This thesis describes the utility of \( \text{-acetyl coumarin} \) as a key starting material for the preparation of a novel series of coumarin derivatives and studies the antimicrobial activities of these compounds. Firstly different chalcones were synthesized, when these chalcones reacted with malononitrile, thiosemicarbazide, cyanoacetamide and ethyl cyanoacetate it gave the corresponding pyridine, pyran, pyrazole, pyridinone and \( \text{-cyanoopyridinonone} \) derivatives respectively. Also, the thesis involves studies on \( \text{-amino-} \)cyano-\( \text{-hydroxy-} \)methoxyphenyl) \( \text{-yl} \) coumarin (IIa). The compound IIa reacted with acetic anhydride and afforded pyrido[\( \text{-d}\)]\( \text{-d} \)]oxazinone derivative VIII, while acetylation with acetyl chloride afforded the compound IX which on cyclization by refluxing in pyridine for \( \text{hrs} \) gave \( \text{-dihyDROP} \)pyrido[\( \text{d}\)]\( \text{-one} \) derivative X, chloroacetylation of compound IIa afforded the compound XI, the reaction of the compound IIa with formamide in refluxing \( \text{DMF} \) and formic acid gave the compounds XII and XIII respectively, the acid hydrolysis of nitriles to amides afforded the compound XIV which was cyclized into the compound XIII by boiling in formic acid. The alkylation of compound IIa with \( \text{-halo acetic acid} \) derivatives (chloroacetonitrile and ethyl bromoacetate ) was achieved in dry acetone containing anhydrous potassium carbonate and afforded the pyrrolopyridine derivatives XV and XVI respectively, the reaction of compound IIa with active methylene compounds such as diethyl malonate, ethyl cyanoacetate and malononitrile afforded the pyridopyridine derivatives XVII-XIX respectively. The reaction of compound IIa with \( \text{p-nitro benzaldehyde} \) in ethanol afforded the pyrimidopyridine derivatives XXI, while on fusion it gave the Schiff base XX which cyclized into XXI. The reaction of compound IIa with cyclohexanone in presence of anhydrous zinc chloride afforded Tacrine analogue XXII, while the reaction of IIa with phenyl isothiocyanate and thiourea afforded pyrimidinethione derivatives XXIII and XXIV respectively. The compound IIa reacted with ethylenediamine in the presence of a catalytic amount of carbon disulfide and gave the compound XXVII which on diazotization afforded \( \text{dihydroimidazo[\( \text{e}\]pyrido[\( \text{c}\]pyridine derivative XXVIII, in the other hand diazotization of compound IIa afforded pyridopyridine derivatives XXVII, XXVIII, XXIX and XXX respectively. The refluxing of compound IIa with hydroxylamine hydrochloride in glacial acetic acid containing a catalytic amount of anhydrous sodium acetate gave pyrazolo[\( \text{-b}\)]pyridine derivative XXX. All of the newly synthesized