيذية للبرامج وعمل مقاصة للمواد الدراسية، وبشرط ألا تقل مدة الدراسة بالكلية عن سنتين دراسيتين (تشمل المواد الدراسية بالمستوى الثالث والرابع على الأقل).

ثانياً التسجيل الأكاديمى:

أ- يشرف وكيل الكلية لشئون التعليم والطلاب على تنفيذ قواعد التسجيل وإجراءاته واعداد القوائم لكل من المجموعات الدراسية، الجدول الدراسى، توزيع الطلاب على السادة المرشدين الأكاديميين، تجهيز بطاقات المقررات للطلاب وهى عبارة عن البطاقات المنفردة لكل مقرر بالإضافة إلى البطاقات الإجمالية لكل طالب، على أن تسجل البيانات الأكاديمية فى سجلات خاصة معتمدة . ويتم الانتهاء من تسجيل الطلاب فى الأسبوع الأول من بدء الفصل الدراسى .

ب- يجوز للطالب الذى لم يتمكن من التسجيل لأسباب قهرية تقرها اللجنة التنفيذية للبرامج وتعتمدها اللجنة العليا للبرامج النوعية أن يسجل تسجيلا متأخرا خلال الفترة الإضافية للتسجيل (الأسبوع الثانى).

ثالثاً الإرشاد الأكاديمي:

يخصص لكل طالب مرشد أكاديمى، مهمته توجيه الطالب دراسياً ومساعدته على اختيار المواد مع تحديد عدد الساعات التى يسجل فيها وفقا لظروفه وقدراته واستعداداته، ومساعدته على حل المشكلات التى قد تعترضه

أثناء الدراسة. وتخصص بطاقة لكل طالب يسجل فيها كافة البيانات اللازمة عنه والنتائج التى حصل عليها، كما يقوم بمراجعة المواد التى يسجل فيها الطالب فى كل فصل دراسي حتى تخرجه من الكلية .

رابعاً العبء الدراسى:

١- يسمح للطالب بالتسجيل فيما لا يقل عن ١٤ ساعة ولا يزيد عن ١٨ ساعة معتمدة لكل فصل دراسى . ويستثنى من ذلك الحالات التالية:

أ- الطالب المتفوق (الذى له معدل تراكمي ٣,٦٦٧ فأكثر) أن يضيف إلى ذلك ساعتين معتمدتين فى الفصل الدراسي الواحد وبحد أقصى ٨ ساعات معتمدة طوال فترة الدراسة .

جـ- يجوز لمجلس الكلية زيادة الحد الأقصى للعبء الدراسى فى الفصل الدراسى الأخير للطالب بحد أقصى أربع ساعات معتمدة بغرض إتمام متطلبات التخرج .

د - لا يسمح للطالب الذى له معدل تراكمي ٢,٠٠ بالتسجيل فى أكثر من ١٢ ساعة معتمدة فى الفصل الدراسى الواحد ويراقب أكاديميا حتى يتجاوز هذا المعدل.

هـ- يجوز أن يعفى الطالب المحول من جامعة أخرى معترفاً بها من بعض مقررات المستويين الأول والثانى إذا ثبت أنه قد درس ونجح فى مقررات تعادلها فى الجامعة المحول منها ويكون الإعفاء بقرار من رئيس الجامعة بعد موافقة مجلس الكلية ولا يجوز الإعفاء من أى أجزاء من مقررات الفرقتين الأولى والثانية.

مادة (٩) : الإضافة، الحذف، الانسحاب

أ- يجوز للطالب بعد موافقة المرشد الأكاديمي أن يضيف أو يحذف مقررا أو اكثر حتى نهاية الأسبوع الرابع فقط من الدراسة وذلك بما لا يخل بالعبء الدراسى المنصوص عليه فى المادة (٨).

ب- يجوز أن ينسحب الطالب من دراسة أى مقرر حتى نهاية الأسبوع الثامن من بدء التسجيل للفصل الدراسى وذلك بموافقة المرشد الأكاديمي . ويُسجَل هذا المقرر فى سجل الطالب الأكاديمي بتقدير "منسحب" بشرط أن لا يكون الطالب قد تجاوز نسبة الغياب المقررة قبل الانسحاب . وتعرض حالات الانسحاب الإضطرارية بعد هذا الميعاد على "اللجنة التنفيذية للبرامج" للنظر فيها وإقرارها من " اللجنة العليا للبرامج النوعية "على ألا يخل الانسحاب بالعبء الدراسى للطالب وفقاً للمادة (٨).

مادة (١٠) : يخضع الطالب للنظام العام للجامعة والكلية، وتطبق عليه قواعد الفصل من الجامعة، وفرص إعادة القيد والأعذار المقبولة لعدم أداء الامتحان، ووقف القيد الدراسى وكافة القواعد والقوانين واللوائح الخاصة بشأن تأديب الطلاب، والمنصوص عليها فى قانون تنظيم الجامعات ولائحته التنفيذية .

مادة (١١) : المواظبة: يتولى أستاذ المقرر تسجيل حضور الطلاب فى بدء كل محاضرة نظرية أو فترة عملية فى 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 اللجنة التنفيذية للبرامج بخطاب فى حالة تجاوز الطالب ٢٠٪ من مجموع ساعات المقرر لإتخاذ اللازم و إنذار الطالب.

ب- إذا زادت نسبة الغياب عن ٢٥٪ من مجموع ساعات المقرر وكان غياب الطالب بدون عذر تقبله اللجنة التنفيذية للبرامج وتعتمده اللجنة العليا للبرامج النوعية ، يسجل للطالب تقدير ''محروم'' فى المقرر وتدخل نتيجة الرسوب فى حساب المعدل التراكمي للطالب.

ج- إذا زادت نسبة الغياب عن ٢٥٪ وكان غياب الطالب بعذر تقبله اللجنة التنفيذية للبرامج وتعتمده اللجنة العليا للبرامج النوعية يسجل للطالب تقدير غائب بعذر ولا تحتسب نتيجة التقدير "غائب بعذر" فى المعدل الفصلى أو المعدل التراكمى العام للطالب.

مادة (١٢) : التقييـــم

أولا : يتم تقييم امتحان كل مقرر من ١٠٠ (مائة) درجة.

ثانياً : يتم تقييم الطالب فى المقررات النظرية والعملية بناءً على :

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

نوع الامتحان	المقرر نظرى وعملى	المقرر نظرى فقط	المقرر عملى فقط
إمتحان نظرى نهائى	40%	50%	-
إمتحان نظرى عملى نهائى	20%	-	20%
إمتحان شفوى نهائى	10%	10%	10%
إمتحان نصف فصلى نظرى	10%	20%	
تقييم مستمر - واجبات وتطبيقات - وتكليفات	20%	20%	70%
مجموع درجات الإمتحانات	100	100	100

ب- بالنسبة للمقال المرجعى أو مشروع التخرج بالمستوى الأخير والمخصص له ٣ ساعات معتمدة توزع درجاته بواقع ٦٠٪ على جودة المقال أو تقرير المشروع، و٢٠٪ للمناقشة الشفهية و٢٠٪ للمتابعة الدورية من أحد أعضاء هيئة التدريس.

ج- بالنسبة للتدريب الميدانى يخصص له ٣ ساعات معتمدة توزع درجاته بواقع ٤٠٪ على جودة تقرير الطالب، و٤٠٪ لتقرير مشرف التدريب و٢٠٪ للمناقشة.

د- تتم الإمتحانات الشفهية والتحريرية بواسطة لجنة من اثنين من أعضاء هيئة التدريس علي الأقل من بينهم القائم بتدريس المقرر، ويعتبر الطالب الغائب فى الإمتحان العملى النهائى أو الإمتحان التحريرى النهائى غائباً فى المقرر، ويعتبر الطالب الذى يحصل على درجة أقل من ٤٠٪ من درجة الإمتحان النهائى راسباً فى المقرر.

هـ- تمنح مرتبة الشرف للطالب الذى ينهى دراسته بالكلية فى غضون المدة الإعتيادية للتخرج والتى لاتزيد عن ٨ فصول دراسية أساسية بتقدير ممتاز بحد أدنى ٨٥٪ من المجموع الكلى للدرجات بما يحقق معدل تراكمى من النقاط قدره 3.667 أو أكثر وبشرط ألا يقل معدله التراكمى فى أى فصل دراسى عن 3.0 (٧٥٪ من مجموع الدرجات) وألا يكون قد رسب فى أى مقرر دراسى خلال دراسته فى الكليـــة أو فى الكلية المحول منها إذا كان قد قضى مدة دراسة لا تزيد عن عامين فى كلية أخرى.

و- يجوز أن تؤجل نتيجة مقرر من المقررات لعدم اكتمال متطلباتها لأسباب قهرية (عدم دخول الطالب الامتحان النهائي لمقرر لعذر مقبول) بعد عرضها على اللجنة العليا للبرامج النوعية ولمدة لا تتجاوز فصل دراسي واحد، ويعطى الطالب فى هذه الحالة تقدير غير مكتمل (غ م). وإن لم يستكمل الطالب متطلبات المقرر فى الفترة التى يعقد بها الامتحان النهائي للمقررات غير المكتملة، وهى الأسبوع الأول من الفصل الدراسى التالي مباشرة، يعتبر الطالب راسبا ويرصد له التقدير راسب.

مادة (١٣): الدلالات الرقمية والرمزية للدرجات والتقديرات.

(١) تقدر الدرجات التى يحصل عليها الطالب فى كل مقرر دراسى على النحو التالى:-

الدرجـة المئوية	المكافئ الرقمى بالنقاط من ٤	رمز التقدير		التقدير Grade	
90 -> 100	4.000	A^+	أ+	ممتاز	Excellent
85 -> 90	3.667	A	أ	ممتاز	Excellent
80 -> 85	3.333	B^+	ب+	جيد جدا	Very Good
75 -> 80	3.000	B	ب	جيد جدا	Very Good
70 -> 75	2.667	C^+	جـ+	جيد	Good
65 -> 70	2.333	C	جـ	جيد	Good
60 -> 65	2.000	D	ل	مقبول	Pass
0 -> 60	0.000	F	ر	راسب	Fail
0 -> 60	0.000	P	م ج	مؤجل	Postponed
0 -> 60	0.000	IC	غ م	غير مكتمل	Incomplete
0 -> 60	0.000	DN	م	محروم	Denial
0 -> 60	0.000	W	م ن	منسحب	Withdrawn
60 -> 100	------	AuP	ن ح	ناجح حضور	Audit-Pass
0 -> 60	------	AuF	ر ح	راسب حضور	Audit-Fail

(٢) إذا تكرر رسوب الطالب فى مقرر ما، يكتفي باحتساب الرسوب مرة واحدة فقط فى معدله التراكمي ولكن تسجل عدد المرات التى أدى فيها إمتحان هذا المقرر فى سجله الأكاديمي وتحسب درجة النجاح التى حصل عليها عند إجتياز الإمتحان.

(٣) المعدل الفصل والمعدل التراكمى

أ- المعدل الفصلى(Grade Point Average (GPA هو متوسط ما يحصل عليه الطالب من نقاط فى فصل دراسى واحد ويقرب إلى رقمين عشريين فقط ويحسب كما يلى :

$$\text{المعدل الفصلى} = \frac{\text{مجموع حاصل ضرب نقاط كل مقرر فصلى} \times \text{عدد ساعاته المعتمدة}}{\text{حاصل جمع الساعات المعتمدة لهذه المقررات فى الفصل}}$$

ب- المعدل التراكمى(Cumulative Grade Point Average (CGPA : هو متوسط ما يحصل عليه الطالب من نقاط خلال كل الفصول الدراسية التى درسها ويقرب إلى ثلاثة أرقام عشرية، ويبين فى شهادة الطالب النقاط المكتسبة والنسبة المئوية إلى جانب التقديرالعام للتخرج ويحسب المعدل التراكمى كما يلى:

$$\text{المعدل التراكمى العام} = \frac{\text{مجموع حاصل ضرب نقاط كل مقرر تم دراسته} \times \text{عدد ساعاته المعتمدة}}{\text{حاصل جمع الساعات المعتمدة لهذه المقررات التى تم دراستها}}$$

(٤) الحد الأدنى للمعدل التراكمي للتخرج هو ٢,٠٠ .

مادة (١٤): الإنذار الأكاديمي والنقل وإيقاف القيد وإلغاء القيد:

(١) إذا زادت نسبة غياب الطالب عن ٢٥٪ من ساعات أى مقرر فى أى فصل دراسى ولم يقدم عذراً مقبولاً لدى اللجنة التنفيذية للبرامج، لا يسمح له بدخول الإمتحان النهائى للمقرر ويسجل له فيه تقدير محروم.

(٢) إذا حصل الطالب فى أى فصل دراسى على تقدير تراكمى أقل من ٢,٠ ينذر الإنذار الأول .

(٣) إذا تكرر المعدل المتدنى للطالب لفصل دراسى ثان ينذر الإنذار الثانى ويعتبر الطالب مراقباً أكاديمياً ولا يسمح له بالتسجيل إلا فى الحد الأدنى وهو ١٢ ساعة معتمدة.

(٤) الطالب الذى لا يحقق معدل تراكمى 2 أو أكثر عند إتمامه متطلبات التخرج يجب عليه إعادة التسجيل فى عدد من المقررات الدراسية بحد أقصى ١٢ ساعة معتمدة فى فصل دراسى واحد ويحصل على كامل الدرجة فى هذه المقررات حتى يحقق المعدل المطلوب للتخرج، ويحسب له التقدير الأعلى للمقررات التى نجح فيها ويضاف فى سجله الأكاديمى

(٥) 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 الأكاديمى و اللجنة التنفيذية للبرامج و اللجنة العليا للبرامج النوعية ومجلس الجامعة.

(٦) إذا إنقطع الطالب عن الدراسة بالكلية لمدة لاتجاوز فصلين دراسيين لأسباب قهرية وافقت عليها اللجنة التنفيذية للبرامج و اللجنة العليا للبرامج النوعية ، يتاح للطالب فرصة أخرى للتسجيل ويستأنف دراسته فى الفصل الدراسى التالى، وتحتسب مدة الإنقطاع ضمن فرص التأجيل المتاحة للطالب.

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

- **يفصل طالب المستوى الأول إذا لم يجتاز ٣٠ ساعة معتمدة من المقررات التى سجل فيها وأدى فيها الإمتحان خلال أربعة فصول دراسية رئيسية.**
- **يفصل طالب المستوى الثانى إذا لم يجتاز 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.**
- **يفصل طالب المستوى الثالث إذا لم يجتاز 100 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.**
- **إذا اجتاز الطالب ١٠٠ ساعة معتمدة على الأقل يكون له حق الاستمرار فى الدراسة حتى التخرج بمصروفات يحددها مجلس الكلية.**

(٨) يلغى قيد الطالب إذا إرتكب مخالفة تخل بالآداب أو تخالف أنظمة الكلية أو الجامعة أو طبق فى حقه لائحة تأديب الطلاب بما يتفق مع قانون تنظيم الجامعات .

مادة (١٥) : تسرى أحكام هذه اللائحة مع بداية العام الجامعي التالي لإقرارها بقرار وزاري من وزير التعليم العالي . وتطبق فور سريانها على :

أ-الطلاب المستجدين بالفرقة الأولى بالكلية .

ب-الطلاب الباقين للإعادة بالفرقة الأولى .

مادة (١٦) : نظام الإستماع :

يجوز لمجلس الكلية بعد أخذ رأى مجالس الأقسام العلمية المختصة بأن يقبل طلاب من جامعات أخرى كمستمعين لبعض المقررات بالكلية وفقاً لقواعد ورسوم يحددها مجلس الكلية.

مادة (١٧) : يجوز لمجلس الكلية بعد أخذ رأي الأقسام العلمية المختصة الدراسة بنظام التعليم الهجين بالنسبة التي حددها المجلس الأعلى للجامعات.

مادة (١٨): تطبيق الأحكام العامة لمواد الائحة الخاصة بمرحلة البكالوريوس لكلية العلوم – جامعة القاهرة و أحكام قانون تنظيم الجامعات ولائحته التنفيذية فيما لم يرد فيه نص فى هذه اللائحة .

Biochemistry and Microbiology Program

Credit hours program (136 hr.)

The Bachelor program seeks to prepare graduates having a distinguished level of scientific efficiency and lab experience with which he can grasp the biochemical bases of biological processes that occur inside microbes, animal and human's body to improve environment and health, can cope with the continuous progress in all scientific fields with professional ethics, and can carry on scientific research in all Biochemistry /Microbiology fields; in addition to development of human efficiencies capable of meeting the needs of the labour market and competing locally, regionally and internationally with outstanding leadership skill.

In this program, students will study foundation (including University and Faculty requirements) and allied courses as well as basic and specialization curricula. Basic curricula are intended to provide students with knowledge of the fundamental zoology, entomology, botany, chemistry, mathematics, physics and biophysics in the first and second semesters. Then, students will focus on the specialized courses from the third semester. Beyond compulsory courses, the program offers a variety of elective courses in different updated fields starting from the third semester. Our program also provides good balance between knowledge, training, practical skills and researches to produce graduates with expertise of the highest standard with diverse, hands-on, experiential opportunities to serve their communities.

Vision

The Bachelor program seeks to prepare graduates having a distinguished level of scientific efficiency and lab experience with the continuous progress in all scientific fields with professional ethics, capable of meeting the needs of the labour market and competing locally, regionally and internationally with outstanding leadership skill.

Mission

Promoting high impact education and innovative research in a diverse and inclusive environment by investigating fundamental questions and solutions in microbiology and biochemistry, and translating those discoveries into everyday life, science, medicine, and industry.

Objectives

1. Achieve excellence in higher education and scientific research in both biochemistry and microbiology.
2. Provide students with in-depth specialist courses and practical skills to cater the increasing demand in the country for those specializations.
3. Affect optimal use of modern technology in education and scientific research.
4. Provide a favorable environment for study and scientific research.
5. Exhibit the ability to design a suitable experiment or research using the scientific method.
6. Introduce the concepts of application and research in biochemistry and microbiology.
7. Attract the best faculty staffs and members, researchers and students.
8. Build bridges within and outside the Faculty and communicate with various sectors of the community and globally.
9. Develop suitable training programs to upgrade the quality of the Department's graduates.
10. Look at scientific problems from various angles and discover new ways to solve or change their perspective.
11. Disseminate the impactful knowledge and translating scientific discoveries.
12. Engage in outreach to enhance community understanding of the importance of biochemistry and microbiology.
13. Think about future health, social, economic, and scientific problems, and visualizing remote needs and work on finding solutions.

14. Develop a knowledge of how to setup, and how to operate, various scientific apparatus used in the study of biochemistry and microbiology.
15. Learn how to obtain and interpret data from various scientific instruments.
16. Develop an ability to think logically and clearly, to articulate their thoughts, and to critically evaluate experimental data and the scientific literature.

Teaching Methods:

1- Interactive education.

2- Cooperative education.

3- E-learning.

4- Brain storming.

5- Self-learning.

6- Experimental education.

7- Indirect education.

By using:

- Interactive smart boards.
- Preparing reports and assignments and discussing them in groups.
- Office work.
- Preparing research papers and discussing them in groups.
- Research project
- Training
- Seminars and presentations

Stakeholders

The Program is committed to providing the quality education required to meet the needs of this expanding field, through both lectures and practical sessions. This program's main goal and focus is to guide and impart innovative education that meets international standards. The curriculum includes a diverse range of biochemistry and microbiology courses at the undergraduate level. It is a center of expertise for many aspects of Biochemistry/Microbiology fundamentals and applications. The program is capable of producing skilled Biochemists/Microbiologists demanded by different labs and industries.

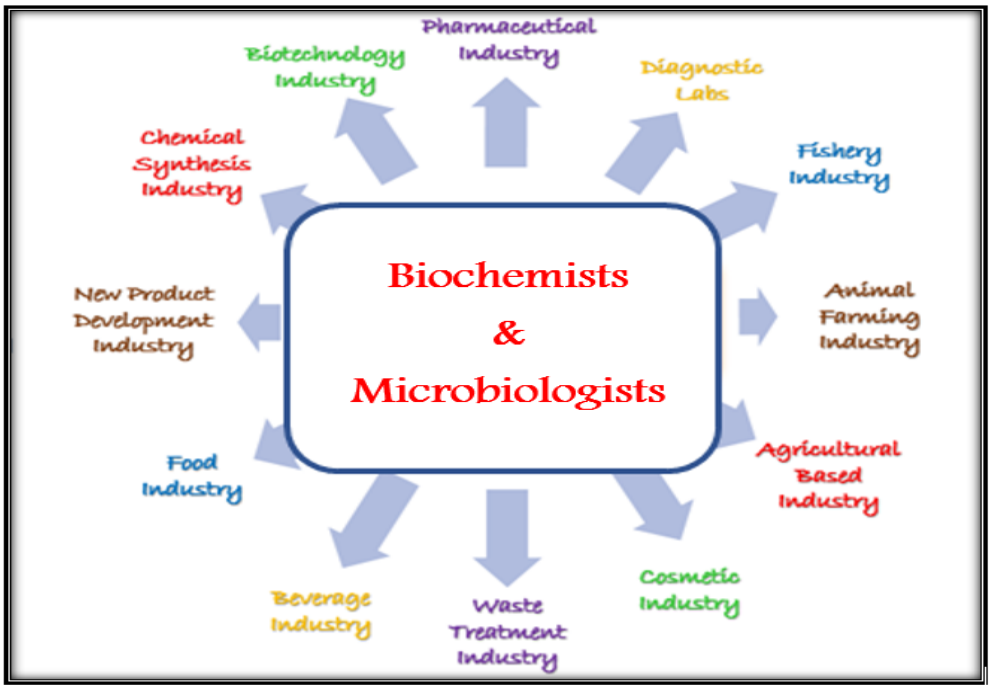
Main employment sectors are (figure below):

Academia – University lecturers, Researchers

Industries – Microbiologists, Quality assurance managers, Product Development managers etc.

Government bodies – High skilled microbiologists,

Entrepreneurs- Participation/develop business relevant to Biochemistry and Microbiology.



Similar program :

- BSc Hons Biochemistry and Microbiology in University of Strathclyde (https://www.strath.ac.uk/courses/undergraduate/biochemistrymicrobiology/)
- Biochemistry and Microbiology Program in University of Victoria (https://www.uvic.ca/students/undergraduate/hands-on-learning/experiences/biochemistry-microbiology.php)
- BSc Majoring in Biochemistry and Microbiology, The University of the Free State (https://www.educations.com/study-abroad/the-university-of-the-free-state/bsc-majoring-in-biochemistry-and-microbiology-1410353)

Graduates destination:

In the medical field: work in medical diagnotic laboratories, pharmaceutical and antibiotic factories, vaccine production, water companies and food factories for microbial analysis and quality control

In the industrial field: work in fertilizer factories, microbial fermentation industries, biological products of microorganisms, food, beverage and cosmetics factories

Fields of biotechnology: work in companies producing agricultural biotechnological and environmental products

Scientific research: pollution control - food safety - drug development-

work in forensic medicine and forensic evidence in molecular, microbial and chemical analyses

General rules of the program:

The program follows the general regulations for the bachelor's degree in the credit-hour system, at the Faculty of Science, Cairo University, and the subsequent amendments.

Academic Programs Offered by Chemistry, Botany and Microbiology Departments

I- The study plan

The study plan of Biochemistry and Microbiology BSc. Degree program includes:

(8) hrs. University requirements

+ (٢٨) hrs. Faculty requirements

+ (١٠٠) hrs. program courses (8٣ hr core courses +٥ hr auxiliary courses + 6 hr allied course + 3 hr Project + 3 hr Training)

Faculty requirement:

Mathematics: 6 credit hours (4 L + 2 T)

Physics: 6 credit hours (4 L +2 P)

Chemistry: 6 credit hours (4 L + 2 P)

Zoology: 3 credit hours (2 L+ 1P)

Botany: 3 credit hours (2 L+1 P)

Entomology: 2 credit hours (1L+1P)

Biophysics: 2 credit hours (1L+1P)

University Requirements:

LEVEL	SEMESTER	SUBJECT code	SUBJECT NAME	PRE-REQUISITE	SUBJECT CASE		HOURS				REMARKS
					Compulsory	Elective	Lectures	Practical	Tutorial	Credit	
1st	**1st**	U1101	COMPUTER SCIENCES	---	**2**		**1**	**2**	**-**	**2**	
	1st	U1102	ENGLISH LANGUAGE	---	**2**		**2**	**-**	**-**	**2**	
	2nd	U1103	SOCIAL ISSUES	---	**2**		**2**	**-**	**-**	**0**	Credit hours are not counted
	٢nd	U1204	INTRODUCTION TO LEGAL STUDIES	---		**2**	**2**	**-**	**-**	**2**	Choose 4 Cr. hr.
	2nd	U1208	HISTORY AND PHILOSOPHY OF SCIENCE	---		**2**	**2**	**-**	**-**	**2**	
	2nd	U1209	ENVIRONMENTAL CULTURE	---		**2**	**2**	**-**	**-**	**2**	
	2nd	U1210	CRITICAL THINKING	---		**2**	**2**	**-**	**-**	**2**	
	2nd	U1211	BUSINESS ENTREPRENEURSHIP	---		**2**	**2**	**-**	**-**	**2**	

Biochemistry and Microbiology Program
The proposed study plan

LEVEL	SEMESTER	SUBJECT No.	SUBJECT NAME	PRE-REQUISITE	SUBJECT CASE		HOURS				REMARKS	
					Compulsory	Elective	Lectures	Practical	Tutorial	Credit		
1st	1st	BCMZ 1101	ZOOLOGY	---	3		2	3	-	3		28 hr compulsory + 8 hr University requirement
		BCMC 1102	CHEMISTRY 1	---	3		2	3	-	3		
		BCMP 1103	PHYSICS 1	---	3		2	3	-	3		
		BCMMt 1104	MATH 1	---	3		2	3	-	3		
		BCME 1105	ENTOMOLOGY	---	2		1	3	-	2		
	2nd	BCMBp 1201	BIOPHYSICS	---	2		1	3	-	2		
		BCMC 1202	CHEMISTRY 2	---	3		2	3	-	3		
		BCMP 1203	PHYSICS 2	---	3		2	3	-	3		
		BCMMt 1204	MATH 2	---	3		2	3	-	3		
		BCMB 1205	BOTANY	---	3		2	3	-	3		

SECOND LEVEL

LEVEL	SEMESTER	SUBJECT No.	SUBJECT NAME	PRE-REQUISITE	SUBJECT CASE		HOURS				Remarks	
					Compulsory	Elective	Lectures	Practical	Tutorial	Credit		
2nd	3rd	BCMM 2301	Microbial physiology	BCMB 1205	**2**		**2**	**-**	**-**	**2**		**14 hr** compulsory **+ 2 hr** electives
		BCMM 2302	Bacteriology and Actinomycetes	BCMB 1205	**2**		**2**	**-**	**-**	**2**		
		BCMM 2303	Microbiology Lab 1	---	**1**		**-**	**3**	**-**	**1**		
		BCMC 2304	Thermodynamics & separation techniques	BCMC 1102	**2**		**2**	**-**	**-**	**2**		
		BCMC 2305	Bio molecules 1	BCMC 1202	**2**		**2**	**-**	**-**	**2**		
		BCMC 2306	Bio molecules 2	BCMZ 1101	**2**		**2**	**-**	**-**	**2**		
		BCMC 2307	Biochemistry Lab 1	---	**1**		**-**	**3**	**-**	**1**		
		BCMMt 2308	Biostatistics	---	**2**		**1**	**-**	**2**	**2**		
		BCMA 2309	Bioethics and Biosafety	allied		**1**	**1**	**-**	**-**	**1**	**Choose 2 Cr. hr.**	
		BCMA 2310	Language course 1 (Deutch or French)	allied		**1**	**-**	**-**	**2**	**1**		
		BCMA 2311	Marketing	allied		**1**	**1**	**-**	**-**	**1**		

	4th	BCMM 2401	Applied Microbiology	BCMM 2302	**2**		**2**	**-**	**-**	**2**		**13 hr** compulsory **+** **4 hr** electives
		BCMM 2402	Microbiology Lab 2	---	**1**		**-**	**3**	**-**	**1**		
		BCMM 2403	Microbial genetics	BCMB 1205	**3**		**2**	**3**	**-**	**3**		
		BCMC 2404	Amino acid and protein metabolism	BCMC 2305	**2**		**2**	**-**	**-**	**2**		
		BCMC 2405	Carbohydrates and lipid metabolism	BCMC 2305	**2**		**2**	**-**	**-**	**2**		
		BCMC 2406	Enzymology	BCMC 2304	**2**		**2**	**-**	**-**	**2**		
		BCMC 2407	Biochemistry Lab 2	---	**1**		**-**	**3**	**-**	**1**		
		BCMM 2408	Bacterial and fungal pathogenesis	BCMM 2302		**2**	**1**	**3**	**-**	**2**	Choose 2 Cr. hr.	
		BCMM 2409	Food Microbiology	BCMM 2301		**2**	**1**	**3**	**-**	**2**		
		BCMA 2410	Computer sciences (IT)	allied		**2**	**1**	**-**	**2**	**2**	Choose 2 Cr. hr.	
		BCMA 2411	Quality control and Quality assurance	allied		**2**	**2**	**-**	**-**	**2**		

THIRD LEVEL

LEVEL	SEMESTER	SUBJECT No.	SUBJECT NAME	PRE-REQUISITE	SUBJECT CASE		HOURS				Remarks	
					Compulsory	Elective	Lectures	Practical	Tutorial	Credit		
3rd	5th	BCMM 3501	Virology and Viral pathogenesis	BCMM 2302	2		2	-	-	2		**14 hr** compulsory + **3 hr** electives
		BCMM 3502	Microbial water pollution	BCMB 1205	3		2	3	-	3		
		BCMM 3503	Microbiology Lab 3	---	1		-	3	-	1		
		BCMC 3504	Endocrinology	BCMC 2404	2		2	-	-	2		
		BCMC 3505	Nutrition	BCMC 2405	2		2	-	-	2		
		BCMC 3506	Body fluids and biological functions	---	2		2	-	-	2		
		BCMC 3507	Biochemistry Lab 3	---	1		-	3	-	1		
		BCMMt 3508	Mathematical modelling	-	1		-	-	2	1		
		BCMM 3509	Biotechnological application in microbiology	BCMM 2301		2	1	3	-	2	**Choose** 2 Cr. hr.	
		BCMM 3510	Microbial disease dynamics	BCMM 3501		2	1	3	-	2		

	BCMA 3511	Language course 2 (Deutch or French)	BCMA 2310	**1**		**-**	**-**	**2**	**1**	**Choose** 1 Cr. hr.	
	BCMA 3512	Seminars 1	-	**1**		**-**	**-**	**2**	**1**		
6th	BCMM 3601	Microbial fermentation and bioenergy	BCMM 2401	**2**		**2**	**-**	**-**	**2**		**6 hr** compulsory + **8 hr** elective **+ 3 hr** Training
	BCMM 3602	Microbiology Lab 4	---	**1**		**-**	**3**	**-**	**1**		
	BCMM 3603	Molecular biology	BCMM 2403	**2**		**2**	**-**	**-**	**2**		
	BCMC 3604	Immunology	BCMC 3506		**2**	**2**	**-**	**-**	**2**	**Choose** 6 Cr. hr.	
	BCMC 3605	Cancer biology	BCMC 3504		**2**	**2**	**-**	**-**	**2**		
	BCMC 3606	Drug metabolism	BCMC 3505		**2**	**2**	**-**	**-**	**2**		
	BCMC 3607	Isolation, purification and characterization of enzymes	BCMC 2406		**2**	**2**	**-**	**-**	**2**		
	BCMM 3608	Microbial diversity	BCMB 1205		**2**	**1**	**3**	**-**	**2**	**Choose** 2 Cr. hr.	
	BCMM 3609	Intercellular signaling and diseases	BCMM 3510		**2**	**2**	**-**	**-**	**2**		
	BCMT 3610	Training	Pass 63 hrs	**3**		**-**	**9**	**-**	**3**		
	BCMC 3611	Biochemistry Lab 4	---	**1**		**-**	**3**	**-**	**1**		

FOURTH LEVEL

LEVEL	SEMESTER	SUBJECT No.	SUBJECT NAME	PRE-REQUISITE	SUBJECT CASE		HOURS				Remarks	
					Compulsory	Elective	Lectures	Practical	Tutorial	Credit		
	7th	BCMM 4701	Microbiological analyses	BCMM 2301	3		2	3	-	3		7 hr compulsory + 6 hr electives + 3 hr Bachelor project
		BCMM 4702	Microbiology Lab 5	---	1		-	3	-	1		
		BCMM 4703	Molecular biology Lab	BCMM 3603	1		-	3	-	1		
		BCMC 4704	Biochemistry lab 5		1		-	3	-	1		
		BCMM 4705	Microbial Endophytes	BCMM 2302		2	1	3	-	2	Choose 2 Cr. hr.	
		BCMM 4706	Biometry	---		2	2	-	-	2		
		BCMC 4707	Clinical Biochemistry	BCMC 2405		2	2	-	-	2	Choose 4 Cr. hr.	
		BCMC 4708	Stem cells	BCMC 3603		2	2	-	-	2		
		BCMC 4709	Neurosciences	---		2	2	-	-	2		
		BCMC 4710	Forensic science	BCMC 3603		2	2	-	-	2		
		BCMJ 4711	Bachelor project	Pass 90 hrs	٣		1	6	-	3		
		BCMMt 4712	Biological modeling Lab	----	1		-	-	2	1		
	8th	BCMM 4801	Bioinformatics	BCMM 2308	2		2	-	-	2		

	BCMC 4802	Biochemistry lab 6	---	**1**		**-**	**3**	**-**	**1**		**6 hr.** compulsory + **11 hr.** elective
	BCMC 4803	Nanotechnology and bioremediation	BCMM 4701		**2**	**2**	**-**	**-**	**2**	**Choose 4 Cr. hr.**	
	BCMM 4804	Microbial life and Climatic changes	BCMM 2301		**2**	**1**	**3**	**-**	**2**		
	BCMM 4805	Microbial toxicology	BCMM 3510		**2**	**1**	**3**	**-**	**2**		
	BCMC 4806	Inborn error of metabolism	BCMC 2404		**2**	**2**	**-**	**-**	**2**	**Choose 4 Cr. hr.**	
	BCMC 4807	Industrial biochemistry	---		**2**	**2**	**-**	**-**	**2**		
	BCMC 4808	Drug design	BCMC 3606		**2**	**2**	**-**	**-**	**2**		
	BCMC 4809	Genetic engineering and gene therapy	BCMC 4708		**2**	**2**	**-**	**-**	**2**		
	BCMJ 4810	Research project	BCMJ 4711	**3**		**-**	**6**	**-**	**3**		
	BCMM 4811	Microbiomes	---		**2**	**2**	**-**	**-**	**2**	**Choose 2 Cr. hr.**	
	BCMM 4812	Medical Microbiology	BCMM 4805		**2**	**2**	**-**	**-**	**2**		
	BCMM 4813	Cell and tissue culture technology	BCMM 3603		**2**	**1**	**3**	**-**	**2**		
	BCMA 4814	Language course 3	BCMA 3511		**1**	**-**	**-**	**2**	**1**	**Choose 1 Cr. hr.**	
	BCMA 4815	Seminars 2	BCMA 3512		**1**	**-**	**-**	**2**	**1**		

Symbol:

BCM	Program symbol	Mt	Math	P	Physics	C	Chemistry
B	Botany	Z	Zoology	Bp	Biophysics	U	University
J	Bachelor project Research project	T	Training	A	Allied	E	Entomology
				Cr.	Credit	hr	hour

Course Code	**0**000	Level (1-4)	0**0**00	Semester (1 to 8)	00**00**	Course No. in semester

Level	Semester	Compulsory	Elective	Allied elect.	Training	Project	Total
one	One	18					18
	Two	14	4				18
Two	Three	14		2			16
	Four	13	2	2			17
Three	Five	14	2	1			17
	Six	6	8		3		17
Four	Seven	7	6			3	16
	Eight	6	10	1			17
Total Cr.hr.		92	32	6	3	3	136
%		67.7	23.5	4.4	2.2	2.2	100

The structure and Components of the Program:

Courses' group	Numbers of hours	Percentage %
Basic Sciences	٢٨	٢٠,٦
Social and Human Sciences	8	٥,٩
Specialty Sciences	٨٠	٥٨,٨
Auxiliary courses	8	5.9
Allied courses	٦	٤,٤
Training	٣	٢,٢
Project	3	2.2
Total	١٣٦	100

1st semester

BCMZ 1101 Zoology :[comp, 3 cr., 2 lec. + 3 pra.]

The aim of this course is to prepare the candidates to be professional in the field of cell biology and Histology through increasing his/ her awareness about:

1. The Cell structure, Cell Chemistry, Structure and function of the cell membrane, signal transduction and the different ways of secretion through the cell memebrane. Ultra structure, shapes and molecular structure of membranous cell organelles and non- membranous cell organelles. Functions and significant adaptations of each organelle, cell inclusions, Nucleus, Cytoskeleton and Cell dynamics.
2. Cell cycle, cell divisions and cell death.
3. Celluar adhesion and different types of animal tissues and relating tissue structure to its function.

Epithelium - connective tissue - muscle tissue - nervous tissue

٤. The microanatomy and ultra-structure of different organs, tissues and the regional variation and its significance.

BCMC 1102 Chemistry 1: [comp, 3 cr., 2 lec. + 3 pra.]

I- Analytical chemistry

1. The role of analytical chemistry - typical quantitative analysis - calculations used in analytical chemistry - units of measurement - solutions and concentrations terms- analytical samples -methods of sampling - statistics of sampling.
2. Classical methods of analysis:
   A. Volumetric analysis
   B. Optical method of analysis

II. Physical chemistry:

Units and measurement , Study the three states of matter , gases laws, general gas equation, Properties of liquids and solids, Intermolecular forces, properties of liquids , types and properties of solids , Study the properties of solutions, Factors affecting solubility , Ideal and non-ideal solutions, distribution law- colligative properties of solutions.

BCMP 1103 Physics 1: [comp, 3 cr., 2 lec. + 3 pra.]

Newton's Laws, work and energy, rotational motion, fluids, thermodynamics, and waves. A non calculus-based approach for majors in the life sciences, preprofessional health programs, agriculture, and veterinary medicine.

BCMMt 1104 Math 1: [comp, 3 cr., 2 lec. + 3 tu.]

Introduction of functions as mathematical models. 2. Llimits and continuity, and develop skills for their computations. 3. Definition of the

derivative, and development of skills for using rules of differentiation. 4. Skills related to applications of the derivative. 5. Establishment of mathematical modeling of various life problems as optimization problems. 6. Introduction of basic tools to sketch polynomials, rational, trigonometric functions and radicals. 7. Introduce the definite and indefinite integrals, and develop skills for their evaluation. 8. Establish mathematical models of various life problems as integration problems.

BCME 1105 Entomology : [comp, 2 cr., 1 lec. + 3 pra.]

This course provides an introduction to ecology, covering interactions between insects and the environment on the level of populations, communities, and ecosystems. Ecological principles are used to explore the theory and applications of major issues facing humanity in the 21st century, including population dynamics, disease ecology, biodiversity and invasive species, global change, and other topics of environmental sustainability.

2nd semester

BCMBp 1201 Biophysics:[comp, 2 cr., 1 lec. + 3 pra.]

Introduction: -The nervous system and the neurons - Electrical potential of the nerves – Electromyogram – Electrocardiogram – Electroencephalogram - Electroretinogram – Electroocculogram. Physics of Diagnostic Radiology: - Production of X-Ray - Absorption of X-Ray - X –ray Image and its Problem. Radionuclide in Medicine: - Characteristics and units of radioactivity - Sources of radioactivity for nuclear medicine - Statistical aspects of nuclear medicine - Geiger-Mueller counter, photo-multiplier tube, pulse height analyzer - The gamma camera, radiation doses in nuclear medicin. Radiation Protection in Medicine: - Background radiation - Hazards of exposure to radiation - Biological effects of radiation - Shielding against high radiation exposure. Heat and Cold in Medicine: - IR radiation, heat therapy using conductive methods, infrared radiowave heating (diathermy) Microwave and ultrasonic diathermy, cryogenics, cryobiology - Preservation of organs, blood preservation and cryosurgery. Light in Medicine: - General properties of light measurements of light and its units- Application of visible light in medicine - Flexible fibers optics, endoscopes, application of UV and IR in medicine, IR imaging, Laser and its clinical application, microscopes.

BCMC1202 Chemistry 2: [comp, 3 cr., 2 lec. + 3 pra.]

Organic Chemistry; studies the reactivity of carbon and systematizes the properties of the compounds that contain it. Basic ideas about the characteristics and reactivity of the different functional groups are given, as well as the conformational analysis and the stereochemistry of organic compounds.

Introduction (Lewis structures, resonance, coordinates and reaction profile). AlKans (Constitutional isomerism, optical isomerism, enantiomers, diastereoisomers). Halogenated derivatives (Structure and obtaining, nucleophilic substitution, reactions SN1 and SN2, eliminations). Alkene and alkynes (Bond, isomers, properties, reactions, additions, oxidations). Alcohols and ethers (Alcohols: structure and properties, obtaining and reactions, oxidation of alcohols, ethers: properties, synthesis, epoxides). Aldehydes and ketones (The carbonyl group: structure and properties, obtaining aldehydes and ketones, reactions of oxidation, reduction and addition, keto-enol tautomerism). Carboxylic acids and derivatives (Electronic structure, acidic character, physical properties, obtaining, derivatives, esters, lactones). Nitrogen derivatives (Amines, properties, obtaining, ammonium salts). Benzene (Electronic structure, benzene-aromaticity, aromatic hydrocarbons, aromatic electrophilic substitution). Benzene derivatives (Ring reactions, effect of substituents, nitrogen derivatives, phenols). Polymers (Characteristics, obtaining, most important polymers, structure and properties).

BCMP 1203 Physics 2: [comp, 3 cr., 2 lec. + 3 pra.]

Electric forces and fields, electric potential, electric circuits, magnetic forces and fields, geometrical optics, relativity, and modern physics. A noncalculus-based approach for majors in the life sciences, preprofessional health programs, agriculture, and veterinary medicine

BCMMt 1204 Math 2 : [comp, 3 cr., 2 lec. + 3 tu.]

Provide knowledge on basic transcendental functions and their properties as mathematical models, particularly the use of the exponential function in carbon aging and, population model and substance metabolism. 2. Introduction of various techniques to compute integrals, provided numerical integration and improper integral. 3. Model life problems in terms of integration and numerical integration. 4. Introduction of infinite

series and develop skills to determine their convergence. 5. Introduce power series and expansion of functions in Taylor series. 6. Model life problems in terms of sequences and series. 7. Studying the conic sections. 8. Introduction to parametric curves and polar coordinate systems and studying properties of plane curves. 9. Model life problems in parametric equations.

BCMB 1205 Botany : [comp, 3 cr., 2 lec. + 3 pra.]
Classification of the kingdoms & life cycles, cell biology and physiology (respiration, enzymes, photosynthesis, ….). Introductory study of genetics.

3rd semester

BCMM 2301 Microbial Physiology: [comp, 2 cr., 2 lec.]
Students will become familiar with Microbes Physiology & their metabolism provide insight knowledge on their sources of energy &its utilization as they are tiny factories for the production of high-value low-volume products to low-value high-volume products which are its primary & secondary metabolites. To explain prokaryotic and eukaryotic structure and composition as well as the means by which nutrients are transported into cells across membranes. The important metabolic processes that occur in prokaryotes and eukaryotic microorganisms under different environmental conditions will be discussed to explain the central metabolic pathways starting from glucose, as well as other trophic variations found in prokaryotes including the use of organic compounds other than glucose, anaerobic fermentation, anaerobic respiration, chemolithotrophy and photosynthesis. Kinetic of the energy and biochemistry of Nitrogen fixation also will be covered. The regulation of metabolism through control of gene expression and enzyme activity is also covered. **Prerequisite: BCM**B1205.

BCMM 2302 Bacteriology and Actinomycetes : [comp, 2 cr., 2 lec.]
Students will become familiar with structure, morphology and life cycle. Techniques including substrate production, sterilisation, disinfection, isolation methods and isolation media. Study the growth, physiology, metabolism and secondary metabolites of bacteria and actinomytes, the aetiological ability of bacteria and actinomytes. **Prerequisite: BCM**B 1205.

BCMM 2303 Microbiology Lab 1 : [comp, 1cr., 3 pra.]

Preparation of solid and liquid media, sterilization, incubation, different microbial cultures, Growth curves, evaluation of growths, factor affecting the microbial growth (Carbon sources, Nitrogen sources, temperature, pH, C/N ratios, ……), aerobic and anaerobic respirations, enzymatic activities and antimicrobial activities.

BCMC 2304 Thermodynamics & Separation techniques : [comp, 2 cr., 2 lec.]

Thermodynamics

Introduction and basic concepts, Energy transfer and analysis, First law of thermodynamics, Properties of pure substances, Phases and phase changes, Closed systems, Energy balance, Specific heats, Enthalpy, Second law of thermodynamics, Third law of Thermodynamics,

Separation Techniques

Separation Techniques: (Brief about the methods and applications), Chromatographic process, High Performance Liquid Chromatography , Gas Chromatography, Supercritical Fluid Chromatography (SFC), Electrophoresis. **Prerequisite: BCM**C 1102

BCMC 2305 Bio molecules 1 : [comp, 2 cr., 2 lec.]

Classification of carbohydrates. Function/Role of carbohydrates. Physical property of carbohydrates. Stereochemistry of carbohydrates. Chemical structure of amino acids, classification of amino acids. Chemical reactions of amino acids. Chemistry composition of lipids. Types of Fatty acids. Properties of fatty acids in lipids. Physical property of Fatty acids. Chemical property of fatty acids. Nomenclature of fatty acids. **Prerequisite: BCM**C 1202

BCMC 2306 Bio molecules 2 : [comp, 2 cr., 2 lec.]

Definition of nucleotides. Components of nucleotides. Nomenclature of nucleotides. Structures of some common nucleosides. Derivatives of nucleotides. Functions/Roles of nucleotides and their derivatives. Differences between deoxyribonucleic Acid (DNA) and Ribonucleic acid (RNA). Structural and chemical differences between DNA and RNA. Similarities between DNA and RNA. Functions / roles of DNA function / Roles of RNA. **Prerequisite: BCM**Z 1101

BCMC 2307 Biochemistry Lab 1 : [comp, 1cr., 3 prac.]
Separation and identification of food stuff using different chemical compounds and different techniques.

BCMMt 2308 Biostatistics : **[comp, 2 cr., 1 lec. + 2 tu]**
Introductions to statistics, Describing the data using frequency tables, graphs and measures, Exploring the data and finding the outliers, An introduction to probability, random experiments and basic rules of probability, Random variables (Discrete with Binomial and Poisson distributions) and (Continuous with Normal Distribution), Sampling distributions and hence the confidence intervals of mean, Proportion, variance, difference between two means, difference between two Proportion, ratio of two variances, Hypothesis testing including one sample and two samples for mean, proportion and variance, Applying the statistical concepts using Minitab part-1.

Allied courses: the candidates choose 2 Cr. hrs.:

BCMA 2309 Bioethics and Biosafety [comp, 1 cr., 1 lec.]
Biorisks associated with microbiology, biochemistry, biotechnology and molecular genetics research, risk assessment, biosafety guidelines and levels, bioethical issues and their solutions, environmental ethics, biomedical ethics, living organisms rights, intellectual property rights to modern innovations, patent laws and processing.

BCMA 2310 Language course 1 (Deutch or french) [elect, 1cr., 2 tu.]

BCMA 2311 Marketing [elect, 1cr., 1 lec.]
What is marketing? – customer needs, wants and demands – market offerings - produts, services and experienes – customer value and satisfaction – exchanges and relationships - markets – marketing management orientations – creating customer loyalty and retention – the changing marketing landscape.

4th semester

BCMM 2401 Applied Microbiology : [comp, 2 cr., 2 lec.]

Applied microbiology is the study of the microbial world and the way it interacts with our own. It looks at how we can harness and utilize the powers of the microbes (bacteria, cyanobacteria, fungi and actinomycetes) in areas ranging from tissue culture, biotechnology to pest control, to bio-refineries, to pharmaceutical applications. A wide range of microbial bioproducts is discussed. **Prerequisite: BCM**M 2301

BCMM 2402 Microbiology Lab 2 : [comp, 1cr., 3 pra.]

Factor affecting the production of microbial secondary metabolites. Chromatochraphic and instrumental separation and identification of secondary metabolites. Antibiotic tests, biological control and bioremediation assays. Evaluation and interpretation of all experiments.

BCMM 2403 Microbial Genetics : [comp, 3 cr., 2 lec. + 3 pra.]

The topics include cell cycle and cell division and how they regulate. Differences between prokaryotic and eukaryotic gene expression and regulation of gene expression. The central dogma (Chromatin structure, organization and rearrangement, codes, nucleic structures, genes, DNA replication and repair, RNA polymerases, cis- and trans-acting elements, RNA processing, RNA transcription, Protein synthesis), the mechanisms used to control and regulate gene expression. Mechanisms for the preservation, mutation and repair, exchange of genetic information between organisms, including (conjugation, transduction and transformation). Gene regulation mechanisms that are of significance for the virulence and development of antibiotic resistant microbes. Plasmids (definition, function, types, structure), vectors. **Prerequisite: BCM**B 1205

BCMC 2404 Amino acids,and protein metabolism : [comp, 2 cr., 2 lec.]

Amino acids; structure, synthesis and functions, biosynthesis and breakdown of some amino acids, peptides, chemical nature and reactions. Classification and types of proteins. Urea cycle. Protein reactions. Creatine and creatinine biosynthesis. Polyamines. **Prerequisite: BCM**C 2305

BCMC 2405 Carbohydrates and lipid metabolism:[comp, 2 cr., 2 lec.]

The exercise metabolism, view of energy metabolism, particularly as affected by acute and chronic exercises. Study different pathways through carbohydrate and lipids for energy production. Metabolism of blood glucose. Major pathway for carbohydrates metabolism. Lipid metabolism. Steps of fatty acid oxidation (β-oxidation). Biosynthesis of triacylglycerol's (triglycerides). Microsomal system for synthesis of higher chain fatty acids. **Prerequisite: BCM**C 2305

BCMC 2406 Enzymology :[comp, 2 cr., 2 lec.]

General Introduction on enzymes. Factors that effect the activity of enzymes. Enzymes regulation. Classification of enzymes. Differences between free and immobilized enzymes. Production of enzymes. Biotechnology production of enzymes. Application of immobilized enzymes. Enzyme purification. Role of NAD+ NADP+, Folic acid and Vit., B12 as biocatalysts. FMN/FAD, coenzyme A, Lipoic acid, biotin, tetrahydrofolate and metal ions as biocatalysts. Michaelis–Menten equation . Michaelis–Menten kinetic model of a single-substrate reaction. Direct use of the Michaelis–Menten equation for time course kinetic analysis. Practical significance of kinetic constants. Michaelis–Menten kinetics with intermediate. Multi-substrate reactions. Ternary-complex mechanisms. Ping–pong mechanisms. **Prerequisite: BCM**C 2304

BCMC 2407 Biochemistry Lab 2 : [comp, 1cr., 3 prac.]

Equipment's and tools used in clinical labs and their uses. Preparation of different buffers and their role in biochemical reactions.

Elective course: the candidates choose 2 Cr. hrs.:

BCMM 2408 Bacterial and Fungal Pathogenesis :[elec, 2 cr., 1 lec. + 3 pra.]

The mechanisms of bacterial and fungal pathogenesis. Different mechanisms of host resistance to bacteria and fungi are explored in detail. In each example, bacterial and fungal reproduction, cytopathic effects, immune response, and bacteria & fungal evasion are discussed. Account for mechanisms of transmission, virulence, pathogenicity of pathogenic microorganisms and methods for treatment and prevention of medically important microorganisms. Account for the mechanisms of

action of antibiotics and the genetic and evolutionary mechanisms behind bacterial and fungal development of resistance to antibiotics. **Prerequisite: BCM**M 2302

BCMM 2409 Food Microbiology : [elec, 2 cr., 1 lec. + 3 pra.]
Microorganisms metabolism: Fermentations and respirations. Electron balance and energy yield. Microbial food industry (enzymes and secondary metabolites of bacteria, actinomycetes, fungi and blue-green algae). Infections in general, food borne infections and poisoning (intoxications), mycotoxins, virulence properties. Microbial taxonomy with description of microorganisms related to quality deterioration and food safety. - methods for detecting microorganisms in food, microorganisms as indicators of quality change and food safety as well as microbiological criteria. Factors that determine microbial activity in food: Contamination sources, the properties of the foodstuff, storage conditions, microorganisms properties, biofilm, bacteriosines, natural inhibitors in food, etc. Microbial resistance to preservation processes. Microbial quality changes in food. **Prerequisite: BCM**M 2301.

Allied courses: the candidates choose 2 cr. hrs.:
BCMA 2410 Computer sciences : [elec, 2 cr., 1 lec.+2tu.]
This course will introduce students to programming and software development through the lens of data exploration. This course teaches students how to read and write code, as well as test and "debug" it. This course covers functions, variables, and types, as well as conditionals and Boolean expressions and loops. It also covers handling exceptions, finding and fixing bugs, and writing unit tests; using third-party libraries; validating and extracting data with regular expressions; modeling real-world entities with classes, objects, methods, and properties; and reading and writing files.

BCMA 2411 Quality control and Quality assurance [elec, 2 cr., 2 lec.]
A major objective of this course is to provide a strong background in those chemical principles that are particularly important to analysis and requirements of accreditation of laboratories. Concepts of quality and quality systems - Requirements of accreditation of laboratories - Proficiency testing-validation of methods- collaborative studies

5th semester

BCMM 3501 Virology and Viral Pathogenesis : [comp, 2 cr., 2 lec.]
Replication of viruses in populations, animals, and the host cell. The effects of viral infection on populations, individuals, and specific molecular effects on the target cell. Role of viral infections in cancer and degenerative diseases. Transmission of viral diseases, symptoms, environmental factors affecting viruses, the mechanisms of viral pathogenesis and the different host resistance to viruses are explored in detail. HIV, SARS and Influenza as well as the new century viruses are used as examples. In each case, viral replication, cytopathic effects, immune response, and viral evasion are discussed. **Prerequisite: BCM**M 2302.

BCMM 3502 Microbial Water pollution : [comp, 3 cr., 2 lec. + 3 pra.]
Provide information on the basic concepts of water pollution produced by microbes and algae, and its effects on human and ecosystem health. Mechanisms of polluted water treatments, biological, biochemical and radiation methods.
Prerequisite: BCMB 1205

BCMM 3503 Microbiology Lab 3 : [comp, 1cr., 3 pra.]
Viral symptoms, dilution end-point of plant and animal viruses, serology, inhibition of virus. Environmental factors affecting viral infections.

BCMC 3504 Endocrinology : [comp, 2 cr., 2 lec.]
Functions and characteristics of the Endocrine System. Mode of hormones action. Different types of hormones. Characteristics of the Endocrine System. Chemical Structure of Hormones. Control of Secretion Rates. Transport and Distribution in the Body. Metabolism and Excretion. Metabolic clearance rate (MCR). Classes of Hormone Receptors. Mode of action of hormones. Signal Transduction. Membrane-Bound Hormone Receptors, Intracellular Hormone Receptors. Action of Steroid Hormones versus Gonadotropin Hormones. Mechanisms of endocrine disease. Pituitary Gland and Hypothalamus. Characteristics of hypothalamic releasing hormones. Relationship of the Pituitary Gland to the Brain. Hormones of the Posterior Pituitary. Hormones of the Anterior Pituitary. Thyroid Gland, Parathyroid Glands, Endocrine Pancreas, Adrenal Glands. **Prerequisite: BCM**C 2404

BCMC 3505 Nutrition : [comp, 2 cr., 2 lec.]

Identify the two major classes and requirements of vitamins. Role of some vitamins and minerals in nutrition and their related diseases. Recognize vit A, vit.D vitamin E and Vit. K. The requirement and sources of iron. The sources of water soluble vitamins. The chemistry of vitamin C. The coenzyme activity. The chemistry of Riboflavin (Vitamin B2), folic acid. Zinc and magnesium metabolism. Calcium metabolism. **Prerequisite: BCM**C 2405

BCMC 3506 Body Fluids and Biological functions :[comp, 2 cr., 2 lec.]

Organs and organs system (structure and function) such as kidney, liver, digestive system, heart, etc. Types, distribution and homeostasis of body fluids. Blood functions. Blood composition. Blood plasma and proteins. Red Blood Cells (RBCs). Hemoglobin; (structure and gas transport). White blood cells. Platelets and blood clotting. Cerebrospinal fluid (CSF). Main functions. Flow and circulation of CSF. Sample collection. Hydrocephalus. Lymph andLymph function. Difference between blood and lymph. Urine. Diagnostic body fluid testing and clinical significance.

BCMC 3507 Biochemistry Lab 3 : [comp, 1 cr., 3 prac.]

Urine assays. Determination of some metabolites using biochemical reactions.

BCMMt 3508 Mathematical modelling : [comp, 1 cr., 2 tu.]

1.Developing the notion of vectors and their properties in plane and space. 2. Presenting the calculus of vector functions and curves. 3. Knowing the basic quadric surfaces, level curves and their applications, in cartesian, polar and cylindrical coordinates. 4. Developing the ability to differentiate functions of several variables. 5. Modeling and solving optimization problems in several variables. 6. Providing students with the skills of computing multiple integrations. 7. Modeling various applications to practical problems as multiple integration. 8. Knowing, line, and surface integrals as well as Green's & Stokes' theorems. 9. Modeling various physical problems as line, and surface integrations and to solve them.

Elective course: the candidates choose 2 Cr. hrs.:

BCMM 3509 Biotechnological Applications in Microbiology : [elec, 2 cr., 1 lec. + 3 pra.]

Covers microbiological and biochemical background related to current biotechnological applications. Case studies of biotech-companies, and basic information related to patents and start-up companies. Topics include biofuel, bioremediation, agricultural, medicinal and environmental applications. **Prerequisite: BCM**M 2301.

BCMM 3510 Microbial Disease Dynamics : [elec, 2 cr., 1 lec. + 3 pra.]

Learn how the immune system interacts with microbial infectious diseases. An introduction to microbial diseases and immunology. It concentrates on the way in which the immune system is critical to the prevention of infections. **Prerequisite: BCM**M 3501.

Allied courses: the candidates choose 1 Cr. hrs.:

BCMA 3511 Language course2 [Elec, 1 cr., 2 tu.]

Prerequisite: BCMA 2310

BCMA 3512 Seminars 1 [Elec, 1 cr., 2 tu.]

Attend two special seminars in the field of biochemistry and microbiology. Present the comment on the seminar and presented it in class meeting.

6th semester

BCMM 3601 Microbial fermentation and bioenergy:[comp, 2 cr., 2 lec.]

To study the design and construction of fermentors and parameters to be monitored and controlled in fermentation process. Study the principle of sterilization necessary for fermentation. Study the cell growth and formation of products. Evaluation of the kinetics and mechanism of microbial growth. Introduction and applications of biofuels produced from different microbes (bacteria, fungi, cyanobacteria and algae). **Prerequisite: BCM**M 2401

BCMM 3602 Microbiology Lab 4 : [comp, 1 cr., 3 pra.]

Fermentation experiments, factors affecting fermentation process, biofuel productions, factors affecting biofuel productions.

BCMM 3603 Molecular Biology : [comp, 2 cr., 2 lec.]

Molecular biology techniques and interpretations, molecular markers and their applications, evolution, biosystematics. Restriction enzymes and ligases, sequencing, genome, genetic engineering, gene cloning, vector and vectorless transformation methods, CRISPR-Cas9. Dideoxy Scaling Gel Method. Synthetic and inhibitory compounds. Enzyme Catalysis and Protein Engineering. Energy transduction in Bacteria, Mitochondria and Chloroplasts. Transmembrane signaling molecules and mechanisms. **Prerequisite: BCM**M 2403

Elective course: the candidates choose 6 Cr. hrs.:

BCMC 3604 Immunology : [comp, 2 cr., 2 lec.]

General characteristics of the immune system. Major histocompatibility. Immunotherapy. Innate immunity and its elements. Acquired immune system. Lymph and lymphatic organs. Antigen types. B and T Cell receptors. Humoral immune response. Cell mediated immune response. Advanced study in immunotherapy. Hypersensitivity; types, mechanisms, Factors in the development of allergic diseases. Diseases in Humans. Radioallergosorbent Test (RAST). Protective role of IgE. Non-autoimmune type II reactions. Autoimmune diseases mediated by direct cellular damage. Components of the Immune system. Organs and tissues. Immune cells. **Prerequisite: BCM**C 3506

BCMC 3605 Cancer biology : [comp, 2 cr., 2 lec.]

Introduction to cancer and cancer biology. Cancer risk factors. Morphological features of apoptosis. Therapeutic approaches targeting apoptosis**.** Abnormal cell growth. Differences between normal and cancer cells. Differences between benign and malignant tumors. Nomenclature & Classification of tumors. Tumors grading and staging. Cancer risk factors. Cancer incidence. Gene contribution to cancer. Mutations and cancer. Compare and contrast oncogenes and tumor suppressors. The contribution of genes to the risk and growth of cancer. Use all this information to describe how cancer is a genetic disease. Hallmarks of Cancer. Introduction to the Hallmarks of cancer. Types of cell death. Apoptosis, necrosis pathways. **Prerequisite: BCM**C 3504

BCMC 3606 Drug metabolism: [comp, 2 cr., 2 lec.]

Pharmacology definition, the nature of drug, drug reactivity and drug-receptor bond, bındıng with receptors bonds. Pharmacodynamics

processes, Types of drug-receptor interactions, Agonist drugs, Antagonist drugs. Pharmacokinetic processes. Pharmacokinetics and pharmacodynamics. **Prerequisite: BCM**C 3505

BCMC 3607 Isolation, purification and characterization of enzymes : [elec, 2 cr., 2 lec.]

Steps involved in isolation of a protein or enzyme. Steps involved in purification of a protein or enzyme. Enzyme activity, specific activity, purification fold & yield. **Prerequisite:** BCMC 2406

Elective course: the candidates choose 2 Cr. hrs.:

BCMM 3608 Microbial Diversity : [elec, 2 cr., 1 lec. + 3 pra.]

Students will learn what microorganisms are (identification, phylogeny, genome structure, and regulation), how they make a living (their diverse roles in ecosystems: from free-living to symbiotic to pathogenic). Content will cover all major groups of microorganisms, including bacteria, archaea, viruses, and eukaryotes (protists, algae and fungi). **Prerequisite: BCM**B 1205

BCMM 3609 Intercellular Signaling and Disease : [elec, 2 cr., 2 lec.]

Introduces cell-to-cell communication mechanisms, which are fundamentally essential but still not well understood. From well-established to cutting-edge, researches of intercellular communication and how its malfunction leads to diseases are discussed. **Prerequisite: BCM**M 3510

BCMT 3610 Training : [comp, 3 cr., 6 pra.]

8 week training in Biochemistry or Microbiology activity system.

Prerequisite: Pass 63 hrs.

BCMC 3611 Biochemistry Lab 4 : [comp, 1 cr., 3 prac.]

WBCs Cell count and differentiation using microscope. Seminal analysis and stool examination.

7th semester

BCMM 4701 Microbiological Analyses : [comp, 3 cr., 2 lec. + 3 pra.]

This course will review the sampling and analysis of microbiological contaminants in water, air, soil and on different surfaces. Explain the advantages/disadvantages of using indicator bacteria in

environment/occupational settings. Infection controls. Students will learn how to utilize, compare and analyze the different types of assays. Study pharmaceutical and medical analyses. **Prerequisite: BCMM** 2301

BCMM 4702 Microbiology Lab 5 : [comp, 1 cr., 3 pra.]
Analyses of microbiological contaminants in water, air, soil and on different surfaces. Some pharmaceutical and medical analyses. Infection controls assays.

BCMM 4703 Molecular biology Lab : [comp, 1 cr., 3 pra.]
Protein isolation and SDS-PAGE, isozymes, DNA and RNA extractions, cDNA synthesis, PCR & q-PCR, electrophoresis Profiling with molecular markers (RAPD, ISSR, Scot, sRAP,….), genetic transformation, gene cloning, restriction enzymes, comet assay, interpretation by dendrograms, evaluation of polymorphisms, Western blotting/ELISA. **Prerequisite: BCM**M 3603

BCMC 4704 Biochemistry Lab 5 : [comp, 1 cr., 3 prac.]

Determination of some metabolites in different biological samples using specific kits.

Elective course: the candidates choose 2 Cr.hrs.:
BCMM 4705 Microbial Endophytes : [elec, 2 cr., 1 lec. + 3 pra.]
Studying intercellular relationship in certain plant species that lead to a symbiotic interaction between the host and its endophytic microbes. This course demonstrates the ability of many types of endosymbionts, acting as a unit with hosts to better survive, compete and reproduce. Applications of such endophytes are also discussed, for example, pharmaceutical developments and agricultural management. **Prerequisite: BCM**M 2302

BCMM 4706 Biometry : [elec, 2 cr., 2 lec.]
The purpose of the course is to teach fundamental concepts and techniques of descriptive and inferential statistics with applications in microbiology. Basic statistics, including probability, descriptive statistics. Inference for means and proportions, and regression methods are presented.

Elective course: the candidates choose 4 Cr.hrs.:

BCMC 4707 Clinical Biochemistry : [comp, 2 cr., 2 lec.]

This course deals with some disease such as Diabetes mellitus, anaemias, viral hepatitis, gout. Calcium homeostasis. Regulation, parathyroid hormone, calcitonin and Calcium distribution. Deficiency, causes and diseases. Iron metabolism & anaemia. General treatment for anemia. carbohydrate digestion, regulation of plasma glucose level, normal Insulin metabolism and action of insulin on the cell. Action of insulin on carbohydrate, protein and fat metabolism. Classification of Diabetes mellitus (DM): Type 1 Diabetes Mellitus. Type 1 Diabetes Mellitus Etiology. Risk Factors. Clinical symptoms. Pathophysiology. Drug Therapy. Complications of DM, gout and uric acid synthesis. Antimetabolites of purine nucleotides. Viral hepatitis A-E Viruses. Types, transmission, diagnosis, prevention and treatment. Lipids and lipoprotein disorders. Apolipoproteins, types of lipoproteins. Causes of hyperlipidemia and dyslipidemias. Arteriosclerosis and Hypolipoproteinemia. Treatment of hyperlipidemia. **Prerequisite: BCM**C 2405

BCMC 4708 Stem Cells : [elec, 2 cr., 2 lec.]

Diversity of Human Cells. Stem cell types, characteristic features, differentiation. Role of stem cells in medical applications.

BCMC 4709 Neurosciences : [elec, 2 cr., 2 lec.]

The course covers 7 major topics in cognitive neuroscience: sensory systems, long-term memory and sleep, motor control, attention, working memory, cognitive control, and social neuroscience.

BCMC 4710 Forensic Science : [elec, 2 cr., 2 lec.]

Modern and advanced methods and strategies of nucleic acid manipulation, and characterization of genes in cells and whole organisms are presented. Topics include; delivery of genes into cells and animals, generation of transgenic and gene knockout animals, genome editing, DNA forensics, and aspects of systems biology. **Prerequisite BCMC 3603**

BCMJ 4711 Bachelor Project : [comp, 3 cr., 1 lec. ,6 prac.]

At first original laboratory research in the field of biochemistry or microbiology under the supervisions of faculty members is approved by the administration of the program. Student must present seminar at the end of the semester to evaluate their proposal research project (2 hr/w credit hours per week equivalent 6 hr/w laboratory hours per week). The course is designed to offer students an in-depth understanding of research design and methodology and train them in creating a study plan and critically assessing scientific literature. This course will provide students with the body of theoretical knowledge and practical skills of scientific work (1 hr/w Lecture per week). The course includes: Concepts in international journal and scientific publication - Introduction to data and statistical analysis - Ethical issues - Useful websites and applications for researchers - Plagiarism and paraphrasing - Writing and presenting a granted research proposal - The journey of paper writing, submission and reviewing - Poster presentation and important tips to participate in a conference. **Prerequisite: Pass 90 hrs.**

BCMMt 4712 Biological modeling Lab : [comp, 1 cr., 2 tu .]

1. Introducing higher order differential equations and their solutions.
2. Introducing solutions of systems of first order differential equations.
3. Studying numerical solutions of differential equations using computer algebra systems (CAS).
4. Investigating continuous population models.
5. Studying discrete population models.
6. Introducing basic models for interacting populations.
7. Studying the dynamics of infectious diseases.

8th semester

BCMM 4801 Bioinformatics :[comp, 2 cr., 2 lec.]

Students will become familiar with a variety of currently available genomic, transcriptome and proteomic databases (GeneBank, Swiss-Prot, ….), analyze their search results using software available on the internet (e.g. BLAST, ClustalW, ….), primer design. Students will learn how to compare and analyze biological sequences and how to interpret the results of their analyses. Students will learn how to construct phylogenetic trees based on biological sequence data. Students will become familiar with the principles and applications of microarrays. Students will be able to perform elementary predictions of protein structure and function.

Students will be able to perform elementary comparative genomic analysis. **Prerequisite: BCM**M 2308

BCMC 4802 Biochemistry Lab 6 : [comp, 2 cr., 3 prac.]
Isolation, purification and characterization of some proteins, enzymes using different molecular techniques.

Elective course: the candidates choose 4 Cr. hrs.:

BCMM 4803 Nanotechnology and bioremediation : [comp, 2 cr., 2 lec.]
This class will present students with various aspects of active research on next-generation nanoscale materials and electronic devices. Topics include nanomaterials, nanofabrication, nanoelectronics, and bionanotechnology. Bioremediation covers strategies ranging from in situ (microorganisms and plants), solid phase, slurry phase, and vapor-phase treatments. Emphasis also will be placed on natural attenuation. **Prerequisite: BCM**M 4701

BCMM 4804 Microbial life and Climatic change : [elec, 2 cr., 1 lec. + 3 pra.]
provides an overview of microbial life, and their importance in the biosphere. introduces the relationship between microbes and climate change while describing microbial diversity and activities in different environments. **Prerequisite: BCM**M 2301

BCMM 4805 Microbial toxicology : [elec, 2 cr., 1 lec. + 3 pra.]
The goal of this course is to introduce the students to some of the unifying concepts of microbiology and toxicology relating to water, food and feed-stuffs, the most common and significant sources of infectious diseases caused by microbial contamination. The course will explore the types of toxicants, their routes of exposure and modes of action, as well as their effects on human health and the environment. **Prerequisite: BCM**M 3510

Elective course: the candidates choose 4 Cr. hrs.:

BCMC 4806 Inborn Error of metabolism: [elec, 2 cr., 2 lec.]
Study some genetic disorders; causes, diagnosis and routes of treatment.

Disturbances in protein metabolism and amino acids; causes, diagnosis and treatment. Mutation of some enzymes and related diseases. **Prerequisite: BCM**C 2404.

BCMC 4807 Industrial biochemistry : [elec, 2 cr., 2 lec.]
study of the structure and biological function of cellular molecules such as proteins and DNA, and how these molecules interact to form living cells). Study of the applications of biological molecules for medical, industrial, environmental, agricultural or analytical purposes.

BCMC 4808 Drug design : [elec, 2 cr., 2 lec.]
In this course, a systematic approach establishes the fundamental physicochemical principles applicable to dosage forms. The foundational scientific principles are illuminated with key examples of solution drug dosage forms. These concepts are relevant to current as well as future dosage forms as drugs must be dissolved before they can be absorbed into the systemic circulation and eventually reach the site of action. **Prerequisite:** BCMC 3606

BCMC 4809 Genetic engineering and gene therapy : [elec, 2 cr., 2 lec.]
This course deals with gene therapy background. How does gene therapy work? Types of gene therapy and role of viruses in this type of treatment. **Prerequisite:** BCMC 4708

BCMJ 4810 Research Project : [comp, 3 cr., 6 prac.]
The laboratory research in the field of Biochemistry or microbiology is completed in semester eight. Student must present scientific paper, poster and seminar at the end of the semester to evaluate their bachelor project (2 hr/w credit hours per week equivalent 6 hr/w laboratory hours per week). **Prerequisite: BCM**J 4711

Elective course: the candidates choose 2 Cr. hrs.:

BCMM4811 Microbiomes : [elec, 2 cr., 2 lec.]
Microbiomes will describe a deep understanding of microbial communities and their diversity on hosts, such as gut microbiome and its effect on health. How microbiomes can be used to improve health and treat diseases and how the microbiome continues to shape the future of

precision health therapeutics, where it is targeted to treat a variety of disease states.

BCMM4812 Medical Microbiology : [elec, 2 cr., 2 lec.]
The course will describe biological characteristics of microbes, principles of disease transmission and prevention, pathogenesis and immunity, antibiotic resistance. Understand how microbes cause infectious disease. Describe a range of bacterial, viral and eukaryotic pathogens responsible for infectious disease in terms of biological characteristics, pathogenesis and epidemiology, diseases caused. **Prerequisite: BCM**M 4805

BCMM4813 Cell and Tissue Culture Technology : [elec, 2 cr., 1 lec., 3 prac.]
Tissue culture as a tool for genetic engineering, vector and vectorless ways of microbes and plant transformation, applications for different disease resistances, for stresses tolerance, bioreactors of genetic modified organisms (GMOs), debates of using GMOs. **Prerequisite: BCM**M 3603

Allied courses: The candidates choose 1 Cr. hr.

BCMA 4814 Language course 3 [elec, 1cr., 2 tu.]
Prerequisite: BCMA 3511

BCMA 4815 Seminars 2 [elec, 1cr., 2 tu.]
Attend two special seminars in the field of biochemistry and microbiology. Present the comment on the seminar and presented it in class meeting. **Prerequisite: BCM**A 3512.