Bachelor of Honours

ACADEMIC CALENDAR
&
COURSE PLAN

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উদ্ভিদবিজ্ঞান বিভাগ
রাজশাহী কলেজ, রাজশাহী

প্রসঙ্গ কথা

বাংলাদেশের ঐতিহ্যবাহী বিদ্যাপীঠ রাজশাহী কলেজের ঐতিহ্যের ধারক, বাহক এবং নতুন ঐতিহ্যের সূচনাকারী বিভাগ হল উদ্ভিদবিজ্ঞান বিভাগ। ১৯৩০ সালে এ বিভাগ প্রতিষ্ঠা লাভ করে। যাত্রা শুরু থেকে এই বিভাগ তৈরী করেছে অসংখ্য ছাত্র-ছাত্রী, যারা পরবর্তীতে হয়েছে প্রথিতযশা এবং সমাজ ও দেশের জন্য রেখেছে অনন্য অবদান।

বর্তমানে যে ভবনে উদ্ভিদবিজ্ঞান বিভাগের অবস্থান সেই ভবনটি রাজা প্রমথনাথ বাহাদুরের ছেলে বসন্ত কুমারের বিশ হাজার টাকা অনুদানে নির্মিত হয় ১৯৩০ সালেই। একই সঙ্গে ভবনটির নিচ তলায় মূল্যবান আসবাবপত্র ও যন্ত্রপাতিতে সুসজ্জিত Botany Laboratory-ও প্রতিষ্ঠা করা হয় এবং ১৯৩০ সাল থেকেই এই ভবনে উচ্চমাধ্যমিক স্তরে উদ্ভিদবিজ্ঞানে পাঠ দান করা হয়। এ সময় রাজশাহী কলেজর অধ্যক্ষ ছিলেন-Dr.W.A.Jenkins এবং উদ্ভিদবিজ্ঞানের একমাত্র লেকচারার ছিলেন বাবু বলাই চাঁদ কুন্ডু। যিনি B.C.Kundu নামে সমধিক পরিচিত।

১৯৩০-১৯৪২ সাল পর্যন্ত উদ্ভিদবিজ্ঞানকে শুধুমাত্র I.A. এবং I.Sc. শ্রেণীর Subject Combination হিসেবে পড়ানো হত। ১৯৪২ সালের পর থেকে B.Sc. পাস কোর্সের এবং অনার্সের Subject Combination হিসেবে উদ্ভিদবিজ্ঞানকে পদার্থ, গনিত এবং রসায়নের সাথে পড়ানো হত।

১৯৫৭ সাল থেকে এ কলেজে 'উদ্ভিদবিজ্ঞান' বিষয়ে অনার্স কোর্স চালু হয়। এ সময় কলেজের অধ্যক্ষ ছিলেন-ড.আব্দুল হক এবং বিভাগীয় প্রধানের দায়িত্বে ছিলেন-ড.শামসুল হুদা চৌধুরী। প্রাসঙ্গিক ভাবে উল্লেখ করা যেতে পারে যে, রাজশাহী বিশ্ববিদ্যালয় ১৯৫৩ সালে প্রতিষ্ঠিত হলেও তখন পর্যন্ত সেখানে উদ্ভিদবিজ্ঞান বিষয়ে অনার্স কোর্স ছিলনা। অর্থাৎ সে সময় তৎকলীন পূর্ব পাকিস্থানে কেবল ঢাকা বিশ্ববিদ্যালয় ও রাজশাহী কলেজেই উদ্ভিদবিজ্ঞান বিষয়ে অনার্স কোর্স ছিল।

এভাবে একসময়ের ক্ষুদ্র পরিসর থেকে যাত্রা আরম্ভ করা উদ্ভিদবিজ্ঞান বিভাগ ধীরে ধীরে মহিরুহে পরিণত হয়ে দেশের বিভিন্ন এলাকায় জ্ঞান-বিজ্ঞানের প্রভা ছড়িয়ে দিয়ে এক বিপুল সংখ্যক আলোকিত মানুষ তৈরীর কাজে ব্রতী আছে। বর্তমানে উদ্ভিদবিজ্ঞান বিভাগ পাস, অনার্স ও মাস্টার্স (প্রথম ও শেষ পর্ব) শ্রেণীর প্রায় ১০০০ জন শিক্ষার্থীদের পদচারণায় সর্বদা মুখরিত থাকে। ১২ টি সৃষ্ট পদের মধ্যে বর্তমানে ১ জন সংযুক্ত সহ মোট ১৩ জন শিক্ষক কর্মরত আছেন। ২ টি সৃষ্ট ডেমোনেষ্ট্রোর পদের মধ্যে বর্তমানে ১ জন কর্মরত আছেন। বিভিন্ন শ্রেণীর ভাল ফলাফল ও সাংস্কৃতিক কর্মকান্ডে সম্পৃক্ততার মান বিচারে উদ্ভিদবিজ্ঞান বিভাগ কলেজের মধ্যে অন্যতম হিসেবে স্বীকৃত। উদ্ভিদবিজ্ঞান বিভাগ পুরোনো ঐতিহ্যে মহিমান্বিত। এ ঐতিহ্য আমাদের গর্ব। বিভাগের সাথে আমরা যারা সংশ্লিষ্ট তারা যেন সেই ঐতিহ্যকে লালন করি।

উদ্ভিদবিজ্ঞান বিভাগের রয়েছে ৪টি শ্রেণি কক্ষ। এ বিভাগের শ্রেণি কক্ষগুলিতে পাঠদানে ব্যবহার করা হয় মাল্টিমিডিয়া, সাউন্ড সিস্টেম, ওভার হেড প্রজেক্টর, ল্যাপটপ দিয়ে । এই বিভাগে রয়েছে পুরাতন ও আধুনিক যন্ত্রপাতিসহ ১টি সমৃদ্ধ ল্যাবরেটরী। বিভাগের ৪টি শ্রেণী কক্ষ বিভাগের গবেষণাগার হিসেবে ব্যবহৃত হয়। রাজশাহী কলেজের উদ্ভিদবিজ্ঞান বিভাগের রয়েছে সমৃদ্ধ বায়োটেকনোলজি ল্যাবরেটরী। এ বিভাগের রয়েছে একটি সেমিনার লাইব্রেরী । । এই লাইব্রেরীতে উদ্ভিদবিজ্ঞান বিষয়ের প্রায় ২৫০০ বই আছে, দেশ বিদেশের জার্নালও এখানে সংগৃহিত আছে। এই বিভাগে রয়েছে ২টি কম্পিউটার ও ৩টি ল্যাপটপ কম্পিউটার। কম্পিউটারসমূহে রয়েছে ব্রডব্যান্ড ইন্টারনেট সুবিধা এবং কম্পিউটারসমূহ কেন্দ্রীয়ভাবে প্রশাসনের সাথে সংযুক্ত। কম্পিউটার কক্ষের জন্য রয়েছেন একজন কম্পিউটার অপারেটর। বিভাগে রয়েছে একটি শিক্ষক কক্ষ। যেখানে শিক্ষকগণ বিভাগীয় ও একাডেমিক কার্যক্রম পরিচালনা করেন। বিভাগে রয়েছে একটি বিভাগীয় প্রধান কক্ষ । যেখানে বিভাগীয় প্রধান বিভাগীয় ও একাডেমিক কার্যক্রম পরিচালনা করেন।

এই বিভাগের প্রতিটি বর্ষের ছাত্র-ছাত্রীদের শিক্ষা সংক্রান্ড় তত্ত্বাবধানের জন্য রয়েছেন দুইজন করে কোর্স তত্ত্বাবধায়ক। নিয়মিত নেওয়া হয় ক্লাস টেস্ট ও ইনকোর্স পরীক্ষা। পাঠদান প্রক্রিয়াকে আরও ফলপ্রসূ করতে এবং ছাত্র-ছাত্রীদের মেধার বিকাশে এ বিভাগ বিভিন্ন কার্যক্রম পরিচালনা করে থাকে। যেমন: অ্যাসাইমেন্ট লিখন, পুস্ড়ক পরিচিতি, সেমিনার ইত্যাদি। শিক্ষার্থীদের পরীক্ষার ফলাফল আনুষ্ঠনিক ভাবে প্রকাশ করা হয় এবং পুরস্কৃত করা হয়। ক্লাসে সর্বাধিক উপস্থিতি সম্পন্ন শিক্ষার্থীদেরও পুরস্কৃত করা হয়।

এছাড়াও এ বিভাগের শিক্ষার্থীবৃন্দ বিভিন্ন সহপাঠ্যক্রমিক কার্যক্রমেও অংশগ্রহণ করে থাকেন। বিভাগে অনার্স ১ম বর্ষ ,মাস্টার্স শেষ পর্ব ও মাস্টার্স-১ম পর্বে ভর্তিকৃত ছাত্র-ছাত্রীদের তাদের ক্লাসের ১ম দিনে আনুষ্ঠানিক ভাবে 'রিসিপশন ও ওরিয়েন্টেশন' এর মাধ্যমে বিভাগ কর্তৃক বরণ করে নেওয়া হয়। এছাড়াও বিভাগের বিভিন্ন বর্ষের ছাত্র-ছাত্রীরা জাঁকজমক অনুষ্ঠানের মাধ্যমে নবাগত শিক্ষার্থীদের বরণ করে থাকে। এ বিভাগের বিভিন্ন বর্ষের ছাত্র-ছাত্রীরা তাদের কোর্স সমাপনে 'কোর্স সমাপনি' অনুষ্ঠানও করে থাকে। এ বিভাগের শিক্ষার্থীদের রয়েছে সাংস্কৃতিক অঙ্গনে সরব পদাচরণা। কলেজ কর্তৃক আয়োজিত বিভিন্ন ধরণের শিক্ষা-সাংস্কৃতিক প্রতিযোগিতার বেশীর ভাগ সাফল্য এ বিভাগের ছাত্র-ছাত্রীরা অর্জন করে থাকেন। এছাড়াও কলেজ কর্তৃক আয়োজিত বিভিন্ন ধরণের অনুষ্ঠানে এ বিভাগ অংশগ্রহণ করে তার শ্রেষ্ঠত্ব প্রমাণ করে থাকে। এছাড়াও এ বিভাগের শিক্ষক-শিক্ষার্থীর উদ্যোগে বের করা হয় দেয়াল পত্রিকা, স্মরণিকা ইত্যাদি। এ বিভাগের বিভিন্ন বর্ষের ছাত্র-ছাত্রীরা শিক্ষকবৃন্দের তত্ত্বাবধানে দেশের বিভিন্ন স্থানে শিক্ষা সফর করে থাকে। বিভিন্ন সময়ে আয়োজন করা হয় শিক্ষা বিষয়ক সেমিনার।

বিভাগের শিক্ষকমন্ডলীর পরিচিতি

নাম	পদবী
মোসাঃ হালিমা খাতুন	অধ্যাপক ও বিভাগীয় প্রধান
ড. মোঃ রেজাউল করিম	সহযোগী অধ্যাপক (সংযুক্ত)
নূরুননেসা খাতুন	সহযোগী অধ্যাপক
ড. আ.ন.ম.আল মামুন চৌধুরী	সহযোগী অধ্যাপক
মোসাঃ নাসিমা খাতুন	সহযোগী অধ্যাপক
জান্নাতুল ফেরদাউস	সহকারী অধ্যাপক
মোঃ শরিফুল ইসলাম	সহকারী অধ্যাপক
মোঃ মোনতাজ আলী সরকার	সহকারী অধ্যাপক
মোসাঃ নাজমা সুলতানা	সহকারী অধ্যাপক
কনক কান্তি সরকার	প্রভাষক
শারমিন সাকিলা	প্রভাষক
আফরোজা আক্তার	প্রভাষক
মোছাঃ বিলকিছ খানম	প্রভাষক
মোঃ আকবর আলী	প্রদর্শক

কর্মচারিবৃন্দের পরিচিতি

মোঃ গোলাম কিবরিয়া	কম্পিউটার অপারেটর
মোঃ মাসুন রানা	এমএলএসএস
মোঃ তুষার	এমএলএসএস

বিভাগের শ্রেণিভিত্তিক সমন্বয়কারী শিক্ষক গণের নাম

ক্রমিক নম্বর	বর্ষ	নাম
১.	প্রথম বর্ষ অনার্স	১. ড. আ.ন.ম আল মামুন চৌধুরী
		২. জান্নাতুল ফেরদাউস
২.	দ্বিতীয় বর্ষ অনার্স	১. মোছাঃ নাজমা সুলতানা
		২. শারমিন সাকিলা
৩.	তৃতীয় বর্ষ অনার্স	১. নূরুননেসা খাতুন
		২. মোঃ শরিফুল ইসলাম
৪.	চতুর্থ বর্ষ অনার্স	১. ড. মোঃ রেজাউল করিম
		২. মোঃ আকবর আলী
৫.	মাস্টার্স প্রথম পর্ব	১. কনক কান্তি সরকার
		২. মোছাঃ বিলকিছ খাতুন
৬.	মাস্টার্স শেষ পর্ব	১. মোছাঃ নাসিমা খাতুন
		২. মোঃ মোনতাজ আলী সরকার

বিভাগের জাতীয় বিশ্ববিদ্যালয় পরীক্ষার ফলাফল

গত ৫ বছরের অনার্স পর্যায়ের ফলাফল

বছর	১ম শ্রেণি	২য় শ্রেণি	৩য় শ্রেণি	পাস	ফেল	অন্যান্য	মোট
২০১২	৪৮	৪৯	০৩	২	৩	৪	১০৯
২০১১	২৫	৭৮	০৩	০৭	০১	-	১১৪
২০১০	১৮	১০২	০৪	০৫	০৫	-	১৪২
২০০৯	১২	৯০	১৪	০০	০৪	-	১২৯
২০০৮	০২	১১৭	০৭	০৪	০০	-	১৩৭

গত ৫ বছরের মাস্টার্স পর্যায়ের ফলাফল

বছর	১ম শ্রেণি	২য় শ্রেণি	৩য় শ্রেণি	পাস	ফেল	অন্যান্য	মোট
২০১১	১৩১	১০৫	০০		৩১	০৫	২৭২
২০১০	৯০	১৩৮	০০		২৯	-	২৫৭
২০০৯	১৪৭	৭০	০০		১৮	-	২৩৫
২০০৮	৫৩	৯০	০০		২৮	-	১৭৪
২০০৭	৩৬	৬৪	০০		২২	-	১২৬

সহশিক্ষা কার্যক্রম ঃ

১. প্রতি শিক্ষাবর্ষের নবাগত শিক্ষার্থীদের 'রিসিপশন ও ওরিয়েন্টেশন' অনুষ্ঠানের মাধ্যমে বরণ।
২. বার্ষিক ক্রীড়া এবং সাহিত্য ও সাংস্কৃতিক প্রতিযোগিতায় শিক্ষার্থীদের অংশগ্রহণ।
৩. জাতীয় দিবসসমূহ উদযাপন ও বিভিন্ন প্রতিযোগিতায় শিক্ষার্থীদের অংশগ্রহণ।
৪. বিভাগের উদ্যোগে দেয়াল পত্রিকা ও স্মরণিকা প্রকাশ।
৫. বাংলা নববর্ষ, বসন্ত উৎসব, বর্ষাবরণ, সরস্বতী পূজা, রবীন্দ্র, নজরুল জয়ন্তী উদযাপনে শিক্ষার্থীদের অংশগ্রহণ।
৬. বনভোজন ও শিক্ষা সফরে শিক্ষার্থীদের অংশগ্রহণ।
৭. শিক্ষা বিষয়ক সেমিনারের আয়োজন।
৮. রোভার্স স্কাউটস ছাত্র-ছাত্রীদের আত্মনির্ভরশীল করে তোলার জন্য বিভিন্ন সামাজিক কার্যক্রমে অংশগ্রহণ।
৯. বিএনসিসি জাতীয় প্রতিরক্ষায় নিজেদের সম্পৃক্ত রাখার প্রত্যয়ে ছাত্র-ছাত্রীদের নিয়োজিত হওয়ার কার্যক্রম।
১০. বাঁধন স্বেচ্ছায় রক্তদান করে মানবতার সেবায় নিয়োজিত একটি সংগঠন।
১১. বরেন্দ্র থিয়েটার গ্রুপ থিয়েটার আন্দোলনভিত্তিক নাটক ও জীবনধর্মী চলচ্চিত্র বিষয়ক সংগঠন।
১২. অন্বেষণ জাতীয় পালাপার্বণে বিশুদ্ধ সাংস্কৃতিক চর্চার একটি সংগঠন।
১৩. আরসিডিসি (রাজশাহী কলেজ ডিবেটিং ক্লাব) ছাত্র-ছাত্রীদের মেধা বিকাশের জন্য বিতর্ক চর্চামূলক সংগঠন।
১৪. রাজশাহী কলেজ নাট্য সংসদ 'উদয়ের পথে আমরাও' এই ভাবনায় সৃষ্টিশীল ও ইতিবাচক নাট্য আন্দোলনে বিশ্বাসী এই সংগঠনটি আলো জ্বালানোর প্রত্যয় নিয়ে কাজ করছে।
১৫. রাজশাহী কলেজ সঙ্গীত চর্চা কেন্দ্রের উদ্যোগে শিক্ষার্থীদের সঙ্গীতসহ অন্যান্য বিষয় শেখানো হয়।
১৬. সরকারি প্রজ্ঞাপনের মাধ্যমে যে সব সহশিক্ষা কার্যক্রমের নির্দেশনা আসে তা আয়োজন করা।

রাজশাহী কলেজ, রাজশাহী

একাডেমিক ক্যালেন্ডার

স্নাতক (অনার্স) পর্যায়

শিক্ষাবর্ষ : ২০১৪-২০১৫

(১০০ নম্বরের কোর্সের ৬০ ক্লাস ঘন্টা = ৪ ক্রেডিট, ৫০ নম্বরের কোর্সের ৩০ ক্লাস ঘন্টা = ২ ক্রেডিট)

১ম বর্ষ অনার্স			
পর্ব	**ক্লাস (১৯০ কার্যদিবস)**	**পরীক্ষা**	**ফলাফল প্রকাশ**
১ম ইনকোর্স	২২/০২/২০১৫ – ২৬/০৫/২০১৫ = ৬০ কার্যদিবস ১০০ নম্বরের কোর্স (২৫ ক্লাস ঘন্টা) ৫০ নম্বরের কোর্স (১২ ক্লাস ঘন্টা)	২৭/০৫/২০১৫ ১০/০৬/২০১৫	---
২য় ইনকোর্স	১১/০৬/২০১৫ – ০৪/১০/২০১৫ = ৫৮ কার্যদিবস ১০০ নম্বরের কোর্স (২৫ ক্লাস ঘন্টা) ৫০ নম্বরের কোর্স (১২ ক্লাস ঘন্টা)	০৫/১০/২০১৫ ১৯/১০/২০১৫	---
নির্বাচনী	২৮/১০/২০১৫ – ৩০/১১/২০১৫ = ২৮ কার্যদিবস ১০০ নম্বরের কোর্স (১০ ক্লাস ঘন্টা) ৫০ নম্বরের কোর্স (০৬ ক্লাস ঘন্টা)	০১/১২/২০১৫ ১৫/১২/২০১৫	পরীক্ষা সমাপ্তির ২ সপ্তাহের মধ্যে

২য় বর্ষ অনার্স			
পর্ব	**ক্লাস**	**পরীক্ষা**	**ফলাফল প্রকাশ**
১ম ইনকোর্স	ক্লাশ শুর“র তারিখ থেকে ১৫ সপ্তাহ ১০০ নম্বরের কোর্স (২৫ ক্লাস ঘন্টা) ৫০ নম্বরের কোর্স (১২ ক্লাস ঘন্টা)	ক্লাস শুর“র ১৫ সপ্তাহের মধ্যে	---
২য় ইনকোর্স	১ম ইনকোর্স পরীক্ষার পরবর্তী ১৫ সপ্তাহ ১০০ নম্বরের কোর্স (২৫ ক্লাস ঘন্টা) ৫০ নম্বরের কোর্স (১২ ক্লাস ঘন্টা)	১ম ইনকোর্স পরীক্ষা থেকে পরবর্তী ১৫ সপ্তাহের মধ্যে	---
নির্বাচনী	২য় ইনকোর্স পরবর্তী ১ মাস ১০০ নম্বরের কোর্স (১০ ক্লাস ঘন্টা) ৫০ নম্বরের কোর্স (০৬ ক্লাস ঘন্টা)	২য় ইনকোর্স পরবর্তী ১ মাসের মধ্যে	পরীক্ষা সমাপ্তির ২ সপ্তাহের মধ্যে

৩য় বর্ষ অনার্স			
পর্ব	**ক্লাস**	**পরীক্ষা**	**ফলাফল প্রকাশ**
১ম ইনকোর্স	ক্লাশ শুর“র তারিখ থেকে ১৫ সপ্তাহ ১০০ নম্বরের কোর্স (২৫ ক্লাস ঘন্টা) ৫০ নম্বরের কোর্স (১২ ক্লাস ঘন্টা)	ক্লাস শুর“র ১৫ সপ্তাহের মধ্যে	---
২য় ইনকোর্স	১ম ইনকোর্স পরীক্ষার পরবর্তী ১৫ সপ্তাহ ১০০ নম্বরের কোর্স (২৫ ক্লাস ঘন্টা) ৫০ নম্বরের কোর্স (১২ ক্লাস ঘন্টা)	১ম ইনকোর্স পরীক্ষা থেকে পরবর্তী ১৫ সপ্তাহের মধ্যে	---
নির্বাচনী	২য় ইনকোর্স পরবর্তী ১ মাস ১০০ নম্বরের কোর্স (১০ ক্লাস ঘন্টা) ৫০ নম্বরের কোর্স (০৬ ক্লাস ঘন্টা)	২য় ইনকোর্স পরবর্তী ১ মাসের মধ্যে	পরীক্ষা সমাপ্তির ২ সপ্তাহের মধ্যে

৪র্থ বর্ষ অনার্স			
পর্ব	**ক্লাস**	**পরীক্ষা**	**ফলাফল প্রকাশ**
১ম ইনকোর্স	ক্লাশ শুর“র তারিখ থেকে ১৫ সপ্তাহ ১০০ নম্বরের কোর্স (২৫ ক্লাস ঘন্টা) ৫০ নম্বরের কোর্স (১২ ক্লাস ঘন্টা)	ক্লাস শুর“র ১৫ সপ্তাহের মধ্যে	---
২য় ইনকোর্স	১ম ইনকোর্স পরীক্ষার পরবর্তী ১৫ সপ্তাহ ১০০ নম্বরের কোর্স (২৫ ক্লাস ঘন্টা) ৫০ নম্বরের কোর্স (১২ ক্লাস ঘন্টা)	১ম ইনকোর্স পরীক্ষা থেকে পরবর্তী ১৫ সপ্তাহের মধ্যে	---
নির্বাচনী	২য় ইনকোর্স পরবর্তী ১ মাস ১০০ নম্বরের কোর্স (১০ ক্লাস ঘন্টা) ৫০ নম্বরের কোর্স (০৬ ক্লাস ঘন্টা)	২য় ইনকোর্স পরবর্তী ১ মাসের মধ্যে	পরীক্ষা সমাপ্তির ২ সপ্তাহের মধ্যে

*** কলেজ কর্তৃপক্ষ প্রয়োজনে যে কোন কার্যক্রম বা সময়সূচি পরিবর্তন করতে পারে।**

শিক্ষার্থী ও অভিভাবকদের জ্ঞাতব্য

১। ব্যাচেলর (অনার্স) পরীক্ষায় অংশগ্রহণের যোগ্যতা হিসাবে মোট লেকচার ক্লাস/ব্যবহারিক ক্লাসের ৭৫% উপস্থিতি থাকতে হবে। বিশেষ ক্ষেত্রে অধ্যক্ষ বিভাগীয় প্রধানের সুপারিশের ভিত্তিতে উপস্থিতি ৭৫%-এর কম এবং ৬০% বা তার বেশি থাকলে তা বিবেচনার জন্য সুপারিশ করতে পারবেন। ৭৫% এর কম উপস্থিতির জন্য পরীক্ষার্থীকে পরীক্ষার ফরম পূরণের সময় ৫০০ (পাঁচশত) টাকা নন-কলেজিয়েট ফি অবশ্যই জমা দিতে হবে।

২। পরীক্ষার জন্য প্রেরিত পরীক্ষার্থীর আবেদনপত্রে অধ্যক্ষ/বিভাগীয় প্রধান প্রত্যয়ন করবেন যে-
(i) পরীক্ষার্থীর আচরণ সন্তোষজনক;
(ii) লেকচার ক্লাসে, ব্যবহারিক ক্লাসে, ইন-কোর্সে ও মাঠ পর্যায়ে তার উপস্থিতি সন্তোষজনক;
(iii) পরীক্ষার্থী কলেজের সকল অভ্যন্তরীণ পরীক্ষায় উত্তীর্ণ হয়েছে এবং বিশ্ববিদ্যালয় কর্তৃক আরোপিত সকল শর্ত পূরণ করেছে।

৩। ক্লাস শিক্ষক নির্ধারিত কার্যক্রমে শিক্ষার্থীদের সক্রিয়ভাবে অংশগ্রহণ করতে হবে।

৪। জাতীয় বিশ্ববিদ্যালয়ের সিলেবাস ও কোর্সসমূহে কোন পরিবর্তন আসলে কলেজ কর্তৃপক্ষ তা বিবেচনায় আনবেন।

৫। ইনকোর্স পরীক্ষাসহ অন্যান্য পরীক্ষার নির্দিষ্ট তারিখে অংশগ্রহণে ব্যর্থ হলে পরিবর্তিতে আর উক্ত পরীক্ষা দেয়ার সুযোগ থাকবে না।

৬। নির্বাচনী পরীক্ষার ফলাফল আনুষ্ঠানিকভাবে প্রকাশ এবং ভাল ফলাফল অর্জনকারী ও ক্লাসে সর্বাধিক উপস্থিত শিক্ষার্থীদের পুরস্কৃত করা হবে।

৭। ছাত্র-ছাত্রীদের প্রত্যেক পরীক্ষার পূর্বে বেতন অন্যান্য ফি হালনাগাদ পরিশোধ করে প্রবেশপত্র সংগ্রহ করতে হবে।

৮। কোন ছাত্র-ছাত্রীদের কলেজের শৃঙ্খলা পরিপন্থী কোন কাজ করলে কর্তৃপক্ষ বহিষ্কারসহ আইনানুগ যে কোন শাস্তিমূলক ব্যবস্থা নিতে পারবেন।

৯। এই প্রতিষ্ঠানের নিয়মশৃঙ্খলা বজায় রাখতে এবং সবচেয়ে ভাল ফলাফল করতে সকল ছাত্র-ছাত্রীর প্রচেষ্টা ও অভিভাবকবৃন্দের সহযোগিতা আমাদের কাম্য।

১০। ধর্মীয় অনুষ্ঠানাদি চান্দ্রমাসের ওপর নির্ভরশীল হওয়ায় উল্লিখিত ছুটির তারিখ পরিবর্তিত হতে পারে।

১১। প্রয়োজনে যে কোন কার্যক্রম কর্তৃপক্ষ পরিবর্তন করতে পারে।

Course Plan

Honours
1st Year
2nd Year
3rd Year
4th Year
Session : 2014-2015

Department of Botany
Rajshahi College, Rajshahi.

Department of Botany
Rajshahi College, Rajshahi.
Subject: Botany

1st Year Honours (2014-15)

Courses and Marks Distribution

Subject Code	Course Title	Marks	Credits
3052	Microbiology	100	4
3053	Mycology	100	4
3054	Higher Cryptogams	100	4
3060	Practical	100	4
6282	Chemistry-I	100	4
6285	Chemistry-I Practical	50	2
6312	Introduction to Zoology: Protozoa and nonchordates, Human Physiology, and Applied Zoology	100	4
6315	Zoology Practical – I	50	2
	Total=	700	28

Department of Botany
Rajshahi College, Rajshahi.

Course Plan

1st Year Honours (2014-15)

Course Code : 3052 **Assigned Course Teacher: Zannatul Ferdous**
Course Title: Microbiology **Mst, Najma Sultana**
Marks 100, 4 Credits, 60 Lectures **Konok Kanti Sorker**

EXAM	Chapter	Content	Lectures
1st In-course (25 Lectures)	1st	1. Introduction: A brief historical background and scope of the subject.	**4**
	2nd	2. Living organisms: Characters and possible origin, biogenesis, spontaneous generation and germ theory of infectious diseases.	**8**
	3rd	3. Position of microorganisms in the 5-kingdom system of R. H. Whittaker (1969).	**4**
	4th	4. Prions, Viroids, Rickettsia and Mycoplasma: Structure, properties and importance.	**9**
2nd In-course (25 Lectures)	5th	5. Viruses: Nature, structure of simple RNA virus (TMV) and DNA virus (T_2 phage); multiplication of viruses: transmission of plant viruses, importance of viruses.	**6**
	6th	6. Archaebacteria: Characteristics and importance.	**4**
	7th	7. Bacteria: Prokaryotic nature, size, shape and arrangement of bacterial cell; surface appendages - flagella, pili, capsule, cell wall, nucleoid, protoplast, endospore. Multiplication of bacteria (binary fission), and basis of genetic recombination in bacteria. Importance of bacteria.	**10**
	8th	8. Actinomycetes: Discovery, structure, reproduction and importance.	**5**
Test (10 Lectures)	9th	9. Growth and nutrition of microorganisms: Generation time, phases of growth curve, essential elements of microbial growth, nutritional groups of microorganisms – Autotrops and hetertrophs.	**4**
	10th	10. Microbial association: Commensalism, synargism, antagonism and symbiosis.	**2**
	1st to 8th	Revision	**4**

Books Recommended

1. Frobisher, M., R.D. Hinsdill, K.T. Grabtree and C.R. Gooddheart. 1974: Fundamentals of Microbiology (9th ed.). W.B. Saunders Co. London.

2. Dubey, R.C. and D.K. Maheshwari. 1999: A Text Book of Microbiology. S. Chand and Co. Ltd.
3. Pelczer, M.J., E.C.S. Chan and N.R. Krieg. 1993:Microbiology: Concepts and Applications. McGraw Hill Book Co. Inc. New York.
4. Tortora, G.J., B.R. Funke and C.L. Case. 1997: Microbiology (6th ed.) Addison Wesley Longman, Inc., California.
5. ইসলাম, এম. রফিকুল, মিহির লাল সাহা এবং এম. এ. বাসার. ২০০৪: অণুজীব বিজ্ঞান, হাসান বুক হাউজ, ঢাকা।

First Year Honours (2014-2015)

Course Code: 3053 **Assigned Course Teacher: Mst. Nasima Khatun**
Course Title: Mycology **Md. Shariful Islam**
Marks: 100, 4 Credits, 60 Lectures **Md. Montaz Ali Sarker**

EXAM	Chapter	Content	Lectures
1st In-course (25 Lectures)	1st	1. Introduction: The subject Mycology and its scope	**5**
	2nd	2. Myxomycetes: A brief account of the habit, habitats, structure, reproduction and importance ofthe group.	**6**
	3rd	3. Fungi: General characteristics, ultrastucture, somatic structure, cell wall composition, growth, nutrition, reproduction , sexual compatibility.	**8**
	4th	4. Origin and classification of fungi as given by G. C. Ainsworth (1966) and C. J. Alexopoulos & C. W. Mims (1986).	**6**
2st In-course (25 Lectures)	5th	5. General characteristics of the following fungal classes and study of the somatic and reproductive features of the genera mentioned against each class: (i) Chytridiomycetes: *Olpidium*, *Synchytrium;* (b) Oomycetes: *Saprolegnia*, *Phytophthora* and *Albugo*; (c) Zygomycetes: *Rhizopus;* (d) Ascomycetes: *Saccharomyces*, *Aspergillus, Penicillium, Erysiphe, Meliola, Claviceps, Neurospora;* (e) Basidiomycetes: *Puccinia, Ustilago.Tilletia, Polyporus, Agaricus;* (f)Deuteromycetes: *Candida, Alternaria Cercospora, Fusarium, Macrophomina,Colletotrichum and Marssonina.*	**15**
	6th	6. A general discussion on the role of fungi as: (i) Saprophytes in nature, (ii) Plant parasites, (iii) Mycorrhizae as plant symbionts, and (iv) Producers of important metabolites.	**10**
Test (10 Lectures)	7th	7. Lichen: Habitats, habit, morphology (thallus types), anatomy, reproduction and importance.	**5**
	1 to 6th	Revision	**5**

Books Recommended

1. Ainsworth, G. C. 1996 . A general purpose classification of fungi. Bibliography of systematic

Mycology, pp 1-4, Commonwealth Mycological Institute, London.
2. Alexopoulos, C.J., C.W. Mims and M. Blackwell. 1996: Introductory Mycology (4th ed.), Wiley, Eastern Ltd., Calcutta, India.
3. Hawker, Lilian, E. 1967: Fungi, Hutchinson Univ. Library, Cambridge Univ. Press, London.
4. Moore-Landecker, Elizabath. 1982: Fundamentals of the Fungi. Prentice-Hall. Inc., New Jersey, USA.
5. Webster, J. 1980: Introduction to Fungi. Cambridge Univ. Press, London, UK.

Course Code: 3063 **Assigned Course Teacher : Mst. Halima Khatun**

Course Title: Phycology **Nurunnesa Khatun**

Marks: 100, 4 Credits, 60 Lectures **Sharmin Sakila**

Afroza Akter

EXAM	Chapter	Content	Lecture
1st In-course (25 Lectures)	1st	**Introduction:** Definition, history and scope of Phycology.	**4**
	2nd	**Algal Habitat:** Aquatic (fresh water, brackish and marine) terrestrial and sub-aerial.	**8**
	3rd	**Classification of algae:** Up to Class according to F.E. Fritsch (1946) and R.R. Lee (1989).	**4**
	4th	**Pigment and Food:** Pigments and reserve food materials in major divisions of Algae.	**9**
	5th	**Plastid:** Types of chloroplasts of algae and their distribution.	
	6th	**Morphology:** Range of vegetative structure of algae.	
2nd In-course (25 Lectures)	7th	**Reproduction:** Reproduction and perennation in algae.	**6**
	8th	General characteristics, classification up to order and reproduction of the following classes and the study of life history of the genera mentioned against classes**:** **1)** Cyanophyceae: *Oscillatoria* and *Gloeotrichia;* 2) Chlorophyceae: *Chlamydomonas, Chlorella, Volvox* , *Oedogonium* and *Frischiella;* 3) Charophyceae: *Chara;* 4) Euglenophyceae: *Euglena;* 5) Bacillariophyceae: *Navicul*a and *Chaetoceros;* 6) Phaeophyceae: *Ectocarpus* and *Sargassum;* 7) Rhodophyceae: *Polysiphonia* and *Gelidium;* 8) Cryptophyceae: *Cryptomonas;* 9) Xanthophyceae: *Vaucheria.*	**4**
	9th	Growth pattern and nutrition in algae.	**10**
Test (10 Lectures)	10th	Origin and evolutionary trends in algae.	**4**
	11th	**Phytoplankton:** Definition and general characters, floating mechanisms; classification, ecological and biological importance; general composition of fresh water and marine phytoplankton.	**2**
	12th	**Importance:** Economic and biological importance of freshwater and marine algae including nitrogen economy of nature	**4**
	Revision: 1st & 2nd in-course		

Books Recommended

1. Bold H.C. and M.J. Wynne. 1978: Introduction to the Algae. Prentice Hall, India.
2. Chapman, V.J. and D.J. Chapman. 1973: The Algae. Macmillan, London.
3. Fritsch, F.E. 1946: The Structure and Reproduction in Algae. Vol. 1 & 2, Cambridge Univ. Press.
4. Lee, R.R. 1989: Phycology. Cambridge Univ. Press, UK.

5. Prescott, G.W. 1968: The Algae : A Review. Thomas Nelson, London.
6. Round F.E. 1973: The Biology of Algae. St. Martin's Press, New York.
7. Round, F.E. 1981: The Ecology of Algae, Cambridge Univ. Press, UK.
8. Smith, G.W. 1950: The Fresh Water Algae of the United States. McGraw Hill Book Co. Inc., New York.
9. Van dam Hoek, C.D.G. Mann and H.M. Johns. 1996: Algae : An Introduction to Phycology, Cambridge Univ. Press.
১০. রা$^{য়}$, শ্যা^{ম}ল ক$^{ু}$মার, পাল, নিশীথ ক$^{ু}$মার; পাশা, ে$^{ৌ}$ড়ফা কা^{ম}াল, ১৯৯৫:অপ$^{ু}$পক উ$^{দ্ভি}$দবিজ্ঞান (১^{ম}), বাংলা একাডে$^{মী}$, ঢাকা

First Year Honours (2013-2014)

Practical

Practical Code : 3060 (A)
50 Marks, 2 Credits, 30 Lectures

Microbiology; 25 Marks

1. Potato culture to study different types of bacterial colonies.
2. Plate culture using Nutrient Agar (NA) medium
3. Purification of bacterial culture: (i) stock plate method and
   (ii) dilution plate method.
4. Differential staining: (i) gram staining and
   (ii) spore staining.
5. Demonstration of fermentation.
6. .Observation of C/S test results.
7. Study of the symptoms of available plant diseases caused by viruses and bacteria.

Mycology; 25 Marks

1. Techniques for preparing temporary slides of fungal specimens for microscopic examinations.
2. Laboratory studies of the locally available members of the Myxomycetes and fungi covered in the theory.
3. Preparation of culture medium for fungal growth like Potato dextrose Agar (P.D. A.) and growing fungi for class work.

Practical Code : 3060 (B)
50 Marks, 2 Credits, 30 Lectures

A. Higher Cryptogams (Bryophyta)

1. The following members need to be studied and identified up to genus
   (i) *Riccia*, (ii) *Dumortiera*,
   (iii) *Plagiochasma*, (iv) *Marchantia*,
   (v) *Lejunea* and (vi) *Anthoceros*.
2. The following members will be on demonstration in the practical class. The students are required to be acquainted with these members:
   (i*) Riccia fluitans*, *(ii) Ricciocarpus natans*,
   (iii)Sphagnum, *(iv) Physcomitrium*,
   (v) Fissidens, *(v) Leucobryum* and
   (iv) *Plagiothecium.*

B. Higher Cryptogams (Pteridophyta)

1. The following members are to be studied and identified up to the genus.
   (i) *Lycopodium*, (ii) *Selaginella*,
   (iii) *Equisetum*, (iv) *Nephrodium*,
   (v) *Pteris*, (vi) *Lygodium*,
   (vii) *Marsilea*, (viii) *Azolla* and
   (iv) *Ceratopteris*.
2. The following members are to be demonstrated in the practical classes:

(i) *Psilotum*, (ii) *Isoetes*,
(iii) *Salvinia*, (iv) *Drynaria* and
(v) *Niphobolus*. 5

Books Recommended

১। ব্যবহারিক উদ্ভিদবিদ্যা-মোঃ আজিজুল বারী, কবির পাবলিকেসন্স, বাংলাবাজার, ঢাকা।
২। ব্যবহারিক উদ্ভিদবিদ্যা-দেবাশীষ কুমার রায়, হাসান বুক হাউস

First Year Honours (2013-2014)
Course Code: 6282
Course Title: Chemistry-I
Marks: 100, 4 Credits, 60 Lectures

Exam	Chapter	Content	Lecture
1st In-Course (25-Lectures)	1st	**Measurements and the Scientific Method :** Measurements, units, SI units, reliability of measurements-precision and accuracy; rounding off, significant figures, slgnificant figures in calculation, mean and median, errors, sources of errors.	1
	2nd	**Structure of atom :** Atom, isotopes, atomic masses, mass spectroscopy, atomic nucleus, nuclear binding energy, nuclear reactions-fission and fusion reactions, Bohr atom model, spectrum of atomic hydrogen, dual nature of electron, Heisenberg uncertainty principle, quantum numbers, atomic orbitals. Aufbau principle, pauli exclusion principle, Hund's rule of maximum multiplicity, electronic configuration of atoms.	6
	3rd	**Periodic Table :** Periodic law, periodic table, electronic configurations from the periodic table, periodic properties of the elements such as ionization energies, electron affinity, electro negativity, atomic/ionic radius along a period and down a group, diagonal relationship.	6
	4th	**Chemical Bonds :** Chemical bond, types of chemical bonds-ionic, covalent coordination, metallic, hydrogen, polar and no polar covalent bonds, Lewis dot structure, shapes of molecules, VSEPR theory, valence bond theory, hybridization, σ-and π-bonding in compounds, molecular orbital theory.	6
	11th	**Hydrocarbons :** Hydrocarbons, saturated and unsaturated hydrocarbons, alkanes, alkenes, and alkynes, nomenclature of organic compounds-the IUPAC system natural gas, petroleum, petrochemicals.	6
2nd In-Course (25-Lectures)	5th	**Oxidation and reduction :** Redox reactions, writing and balancing redox reactions.	4
	6th	**States of Matter :** Comparison between solids, liquids and gases, changes of state, m.p. and b.p. phase transition, phase diagram of water.	2
	7th	**Gaseous and their Properties :** The gas laws, the perfect gas equation, the kietic theory of gases, Van der waals equations, real gases, Graham's laws of diffusion and effusion.	6
	8th	**Solutions :** Solubility and intermolecular forces. solubility product, types of concentration units, colligative properties, of solutions, Henry's law, Nernst distribution law.	5
	12th	**Study of different classes of organic Compounds :** Alcohols, aldehydes, ketones, carboxylic acids, esters, amines and amides.	8
Test (10 Lectures)	9th	**Acids and Bases :** Various concepts on acids and bases, conjugate acids and bases, neutralization reactions acid-base strength, pH, acid-base titrations, acid-base indicatiors, acid-base properties of salts, the common ion effect, buffer solutions, hard and soft acids and bases.	5
	10th	**Chemical Equilibrium :** Reversible reactions and the equilibrium state, the equilibrium law, reaction quotients and equilibrium constants, calculations using K_c K_p.	5

Books recommended:

1. General Chemistry, D. D. Ebbing, Houghton Miffin Co.
2. Chemistry – The Molecular Nature of Matter and Change, M. Siberberg. WCB /Mc Graw- Hill.
3. Introduction to Modern Inogranic Chemistry, S.Z. haider, Friends' International.
4. Principles of physical chemistry, M. M. Huque and M. A Nawab, students' publications.
5. Essentials of Physical chemistry, B.S Bahl, G.D Tuli and A Bahl, S. Chand & Co.Ltd.
6. Advanced Organic Chemistry, B.S. Bahl and A Bahl, S. Chand & Co. Ltd.
7. Organic Chemistry: T Morrison and R.N Boyed,
8. Fundamental of Organic Chemistry by W Solomons

Course Code 6285:
Chemistry-I Practical
100 Marks, 4 Credits, 60 Lectures

1. Preparation of FeSO4 7H2O, Mohr's salt and potash alum.
2. Separation and identification of four radicals from a mixture of anions and cations The cations are pb2+, cu2+, Cd2+ , Al3+ , Fe2+ , Fe3+, Co2+, Ni2+, Zn2+ Ca2+, Ba2+, Na+, K+ , and NH4 + , the anions are NO3, CO3 2-, S2-, SO4 2-, Cl , Br and I+
3. Standardization of NaOH solution using standard oxalic acid solution,
4. Determination of Fe2+ using standard permanganate solution
5. Iodometric determination of copper(II) using standard Na2SO3 solution.
6. Gravimetric determination of nickel as Ni(HDMG)2 complex
7. Determination of the enthalpy change for the decomposition sodium dicarbonate into sodium carbonate.
8. Determination of the pH- neutralization curves of a strong acid by a strong base.
9. Investigation of the conductance behaviour of electrolytic solution and applications (acetic acid)
10. Determination of the presence of nitrogen, halogen and sulphur in organic compounds.
11. Identification of the functional groups (unsaturation, alcohol, phenol, carbonyl, aldehlyde, ketone, carboxylic acid, aromatic amine, amide and nitro- groups) in organic compound.

Books Recommended:

1. A Text Book of Quantitative Inorganic Analysis, A.I. Vogel, 3rd/4th edition, ELBS and Longman Green & Co. Ltd.
2 A Text Book of Quantitative Inorganic Analysis, A.I. Vogel 3rd /4th edition, ELBS and Longman Green & Co. Ltd.
3 Practical physical chemistry, A Faraday.
4. A Text Book of practical organic chemistry, A.I. vogel, ELBS edition.

1st Year Honours (2013-2014)

Course Code : 6312

Course Title: Introduction to Zoology: Protozoa and nonchordates, Human Physiology, and Applied Zoology

Marks 100, 4 Credits, 60 Lectures

Exam	Chapter	Content	Lecture
1st in-course (25 Lectures)		**Group-A**	
	2	**Protozoa and non-chordates** General characteristics Examples: Porifera, Cnidaria,Ctenophora, Phoronida, Brachiopoda, Bryozoa/Ectoprocta, Hemichordata. **Broad Classification:** Sarcomastigophora; Animal kingdom.. Gametogenesis ..... classification of animals: Classification up to phyla on the basis of organization, symmetry, coelom and phylogeny;	2 1 2 2
	2	**Protozoa and non-chordates** General characteristics Examples: Apicomplexa, Ciliophora, Loricifera, Priapulida..... Types study: a. Phylum Sarcomastigophora: *Euglena*..... b. Phylum Apicomplexa: *Eimeria*..... c. Phylum Ciliophora: *Paramecium*.....	1 2 2 2
	2	**Definition & Scope of zoology; Foundation of animal life; level of organization (**protoplasmic, cellular, tissue, organ, organ system, organism, species, individual, population, community, fauna, biota, ecosystem, biosphere, biodiversity.**)** **Protozoa and non-chordates** General characteristics Examples: Platyhelminthes, Gastrotricha, Acanthocephala, Mollusca. **Type study:** d. Phylum Porifera: *Scypha* e. Phylum Cnidaria: *Obelia* g. Phylum Mollusca: *Pila* j. Phylum Hemichordata: *Balanoglossus*.	11
2nd in-course (25 Lecture)		**Group-A**	
	2	**Protozoa and non-chordates** **Type study:** i. Phylum Echinodermata: *Astropecten*..... **Introduction to Zoology:** Cells: Cell and cell theory, structure and functions of cell organelles..... Human physiology: Vitamin.....	3 5 2
		Group-B	
	1	**Human Physilogy:** Digestion:, ... Restriration:..... Circulation:.....	2 2 4

	Group-A		
	2	**Protozoa and non-chordates** General characteristics Examples: Rotifera, Nematomorpha, **Broad Classification:** Annelida, Arthropoda..... **Type study:** f. Phylum Nematoda: *Ascaris*..... h. Phylum Arthropoda: Prawn.....	2 2 3
Test (10 Lectures)	**Group-A**		
	2	**Protozoa and non-chordates**: General characteristics Examples: Supuncula, Pogonophora, Tardigrada, Onychophora, Phoronida, Chaetognatha, Echinodermata,	2
	Group-B		
	1	**Human Physilogy:** Excretion, Reproduction & endocrine glands.	4
	2	**Applied Zoology:** Introduction to the major fields of applied zoology: Entomology, Fisheries Biology, Wildlife Biology, and Parasitology. Agricultural pests: Major pests of rice, jute, sugarcane and stored grains. Integrated fish farming: Types, poultry, livestock and paddy-cum-fish culture. Poultry farming: System of poultry farming, diseases of poultry and their control, economic importance of poultry and their impacts on socio- economic condition of Bangladesh.	4
		Revision: 1st & 2nd in-course	

Zoology Practical-I

Course Code: 6315
50 arks, 2 Credits

1. Study of museum specimens: Representative of all major non-chordate phyla (minimum 20 pecimens to be studied).

2. Study of permanent slides: Whole mount, body parts and various cells and invertebrate tissues (at least 10 slides to be studied)

a. Whole animals – representatives of protozoans, rotifers and arthropods.
b. Mouth parts of arthropods.
c. Parasites – nematodes and platyhelminths.
d. Different larval forms of invertebrates.
e. Histological slides of invertebrates.

3. Preparation and study of whole mounts of different non-chordates.

4. External morphology and dissection of various organ systems of earthworm, cockroach, rawn, *Pila* and *Lamellidens*.

a. Digestive system of prawn, *Pila* and *Lamellidens*.
b. Circulatory system of earthworm and prawn.
c. Nervous system of cockroach, grasshopper, prawn, *Pila* and *Lamellidens*.

5. Temporary mounting –

a. Brain of earthworm.
b. Salivary gland of cockroach.
c. Statocyst of prawn.

6. Study of appendages of prawn.

7. Animal physiology –

a. Estimation of blood pressure and pulse rate.

b. Determination of blood group.

8. Class records.

Distribution of Marks for First Year Final Examination

1. Major dissection (dissection 8 + display 2 + drawing and labeling 3) **= 13 marks.**

2. Temporary mount (staining, mounting and display 3 + drawing and labeling 2) **= 5 marks.**

3. Spotting of museum specimens – 8 items (identification and classification 1 + diagnostic characteristics 1) **= 16 marks.**

a. Invertebrate specimens (4 items) 2 × 4 = 8 marks.

b. Whole mount slides (mouth parts, parasites, larvae) (2 items) 2 × 2 = 4 marks.

c. Histological slides (2 items) 2 × 2 = 4 marks.

4. Appendages (detachment, placement and drawing on a paper sheet 3, labeling 2, displaying 1) = **6 marks.**

5. Class records = **10 marks.**

REFERENCES

1. C.P. Hickman and L.S Roberts. 1995. *Animal Diversity* Wm.C. Brown

2. L.S. Dillon. 1976. *Animal Variety: An Evolutionary Account:* Wm C. brown Company Publishers, Dubuque,
Iwoa.

3. J.D. Bernal. 1969. *The Origin of Life.* Weidenfeld and Nicolson, London.

4. E.E. Ruppert and R.D. Barnes. 1994. *Invertebrate Zoology (*6th edition). Saunders College Publishing-
harcourt Brace College Publishers, New York, London

5. C.P. Hickman. *Integrated Principles of Zoology,* C.V. Morsby Co. Inc., New York

6. A.J. Marshal and W.D. Williams. *Text Book of Zoollogy Invertebrates, (*edited the 7th edition of Text
Book of Zoology, Vol. I,T.J. Parker and W.A. Haswell)

7. N.J. Reigle. A *Synoptic Introduction to the Animal Kingdom.*

8. E.O. Wilson, T, Eisner and W.R. Brigges, *Life: Cells, Organisms Populations.*

9. C.C. Chatterjee Human Physiology Vols. I & II

10.W.H. Davson . *A Text Book of General Physiology*

11.G.L. Presser and P.A. Brown Comparative Animal Physiology

12. B.I. balinsky. *An Introduction of Embryology*

13. D. Dent. Insect Pest Management. Chapman and Hall, London.

Department of Botany
Rajshahi College, Rajshahi.
Subject: Botany

2nd Year Honours (2013-2014)

Courses and Marks Distribution

Course Code	Course Title	Marks	Credits
3062	Origin & Evolution of Life and Biodiversity & Conservation	100	4
3063	Phycology	100	4
3064	Gymnosperms and Palaeobotany	50	2
3070	Botany Practical	50	2
7312	Zoology-II	100	4
7316	Zoology Practical-II	50	2
7282	General Chemistry-II	100	4
7283	Environmental Chemistry	50	2
3096	Viva-Voce	50	2
	Total =	**650**	**26**

Department of Botany
Rajshahi College,Rajshahi.
Course Plan

2nd Year Honours (2013-2014)

Course Code: 3062 **Assigned Course Teacher: ANM Al Mamun Chow.**

Course Title: Origin & Evolution of Life and Biodiversity & Conservation **Kanak Kanti Sarker**

Mst. Bilkis Khanam

Marks: 100, 4 Credits, 60 Lectures

EXAM	Chapter	Content	Lectures
		ORIGIN AND EVOLUTION OF LIFE	
1st In-course (25 Lectures)	1st	**Historical framework of the origin and evolution of Life:** Pre-Darwinian and post- Darwinian concept.	**2**
	2nd	**About the Life:** Characteristics, organization and diversity of living things, question of spontaneous generation.	**3**
	3rd	**The physical frame of life:** The earth's structure and atmosphere of past and present ages, geological and fossil dating, continents, continental drift and its pre-biotic environment.	**5**
	4th	**The biochemical basis and origin of life:** Biochemical basis of life, inorganic and organic molecules and life, origin and evolution of basic biomolecules; theories of origin of life on chemical and biochemical basis	**5**
	5th	**Proteins and genetic organization:** Concept of metabolism and replication, the protein and RNA world, origin and evolution of metabolic and replication process (respiration, photosynthesis and reproduction); origin and evolution of prokaryotic and eukaryotic cells, evidences supporting protein and nucleic acid evolution.	**5**
	6th	**Evolutionary theories:** Concept of organic evolution evidences supporting organic evolution; theories of organic evolution- Lamarck; Darwin, Germplasm; evolutionary tree.	**5**
		BIODIVERSITY AND CONSERVATION	
2nd In-course (25 Lectures)	1st	**Introduction:** Definition, aims and objectives, different types of Biodiversity.	**4**
	2nd	**Elementary knowledge:** Longitude, latitude and altitude, continental drift, tectonic movement, land bridge, biogeography and temperate, tropical, tundra and alpine zones of the world and their vegetation.	**6**
	3rd	**Characterization of biodiversity from ecological perspectives:** Species diversity within areas and species richness, functional diversity, basic principles, micro-biotaersity, World biodiversity hot-spots	**6**
	4th	**Loss of biodiversity:** Causes of loss of biodiversity; effect of the degradation of biodiversity; causes of species extinction	**4**
	5th	**Biodiversity in context of Bangladesh:** Elementary knowledge on the patterns of biodiversity in Bangladesh.; indigenous, exotic, common, rare threatened and endangered species of Bangladesh; plant introduction in Bangladesh; basic knowledge on plant resources of Bangladesh.	**5**

Test (10 Lectures)	6th	**Biodiversity conservation:** Causes of loss of biodiversity and need of biodiversity conservation.	**4**
	7th	**Methods of plant protection and conservation types:** *In-situ* and *Ex-situ* conservation, role of national parks and eco-parks, reserve forests, sanctuary, wetland areas, botanic gardens, agriculture orchard, seed banks and field gene banks of Bangladesh in biodiversity conservation.	**6**
	8th	**Conservation values and ethics:** Value of biodiversity and conservation ethics	**6**
	9th	**Role and activities:** IUCN, WWF, WCMC, UNICEF, EAS and CITES	**4**
	10th	Introduction to the formation of CBD, Principles and objectives of CBD.	**5**
	Revision: 1st & 2nd in-course		

Books Recommended

1. A.I. Oparin, 1957. The Origins of Life on the Earth. (3rd.ed.) Translated by A. Synge : Oliver & Boyd, Edinburgh.
2. S.W. Fox and K. Wose, 1972. Molecular Evolution and Origin of Life. Freeman & Co., San Francisco. A.G. Cirans – Smith. 1982. Genetic Takeover and Mineral Origin of Life. Cambridge Univ. Press. N.Y.
3. F. Dyson. 1985. Origins of Life. Cambridge University Press., Cambridge.
4. C. Ponnamperuma and J. Chela – Flores. 1995. Chemical Evolution, Structure and Model of the First Cell. Deepak Publishing, USA.
5. M.W. Strickberger 2000. Evolution (3rd. ed.). Jones & Bartlett Pub., London.
6. এম.কে. পাশা, ১৯৯৮. আণবিক জীববিজ্ঞান, প্রথম খন্ড, বাংলা একাডেমী, ঢাকা।
   ম. আখতারুজ্জামান, ২০০০. বিবর্তনবাদ, হাসান বুক হাউজ, ঢাকা।

Course Code: 3063 **Assigned Course Teacher: Mst. Halima Khatun**

Course Title: Phycology **Nurunnesa Khatun**

Marks: 100, 4 Credits, 60 Lectures **Sharmin Sakila**

Afroza Akter

EXAM	Chapter	Content	Lecture
1st In-course (25 Lectures)	1st	**Introduction:** Definition, history and scope of Phycology.	**4**
	2nd	**Algal Habitat:** Aquatic (fresh water, brackish and marine) terrestrial and sub-aerial.	**8**
	3rd	**Classification of algae:** Up to Class according to F.E. Fritsch (1946) and R.R. Lee (1989).	**4**
	4th	**Pigment and Food:** Pigments and reserve food materials in major divisions of Algae.	**9**
	5th	**Plastid:** Types of chloroplasts of algae and their distribution.	
	6th	**Morphology:** Range of vegetative structure of algae.	
2nd In-course (25 Lectures)	7th	**Reproduction:** Reproduction and perennation in algae.	**6**
	8th	General characteristics, classification up to order and reproduction of the following classes and the study of life history of the genera mentioned against classes**:** **1)** Cyanophyceae: *Oscillatoria* and *Gloeotrichia;* 2) Chlorophyceae: *Chlamydomonas, Chlorella, Volvox* , *Oedogonium* and *Frischiella;* 3) Charophyceae: *Chara;* 4) Euglenophyceae: *Euglena;* 5) Bacillariophyceae: *Navicul*a and *Chaetoceros;* 6) Phaeophyceae: *Ectocarpus* and *Sargassum;* 7) Rhodophyceae: *Polysiphonia* and *Gelidium;* 8) Cryptophyceae: *Cryptomonas;* 9) Xanthophyceae: *Vaucheria.*	**4**
	9th	Growth pattern and nutrition in algae.	**10**
Test (10 Lectures)	10th	Origin and evolutionary trends in algae.	**4**
	11th	**Phytoplankton:** Definition and general characters, floating mechanisms; classification, ecological and biological importance; general composition of fresh water and marine phytoplankton.	**2**
	12th	**Importance:** Economic and biological importance of freshwater and marine algae including nitrogen economy of nature	**4**
	Revision: 1st & 2nd in-course		

Books Recommended

1. Bold H.C. and M.J. Wynne. 1978: Introduction to the Algae. Prentice Hall, India.
2. Chapman, V.J. and D.J. Chapman. 1973: The Algae. Macmillan, London.
3. Fritsch, F.E. 1946: The Structure and Reproduction in Algae. Vol. 1 & 2, Cambridge Univ. Press.
4. Lee, R.R. 1989: Phycology. Cambridge Univ. Press, UK.
5. Prescott, G.W. 1968: The Algae : A Review. Thomas Nelson, London.
6. Round F.E. 1973: The Biology of Algae. St. Martin's Press, New York.
7. Round, F.E. 1981: The Ecology of Algae, Cambridge Univ. Press, UK.
8. Smith, G.W. 1950: The Fresh Water Algae of the United States. McGraw Hill Book Co. Inc., New York.
9. Van dam Hoek, C.D.G. Mann and H.M. Johns. 1996: Algae : An Introduction to Phycology, Cambridge Univ. Press.
১০. রা$^{য়}$, শ্যা^{ম}ল কু^{ম}ার, পাল, নিশীথ কু^{ম}ার; পাশা, মৌ$^{ঁ}$ড়ফা কা^{ম}াল, ১৯৯৫:অপু$^{ঁ}$পক উদ্ভিদবিজ্ঞান (১^{ম}), বাংলা একাডে$^{মী}$, ঢাকা

Course Code: 3064 **Assigned Course Teacher: ANM Al Mamun Chow.**

Course Title: Gymnosperm and Palaeobotany **Md. Montaz Ali Sarkar**

Marks: 50, 2 Credits, 30 Lectures **Mst. Najma Sultana**

EXAM	Chapter	Content	Lectures
		Gymnosperm	
1st In-course (25 Lectures)	1st	**Introduction:** Habit, habitat, characteristic features, origin and evolution, and importance of Gymnosperms.	**4**
	2nd	Classification of Gymnosperms.	**8**
	3rd	Comparative account of Gymnosperms with pteridophytes and angioperms.	**4**
	4th	Distribution of gymnosperms with reference to Bangladesh and their economic importance.	**4**
	5th	Life history of *Cycas*, *Pinus* and *Gnetum.*	**5**
		Palaeobotany	
2nd In-course (25 Lectures)	1th	**Introduction:** Definition and scope of Palaeobotany	**6**
	2nd	Types of fossils and fossilization process.	**4**
	3rd	Geological time scale of the earth.	**10**
	4th	Appearance and extinction of life forms in different geological periods.	**5**
Test (10 Lectures)	9th	**Fossil Pteridophytes:** *Lepidodendron* and *Calamites.*	**5**
	10th	**Fossil Gymnosperms:** Cycadophilicales- *Lygenopteris, Oldhamia, Bennettitales;* Cycadeoidea.	**5**
	Revision: 1st & 2nd in-course		

Books Recommended

1. Arnold, C. R. 1977: An Introduction to Palaeobotany. Tata McGraw Hill Pub. House Co., New Delhi. Biswas, C. and B.M. Johri. 1997: The Gymnosperms. Norasa Pub. House, New Delhi.
2. Caulter, J. M. and C. J. Chamberlain, 1917 (1964): Morphology of Gymnosperms. Central Book Depot,Allahabad, India.
3. Mukherji, H. 1997: Plant Groups. New Central Book Agency, Ltd. Calcutta.
4. Parihar, N.S. 1955: An Introduction to Embryophyta Vol. I & II. Central Book Depot, Allahabad.
5. Sharma, O. P. 1980: Gymnosperms – A treatise, Progati Prakashan, Meerut, India.
6. Smith, G.M. 1955: Cryptogamic Botany. Vol. II, Bryophyta & Pteriodphyta. McGraw Hill Co. London.
7. শ্যামল কুমার রায়, নিশীথ কুমার পাল এবং মৌজফা কামাল পাশা ১৯৯৫ : অপুষ্পক উদ্ভিদ বিজ্ঞান, ২-খন্ড, বাংলা একাডেমী, ঢাকা।

BOTANY PRACTICAL

Course Code: 3070 Marks: 50 Credits: 2

Origin and Evolution of Life: 5 marks

Anatomical evidences of evolutionary trends.

Biodiversity Practical: 15 marks

1. Study of different life forms in a suitable place.
2. Analysis of species diversity in an area.
3. Identification of at least 50 species of different plant groups in an around the institution.
4. Collection and preservation of different groups of plants, herbarium specimen preparation technique.
5. Study of crop genetic variations and resources of an area.

Phycology: 15 Marks

1. Local excursion is to be arranged to show and collect algae from different habitats. Collected algae are to be studied in the practical classes.
2. Techniques of preserving algae collected from various habitats
3. Study of the algal genera covered in the theory with special emphasis to their vegetative, reproductive structures and ecological features.

Gymnosperms and Palaeobotany : 15 Marks

Study of museum specimens.

Detailed study including dissection, mountings, description, drawing and identification of *Cycas* and *Pinus* sp.

Study of fossil plants.

Books Recommended

১। ব্যবহারিক উদ্ভিদবিদ্যা-মোঃ আজিজুল বারী, কবির পাবলিকেসন্স, বাংলাবাজার, ঢাকা।

২। ব্যবহারিক উদ্ভিদবিদ্যা-দেবাশীষ কুমার রায়, হাসান বুক হাউস, বাংলাবাজার, ঢাকা।

2nd Year Honours (2013-2014)

Course Code : 7312

Course Title: **Zoology-II**

Marks 100, 4 Credits, 60 Lectures

Exam	Chapter	Content	Lecture
1st in-course (25 Lectures)		Group-A	
	1	**Broad classification** a. Chondriththyes, b. Osteichthyes , c. Amphibia,	4
	2	**Type Study** d. Chondrichthyes : *Scoliodon* e. Osteichthyes : *Labeo rohita* f. Amphibia : *Bufo/Rana*	3 3 3
		Group-B	
	1	**Palaeontology** Geologocal time table; palaeontological history of Horse & Man.	3
	2	**Zoogeography** Zoogeographical regions and sub-regions of the world: Nearctic Region, Ethiopean Region, Neotropical Region-their boundaries, physical characteristics, climatic conditions, vegetation and fauna.	4
	3	**Animal Genetics & Animal Breeding** Modification of Mendelian ratio with animal examples; multiple alleles and pseudoalleles; mutation; chromosomal inheritance of sex determination.	5
2nd in-course (25 Lectures)		**Group-A**	
	1	**Broad classification** Reptilia, Aves and Mammalia.	4
	2	**Type Study** g. Reptilia : *Hemidactylus, h.* Aves : *Columba livia* i. Mammalia : *Cavia porcellus.*	3 3 3
		Group-B	
	4	**Ecology:** Marine ecology; Zonations and Animal Adaptation to Different Zonations; Concept of Biodiversity; Conservation of Natural Resources; Concept and Classification of Resources; Renewable and Non-Renewable Resources.	5
	5	**Applied Zoology** 1. **Introduction to the major fields of Applied Zoology:** Entomology, Fisheries, Wildlife Biology, Parasitology and others. 2. **Agricultural Pests:** Major Pests of Rice, Jute, Sugarcane & stored grain. 3. **Integrated Fish Farming:** Types; Poultry, Livestock and Paddy-cum - Fish Culture.	7
Test (10 Lectures)		**Group-A**	
	2	**Type study** *a.* Urachordata : *Ascidia* b. Cephalochordata : *Branchiostoma* *c.* Cephalaspimorpha: *Petromyzon*	6
		Group-B	
	5	**Applied Zoology** **Poultry farming :** System of poultry farming, diseases of poultry and their control, economic importance of poultry and their impacts on socio-economic condition of Bangladesh.	1
	Total Chapter	Revision	3

Zoology Practical

Course Code : 7316

50 Marks, 2 Credits

1. **Study of Museum Specimens:** Representative of all major Non-Chordate and Chordate phyla (at least 25+25 = 50 specimens to be studied)
2. **Study of Permanent Slides:** Whole mount, body parts, various cells & tissues and different larvae (at least 20 slides to be studied).
3. **Study of Bones:** Comparative study of the skeleton of an amphibian, reptile, a bird and a mammal.
4. **External morphology and Dissection of various organ systems of Non Chordates -** Earthworm,Cockroach, Prawn and *Pila:*
   a. Circulatory system of Earthworm and Prawn.
   b. Nervous system of Earthworm, Cockroach, Prawn.
   c. Reproductive system of Earthworm, Cockroach and Prawn.
5. **Dissection: Dissection of the following Chordate Specimens-**
   Bufo/ any Carp - Brain and Cranial Nerves.
   Lata fish-Afferent and Efferent Blood Vessels
   Lizard - Circulatory System.
6. **Fresh Water Studies:** Identification of plankton and benthic microfauna in fresh water samples.

Distribution of Marks for the Final Examination

1. **Dissection :** One item (**Non Chordate**) 1 item x 9 = **09** Marks
   (Dissection – 4, display – 2, drawing & labeling - 3)
2. **Dissection :** One item (**Chordate**) 1x 9 = **09** Marks
   (Dissection – 4, display – 2, drawing & labeling – 3)
3. **Spotting of Museum Specimens :** 9 items 9x2 = **18** Marks
   (Invertebrate Museum Specimen – 3 items x2 = 06)
   (Vertebrate Museum Specimen – 3 items x 2 = 06)
   (Histological Slides – 2 slides x2 = 04 (1 from Protozoa, Non-Chordates Bones 1 bone x2 = 02). and 1 from Chordates
4. **Fresh Water Studies:** 2 specimens x 2 marks for each = **04** Marks
   (2 micro species to be shown – Identification and 1, characters 1 mark)
5. **Class Records:** = **06** Marks
6. **An extensive oral test will be taken during practical examination session:** = **04** Marks

REFERENCES

1. D. Webster and M. Webster. 1974. *Comparative Vertebrate Morphology,* Academic Press New York.
2. I. Young. 1981. *Life of Vertebrates.* OUP, USA
3. K.V. Kardong. 1997. *Vertebrates: Comparative Anatomy, Function, Evolution* Wm. C. Brown
4. S. Stearus and R. Hoekstra. 2000. *Evolution An Introduction* OUP USA
5. A.J.Cain 1996. *Animal Species and Their Evolution* Princeton UP. USA
6. R.S. Lull. 1976. *Organic Evolution* Seema Publishing Delhi 11007
7. P.J. Darlington. 1998. *Zoogeography. The Geographical Distribution of Animals*. Krieger. USA
8. E.W. Sinnot. L.C. Dunn and Dobzhansky *Principles of Genetics*. McGraw Hill Book Co. New York
9. R.E. Weaver and P.W. Hedrick 1995. *Basic Genetics* Wm. C. Brown Publisher. Dubuque. lowa.
10. E. Mayr and P.D. Ashlock. 1997. *Principles of Syatematic Zoology* McGraw Hill
11. Dennis S. Hill 1997. *The economic importance of insects* (1st edition)Chapman and Half. London
12. P.Southgate and J.Lucas (Editors), 1998. Aquaculture: Fish and *Shellfish Farming* Fishing News.
13. A Midlen and T.A. Reading 1998. *Pollution Control and Environmental Management for Aquaculture.* Chapman & hall
14. M.R. Ross. 1996. *Fisheries Conservation and Management* Prentice Hall
15. V.G. Jhingran and R.S.V. Pullin 1985. *A Hatchery Manual for the Common Chinese and Indian Major Carps.* ADB/ICLARM

Course code : 7282
Course Title : General Chemistry–II
Marks: 100 & Credit: 04, **60 Lectures**

Exam.	Contents	Lectures
1st In-Course (33 Lectures)	1. **Nonmetals:** General properties of nonmetals, ortho and para hydrogen molecules, allotropy of carbon, catenation, halogens and their basic properties, chemistry of noble gases.	4
	2. **Metals:** Metallic bond, electron sea theory of metallic bond, characteristics of metals, band theory of conductivity, conductors, semiconductors and insulators, transition metals and inner transition metals colour and magnetism in transition metal chemistry.	5
	3. **Energy changes in chemical Reactions:** System and surroundings, open system and closed system, thermodynamics, state functions, the first law of thermodynamics, the concept of internal energy and enthalpy, measurement of enthalpy changes, enthalpy of formation, Hess's law, lattice enthalpy, Born-Haber cycle, second law of thermodynamics, entropy and free energy.	5
	4. **Rates of chemical Reactions:** Reaction rate, rate constant, rate law, order of reactions, first order reaction, half life, order and molecularity, effect of temperature on the rate of reaction, collision theory and reaction rates, activation energy, Arrhenius equation.	5
	5. **Electrochemistry:** Redox reactions, electrolytic and galvanic cells, cell notation, standard reduction potentials, emf of cells, the effect of concentration of cell emf, batteries, corrosion.	5
	6. **Catalysis:** Catalyst, homogeneous catalysis, enzyme catalysis, auto catalysis.	4
	7. **Solids:** Properties of solids, crystalline and amorphous solids, distinction between crystalline and amorphous solids, isomorphism, polymorphism and allotropy, crystal lattice unit cell crystal systems Bragg's law.	5
2nd. In-Course (27 Lectures)	8. **Coordination Chemistry:** Coordination compounds, ligands, coordination number, nomenclature, structures of complex compounds, Werner's primary and secondary valency concept, sidwick's electronic concept, valence bond theory, stability of coordination compounds.	5
	9. **Aromatic Compounds:** Aromaticity aromaticity of benzene, Electrophillic aromatic substitution reactions with reference to nitration halogention, sulphonation and alkylation. Heterocyclic compounds: Pyrrole, furan, thiophene, pyridine.	5
	10. **Organic reactions:** Brief study on Electrophilic addition, Nucleophilic addition, Elimination reaction, condensation reaction, oxidation, and reduction reactions and organic compounds. Mechanism and application of the following reactions, Friedel Craft reaction, Clemmenson reduction, Wolf Krishner reduction, Perkin reaction, Claisen reaction, Cannizzaro reaction and Aldol condensation.	5
	11. **Carbohydrates:** Definition, classification, structure and reactions of monosacchanides. Polysaccharide-cellulose and strach.	4
	12. **Amino Acids:** Structures classification, synthesis physical and chemical properties of amino acids.	4
	13. **Polymer Chemistry:** Polymers homopolymer, heteropolymer, low density and high density polymer, copolymers, studies of some polymers- polyvinylchloride, nylon 66, silk and wool.	4
Test	Revision	0

Books Recommended:

১. রসায়ন-II : ড.মো:সিরাজুল ইসলাম

Course code : 7283

Course Title : Environmental Chemistry

Marks: 50 & Credit:02, 30 Lectures

Exam.	Contents	Lectures
1st In-Course (15 Lectures)	. E **1. Environment:** Introduction components of environment, factors affecting environment, environmental management, environment and health, environmental chemistry, segments of environment – atmosphere hydrosphere, lithosphere and biosphere, structure of atmosphere.	5
	2. Pollution and Pollutants: Pollution, environmental pollution, pollutant, classification of pollutants, types of pollution PCBS and their sources and hazards, Detection & estimation of PCBS. Biomultification.	5
	3. Air Pollution: Introduction air quality, major sources of air pollution, gaseous pollutants, acid rain- how acid rain is formed, adverse effects of acid rain, greenhouse effect- how the greenhouse effect is produced, consequences of greenhouse effect and global warming EL Nino phenomenon and its effect, ozone depletion, mechanism of ozone depletion, effects of ozone depletion.	5
2nd . In-Course (15 Lectures)	**4. Water Pollution:** Introduction, classification of water pollutants, physical, chemical and biological characteristics of wastewater, industrial wastewater treatment, municipal water treatment, water quality parameters and standards, measurements of important parameters such as PH, DO, BOD, COD and temperature for water quality assessments.	5
	5. Soil Pollution: Composition of soil, importance of soil to the biosphere, sources of soil pollution, effects of soil pollution- synthetic fertilizer and pesticides, effects of industrial effluents, effects of urban wastes, control of soil pollution.	5
	6. Heavy metals in the Environment: trace metals, light metals and heavy metals, deadly heavy metals, sources of heavy metals, biochemical effects, toxicity, toxicology, control and treatment	5
Test	**Revision**	0

Books Recommended:

1. Environmental Chemistry, B.K. Sharma, Goel Publishing House.
2. Environmental Chemistry, AK. De New Age International Publishers.
3. Environmental Chemistry, S.E. Manahan, CRC Press.
4. A Textbook of Environmental Chemistry and Pollution Control, S.S. Bara S. Chand & Company Ltd.
5. পরিবেশ রসায়ন : প্রফেসর মো: রুস্তম আলী।

2nd Year Honours (2013-2014)

Course Code : 9999

Course Title: **Compulsory English**

Marks 100, No Credits, 60 Lectures

Exam.	Chapter	Content	Lectures
1st In-course (25 Lectures)		Understanding different purposes and types of readings Guessing word-meaning in context. Understanding long sentences Recognizing main ideas and supporting ideas. Answering comprehension questions. Writing summaries.	05
		Writing correct sentences, completing sentences and combining sentences.	02
		Situational writing : Posters, notices, slogans, memos, advertisements etc.	04
		Paragraph writing : Structure of a paragraph; topic sentences; developing ideas; writing a conclusion; types of paragraphs (narrative, descriptive, expository, persuasive); techniques of paragraph development (such as listing, cause and effect, comparison and contrast).	02
		Word order of sentences.	02
		Framing questions.	02
		Tenses, articles, subject-verb agreement, noun-pronoun agreement, verbs, phrasal verbs, conditionals, prepositions and prepositional phrases, infinitives, participles, gerunds. (Knowledge of grammar will be tested through contextualised passages).	08
2nd In-course (25 Lectures)		Newspaper writing : Reports, press releases dialogues etc.	04
		Writing resumés.	02
		Writing letters : Formal and informal letters, letters to the editor, request letters, job applications, complaint letters etc.	05
		Punctuation.	03
		Developing vocabulary : Using the dictionary, suffixes, prefixes, synonyms, antonyms, changing word forms (from verb to noun etc.) and using them in sentences.	06
		Translation from Bengali to English.	05
Test (10 Lectures)		Essay : Generating ideas; outlining; writing a thesis sentence; writing the essay: writing introductions, developing ideas, writing conclusions; revising and editing.	05
		Revision of 1st and 2nd in-course	05

Department of Botany
Rajshahi College, Rajshahi.
Subject: Botany
3rd Year Honours (2014-2015)
Courses and Marks Distribution

Course Code	Course Title	Marks	Credits
3072	Plant Pathology	50	2
3073	Taxonomy	100	4
3074	Economic Botany, Ethnobotany and Pharmacognosy	100	4
3075	Embryology and Palynology	100	4
3076	Anatomy and Cytology & Cytogenetics	100	4
3077	Genetics and Microbial Genetics	100	4
3078	Agronomy & Horticulture and Aforestation	100	4
3079	Practical - I	75	3
3080	Practical – II	75	3
	Total =	**800**	**32**

Department of Botany
Rajshahi College, Rajshahi
Course Plan

3rd Year Honours (2014-2015)

Course Code: 3072 **Assigned Course Teacher : Md. Shariful Islam**

Course Title: Plant Pathology **Md. Montaz Ali Sarkar**

Marks: 50, 2 Credits, 30 Lectures

EXAM	Chapter	Content	Hours
1st In-course (12 Hours)	1st	**Introduction**: History of Plant Pathology, concept of disease in plants, causes, diagnosis, classification and importance of plant disease.	2
	2nd	Methods of studying unknown disease; Koch's postulates	2
	3rd	**Parasitism and disease development**: Parasitism and pathogenesis, stages in the development of plant disease- inoculation, penetration, infection, growth and reproduction, dissemination, over wintering and over summering of the pathogen.	4
	4th	**Symtomalogy**: Viral, bacterial and fungal disease symptoms.	2
	5th	**Toxins in relation to plant disease**: a) Types of toxins -pathtoxinns, vivotoxins and phytotoxin b) Host specific and non-specific toxins c) Effect of toxins on plant disease.	2
2nd In-course (12 Hours)	6th	**Host defense against pathogens**: Structural and biochemical defense.	2
	7th	**Principles of plant disease management**: Forecasting of plant diseases; regulatory, physical, cultural, chemical and biological methods of disease management	2
	8th	**Chemical control of plant diseases**: Nature of chemical compounds in control of plant diseases - copper, mercury and sulphur compounds; spraying, dusting, seed treatment and soil treatment	4
	9th	**Selected fungal diseases of crop plants**: Causal organisms, symptoms, disease cycle and control measures of the following:- i) Tikka disease of Ground nut; ii) stem rot, anthracnose and black band of Jute; iii) late blight and early blight of Potato; iv) rust and leaf spot of Bean; v) brown spot, stem rot and blast of Rice, vi) red rot of Sugarcane; vii) stem rust and loose smut of Wheat.	4
Test (06 Hours)	10th	**Selected bacterial diseases of crop plants**: Characteristics and classification of plant pathogenic bacteria, mode of action of bacteria on host tissues. Causal organism, symptoms and etiology and control measures of the following diseases of plants:- i) Angual leaf spot of cotton; ii) Bacterial blight of rice; iii) Citrus canker, wilt of tomato; iv) Soft rot of potato.	4
	11th	**Viral diseases of plants:** Symptoms, causal organisms, vectors and control measures of the following diseases- i) Tungro disease of Rice, ii) bunchy top of Banana; iii)Vein clearing of Lady's finger, iv) leaf curl of Tomato, v) mosaic of Bean.	2
	Revision: 1st & 2nd in-course		

Books Recommended

1. Agrios, G.N. 1997: Plant Pathology (4th Ed.). Academic Press, London.
2. Fahy, P.C. and G.J. Persley. 1993: Plant Bacterial Disease. A Diagnostic Guide. Acad. Press, London.
3. Mehrotra, R.S. 1980: Plant Pathology. Tata McGraw-Hill Pub. Com., Ltd. New Delhi

Course Code: 3073 **Assigned Course Teacher: Halima Khatun**

Course Title: Plant Taxonomy **Zannatul Ferdous**

Marks: 100, Credits: 4, Class Hours: 60

EXAM	Chapter	Content	Hours
1st In-course (25 Hours)	1st	Characteristics of angiosperms and their differences from gymnosperms and pteridophytes	4
	2nd	**Taxonomy and Systematics**: Definition, basic components, needs, principles and units of classification, aims and objectives of plant taxonomy.	6
	3rd	**Development of plant classification**: Pre-Darwinian and Post Darwinian classification, comparison **among** the contemporary systems of classifications.	4
	4th	**Origin and evolution of Angiosperms**: Origin and phylogeny of Magnoliopsida and Liliopsida.	5
	5th	**International Code of Botanical Nomenclature** (ICBN): Brief history, names of taxa, publication, principles of priority, type method, author's citation and name changes.	6
2nd In-course (25 Hours)	6th	**The herbarium**: Herbarium and its importance, field and herbarium techniques, important herbaria of Bangladesh and World.	5
	7th	**Concept of taxonomic characters**: Good and bad characters, exomorphic and endomorphic characters, taxonomic and diagnostic characters.	8
	8th	**Chemotaxonomy**: Primary and secondary metabolites, semantids in taxonomy.	6
	9th	**Cytotaxonomy**: Chromosomal characters used in taxonomy and their significance.	6
Test (10 Hours)	10th	**Numerical Taxonomy**: Principles, analysis and construction of dendrogram.	
	11th	**Role of taxonomy and phylogeny of angiosperms**:- 1. Primitive and advanced characters of angiosperms 2. Differences between monocot and dicot plants.	4
	12th	**Identifying characters and phylogeny of the following families and scientific names of five important plants of each family;** A) **Magnoliopsida** (Dicots): Magnolaceae, Casuarinaceae, Nymphaeaceae, Tiliaceae, Rubiaceae, Rutaceae, Lamiaceae, Polygonaceae, Euphorbiaceae, Acanthaceae, Moraceae, and Cucurbitaceae. b) **Liliopsida** (Monocots): Alismataceae, Typhaceae, Arecaceae, Liliaceae, Araceae, Poaceae and Cyperaceae.	2
	Revision: 1st & 2nd in-course		

Books Recommended

1. Cronquist, A. 1968: The Evolution and Classification of Flowering Plants. Houghton, Miflin Co. Mass, USA.
2. Davis, P. H. and V. H. Heywood. 1963: Principles of Angiosperm Taxonomy. Oliver Boyd, Edinburgh & London.
3. Lawrence, G.H.M. 1951: Taxonomy of Vascular Plants. The Macmillan Co. New York.
4. Radford, A. E. 1974: Vascular Plant Systematics. Harper & Row Publisher, New York.
5. Stace, C. A. 1989: Plant Taxonomy and Biosystematics (2nd ed.). Edward Arnold, London.
6. G.Singh 2004. Plant Systematics: Theory and Practice (2nd ed.) Oxford &IBH Pub.Co. New Delhi
7. হাসান, এম. এ. এবং এম. কে. আলম. ১৯৯৭ : উদ্ভিদ শ্রেণীবিন্যাস তত্ত্ব (৩য় সংস্করণ), হাসান বুক হাউস, ঢাকা।

Course Code:3074 **Assigned Course Teacher: Konok Kanti Sarker**

Course Title: Economic Botany, Ethnobotany and Pharmacognosy **Sharmin Sakila**

Marks: 100, Credits: 4, Class Hours: 60

EXAM	Chapter	Content	Lectures
		Economic Botany and Ethnobotany	
1st In-course (25 Lectures)	**Economic Botany** 1st	Scientific and local names, Part/s used and importance of 10 important plants of each of the following groups: Cereals, pulses, oil; fiber; timber, fruit, vegetables, spices and aromatic plants.	4
	2nd	Tea: cultivation and processing	6
	3rd	Rubber: cultivation and processing.	4
	Ethnobotany 1st	Introduction: Definition, current concept and scope, main subjects of ethnobotany, aims and objectives of ethnobotanical studies.	5
	2nd	Origin and development of the branch, Present and past of ethnobotanical research in Bangladesh	6
	3rd	Methods of ethnobotanical research: sources of data, protocol, research design, ethnobotanical methods for documentation of data, data collection and transcription.	
	4th	Sacred plants: plants used in religion and mythology.	
		Ethnobotany and Pharmacognosy	
2nd In-course (25 Lectures)	5th	Ethnobotany of the tribes of Bangladesh: Chakma, Garo, Marma, Sawtal, Tripura.	2
	6th	Indigenous Knowledge (IK): Definition, plant related indigenous knowledge, types and sources of indigenous knowledge, IK in folklore, folktales, folksongs and proverbs, importance of IK.	3
	Pharmacognosy 1th	**Introduction**: Definition, its relation to herbal medicine, pharmacology, pharmacopoeia; medicinal and non-medicinal plants, herbal, alternative or complementary medicine.	5
	2th	No-medicinal plants – hallucinogen, allergenic, teratogenic and other toxic plants, plants with pesticide properties	5
	3rd	Drug, medicine and poisons – their definitions and differences.	2
	4th	**Classification of drugs with examples**: a. alphabetic, b. morphological, c. taxonomical, d. chemical and e. pharmacological.	3
	5th	Major 10 -indigenous medicinal plants of Bangladesh, their scientific names, plant parts used as drug source.	1
	6th	Primary and secondary metabolites of plants and their relations to drug principle.	2
	7th	Preparatory methods of herbal medicine- a. whole plant or plant parts, b. fine abstract.	2
Test (10 Lectures)	**Pharmacognosy** 8th	**Cultivation and improvement of production of medicinal plants and active drug principles**: a agronomical and, b. biotechnological means.	2
	9th	Name of important drugs, principles of plant origin with plant source and use of atropine, codine, digitoxin, disogenin, hyoscyamine, scopolamine, reserpine.	3
	10th	Conservation of the medicinal plants of Bangladesh: ways and importance.	2
	Revision: 1st & 2nd in-course		3

Books Recommended

Economic Botany

1. Albert, F.H. 1972: Economic Botany. Tata McGraw Hill Pub. Co. Ltd., New Delhi.
2. Hill, A.F. 1951: Economic Botany, Tata McGraw Hill Pub. Co. Ltd., New Delhi.
3. Pandey, B.P. 1978: Economic Botany S. Chand and Co., New Delhi.
4. হাসান, এম.এ. ১৯৯৬: বাংলাদেশের ভেষজ উদ্ভিদ, আশরাফিয়া বই ঘর, বাংলা বাজার, ঢাকা।

Ethnobotany

1. Alexiades MN. 1996. Selected Guidelines for Ethnobotanical Research: A Field Manual.
2. Cotton, C. M. 1997. Ethnobotany, Principals and Application. John Wiley and Sons Ltd., Chichester, UK.
3. Jain, S. K. 1989. Methods and approaches of ethnobotany. Society of Ethnobiology, Lucknow, India.
4. Jain, S. K. 1989. Methods and approaches of ethnobotany. Society of Ethnobiology, Lucknow, India.
5. Martin, G. J. 1995. Ethnobotany: A methods manual. Chapman & Hall, London.
6. হাসান, এম.এ. ১৯৯৬: বাংলাদেশের লোকজ বনৌষধি, হাসান বুক হাউস, বাংলা বাজার ডাকা।
7. পাল, ডি.সি. ১৯৯৯: লোক উদ্ভিদ বিদ্যা। পশ্চিমবঙ্গ রাজ পুস্ড়কপর্ষদ।

Pharmacognosy

1. A. Ghani. 2002. A Text Book of Pharmacognosy. Asiatic Society, Bangladesh.
2. A. Ghani. 2003. Medicinal Plants of Bangladesh. Asiatic Society, Bangladesh.
3. M. Ali. 2002. Text book of Pharmacognosy, CBS Pub. New Delhi, India.
4. Phil. B. Fontanarosa (Edt.). 2000. Alternative medicine- an objective assessment. J. Fraukos, USA (AMA).
5. W.C. Evans. 2003. Trease and Evans Pharmacognosy, ELBS, UK,.
৬. এ. গনি. ১৯৯৫. ভেষজ বিজ্ঞান, বাংলা একাডেমি, বাংলাদেশ।
৭. এ. গনি. ১৯৯৯. ভেষজ রসায়ন, বাংলা একাডেমি, বাংলাদেশ।

Course Code: 3075 **Assigned Course Teacher: Sharmin sakila**

Course Title: Embryology and Palynolology **Afroza Sultana**

Marks: 100, Credits: 4, Class Hours: 60 **Bilkis Khanam**

EXAM	Chapter	Content	Hours
		Embryology	
1st In-course (25 Hours)	1st	**Introduction**: Definition, historical background of Embryology.	4
	2nd	**Mirosporophyll**: Microsporangium, microsporogenesis and formation of male gametophyte.	6
	3rd	**Megasporophyll**: Megasporangium, megasporogenesis and formation of female gametophyte.	4
	4th	Types of development of different types of embryo sac.	4
	5th	Pollination and fertilization process, and formation of seed.	3
	6th	**Endosperm**: Types of endosperm formation- Nuclear, cellular and helobial, mosaic endosperm, nature.	4
		Embryology and Palynolology	
2nd In-course (25 Hours)	7th	**Embryogenesis**: Development of dicot and monocot embryos, polyembryony and its importance	2
	8th	**Apomixis**: Causes, types and significance of apomixis	4
	9th	**Embryology in relation to taxonomy**: Embryological characters in taxonomic significance.	4
	Palynolology 1th	**Introduction**: Historical review, fundamentals, branches, scope and application.	4
	2nd	**Palynomorphology**: Pollen grain- wall, development, character, morphology (primary, secondary and tertiary characters); sporoderm stratification, NPC-system, evolutionary aspect of pollen and spores, palynotaxonomical aspects, pollen flora.	5
	3rd	**Melissopalynology**: Bee and bee foraging, pollen load, pollen in honey, identification of bee flora and preparation of bee flora calendar, marker pollen, bee flora- importance and management.	3
	4th	**Aeropalynology**: Principles, pollen productivity, buoyancy, frequency, dissemination, distribution and dispersion principles, pollen as pollutants, scope and importance.	3
Test (10 Hours)	5th	**Palayopalynology**: Principles, microfossils, reconstruction of vegetation; relation with archaeology and palaeobotany, tracing of pollen in geological era, scope and importance.	3
	6th	**Pharmacopalynolog**y: Pollen in nutrition and health, allergy in forensic medicine, scope and importance.	3
	7th	**Biogenic palynology**: Pollen as biological material, relation to agriculture, horticulture and plant improvement	4
	Revision: 1st & 2nd in-course		

Books Recommended

Embryology

1. Maheswari, P. 1950: An Introduction to the Embryology of Angiosperms. Tata McGraw Hill Pub. Co. Ltd. Bombay, New Delhi.
2. পাশা, এম. কে., ২০০৬: উদ্ভিদ ভ্রূণবিজ্ঞান, কবির পাবলিকেশন্স, ঢাকা।

Palynology

1. K. Faegri and J. Iversen. 1990: A Text Book of Modern Pollen Analysis. Copenhagen.
2. P.K.K. Nair, 1985: Essentials of Panynology. Asia Publishing House. New Delhi.
3. G. Erdman, 1952: Pollen Morphology & Plant Taxonomy, Waltham Mass, USA.
4. G. Erdtman 1954: An Introduction to Pollen Analysis. Waltham Mass, USA.
5. R.B.Knox.1979. Pollen and Allergy. Edward Arnold. London.
6. পাশা, এম. কে. ২০০৮: পরাগরেণু বিজ্ঞান, বাংলা একাডেমী, ঢাকা।

Course Code: 3076 **Assigned Course Teacher: Nurun Nesa Khatun**

Course Title: Plant Anatomy, Cytology and Cytogenetics **ANM Al Mamun Chow. Nasima Khatun. Konon Kanti Sarkar**

Marks: 100, Credits: 4, Class Hours: 60

EXAM	Chapter	Content	Hours
		PLANT ANATOMY, CYTOLOGY AND CYTOGENETICS	
1st In-course (25 Hours)	**ANATOMY** 1st	**Cell and Cell wall**: Origin, development, gross and ultra-structure and different types of thickenings. The middle lamella– origin development, structure and functions, sculpture, modification and chemical nature of cell wall.	5
	2nd	**Meristematic tissues**: Origin, classification and differentiation; theories related to differentiation of apical meristem; apical cell theory and Tunica-corpus theory, modification of Tunica-corpus concept.	4
	3rd	**Permanent tissue**: Structure and function of parenchyma, collenchyma and sclerenchyma; Secretory and excretory tissues- glandular and laticiferous..	3
	4th	Primary structure of stem, root and leaf	1
	CYTOLOGY 1st	**Introduction**: Definition, historical background of cytology	2
	2nd	Concept of prokaryotic and eukaryotic cells and their differences.	1
	3rd	**Ultra-structure of eukaryotic cell**: Detailed structure and function of cell organelles, chloroplast and mitochondria, ribosome, lysosome, endoplasmic reticulum, golgibody and nucleus.	2
	CYTOGENETICS 1st	**Introduction**: Definition, scope of Cytogenetics.	2
	2nd	**Chromosomal aberration**: A general account and classification	
	3rd	**Deletion:** Definition, kinds, Genetic detection, phenotypic and genotypic effects, breakage-fusion bridge cycle.	2
	4th	**Duplication**: Definition, kinds, genetic detection, position effect	1
	5th	**Inversion**: Definition, kinds, synopsis in inversion heterozygote, consequences of 2-strands, 3-strands and 4-strands double cross over (one extra and another intra loop) of a paracentric inversion heterozygote	2
2nd In-course (25 Hours)	Anatomy 5th	**Normal secondary growth in dicot stem and root**: Formation of annual rings, heart wood, sap wood and formation of periderm.	2
	6th	**Anomalous secondary growth**: In the stem of *Boerhaavia*, *Amaranthus* and *Dracaena*	2
	7th	Root-stem transition in plants	1
	8th	**Stomata**: Definition, origin, development, types, structure and function	1
	Cytology 4th	**Physical and chemical structure of chromosome**: Structure and chemical nature of chromatin; nucleosome -shape and organization up to chromosome; histone – physicochemical characters; non-histone proteins	2
	5th	**Cell division**: Mitosis and cell cycle; meiosis and reproductive cycle	2
	6th	**Special type of chromosome**: a) Salivary gland chromosome; b) Lamp-brush chromosome, c) B-chromosome and d) Synaptenemal complex	
	CYTOGENETICS 6th	**Translocation**: Definition, kinds, different kinds of orientation and configurations of reciprocal translocation, heterozygote at MI, formation of different gametes from those configuration, identification of chromosomes, involved in translocation.	2
	7th	**Chromosomal basis of inheritance**: Gene concept and chromosomal theory of inheritance, Parallelism between chromosomal and genetic segregation	2
	8th	**Architecture of Chromosome**: Chromosome of proto-cell, plasmids, episomes, euchromatins and heterochromatins.	2
	9th	**Polyploidy**: Definition, classification, polyploidy in plants (natural and artificial), artificial induction of polyploidy and its significance in crop improvement.	2
Revision:	**1st & 2nd in-course**		10

Books Recommended

1. Akhtaruzzaman, M. 1997: Koshbidhya (3rd. Ed.), Hassan Book House, Dhaka.
2. Akhtaruzzaman, M. 1997: Kosh-Bangshagatibidhya, Bangla Academy, Dhaka.
3. Garber, E.D. 1992: Cytogenetics, McGraw Hill inc., New York.
4. Moore, D.M. 1976: Plant Cytogenetics. Chapman and Hall Ltd., England.
5. Schulz-Schaeffer, J. 1980: Cytogenetics. Springer-Verlag, New York.
6. Sinha, U. and S. Sinha. 1997 : Cytogenetics, Plant Breeding and Evolution. Vikas Pub. House Pvt. Ltd., New Delhi.
7. Swaminathan, M.S., P.K. Gupta and U. Sinha. 1983: Cytogenetics of Crop plants. MacMillan Ltd., New Delhi.
8. Swanson, C.P., T. Merz and W.J. Young. 1982: Cytogenetics: The Chromosomes in Division, Inheritance and Evolution. (3rd. Ed.). Reprint. Prentice Hall of India. Pvt. Ltd., New Delhi.
9. আহমেদ, সামসুদ্দিন, ২০০০ : সাইটোজেনেটিকস্। বাংলা একাডেমী, ঢাকা।

Course Code: 3077 **Assigned Course Teacher: Dr. Md. Razaul Karim**
Course Title: Genetics and Microbial Genetics **Nurun Nesa Khatun**
Marks: 100, Credits: 4, Class Hours

EXAM	Chapter	Content	Hours
	1st	**Mendelian principles**: Mendel's law of inheritance; exception of Mendel's laws.	5
1st In-course (25 Hours)	2nd	**Physical and chemical basis of heredity**. Chromosome and DNA as the basis	4
	3rd	**Interaction of genes**: Complementary, duplication, epistatic and additive gene interaction, complete and incomplete dominance in Snapdragon (3:6:3:1:2:1:1).	6
	4th	**Linkage and crossing over**: Linked gene and recombination in linked gene; gene mapping in diploid; gene sequences, interference and coincidence.	6
	5th	**Sex determination**: Chromosomal and genetic basis of sex determination; sex linked, sex limited and sex influenced characters	4
2nd In-course (25 Hours)	6th	**Allelism and pleiotropism**: Multiple and pseudoalleles, pleiotropism	3
	7th	**Quantitave inheritance**: Pur line and multiple factor hypothesis, polygenic inheritance.	4
	8th	**Fine structure of gene**: Chemical concept of gene, development of the concept of cistron, recon, muton.	6
	9th	**Biochemical genetics**: Gene-protein relationship, one gene-one enzyme hypothesis, isolation of biochemical mutation.	6
	10th	**Mutation**: Discovery, causes and classification of mutation, role of mutation in evolution, CIB, detection of autosomal mutation, biochemical mutants- prototrophs and auxotroph selection, auxotroph classification.	6
Test (10 Hours)	11th	**Cytoplasmic inheritance**: Inheritance of variegated leaves in higher plants, inheritance of extranuclear genes, maternal inheritance, general idea of plasmid and episome.	4
	12th	**Population genetics**: - Hardy-Weinberg law and its conditions, forces of evolution.	3
	13th	**Mating systems in bacteria**: Partial genetic transfer, conjugation, transduction, transformation and extra- chromosomal elements and inheritance in Bacteria (Plasmids).	3
	Revision: 1st & 2nd in-course		

Books Recommended

1. Benjamin Lewin. 2000: Gene 2000. Oxford University Press , NY.
2. Gordner, E.J. 1960: Principles of Genetics. John Wiley and Sons, Inc. New York, London.
3. Singleton, W.R. 1967: Elementary Genetics. D. Von Nostrand Co., Inc., Canada.
4. Sinnot, E.W., L.C. Dunn and Th. Dobzlaansky. 1985: Principles of Genetics. (5th ed.). McGraw Hill Book Co. Inc., New York, London.
5. Snustad, D.P., *et al.* : Principles of Genetics, John Willey & Sons, Inc.
6. Strickberger, M.W. 1996: Genetics. MacMillan Pub. Co. Inc., New York, London.
7. Whitehouse, H.L.K. 1973: Towards and Understanding of the Mechanism of Heredity, Edward Arnold. England.
8. ইসলাম, এ. এস. ১৯৮৪ : বংশগতি বিদ্যার মূল কথা, বাংলা একাডেমী, ঢাকা।
9. আখতারুজ্জামান, ম. : বংশগতি বিদ্যা, হাসান বুক হাউজ, ঢাকা।

Course Code: 3078 **Assigned Course Teacher: Md. Shariful Islam**

Course Title: Agronomy, Horticulture and Aforestation **Md. Montaz Ali Sarkar**

Marks: 100, Credits: 4, Class Hours: 60

EXAM	Chapter	Content	Hours
	1st	**Introduction**: Definition and scope of Agronomy and Horticulture and Aforestation	5
1st In-course (25 Hours)	2nd	**Tillage**: Purpose, types, merits and demerits, agricultural implements	4
	3rd	**Fertilizer**: Classification of fertilizers and its application, manures, irrigation.	4
	4th	**Cropping**: Crops and cropping, Mono- and multiple relay intercropping and mixed cropping, cropping system, and crop rotation.	4
	5th	**Botany, cultivation and management of crops**: Rice, Wheat, Jute, Sugarcane, cotton and mustard.	4
	6th	**Weeds**: Weeds of the fields, their harmful and beneficial effects and control measures.	4
2nd In-course (25 Hours)	7th	**Horticultural Propagation**- details about cutting, layering, budding, thinning, pruning, grafting, and their merits and demerits; use of root inducing substances in stem cutting propagation.	5
	8th	**Preparation of seed bed**: Sowing and seedling growth composition, doses, application time and procedures.	4
	9th	**Irrigation**: Sources of irrigation water, classification of irrigation system, methods of irrigation, quality of irrigation water and water requirements of crop plants.	3
	10th	**Branches of horticulture**: Classification of horticultural plants with examples.	3
	11th	**Horticultural aspects and cultivation of following**: (i) Vegetables: Potato, Brinjal, Tomato, Lady's finger, and cabbage; (ii) Fruits: Mango, Jackfruit, Papya, Guava,and Lemon (iii) Flowers: Rose, Chrysanthemum and Orchid.	10
Test (10 Hours)	12th	Pre- and Post care seedling, transplantation of seedlings, pruning and training- objectives, method, merits and demerits.	2
	13th	Problems of cultivation of hortucultural plants in plain land and hilly regions of Bangladesh	3
	14th	Concept and components of social forestry and agroforestry.	2
	15th	**Aforestation**: Selection of plants for homestead and forestry; role of social aforestation programme .	3
	Revision: 1st & 2nd in-course		

Books Recommended

1. C.C.Webster. 1980. Agriculture in the tropics. Longman Groups, Ltd. London.
2. A.Alim. 1974. An Introduction to Bangladesh Agriculture.
3. Sadhu, M.K. 1989 : Plant Propagation. New Age Int. Pub. Ltd.

Practical - I
Course Code: 3079
Marks: 75 Credits: 3 Class Hours: 60

Plant Pathology : 10 Marks

1. Preparation and staining of plant pathogenic specimens.
2. Study of symptoms and causal organisms of common plant pathogenic fungi covered in theory.
3. Preparation of Bordeaux mixture
4. Preparation and sterilization of culture media for fungal growth.
5. Collection, identification and preservation of viral, bacterial and fungal specimens for phytopathological herbarium.

Taxonomy of Angiosperms : 25 Marks

1 Study of morphological features and use of taxonomic terms of plant parts, inflorescence and flowers.
2 Study and identification of angiosperm plants up to families with the help of a suitable key of the locally available specimens included in the syllabus.
3 Collection and preparation of herbarium specimens of at least 50 species from different areas of Bangladesh and arrange , and submit those after following a classification.
4 Preparation of field note book and excursion report, to be submitted during examination.

Economic Botany practical: 10

1 Study and identification of economically important plants, plant parts and finished products of Bangladesh included in the syllabus.
2. Collection identification of and uses of ethnobotanical samples.

Ethnobotany practial: 10 Marks

1. Identification, naming and uses of some of common local plant material culture.
2. Plant part used and process of preparation of the identified etnobotanical material.

Practical of Pharmacognosy: 15 Marks

Preparation of herbarium at least 40 important medicinal plants of Bangladesh.
Methods of preparation of different reagents for qualitative test of
(i) Alkaloids,
(ii) Terpenoids,
(iii) Flavinoids.
Qualitative test for alkaloids – spot test by Mayers, Dragendorff, Wagner, Hagers and tannic acid.
Production procedures (methods of production) of marketable items (powder, tablet paste, solution/liquid etc.).
Databases – types.

Practical - II
Course Code: 3080
Marks: 75 Credits: 3 Class Hours: 60

Embryology Practical: 8 Marks

Study of ovule and anther (morphology and anatomy).
Germination of pollen grain and development of pollen tube.
Study of embryo-sac through permanent slides.

Practical of Palynology: 8 Marks

1. Techniques of Pollen collection, preparation and study of permanent pollen slide preparation.
2. Morphology and identification of taxa of common plants by using pollen morphology.
3. Pollen trapping from atmosphere and their study.
4. Pollen study in honey samples.

Plant Anatomy Practical: 14 Marks

1. Preparation of stains: Safranin and fast green, dehydrating agents- alcohol, clearing agents- xylol and clove oil.
2. Study of different of type cells and their wall sculptures in macerated tissues.
3. Transverse and longitudinal sections of *Helianthus*, *Cucurbita* and *Canna* stem.
4. Study of primary and secondary structure of stem, root and leaf.
5. Study of wood of common timber plants.
6. Preparation of permanent slides (double staining) with free hand sections.

Cytology practical: 10 Marks

Preparation of fixative: Conroy's fluid.
Preparation of stain: Acetocarmine.
Study of mitosis in onion root tip cells by acetocarmine squash method.
Study of meiosis in onion/ rhoeo discolor/Setcrassea.

Cytogentics practical: 10 Marks

1. Studies of interchange complex in *Rheo discolour*.

Determination of centromeric type, centromeric index, relative length and chromosome formula from the supplied data.

Genetics practical: 10 Marks

1. Verification of monohybrid and dihybrid F2 ratios by chi-square test.
2. Studies of interaction of genes with the use of maize cob showing segregation of grain color/supplied data.

Agronomy and Horticulture and Aforestry practical: 15 Marks

Identification of different types of fertilizer and seeds of important crops
Seed bed preparation in field and pot preparation for using seedlings.
Transplantation of seedlings, pre- and post- transplanting care.
Viability test of seeds; seed germination and calculation of percentage of germination.
Techniques of vegetative propagation: Cutting, budding, grafting and layering

National University
Subject: Botany
Syllabus for Four Year B.Sc. Honours Course
Effective from 2009-2010 Session

Course content and marks distribution

Fourth Year

Course Code	Course Title	Marks	Credits
3082	Plant Physiology	100	4
3083	Plant Biochemistry	100	4
3084	Ecology and Environmental Science	100	4
3085	Limnology & Aquaculture and Soil & Plant Nutrition	100	4
3086	Plant Breeding and Biostatistics	100	4
3087	Molecular Biology and Bioinformatics	100	4
3088	Plant Biotechnology and Genetic Engineering	100	4
3089	Research Methodology	50	2
3090	Practical Course- I	75	3
3091	Practical Course- II	75	3
1582	History of the Emergence of Independent Bangladesh	100	4
3092	Viva-voce	50	2
	Total =	**1050**	**42**

Course Code: 3082 **Assigned Course Teacher: Najma Sultana**

Course Title: Plant Physiology **Zannatul Ferdous**

Marks: 100, Credits: 4, Class Hours: 60

EXAM	Chapter	Content	Lectures
1st In-course (20 Lectures)	1st	**Life-related physico-chemical phenomena**: Physiology and life, colloids, diffusion, osmosis, plasmolysis, imbibition, osmotic pressure and root pressure.	**4**
	2nd	**Absorption of water**: mechanism of absorption, active and passive absorption, external factors affecting absorption of water; translocation of water, path of translocation of water, mechanism of translocation, different theories on transpiration pull and adhesion-cohesion theory.	**4**
	3rd	**Transpiration:** Overview of transpiration, types of transpiration, mechanism of trans piration, mechanism of opening and closing of stomata, significance of transpiration.	**4**
	4th	**Photosynthesis**: Overview of photosynthesis, photosynthetic pigments, light dependent reaction: action of light, photophosphorylation, light independent reaction: assimilation of CO_2, Calvin cycle, Hatch and Slack cycle, Crasssulacean acid metabolism; comparison fo C_3, C_4 and CAM path ways, factors affecting photosynthesis.	**8**
2st In-course (20 Lectures)	5th	**Respiration and fermentation**: Definition and types of respiration, glycolysis, pyruvate to acetyl CoA formation, TCA cycle, electron transport system, respiratory quotient, anaerobic respiration; definition of fermentation, alcohol fermentation.	**8**
	6th	**Plant Growth Regulators**: Discovery, classification, distribution, chemical nature of plant growth regulators; physiological effects of auxin, gibberellins, cytokinine, abscisic acid.	**6**
		Photoperiodism: An overview, photoperiodic induction, importance of dark period, critical photoperiod, perception of photoperiodic stimulus, discovery and distribution of phytochrome, physical and chemical properties of phytochrome, physiological effects of phytochrome.	**6**
Test (20 Lectures)	7th	**Vernalization:** Brif history, vernalization and flowering, site of perception of vernalization, mechanism of vernalization, devernalization, factors affecting vernalization.	**5**
		Physiology of Seed: Seed structure and development, viability of seeds, germination process and types of germination, conditions necessary for germination; physiological, biochemical and other changes accompanying seed germination; overview of seed dormancy, causes of seed dormancy, methods of breaking dormancy, advantages of dormancy of seed.	**5**
		Plant Growth: Plant growth curve, phases of growth; factors affecting plant growth, types and causes of senescence.	**5**
		Revision	**5**

Books Recommended

1. Devlin, M.R. and H.F. Witham. 1986: Plant Physiology (4th. Ed.). CBS Publishers and Distributors, Delhi.
4. Pandey, S.N. and B.K. Sinha. 1990: Plant Physiology (2nd. Ed.). Vikash Pub. House Pvt. Ltd.
5. Salisbury, F.B. and C. Ross. 1969 : Plant Physiology. Wardsworth Pub. Co. Inc., Belmont, California.
6. Srivastava HS 1991. Elements of Biochemistry, Rastogi Publications, Shiraji Road, Meerut, India.
৭. কর্মকার, যদুলাল. ২০০০ : উদ্ভিদ শরীর বিজ্ঞান, হাসান বুক হাউজ, ঢাকা।

Course Code: 3083 **Assigned Course Teacher: Dr. ANM Al Mamun Chow.**

Course Title: Plant Biochemistry **Zannatul Ferdous**

Marks: 100, Credits: 4, Class Hours: 60

EXAM	Chapter	Content	Lectures
1st In-course (20 Lectures)	1st	**Introduction**: Name and distribution of biochemical substances in plants.	**2**
	2nd	**Carbohydrate**: Introduction to carbohydrates, types of carbohydrates, chemistry and distributions of monosaccharides, oligosaccharides (sucrose, maltose, lactose and cellobiose) and polysaccharides (starch, cellulose and glycogen).	**5**
	3rd	**Amino acids**: General structure, classification of amino acids, essential and non essential amino acids, protein and non-protein amino acids, industrial importance of amino acids.	**4**
	4th	**Proteins**: Biochemistry, structure, classification, functions of proteins.	**4**
	5th	**Lipids**: Overview of lipids, Saturated and unsaturated fatty acids, structure and functions of triglycerides, phospholipids, glycolipids, oxidation of fatty acids.	**5**
2st In-course (20 Lectures)	6th	**Membrane Chemistry**: Chemical nature of plasma membrane, structure and functions.	**2**
	7th	**Enzymes**: Overview of enzymes, classification kinetics of enzymes. structure and mechanisms, (lock and key model, induced fit model), holoenzyme and apoenzyme, coenzyme and cofactors, enzyme inhabitors.	**5**
	8th	**Terpenoids**: Main classes of plant terpenoids, path of terpenoid biosynthesis in plants; essential oils; di-terpenoids and gibberellins; tri-terpenoids and steroids; tetraterpenoids-carotenoids.	**5**
	9th	**Alkaloids**: History, chemistry, distribution, classification, major alkaloids and their plant families, importance of alkaloids.	**4**
	10th	**Phenolic Compounds**: Introduction to phenolic compounds, shikinic acid pathway, Flavonoids: chemistry and distributions, properties of the different flavonoid classes, anthocyanisns, importance of phenolic compounds	**4**
Test (20 Lectures)	11th	**Vitamins**: Introduction to vitamin, source and types of vitamins, importance.	**4**
	12th	**Principles of Some Biochemical Methodologies**: Spectrophotometry, Centrifugation, Chromatography.	**4**
		Revision	**12**

Books Recommended :

1 Conn EE and PK Stumpf 1972. Outlines of Biochemistry (3rd edn.), John Wiley & Sons.Inc.
2 Goodwin, T.W. and E.I. Mereer. 1983: Introduction to Plant Biochemistry (2nd. Ed.). Pergamon Press.
3 Harborne JB 1973. Phytochemical methods. Chapman and Hill, London.
4 Jain, J. L. 1983: Fundamental of Biochemistry (2nd. Ed.). S. Chand and Co. Ltd. New Delhi.
5 Lehninger AL 2005. Principles of Biochemistry (4th edn.), Freeman and Company, New York.
6 Mahler HR and EH Cordes 1971. Biological Chemistry, 2nd edn., Harper and Row.
7 Sivastava, H.S. 1990: Elements of Biochemistry. Rastogi Publication, Meerut.
8 Varner, J.E. and J. Bonner. 1965: Plant Biochemistry. Acad. Press, New York, London.

Course Code: 3084 **Assigned Course Teacher: Nasima Khatun**

Course Title: Ecology and Environmental Science **Afroza Akter**

Marks: 100, Credits: 4, Class Hours: 60

EXAM	Chapter	Content	Lectures
1st In-course (25 Lectures)	Ecology 1st	**Introduction**: Definition, history and scope of Ecology.	**2**
	2nd	**Plant succession**: Types and causes of succession, hydrosere and xerosere.	**3**
	3rd	**Ecosystem**: Definition, structure, components, functions and types of ecosystem; habitat and ecological niche; trophic level and trophic stucture; energy flow in ecosystem; food chains, food webs and ecological pyramids, ecological efficiencies, dynamics of aquatic and terrestrial ecosystems.	**5**
	4th	**Plant adaptations**: Morphological, anatomical and physiological adaptive features of hydrophytes, xerophytes, mesophytes.	**5**
	Environmental Scince 1st	**Introduction**: Definition, aims and objectives, plant and environmental relationship.	**2**
	2nd	**Environmental components**: Atmosphere, hydrosphere, lithosphere, biosphere and their importance	**4**
	3rd	**Natural resources**: Concept and types- water, land, biological, mineral, energy, wildlife, ocean and human resources and their impact on environment.	**4**
2st In-course (25 Lectures)	Ecology 5th	**Forest ecology**: Introduction to forest, types of forest, dominant plants of deciduous, semi-evergreen and tidal forest of Bangladesh and their edaphic features..	**4**
	6th	**Phytogeographical region of world:** Brief account of Phytogeograhpical regions of the world and Indian sub-continent, interactions among floristic plant geography.	**4**
	7th	**Methods of studying vegetation**: Quantitative and qualitative analysis, measurements of vegetation by quadrate, transect and point methods, Study of communities, community dynamics, classification of community.	**4**
	8th	**Role of green plants in nature with reference to** : i) The sun- a thermonuclear energy source, ii) Radiant energy, iii) Human population and food supply.	**3**
	Environmental Scince 4th	**Global environmental issues**: Population explosion, effects of population explosion on the environment.	**3**
	5th	**Drought and desertification**: Drought and aridity index; drought and desertification caused by human activity; prevention and reversal of desertification.	**3**
	6th	**Pollution**: Definition, types of pollutants and pollution; causes and effects of pollution; nature, sources and causes of water and air pollution, control of water and air pollution.	**4**
Test (10 Lectures)	Ecology 9th	**Bio-geochemical cycles:** Introduction to bio-geochemical cycles, types, carbon and nitrogen cycle.	**3**
	Environmental Scince 7th	**Green house effects**: Introduction to green house effects, sources and effects of green house gases, ozone layer depletion, green house gases and the world climate, control of green house gases, Carbon dioxide and the world climate.	**3**
		Revision	**4**

Books Recommended (Ecology)

1. Bannister, P. 1976: Introduction of Physiological Plant Ecology. Blackwell Scientific Publications.
2. Doubenmire, R. F. 1974: Plants and Environment. (3rd. Ed.). Wiley International .
3. Daubenmire, R. F. 1974: Plant Communities – A Text Book of Synecology. Harper and Row Publ. London.
4. Etherington, J. R. 1971: Environmental and Plant Ecology. John Wiley and Sons, Inc., New York.
5. Kershaw, K. A. 1973: Quantitative and Dynamic Plant Ecology, Edward Arnold Ltd.
6. Krebs, C. J. 1978: Ecology: The Experimental Analysis of Distribution and Abundance, Harper International.
7. Kumar, H. D. 1995: Modern Concepts of Ecology, Vikash Pub. House, India.
8. Muller Dombois, D. and H. Ellenberg. 1974: Aims and Methods of Vegetation Ecology, John Wiley & Sons. Inc., New York.
9. Odum, E. P. 1971: Fundamentals of Ecology. Toppan Co. Ltd. Japan.
10. Poole, R. W. 1974: An Introduction of Quantitative Ecology. McGraw-Hill Book Co., NY.
11. Sharma, P. D. 1995: Ecology and Environment. Rastogi Pub., New Delhi.
12. Shukla and P. S. Chandel. 1991: Plant Ecology and Soil Science, S. Chand & Co., India.
13. Waisel, J. 1972: Biology of Halophytes. Academic Press, London.

Books Recommended (Environmental Science

1. Asthana, D. K. and M. Asthana. 1985: Environment : Problems and Solutions, S. Chand & Co.
2. Baldwin, J. H. 1988: Environmental Planning and Management. Int. Book. Dist.
3. Bhatia, H.S. 1998: A Text Book on Environmental Pollution and Control. Galgotia Pub.
4. Chiras, D.D. 1984: Environmental Science. The Benjamin Pub. Co. Inc.
5. Gain, P.S. Moral and P. Raj. 1998: Bangladesh-Environment: Pacing the 21st century. SHED, 44/D, West Panthapath, Dhanmondi, Dhaka-1205, Bangladesh.
6. Jeffries, M.J. 1997: Biodiversity and Conservation. Routledge, London and New York.
7. Kemp, D.D. 1990 : Global Environmental Issues. Routledge.
8. Pandey, G.N. 1999 : Environmental Management. Vikas Pub. House.
9. Santra, S.C. 2001 : Environmental Science. New Central Book Agency, Calcutta.
10. Shukla, R.S. and P. S. Chandel. 1991: Plant Ecology and Soil Science. S. Chand & Co., India.
11. Srivastava, N.Y. 1997 : Environmental Pollution. Ashish Pub. House.
12. Trivedi, R.N. 1997 : A Text Book of Environmental Science. Anmol Pub.
13. Watt, K. F. 1973 : Principles of Environmental Science. McGraw Hill Book Co. New York.

Course Code: 3085 **Assigned Course Teacher: Nurun Nesa Khatun**

Course Title: Limnology and Aquaculture and Soil & Plant Nutrition **Afroza Sultana**

Konok Kanti Sarkar

Marks: 100, Credits: 4, Class Hours: 60

EXAM	Chapter	Content	Lectures
1st In-course (25 Lectures)	Limnology 1st	**Introduction**: Definition, history, classification and scope of limnology, Differences between hydrobiology and limnology, hydrologic cycle.	2
	2nd	**Distribution of fresh water**: Ponds, lakes, rivers and estuaries, aquatic resources of Bangladesh.	3
	3rd	**Lakes**: Definition, origin and distribution, lake basins, zonation and classification of lakes, Special types of lakes, important lakes of world, natural lakes of Bangladesh.	5
	4th	**Physical factors of inland water**: Light and water, source, quality and role of light in aquatic ecosystems, calculation in lentic and lotic waters, water color, thermal stratification and mixing, density of water, cohesion, viscosity and surface tension, classification of lakes depending of mixing, water movement and flow.	5
	Soil & Plant Nutrition 1st	**Soil**: Soil as a natural body, dynamic nature of soil, major components of soil and soil profile.	2
	2nd	**Soil water**: Forms, saturated and unsaturated water, field capacity, water flow/movement, water stress and water logging.	4
	3rd	**Soil organic matter**: Definition, humus, humification and effects on soil properties.	2
	4th	**Soil fertility and productivity**: Concepts fertility and productivity relationships, soil fertility problems and management of saline, alkaline and acid soils; soil erosion and conservation.	2
2st In-course (25 Lectures)	Limnology 5th	**Chemical features of inland water:** Dissolved oxygen, salinity, conductivity, carbonate, bicarbonate, pH, nitrogen, phosphorus, silica and diatom growth, trace elements.	4
	6th	**Structure and productivity of aquatic habitat:** Introduction to productivity, methods of measuring primary productivity of aquatic habitats.	4
	7th	**Eutrophication:** Brief account on eutrophication, causes and effects of eutrophication.	4
	8th	**Aquatic flora:** Phytoplankton, Algae, Macrophytes, aesthetic and economic value.	3
	9th	**Aquaculture:** Introduction to aquaculture and aquatic resource management, natural productivity of ponds/ lakes; maintenance and improvement of ponds/lakes and methods of phytoplankton culture.	3
Test (10 Lectures)	Soil & Plant Nutrition 5th	**Plant Nutrition**: Introduction to plant nutrition, essential elements; criteria of essential elements; micronutrients and macronutrients, role and deficiency symptoms of essential elements.	3

	6th	**Ion absorption of plants**: Factor affecting ion absorption, barrier of ion absorption, structure of plasma membrane, mechanism and types of ion absorption, passive absorption (Donnan equilibrium and cation exchange theory), active absorption (evidence of active absorption; carrier concept; and anion respiration or Lundegardth theory).	**3**
	7th	**Pathways of translocation of ions**: Apoplastic and symplastic pathway, upward movement of ions.	**1**
	8th	**Water and sand culture**: Introduction to water and sand culture, techniques of water culture, advantages and disadvantages of water culture.	**1**
		Revision	**2**

Books Recommended

1. Agarwal, K.C. : Limnology
2. Goldman, C.R. and A.J. Horne. 1983: Limnology. McGraw Hill Inc. Book Co., Tokyo.
3. Khan, M.S. and M. Halim. 1987: Aquatic angiosperms of Bangladesh. Bangladesh Naional Herbarium, BARC, Dhaka.
4. Welch, S. Paul. 1952: Limnology. McGraw-Hill Book Co.
5. Wetzel, R.G. 1983: Limnology, W.B. Saunders Co. London.
6. Wetzel, R.G. and G.E. Likens. 1979: Limnological Analysis. W.B. Sunders Co. Philadelphia, USA.
7. Cole,G.A. 1979:Text Book of Limnology. The Mosby Co. London
8. খন্দকার মনির ুজ্জামান, ১৯৯৪ : লিমনোলজী, ঢাকা বিশ্ববিদ্যালয় প্রকাশনা, ঢাকা।

Books Recommended

1. Epstein, E. 1972. Mineral Nutrition of Plants: Principles and Perspectives. John Wiley and Sons, Inc.
2. Gauch, H.G. 1982. Inorganic Plant Nutrition. Dowdess, Hutchinson & Ross, Inc.
3. Marschner, H. 1992. Inorganic Nutrition of Higher Plants. Academic Press, New York.
4. Sutchiffe. J.F. and F.S. Baker. 1984. Plants and Mineral Salts. Edward Arnold, London.
5. Hewitt, E.J. and T.A. Smith. 1974. Plant Mineral Nutrition. The English University Press, London.

Course Code: 3086 **Assigned Course Teacher: Dr. Md. Razaul Karim**

Course Title: Plant Breeding and Biostatistics **Md. Shariful Islam**

Marks: 100, Credits: 4, Class Hours: 60 **Md. Montaz Ali Sarkar**

EXAM	Chapter	Content	Lectures
1st In-course (25 Lectures)	Plant Breeding 1st	**Introduction**: Definition, scope and objectives of Plant Breeding.	2
	2nd	**Origin and domestication of crops**: Centre of origin of crop plants, importance of this concept in plant breeding, domestication of crops.	3
	3rd	**Plant genetic resources**: Definition, collection, evaluation and conservation (*ex situ* and *in situ*) of germplasm, use of germplasm in plant breeding programmes.	3
	4th	**Reproductive biology and plant breeding**: Pollination mechanism in plant improvement, self incompatibility and male sterility and their significance in crop breeding.	3
	5st	**Hybridization**: Objectives, techniques and importance of artificial hybridization.	2
	6th	**Breeding techniques in self and cross-pollinated crops**: Method, merit and demerits of mass selection, pure line selection, pedigree method and bulk method.	4
	Biostatistics 1st	**Introduction**: Definition, need and scope of Biostatistics; continuous and discontinuous variables, population and samples, random samples.	4
	2nd	**Organization and Presentation of data**: Collection and classification of data; tabular and graphical (histogram, frequency, polygon) representation of data.	2
	3rd	**Distribution**s: Symmetrical and asymmetrical distribution, characteristics and importance of normal and binomial distribution.	2
2st In-course (20 Lectures)	7th	**Heterosis breeding**: Introduction to heterosis, hybrid vigor and inbreeding depression, genetic basis of heterosis, achievements through heterosis breeding.	4
	8th	**Mutation breeding**: Introduction to mutations	4

		breeding, artificial induction of mutation in plants, use of induced mutation technique in crop improvement, limitations of mutation breeding.	
	9th	**Backcross breeding**: Methods, merits and limitations of backcross breeding.	**4**
	10th	**Breeding for resistance to biotic and abiotic stresses:** Methods of breeding for disease, insect, drought and salinity resistance.	**3**
	Biostatistics 4th	**Measures of central tendency and dispersion**: Mean, mode and median; range, variance, standard deviation, standard error, coefficient of variation.	**3**
	5th	**Test of significance**: Null hypothesis, test of significance, t-test and X^2-test.	**2**
Test (15 Lectures)	6th	**Measure of variable association**: Simple correlation, scatter diagram, correlation coefficient, test of significance of correlation coefficient; linear regression, regression coefficient, regression equation, test of significance for regression coefficient	**5**
	7th	**Experimental and design:** Analysis of variance; F-test; one and two way classification of variance; principles of experimental design; completely randomized design (CRD), randomized block design (RBD) and latin square design.	**5**
		Revision	**5**

Books Recommended

1. Allard, R. W. 1999: Principles of Plant Breeding. (3rd. Ed.). John Wiley & Sons. Inc., New York.
2. Chaudhury, H.K. 1978: Elementary Principles of Plant Breeding. Oxford & IBH Pub. Co., New Delhi.
3. Dana, S. 2001: Plant Breeding. Naya Udyog, Calcutta.
4. Poehlman, J. M. and D. Borthakur. 1977: Breeding Asian Field Crops. Oxford and IBH Pub. Co., New Delhi.
5. Simonds, N.W. 1979: Principles of Plant Improvement. Longman Group Ltd. London.
6. Singh, B.D. 1995: Plant Breeding – Principles and Methods, (5th. Ed.). Kalyani Publishers, New Delhi.
৭. Sinha, U. and S. Sinha. 1977 : Cytogenetics, Plant Breeding and Evolution, Vikas Publ. House, Pvt. Ltd. New Delhi.
৮. ভূইয়া, এম. এস. রশীদ. ১৯৯২ : উদ্ভিদ প্রজনন, বাংলা একাডেমী, ঢাকা।

Books Recommended

1. Gomez, A. and A. A. Gomez. 1984: Statistical Procedures for Agricultural Research. John Wiley & Sons, New York.
2. Panse, V. G. and P. V. Sukhatme. 1978: Statistical Methods (3rd. Ed.). Indian Council of Agricultural Research, New Delhi.
3. Verma, B. L., G.D. Shukla and R.N. Srivastava. 1993: Biostatistics. CBS Publication, Delhi.
4. Zaman, S.M.H., K. Rahman and M. Howlader. 1980: Simple Lessons from Biometry. Bangladesh Rice Research Institute, Gazipur.
5. আলী, এম. আশরাফ, ১৯৭৯ : পরিসংখ্যান বিজ্ঞান, বাংলা একাডেমী, ঢাকা।
6. ভদ্র, এস. কে. ১৯৯২ : জীব বিজ্ঞান পরিক্ষণ নক্সা।

Course Code: 3087 **Assigned Course Teacher: Dr. Rezaul Karim**

Course Title: Molecular Biology and Bioinformatics **Konok Kanti Sarkar**

Marks: 100, Credits: 4, Class Hours: 60

EXAM	Chapter	Content	Lectures
1st In-course (20Lectures)	Molecular Biology 1st	**Introduction**: Historical development, macromolecules and store of biological information, the basis of heredity, central dogma.	**4**
	2nd	**Bio-information molecules**: Components, structure, biological and chemical properties of DNA, RNA and proteins.	**4**
	3rd	**DNA replication**: Introduction to DNA replication, semi-conservative DNA replication, mechanism of DNA replication, circular DNA replication, significance of DNA replication.	**5**
	4th	**Repair of damaged DNA molecules:** Introduction to DNA repair, photoreactivation, excision repair, post-replication recombination repair and SOS repair.	**5**
	5st	**Transcription:** Transcription mechanism, post-transcriptional modification of RNAs, RNA splicing.	**2**
2st In-course (20 Lectures)	6th	**Translation:** Genetic code, characteristic features of genetic code, code dictionary, mechanism of translation - aminoacylation, codon recognition and mechanism of protein synthesis.	**5**
	7th	**Regulation of gene expression**: General features of gene regulation, operon concept (*lac*-operon, tryptophan operon).	**5**
	8th	**Mutation**: Characteristics and classification of mutation, point mutation, mutagenesis, site-specific mutagenesis.	**5**
	9th	**Physical mapping and sequencing of genome:** Restriction enzyme, DNA fingerprinting, basic DNA sequencing, modified chain terminator, automated DNA sequencing, sequencing strategy.	**5**
Test (20 Lectures)	10th	**Bioinformatics**: Definition and basic knowledge about bioinformatics; information technology and biomolecular sequence analysis, similarity searches on sequence databases, pair-wise alignments, multiple sequence alignments, application of bioinformatics.	**5**
		Revision	**15**

Books Recommended:

1. D. Frefelder. 1990: Molecular Biology. Norosa Pub. House, New Delhi.
2. Adams, Burdon. Compbell, Leader, Smellie. 1980: The Biochemistry of the Nucleic acids, (9^{th} ed.), Chapman & Hall, London.
3. B. Lewin. 1993, 1995: Gene IV and V. N.J. Willey & Sons. N. York.
4. Alberts Bra, Lewis Raff Roberts and J. Watson, 1992: Molecular Biology of the Cell. (2^{nd}. Ed.), Garland and Pub., New York..
5. A.M.Lesk 2007. Introduction to Genomics. Oxford Univ. Press, London.
6. A.M.Campbell and L.J.Heyer 2007. Discovering Genomics, Proteomics and Bioinformatics. (2^{nd}. Ed. Low Price Edition), Pearson Education, New Delhi.
7. মোস্তফা কামাল পাশা, ১৯৯৮ এবং ২০০০। আণবিক জীব বিজ্ঞান ১ম,২য় ও ৩য় খন্ড, বাংলা একাডেমী, ঢাকা।
8. *Fundamental Concepts of Bioinformatics*, Dan E. Krane and Michael L. Raymer, San Francisco: Benjamin Cummings, 2003. ISBN: 0-8053-4633-3
9. *Bioinformatics: A Practical Guide to the analysis of genes and proteins* edited by Andreas D. Baxevanis, B.F. Francis Ouellette, New York: Wiley-Interscience, 2001, second edition. ISBN: 0-471-38391-0

Course Code: 3088 **Assigned Course Teacher: Sharmin Sultana**

Course Title: Plant Biotachnology and Genetic Engineering **Bilkis Khanam**

Marks: 100, Credits: 4, Class Hours: 60

EXAM	Chapter	Content	Lectures
1st In-course (20 Lectures)	Plant Biotachnology 1st	**Biotechnology:** Definition, scope and importance of plant biotechnology, global importance of biotechnology.	**5**
	2nd	**Recombinant DNA technology:** Gene cloning, restriction endonucleases, cloning vectors, identification and analysis of cloned genes, application and significance of recombinant DNA technology.	**5**
	3rd	**Molecular markers:** Introduction to molecular markers**,** polymerase chain reaction (PCR) and its application, random amplified polymorphic DNA (RAPD), restriction fragment length polymorphism (RFLP), application of molecular markers.	**5**
	4th	**Plant tissue culture:** Laboratory organization, sterilization techniques, plant cell and tissue culture medium, plant growth regulators, plant regeneration, callus culture, organogenesis, somatic embryogenesis, cell suspension culture, protoplast isolation and culture.	**5**
2st In-course (20 Lectures)	5th	**Application of tissue culture techniques:** Micropropagation, somaclonal variation, haploid production, production of disease free plants and commercial aspects of tissue culture	**5**
	Plant genetic engineering 1st	**Plant genetic engineering:** Introduction, gene transfer to plants, *Agrobacterium*–mediated gene transfer, Ti plasmid, vectors of plant transformation, egration, direct gene transfer methods, particle bombardment, electroporation.	**5**
	2nd	**Biogas technology**: Introduction to biogas technology, production method and uses.	**5**
	3rd	**Wastewater treatment biotechnology**: Introduction to wastewater and treatment process, types and characteristics of wastewater, wastewater treatment by activated sludge process. .	**5**

Test (20 Lectures)	4th	**Biofertilizer**: An overview of biofertilizer, major biofertilizer groups, production and uses.	**3**
	5th	**Single cell protein (SCP)**: Definition, types and importance of single cell protein, production of SCP.	**3**
	6th	**Biosafety guidelines and regulations**: Safety consideration in biotechnology, intellectual property right (IPR) related to biotechnology, biosafety guidelines.	**4**
		Revision	**10**

Books Recommended

1. Dubey, R. C. 2001: A Text Book of Biotechnology. S. Chand & Co., New Delhi.
2. Dodds, John H. and Lorin W. Roberts. 1982: Experiments in Plant Tissue Culture. Cambridge Univ. Press, Cambridge, London.
3. Kumar, H.D. 1993: Molecular Biology and Biotechnology. Vikash Publishing House Pvt. Ltd., India
4. Higgins, I.J., D.J. Best and J. Jones: Biotechnology: Principles and Applications.
5. Razdam, M.K. 1993: An Introduction to Plant Tissue Culture. Oxford & IBH Pub. Co. Pvt. Ltd., New Delhi.
6. Smith, S.E. 1996: Biotechnology (3rd ed.). Cambridge Univ. Press, Cambridge, London.
7. Biosafety guidelines of Bangladesh. Ministry of Environment and Forest, Government of the People's Republic of Bangladesh http://dbtbiosafety.nic.in/act/Bangladesh
8. ভদ্র, এস. কে. ১৯৯২ : উদ্ভিদ টিস্যু সম্পদ : প্রযুক্তি ও প্রয়োগ। বাংলা একাডেমী, ঢাকা।
9. মোস্তফা কামাল পাশা, ২০০০। আণবিক জীব বিজ্ঞান, ৩য় খন্ড, বাংলা একাডেমী, ঢাকা।

Course Code: 3089 **Assigned Course Teacher: Dr. ANM Al Mamun Chow.**

Course Title: Research Methodology **Md Shariful Islam**

Marks: 50, Credits: 2, Class Hours: 30

EXAM	Chapter	Content	Lectures
1st In-course (12 Lectures)	1st	**Research Methodology:** Introduction, characteristics of research, research and scientific methods, rationale and significance of research, types of research, research methods and methodology, qualitative and quantitative approaches of research, ethics in research.	**6**
	2nd	**Research Process:** Problem and hypothesis formulation, review of literature, research objectives, sampling techniques, collection, processing and analysis of data; interpretation of the findings.	**6**
2st In-course (10 Lectures)	3rd	**Research design:** Significance of research designs, basic principles of experimental designs, different research designs, developing a research plan, resources of research: Journals, abstracts, e-resources.	**5**
	4th	**Preparation of research reports and oral presentation:** Basic components of a research report, effective report writing, effective oral presentations, audiovisuals, benefits of using visual aids.	**5**
Test (8 Lectures)	5th	**Technical writing:** Thesis writing, preparation of bibliography, publishing a scientific paper, writing of research proposals for grant.	**4**
		Revision	**4**

Books recommended:

1. C.R. Kottaari. 1990. Research Methodology: Methods and Technique (2nd Ed.) Ram Pritograph, Delhi

2. D.V. Huntsberger and B. Billingsley. Elements of Statistical Analysis

Practical

Course Code	3090	Marks: 75	Credits: 3	Class Hours: 45
Course Title:	**Practical -I:** **Plant Physiology, Biochemistry, Ecology and Environmental Science, Limnology & Aquaculture and Soil & Plant Nutrition**			

Plant Physiology: 10 Marks

1. Chlorophyll is essential for photosynthesis.
2. Evolution of oxygen during photosynthesis at different light intensities.
3. Demonstration of stomatal transpiration by four leaves method.
4. Heat evolution during respiration.
5. Pigment separation by paper chromatography technique.
6. Demonstration of plasmolysis by *Rhoeo discolor* leaf peal.

Biochemistry: 10 Marks

1. Tests for reducing and non-reducing sugars.
2. Quantitative test for starch, lipid and protein.
3. Observation of starch grains under compound microscope.

Ecology: 10 Marks

1. Morphological and anatomical studies of hydrophytes and xerophytes.
2. Common hydrophytes and xerophytes of Bangladesh.
3. Determination of frequency, density and abundance of different species by quadrate method.
4. Study of different stomatal types of sun and shade habitats.
5. Halophytic adaptations such as pneumatophore, viviparous germination etc.

Environmental Science: 10 Marks

1. Determination of BOD/COD of polluted water of pond, lake, river etc.

2. Identification of environmentally threatened categories of plants of an area.

Limnology & Aquaculture: 15 Marks

1. Determination of water temperature, pH and Secchi depth of a pond, river, lake etc.
2. Determination of dissolved oxygen (DO), free CO_2 and alkalinity of pond water.
3. Local excursion to a pond/lake/marshy place and collection of hydrophytes, phytoplankton, macrophytobenthos and their analyses in the laboratory.
4. Study of some common macrophytes of Bangladesh: Emerging, floating, submerged and free floating (3-5 from each category).

Soil & Plant Nutrition: 5 Marks

1. Determination of soil pH.
2. Preparation of various plant nutrient solutions such as knop's solution, Hoagland solution.
3. Study of mineral deficiency symptoms.

Collections (Ecology, Limnology & Aquaculture, Plant Nutrition): 5 Marks
Practical Note Book: 10 Marks

Practical

Course Code	3091	**Marks: 75**	**Credits: 3**	**Class Hours: 45**
Course Title:	**Practical -II:** **Plant Breeding and Biostatistics, Molecular Biology and Bioinformatics, Plant Biotechnology and Genetic Engineering, Research Methodology**			

Plant Breeding: 10 Marks

1. Demonstration of hybridization technique
2. Selection and use of marker in hybridization programme.
3. Test of pollen fertility by acetocarmine.

Biostatistics: 15 Marks

1. Recording of quantitative data and presentation in tabular and graphical form.
2. Computation of mean, mode, median, variance, standard deviation and coefficient of variation.
3. Comparison of two samples mean by t-test.
4. Test for goodness of fit by χ^2 test.
5. Testing the nature and magnitude of relationship between two traits of a plant species by correlation and regression analysis.

Molecular Biology and Bioinformatics: 10 Marks

1. Isolation and characterization of DNA from plant tissue.
2. Determination of molecular weight of protein molecules using SDS PAGE gel plates.
3. Estimation of molecular size of DNA using agarose gel plate.

Biotechnology and Genetic Engineering: 15 Marks

1. The students are required to visit to different research institutes involved in biotechnological research and have to submit study report.
2. Demonstration of aseptic culture technique: Preparation and sterilization of culture/fermentation media.
3. Preparation of plant tissue culture medium such as MS medium.
4. Technique of yoghurt/cheese production.

Research Methodology: 5 Marks

1. Preparation of research assignment.
2. Designing of experiment.

Practical Note Book: **5 Marks**
Research institute visit report: **8 Marks**
Research methodology assignment: **7 Marks**

Course Code: 1582
Course Title: History of the Emergence of Independent Bangladesh
Marks: 100, Credits: 4, Class Hours: 60

EXAM	Chapter	Content	Lectures
1st In-course (25 Lectures)	1st	**Introduction:** Scope and description of the emergence of Independent Bangladesh.	**3**
	2nd	**1. Description of the country and its people.** a. Geographical features and their influence. b. Ethnic composition. c. Language. d. Cultural syncretism and religious tolerance. e. Distinctive identity of Bangladesh in the context of undivided Bangladesh.	**5**
	3rd	**2. Proposal for undivided sovereign Bengal and the partition of the Sub Continent, 1947.** a. Rise of communalism under the colonial rule, b. Lahore Resolution 1940. c. The proposal of Suhrawardi and Sarat Bose for undivided Bengal : consequences d. The creation of Pakistan 1947.	**6**
	4th	**3. Pakistan: Structure of the state and disparity.** a. Central and provincial structure. b. Influence of Military and Civil bureaucracy.	**5**

		C. Economic, social and cultural disparity	
	5th	**4. Language Movement and quest for Bengali identity** a. Misrule by Muslim League and Struggle for democratic politics. b. Foundation of Awami league, 1949 c. The Language Movement: context and phases. d. United front of Haque – Vasani – Suhrawardi: election of 1954, consequences.	**6**
2st In-course (20 Lectures)	6th	**5. Military rule: the regimes of Ayub Khan and Yahia Khan (1958-1971)** a. Definition of military rules and its characteristics. b. Ayub Khan's rise to power and characteristics of his rule (Political repression, Basic democracy, Islamisation) c. Fall of Ayub Khan and Yahia Khan's rule (Abolition of one unit, universal suffrage, the Legal Framework Order)	**8**
	7th	**6. Rise of nationalism and the Movement for self determination.** a. Resistance against cultura l aggression and resurgence of Bengali culture. b. The six point movement of Sheikh Mujibur Rahman c. Reactions; Importance and significance of the six Point movement. d. The Agortola Case1968.	**8**
	8th	**7. The mass-upsurge of 1969 and 11 point movement:** a. background b. programme significance and consequences.	**4**
Test	9th	**The war of Liberation 1971** Genocide, repression of women, refugees b. Formation of Bangladesh government and proclamation of Independence c. The spontaneous early resistance and subsequent organized resistance (Mukti Fouz, Mukti Bahini, guerillas and the frontal warfare) d. Publicity Campaign in the war of Liberation (Shadhin Bangla Betar Kendra, the Campaigns abroad and formation of public opinion) e. Contribution of students, women and the	**8**

		masses (Peoples war) f. The role of super powers and the Muslim states in the Liberation war. g. The Anti-liberation activities of the occupation army, the Peace Committee, Al- Badar, Al-Shams, Rajakars, pro Pakistan political parties and Pakistani Collaborators, killing of the intellectuals. h. Trial of Bangabondhu and reaction of the World Community. i. The contribution of India in the Liberation War j. Formation of joint command and the Victory k. The overall contribution of Bangabondhu and his leadership in the Independence struggle.	
	10^{th}	**The Bangabondhu Regime 1972-1975** a. Home coming b. Making of the constitution c. Reconstruction of the war ravaged country d. The murder of Bangabondhu and his family and the ideological turn-around.	**2**
		Revision	**5**

সহায়ক গ্রন্থ

১. নীহার রঞ্জন রায়, *বাঙালীর ইতিহাস*, দে' জ পাবলিশিং, কলকাতা ১৪০২ সাল।

২. সালাহ্ উদ্দিন আহমেদ ও অন্যান্য (সম্পাদিত), *বাংলাদেশের মুক্তি সংগ্রামের ইতিহাস ১৯৪৭-১৯৭১*, আগামী প্রকাশনী, ঢাকা ২০০২।

৩. সিরাজুল ইসলাম (সম্পাদিত), *বাংলাদেশের ইতিহাস ১৭০৪-১৯৭১*, ৩ খন্ড, এশিয়াটিক সোসাইটি অব বাংলাদেশ, ঢাকা ১৯৯২।

৪. ড. হার‍ুন-অর-রশিদ, *বাংলাদেশ: রাজনীতি, সরকার ও শাসনতান্ত্রিক উন্নয়ন ১৭৫৭-২০০০*, নিউ এজ পাবলিকেশন্স, ঢাকা ২০০১।

৫. ড. হার‍ুন-অর-রশিদ, *বাঙালির রাষ্ট্রচিন্ড়া ও স্বাধীন বাংলাদেশের অভ্যুদয়*, আগামী প্রকাশনী, ঢাকা ২০০৩।

৬. ড. হার‍ুন-অর-রশিদ, *বঙ্গবন্ধুর অসমাপ্ত আত্মজীবনী পুনর্পাঠ*, দি ইউনিভার্সিটি প্রেস লিমিটেড, ঢাকা ২০১৩।

৭. ড. আতফুল হাই শিবলী ও ড.মোঃ মাহবুবর রহমান, *বাংলাদেশের সাংবিধানিক ইতিহাস ১৭৭৩-১৯৭২*, সূবর্ণ প্রকাশন, ঢাকা ২০১৩।

৮. মুনতাসির মামুন ও জয়ন্ত কুমার রায়, *বাংলাদেশের সিভিল সমাজ প্রতিষ্ঠার সংগ্রাম*, অবসর, ঢাকা ২০০৬।

৯. আতিউর রহমান, *অসহযোগ আন্দোলনের দিনগুলি: মুক্তিযুদ্ধের প্রস্তুতি পর্ব*, সাহিত্য প্রকাশ, ঢাকা ১৯৯৮।

১০. ড. মোঃ মাহবুবর রহমান, *বাংলাদেশের ইতিহাস, ১৯০৫-৪৭*, তাম্রলিপি, ঢাকা ২০১১।

১১. ড. মোঃ মাহবুবর রহমান, *বাংলাদেশের ইতিহাস, ১৯৪৭-১৯৭১*, সময় প্রকাশন, ঢাকা ২০১২।

১২. সৈয়দ আনোয়ার হোসেন, *বাংলাদেশের স্বাধীনতা যুদ্ধে পরাশক্তির ভূমিকা*, ডানা প্রকাশনী, ঢাকা ১৯৮২।

১৩. আবুল মাল আবদুল মুহিত, *বাংলাদেশ: জাতিরাষ্ট্রের উদ্ভব*, সাহিত্য প্রকাশ, ঢাকা ২০০০।

১৪. শেখ মুজিবুর রহমান, *অসমাপ্ত আত্মজীবনী*, দি ইউনিভার্সিটি প্রেস লিমিটেড, ঢাকা ২০১২।

১৫. সিরাজ উদ্‌দীন আহমেদ, *একাত্তরের মুক্তিযুদ্ধ: স্বাধীন বাংলাদেশের অভ্যুদয়*, ইসলামিক ফাউন্ডেশন, ঢাকা ২০১১।

১৬. জয়ন্ত কুমার রায়, *বাংলাদেশের রাজনৈতিক ইতিহাস*, সুবর্ণ প্রকাশন, ঢাকা ২০১০।

১৭. Harun-or-Roshid, *The Foreshadowing of Bangladesh: Bengal Muslim League and Muslim Politics, 1906-1947,* The University Press Limited, Dhaka 2012.

১৮. Rounaq Jahan, *Pakistan: Failure in National Integration,* The University Press Limited, Dhaka 1977.

১৯. Talukder Maniruzzaman, *Radical Politics and the Emergence of Bangladesh,* Mowla, Brothers, Dhaka 2003.

২০. মেসবাহ কামাল ও ঈশানী চক্রবর্তী, *নাচোলের কৃষক বিদ্রোহ, সমকালীন রাজনীতি ও ইলা মিত্র*, উত্তরণ, ঢাকা ২০০৮।

২১. মেসবাহ কামাল, *আসাদ ও উনসত্তরের গণঅভ্যুত্থান*, বিবর্তন, ঢাকা ১৯৮৬।

Course Code	3092	**Marks: 50**	**Credits: 2**	**Class Hours: 30**
Course Title:	**Viva voce**			